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Detailed Project Report (DPR) for Rejuvenation of Yamuna River Through Forestry Interventions

Volume II

State-wise Forestry Interventions



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Chapter 1

UTTARAKHAND

1.1 INTRODUCTION

Uttarakhand, formerly known as Uttaranchal, is a state in the northern part of India. The state was carved out of Uttar Pradesh on 9th November 2000, and it was renamed as Uttarakhand (meaning 'northern region') in January 2007. Uttarakhand has a highly varied landscape with snow -clad peaks, glaciers, waterfalls and rivers, lakes, alpine meadows, extensive forests, fertile valleys and plains in the south. Some of the highest peaks in the world such as Nanda Devi (7,817 m, the second highest peak in India), Kamet (7,756 m) and Badrinath (7,138 m) are located in Uttarakhand. It borders Tibet on the north; Nepal on the east; and the Indian states of Uttar Pradesh on the south, Himachal Pradesh on the west and north-west and Haryana on the south-western corner. The state has two administrative divisions, Garhwal and Kumaon, with a total of 13 districts (Fig.1.1).



Fig.1.1. Districts of Uttarakhand
(***Source:*** https://www.uttarakhand-tourism.com/map/uttarakhand-map.jpg)

1.2. GEOGRAPHICAL EXTENT

Uttarakhand is predominantly mountainous and covers an area of 53,483 km^2. The state lies between 28°43' N to 31°28' N latitude and 77°34' E to 81°03' E longitude (FSI, 2019b). About 86% part of the

state is mountainous. Physiographically, Uttarakhand can be divided into four zones, namely the Greater Himalaya, the Lesser Himalaya, the Shiwalik and the Terai region (Fig. 1.2). The northern belt of the state is part of Greater Himalaya, having snow-covered mountains and glaciers. The Lesser Himalaya and the Shiwaliks run mostly parallel to the Greater Himalaya and abound in coniferous and broadleaved forests and pastures. The Terai region is a zone of flatter terrain with high water table (Fig. 1.2). Two of the most important rivers of northern India originate in the Greater Himalaya: the Ganga at Gangotri and the Yamuna at Yamunotri.

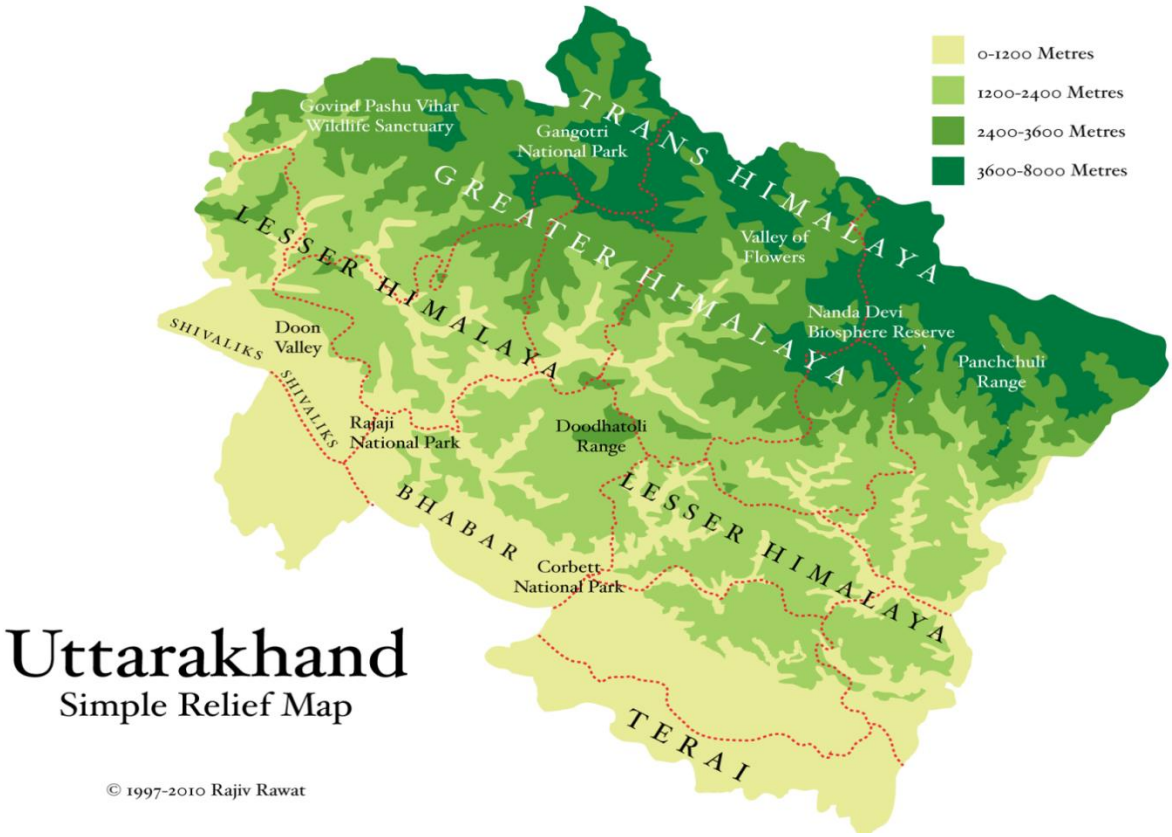


Fig.1.2. Physical map of Uttarakhand State
(***Source:*** http://uttarakhand.org/)

1.3. GEOLOGY

Geologically, the state belongs to the young folded mountains of the Himalayan systems. There are three rock constituents of the geology of Uttarakhand state. Precambrian rock forms the slopes of the region making it prone to erosion, weathering and landslides. Magnesite, talc (steatite), limestone, dolomite, etc. are the important minerals. The region experiences recurrent geological and tectonic movements and lies in a zone of high seismicity with frequent earthquakes of different scales.

1.4. TOPOGRAPHY AND SOILS

1.4.1. Topography

The topography is predominantly mountainous with exception in the south where plains occur along the foothills. The altitude of the state varies from about 250 to 7,817 m (Nanda Devi). Uttarakhand lies on the southern slope of the Himalaya. The climate and vegetation vary greatly with elevation, from

glaciers at the highest elevations to sub-tropical forests at the lower elevations. The highest elevations are covered with ice and bare rock. Below them, between 3,000 and 5,000 m are the western Himalayan alpine scrub and meadows. The temperate western Himalayan sub-alpine conifer forests grow just below the tree line. At 3,000 to 2,600 m elevation, they transit to the temperate western Himalayan broadleaf forests which lie in a belt of 2,600 to 1,500 m elevation. Below 1,500 m elevation lie the Himalayan sub-tropical pine forests. The upper Gangetic plains moist deciduous forests and the drier Terai-Duar savanna and grasslands cover the lowlands along the Uttar Pradesh border in a belt locally known as Bhabhar. These lowland forests have mostly been cleared for agriculture, but a few pockets remain.

1.4.2. Soils

The soils of Uttarakhand, in general, are shallow gritty, impregnated with unweathered fragment of parent rocks and are not very fertile. In large portion of this region, the soil is mixed with fragments of parent rock occurring within a few cm, except in valleys or depression where they go up two metre depth. The Terai zone has fertile silt texture of soil.

1.5. CLIMATE

Uttarakhand is a region of great physical diversity and as such the climate of the region is also quite diversified. Broadly, the state has a temperate climate except in the plain areas where the climate is sub-tropical with temperatures ranging from nearly zero to 43°C. In the hilly region, the climate, in general, is cold and moist and varies with altitude. Different climatic zones are identified as warm temperate (900-1,800 m), cool temperate (1,800-2,400 m), cold zone (2,400-3,000 m), alpine zone (3,000-4,000 m), glacier zone (4,000-4,800 m) and perpetually frozen zone (above 4,800 m). Throughout the state, the temperature during winter ranges from sub-zero to 15°C. The state receives 90% of its annual rainfall in the monsoon season. The eastern part of the Himalaya is subject to relatively heavier rainfall than the western part.

1.6. HYDROLOGY AND WATER RESOURCES

1.6.1. Hydrology

Uttarakhand has a mountainous tract. Precipitation in lower reaches and valleys takes place in form of rain, hail and sleet while it occurs as snow in the higher reaches. snowfall is, however, decreasing in recent time which is a cause of concern. Glaciers are the source of major rivers. Most of the rivers are perennial and known for flash floods. The total irrigation potential of Uttarakhand is 8,64,000 ha (CWC, 2013).

In the plain areas, ground water occurs in multi aquifer systems. Perched water bodies lying above the main water bearing formations are frequently encountered in Bhabar Zone and Doon Valley. Contrary to this, the occurrence of ground water in the hilly areas is limited to small, localized aquifers with limited ground water potential. Ground water in hilly terrains is found in the secondary porosity developed in crystalline igneous and metamorphic rocks in the form of fractures, joints and fissures. Low to moderate ground water potential exists in parts of the state where ground water is located in valley fill deposits of the alluvial plains and piedmont zones. The chemical quality of ground water is generally good and the water can be safely used for drinking, domestic and irrigation purpose. The available data in parts of district Dehradun, Haridwar, Udham Singh Nagar, Pauri Garhwal, Nainital, Champawat and Almora (pre-monsoon 2014) reveal that ground water is fresh and potable and, therefore, suitable for drinking and domestic purpose (Kaur, 2016).

1.6.2. River System

The Ganga and its major tributaries broadly flow in a north to south direction in Uttarakhand (Fig. 1.3). The state is often referred to as the *devbhoomi* (literally 'the land of the gods') due to the numerous temples and pilgrimage centres located mostly along these rivers.

The state is drained by river Ganga and its tributaries. The rivers are snow fed and/or forest fed (Table 1.1). The annual runoff varies from 972 Mm^3 in the Ramganga to a maximum of 5,342 Mm^3 in the Alaknanda. The rivers are the major source of drinking and irrigation water and support the aquatic flora and fauna. The power generation potential out of these resources is assessed to the tune of 40,000 MW as against of existing installed capacity of 3,200 MW under different completed micro- and mega-hydel projects.



Fig. 1.3. Major rivers in Uttarakhand
(***Source:*** www.mapsofindia.com)

i) Yamuna

The Yamuna originates from Yamunotri glacier in Uttarkashi district from the south-west slopes of the Bandarpoonch peak in the lower Himalayas, at a height of 6,315 m. The Yamuna exits Uttarakhand at Dhalipur and enters Himachal Pradesh. It drains Western Garhwal, broadly covering almost half of Western Uttarkashi, a small part of Tehri Garhwal and about two-thirds of the western region of Dehradun. The Yamuna and its tributaries also form part of the Ganga catchment.

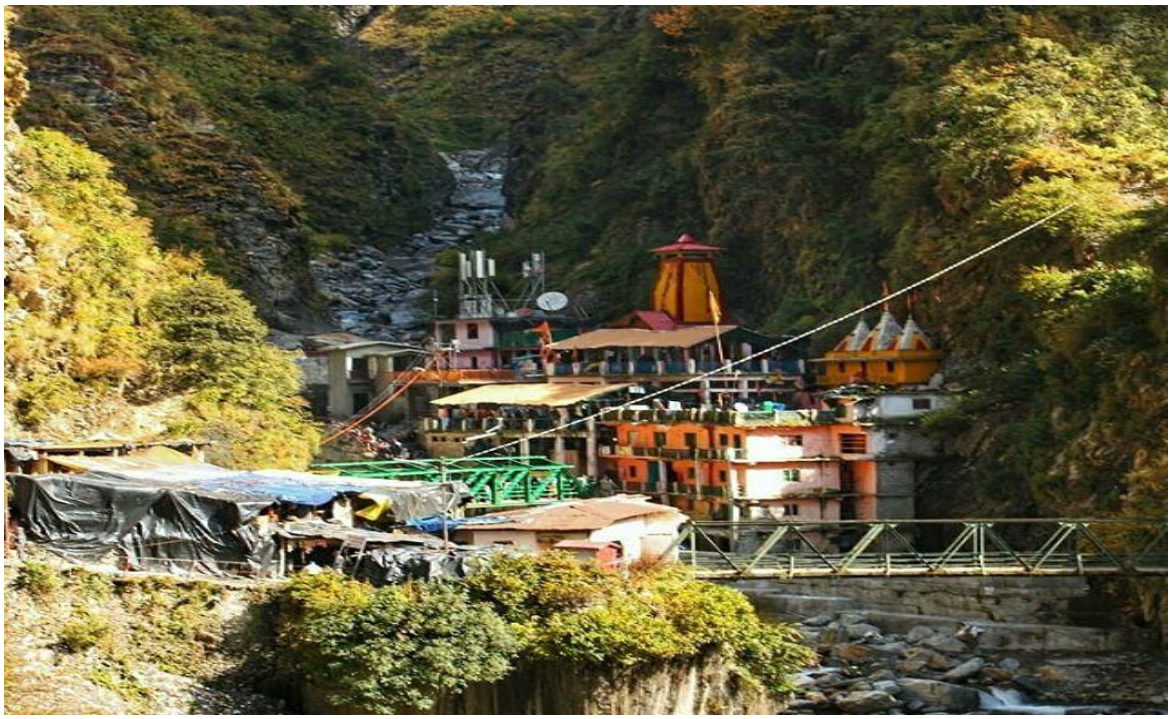


Fig.1.4. Yamunotri shrine
(***Source:*** Project Team**)**



Fig.1.5. Yamuna Valley
(***Source:*** https://iskconnews.org/giving-human-rights-to-the-yamuna-is-not-enough-new-documentary-reveals,6112)



Fig.1.6. Tons Valley
(***Source:*** https://gotraveldiscoverer.wordpress.com/2016/01/25/mori-uttarakhand)

Table 1.1. Length and water runoff of important rivers of Uttarakhand

River	Source	Nature	Length (km)	Annual runoff (Mm^3)
Tons	Har ki Doon	Snow fed	148	4,844
Yamuna	Yamunotri	Snow fed	136	1,651
Bhagirathi	Gaumukh	Snow fed	205	2,533
Alaknanda	Alkapuri	Snow fed	195	5,342
Nayar	Dudhatoli	Forest fed	87	1,626
Kosi	Kausani	Forest fed	168	1,870
Saryu	Tungbhadra	Forest fed	146	1,355
Ramganga	Dhudahoti	Forest fed	155	972
Kali	Kalapani	Snow fed	252	2,387

ii) Tributaries of Yamuna

The following tributaries of Yamuna have been considered for preparation of DPR of Uttarakhand state:

1. Tons River

It originates in Himachal Pradesh, passes through Shimla and Sirmour districts and Jaunsar Bawar region in district Dehradun. Except in some parts, where it flows through the small town of Tiuni and a little beyond, the river forms the boundary of the states of Uttarakhand and Himachal Pradesh. It meets the Yamuna below Kalsi near Dehradun.

2. Rishiganga

Rishiganga, the main tributary of Dhauliganga originates from Rishi glacier and it takes water from Uttar Nanda Devi glacier, Dakshin Nanda Devi glacier and Uttar Rishi glacier. River flows almost all in a straight line westward and makes its confluence with Dhauliganga.. It has a length of 5.64 km.

3. Hanuman Ganga

Hanuman Ganga is 8.03 km, tributary of Yamuna river in Uttarakhand.

1.6.3. Other Water Resources and Aquifers

There are 221 inland natural and man-made wetlands in Uttarakhand including one third (75) of river and streams and almost half (116) of small wetlands (<2.25 ha) (Table 1.2; FSI, 2019b). These wetlands cover 2.22% area of the Recorded Forest (or Green Wash) area.

Almost 95% of the rainfall that falls in the catchment areas goes out of the state as surface runoff due to high slopes; it is, thus, important that this runoff is arrested to some extent by constructing gully plugs and contour bunds. These structures arrest the surface runoff, increase the soil moisture, recharge the shallow ground water aquifers and increase the discharge of springs. Since 85% of Uttarakhand's area is covered by lofty mountains, therefore, the area feasible for artificial recharge is about 15%, wherein site-specific selection of structures is very important. The villages and agricultural field lying in the wider valleys with gentle slope (less than 20%) are the only feasible area for artificial recharge structures. Usually in the broader valleys of Himalayan Mountains and valley bottoms, irrigation facilities are scarce during post monsoon period. In these areas, check dam and percolation tank will be beneficial for sustainable irrigation during the lean period for existing cropping pattern.

Table 1.2. Wetlands inside the recorded forest area (or green wash) in Uttarakhand

Wetland category	**Number of wetland**	**Total wetland area (ha)**
Inland wetlands-Natural		
Lake/Pond	5	17
Ox-bow lake/Cut-off meander	5	14
High altitude wetland	8	34
Riverine wetland	1	1
Waterlogged	1	9
River/stream	75	38,932
Sub-Total	**95**	**39,007**
Inland wetlands-Man-made		
Reservoir/Barrage	9	14,998
Tank/Pond	1	8
Sub-Total	**10**	**15,006**
Wetlands (<2.25 ha)	116	116
Total	**221**	**54,129**
Total recorded forest (or green wash) area		**25,49,446**
Per cent of wetland area inside recorded forest (or green wash) area		**2.12%**

Based on the volume of source available for recharge (computed on the basis of 70% of the average rain fall – 1,500 mm), feasible area for recharge has been calculated. The area suitable for

recharge in the state is given in Fig. 1.7 (CGWB, 2013). In Yamuna basin, the rechargeable areas for aquifers fall in the districts of Tehri, Uttarkashi and Dehradun only.

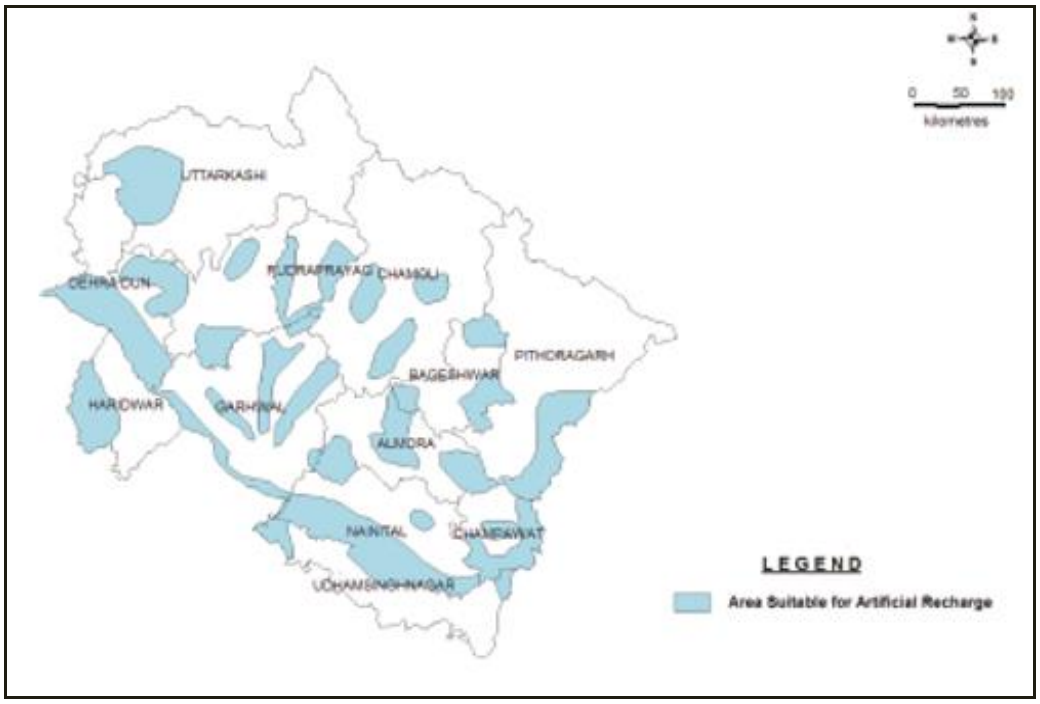


Fig.1.7. Areas suitable for artificial recharge in Uttarakhand
(***Source:*** CGWB, 2013)

1.6.4. Issues about Water Resources

The Himalayan watersheds are under constant threat of mass wasting and erosion caused by depletion of forest cover, hydrological imbalances, natural calamities, and unscientific management and agronomic practices. The ever-increasing population, the pressure on natural resources and changing lifestyles are further compounding the problem. Flash floods and cloudbursts are known to cause large scale devastation. Silt brought by the rivers accumulates in riverbeds leading to several ecological and economic repercussions. Hydrological changes in Uttarakhand influence hydrology in downstream states. Diversion of water into canals leads to reduced river water flow during dry season. Maintaining ecological flow of water is of utmost importance. Sewage discharge in water bodies is a source of concern.

As per a 2018 report of the Comptroller and Auditor General, Uttarakhand is among the states where less than 50% of the population had access to adequate quantities of safe drinking water. Besides the lack of water facilities, the state is also experiencing an over-exploitation of groundwater, land use change, deforestation and drying up of water resources like springs and ponds (Aggarwal, 2019b).In early 2018 also, a report by the United Nations Development Programme found that the state is facing acute water crisis. The drying up of mountain springs, considered lifelines for people in the hills, has worsened the problem of water shortage. A 2018 report by the Indian government's NITI Aayog think tank acknowledged that most of the drinking water supply in the mountainous parts of Uttarakhand is spring-based. It had revealed that approximately 50% of the mountain springs in the Indian Himalayan region, which includes Uttarakhand, are drying up.

1.7. FORESTS AND VEGETATION

The vegetation of the state is broadly grouped under following categories (Table 1.3) based largely on the altitude, rainfall, humidity and species composition.

Uttarakhand is very rich in forest resources (Fig.1.8). As per the Champion and Seth Classification of Forest Types (1968), the forests in Uttarakhand belong to nine Forest Type Groups, which are further divided into 43 Forest Types. Physiographically, the state can be divided into three zones namely, the Himalaya, the Shiwalik and the Terai region. The human and livestock population is largely dependent on forests due to agrarian economy and pastoralism. *Van Panchayats* in Uttarakhand are unique institutions of community forest management which came into existence in 1921. At present, there are 12,167 *Van Panchayats* in the state, which manage an area of 7,32,688 ha of forest. Occurrence of forest fires at regular intervals is a major problem in the state. Recorded Forest Area (RFA) in the state is 38,000 km^2 of which 26,547 km^2 is Reserved Forest, 9,885 km^2 is Protected Forest and 1,568 km^2 is Unclassed Forests (FSI, 2019b).

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period October 2017 to October 2018, the forest cover in the state is 24,303.04 km^2 which is 45.44 % of the state's geographical area. In terms of forest canopy density classes, the state has 5,046. km2 under Very Dense Forest (VDF), 12,805.24 km^2 under Moderately Dense Forest (MDF) and 6,451.04 km^2 under Open Forest (OF) (Table 1.4). Forest Cover in the state has increased by 8.04 km^2 as compared to the previous assessment reported in ISFR 2017 (FSI, 2019b).

Uttarakhand state exhibits rich biodiversity due to its varied topographic, climatic and vegetational conditions. It is estimated that about 7,000 plant species exist in the state of which only 85% flora have been explored so far. The floral diversity of the state contributes 31% of total floral diversity of India. Out of the total floral diversity, 74% species are flowering plants. The state has nearly 5,060 angiosperm species of 1,503 genera under 213 families. Dicots account for more than 75% of flowering species. Angiosperms are followed by lichens, bryophytes, pteridophytes and algae with minimum diversity under gymnosperm and orchids. The Valley of Flowers, a UNESCO World Heritage Site, located in the upper expanses of Bhyundar Ganga near Joshimath in Garhwal region, is known for the variety and rarity of its flowers and plants.

1.8. WILDLIFE

Considering the utmost need for maintaining biodiversity in the state, 7,376 km^2 area has been constituted as national parks and wildlife sanctuaries. Six national parks, seven wildlife sanctuaries and four community reserves constitute the Protected Area Network of the state covering 3.24% of its geographical area (FSI, 2019). The state has the Bengal tiger in Jim Corbett National Park, the oldest national park in the Indian subcontinent. Among fauna, 102 species of mammals, 624 of avifauna (birds), 19 of amphibians, 70 of reptiles and 124 species of fishes have been reported in the state. Besides, two conservation reserves cover an area of 1,200 ha.

Table 1.3. Forest types in Uttarakhand

Forest type	Sub-type	Altitude (m)	Dominant species
Sub- tropical forests	1. Mixed broad leaved	250	*Acacia, Phyllanthus, Bombax, Desmodium oojeinense, Dalbergia, Terminalia, Saccharum* spp., etc.
	2. Deciduous	500	*Shorea robusta, Acacia catechu, Haldina cordifolia, Tectona grandis, Dendrocalamus,* etc.
	3. Low-altitude mountain forests	1,000	*Pinus roxburghii, Mallotus, Syzygium, Carissa, Rhus, Berberis, Rubus, Themeda, Arundinaria,* etc.
Temperate forest	4.Warm temperate	1,300	*Shorea robusta, Pinus roxburghii,* etc.
	5. Temperate coniferous	1,800	*Pinus roxburghii*
	6. Cold- temperate broad leaved	2,000	*Quercus leucotrichophora, Rhododendron arboretum,* etc.
Sub-alpine forest	7. Moist deciduous	2,500	*Quercus dilatata, Cedrus deodara, Pinus wallichiana, Picea smithiana, Abies spectabilis,* etc.
	8. High-altitude coniferous	3,500	*Quercus semecarpifolia, Betula utilis, Pinus wallichiana, Juniperus* spp., *Abies pindrow, Rhododendron lepidotum,* etc.
Alpine vegetation	9. Alpine pastures	4,000	A large variety of grasses, shrubs and flowers, herbaceous plants, pastures and aromatic plants
Trans-Himalaya vegetation	10. Mixed sub-alpine species		*Pinus wallichiana, Cedrus deodara, Picea smithiana, Abies pindrow, Betula utilis,* bushes and herbaceous plants

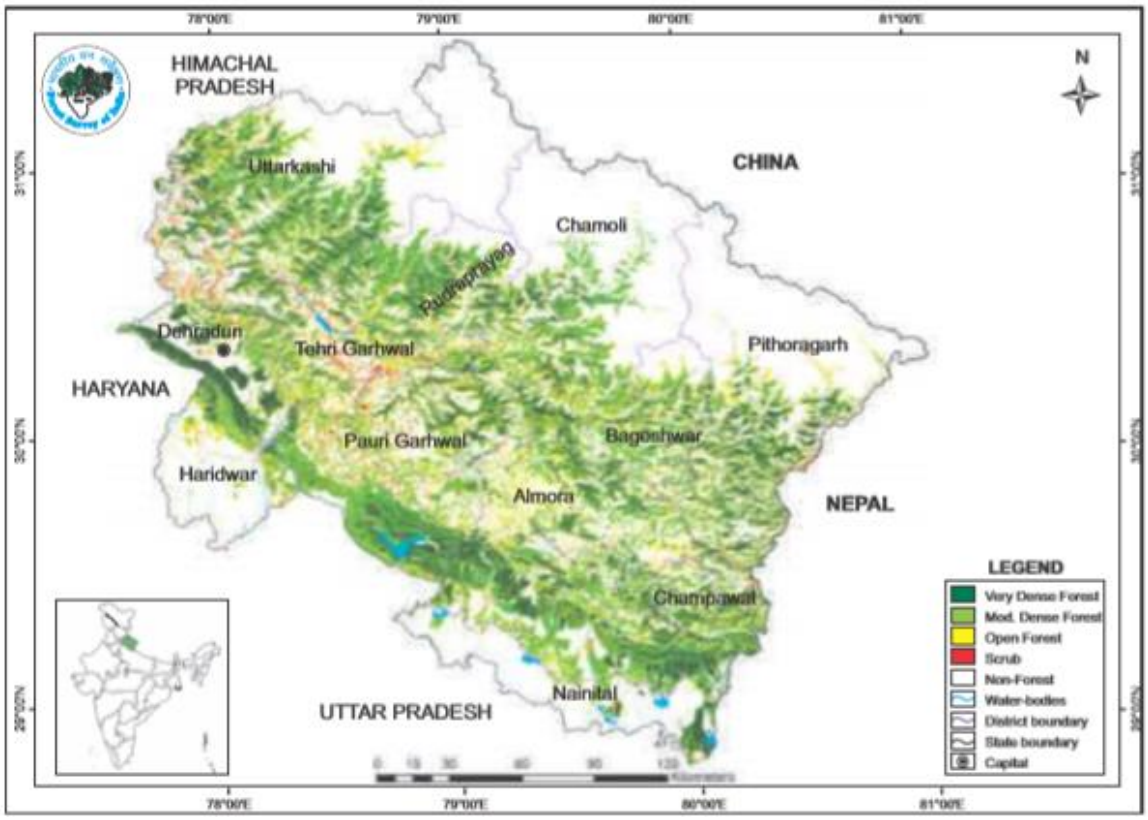


Fig.1.8. Forest cover map of Uttarakhand
(***Source:*** FSI, 2019)

1.9. AGROECOSYSTEM

Agriculture is one of the most significant sectors of the economy of Uttarakhand and net sown area is 700,000.0 ha (Table 1.6; FSI, 2019b). The landholding of the people is very small. Most of the families own about half hectare of land, much of it un-irrigated with low productivity. Rice, wheat, maize, barley, coarse cereals (*manduwa*, *sanwan*, etc.), pulses, oilseeds, sugarcane, potato and vegetables are the most widely grown crops. Fruits like apple, orange, pear, peach, litchi and plum are widely grown and important to the large food processing industry. The people mostly practice subsistence farming.

Rearing of livestock is an integral part of rural occupation. The 19th Livestock Census 2012 has reported a total livestock population of 4.79 M (FSI, 2019). Cow, buffalo, goat and sheep are reared by virtually every family in the rural area. The productivity of these animals is low. Collection of grass and leaf fodder is an essential part of daily chore for the people, especially women. Grazing animals pose the greatest challenge to forest regeneration and plantation establishment in the hills.

Table 1.4. Land use pattern in Uttarakhand

Land use type	Area ('000 ha)	Percentage
Geographical area	5,348	
Reporting area for land utilization	5,993	100.00
Forests	3,800	63.41
Not available for land cultivation	452	7.53
Permanent pastures and other grazing lands	192	3.21
Land under misc. tree crops and groves	388	6.47
Culturable wasteland	317	5.29
Fallow land other than current fallows	87	1.44
Current fallows	57	0.96
Net area sown	**700**	**11.68**

(***Source:*** FSI, 2019)

1.10. DEMOGRAPHY

As per the 2011 census, Uttarakhand has a population of 10.11 M, which is 0.83% of India's population. The rural and urban population of the state constitute 69.77 and 30.23%, respectively (Census India 2011). The tribal population is 2.89%. It has 51,54,178 males and 49,62,574 females. The population density of the state is 189 km^{-2} which is lower than the national average. Urban population of the state is mainly concentrated in bigger cities of Dehradun (0.57M), Haridwar (0.23 M), Haldwani-Kathgodam, Rudrapur, Kashipur and Roorkee municipalities and towns located in agriculturally rich and industrially developed southern part of the state.

1.11. INDUSTRIES

Uttarakhand has several tourist destinations and places of pilgrimage e.g., Mussoorie, Nainital, Haridwar, Rishikesh, Badrinath, Kedarnath, Hemkund Sahib, Gangotri, Yamunotri, Piran Kaliar, etc. In 2018, 2.78 M pilgrims arrived in state for *Chardham* Yatra, out of which 0.73 M pilgrims visited Kedarnath. In 2017, domestic tourist inflows in the state were 34.36 M and foreign tourist visits had crossed over 0.13 M. These figures, which are more than three times the whole population of the state itself, reflect a high 'tourist load' on urban infrastructure and services.

Uttarakhand is being developed as an 'energy state' to tap the hydropower electric potential of over 40,000 MW. As of November 2019, the state had total installed power generation capacity of 3,487.97 MW of which hydro power contributed 1,815.69 MW, followed by thermal power with a contribution of 980.83 MW and 660.21 MW from other renewable sources. Of the total installed power generation capacity, state utilities accounted for the largest share of 1,320.02 MW, followed by 1,229.34 MW under private utilities and 938.61 MW under central utilities.

1.12. RIVERSCAPE ANALYSIS

1.12.1. Remote Sensing and GIS Methodology

The image processing and GIS tools used in the present assessment were ERDAS Imagine, Geomedia Professional, Arc GIS along with other software packages. The GIS softwares provide the tool needed to store, analyze and display geographic information.

1.12.2. Satellite Data Used

Landsat-8 satellite data for the month of February to April 2019 has been used for preparation of Land use/Land cover map of the riverscape. The Row, Path along with Date of Pass of the satellite data used in the current study for the parts of states of and covering the riverscape is given in Table 1.5.

Table 1.5. List of data downloaded for the study

Path	Row	Date of pass	Satellite
146	038	27-03-2019	Landsat-8
146	039	23-02-2019	Landsat-8
147	038	18-03-2019	Landsat-8

1.12.3. Ancillary Data

Almost all of the ancillary information has been taken from various Government of India sources. Information about the state and district boundaries for the riverscape taken up for analysis were obtained from the Survey of India. Basin boundary, Catchment boundary, Sub-Catchment boundary, Watershed boundary and Micro-watershed boundaries where obtained from Soil and Land Use Survey of India, New Delhi. Village and Tehsil boundaries were obtained from the published document 'Administrative Atlas of Uttarakhand' by Census of India (2011). Forest Type and Forest Density data were obtained in digital format from Forest Survey of India. Soil map and soil depth information was obtained from published maps of National Bureau of Soil Survey & Land Use Planning, Nagpur. Soil erosion data which is the backbone of multi-criterion analysis was obtained in GIS format from the Indian Institute of Soil & Water Conservation, Dehradun. Topographical sheets on 1:50,000 scale obtained from Survey of India have been used for Geo-reference only. Bhuvan data was also referred, wherever required for the preparation of land use map.

1.12.4. Bank-Line and Highest Flood Level

For the identification of the riverscape the year 2013 was denoted as the highest flood level year based on literature review and stakeholder's consultation at various levels. Then, a post-monsoon satellite image of the year 2013 was used to create the bank-line of the main stem and considered tributaries of the Yamuna River (Hanuman Ganga, Rishi Ganga, Tons) (Table 1.6 and Fig.1.9).

Table 1.6. Spatial extent of project-area in the state

Geographical area (km^2)	Geographical coordinates		Area in riverscape (km^2)	Per cent area of entire riverscape of Yamuna
	Lat. N	Long. E		
53,483	30° 18' 58.157" to 31° 17' 27.673"	77° 34' 32.461" to 78° 37' 30.417"	5087.84	11.54

The influence zone or the riverscape in the state of Uttarakhand lies between 30° 18' 58.157" to 31° 17' 27.673" N latitudes and 77° 34' 32.461" to 78° 37' 30.417" E longitudes and occupy geographical area of 5,087.84 km^2, which comprises 11.54% of the geographical area of the entire riverscape (Fig,1.9).

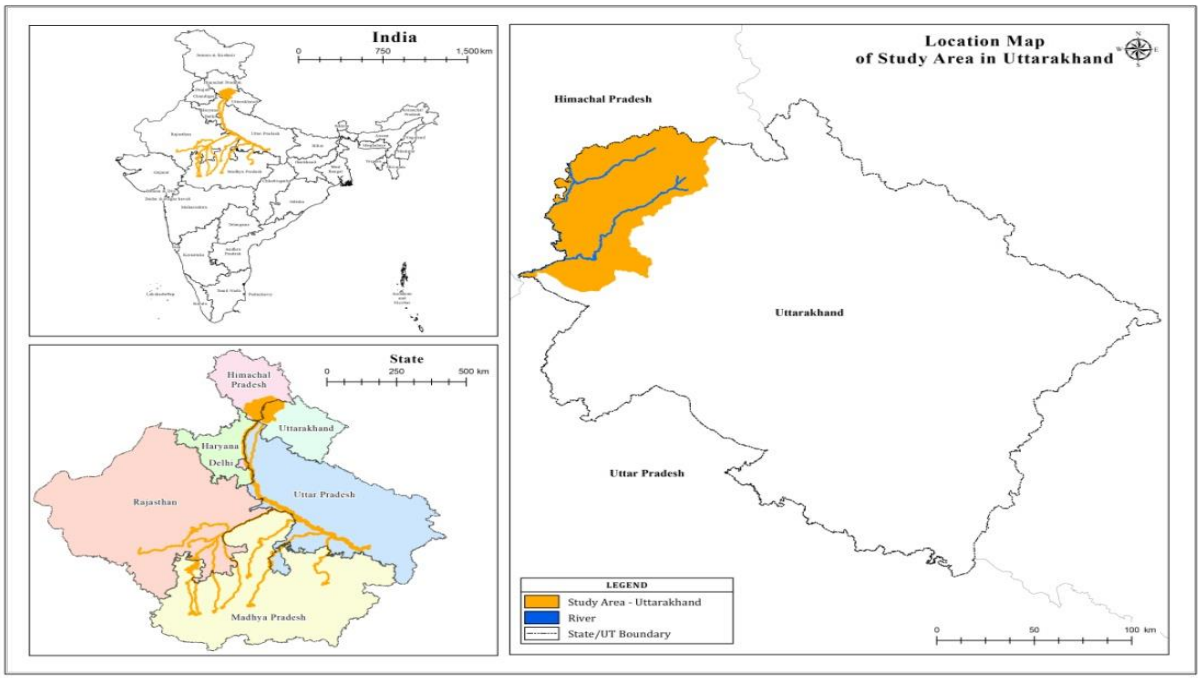


Fig.1.9. Project area in Uttarakhand

1.12.5. Land Use and Land Cover

A total of 17 major land use land cover classes, *viz*., dense forest, open forest, alpine pasture, scrub, grassland, barren, landslide, settlement, agriculture, plantation, industrial area, water body, canal, river, dry river/ river sand, snow, cloud and cloud shadow have been mapped in the Table 1.7 and Fig.1.10.

The maximum area of the state comes under the dense forest category. The land use and land cover data indicate that group of forest, alpine pasture, scrub and open forest area together form the most widespread land use covering 58.1% of the area in the riverscape under DPR. This is followed by agriculture and plantation which cover 12.55% of the area. Water-bodies, cloud and snow cover occupy 13.36% of the area. The share of barren land and industrial area is 14.8% while settlements constitute merely 1.17% of the riverscape.

1.12.6. Altitude

The area in the riverscape is grouped into 9 elevation classes. The distribution of areas under different elevation classes is given in Table 1.8.

Table 1.7. Distribution of area under different land use and land cover categories in the riverscape

S. no.	Land use and land cover	Area (km^2)
1	Dense forest	1,573.33
2	Mod. dense forest	632.06
3	Open forest	473.21
4	Alpine pasture	42.44
5	Scrub	235.15
6	Barren	750.78
7	Industrial area	2.32
8	Settlement	59.68
9	Agriculture	621.52
10	Plantation	17.39
11	Water body	0.07
12	Canal	0.89
13	River	22.95
14	Dry river/River sand	55.61
15	Snow	524.16
16	Cloud	67.07
17	Cloud shadow	9.21
	Total	**5,087.84**

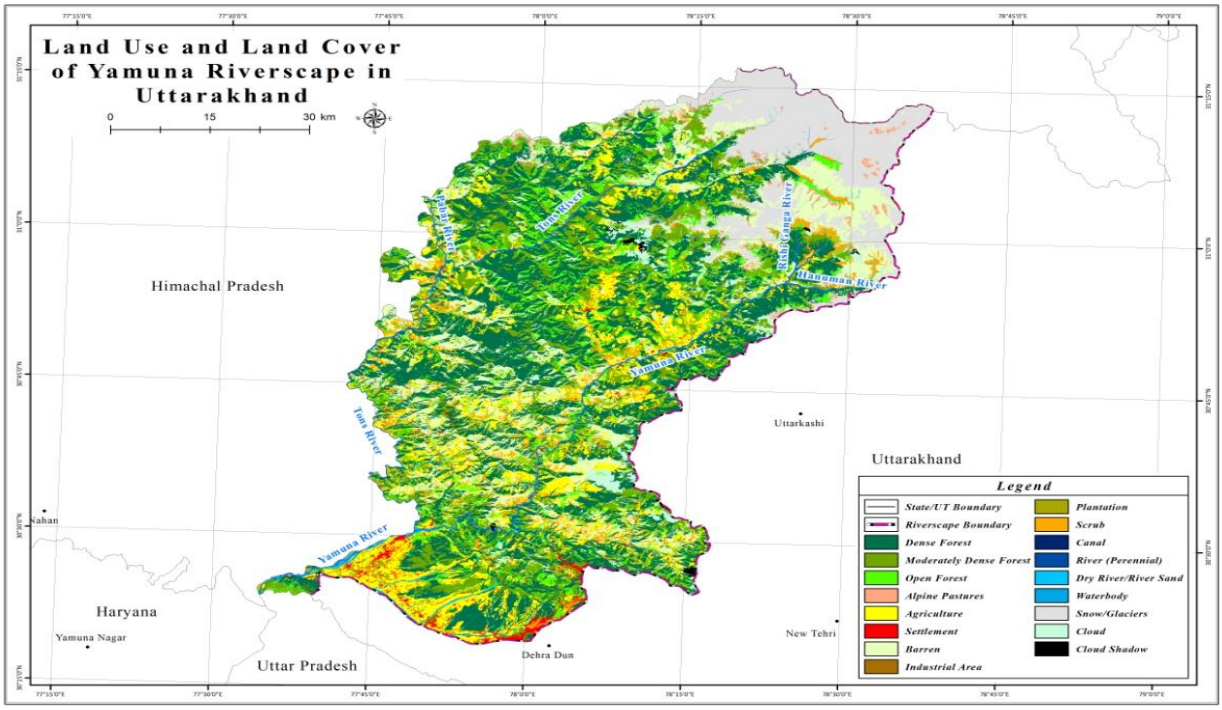


Fig.1.10. Land use and land cover in Yamuna Riverscape
(Based on information from SLUSI, New Delhi)

Table 1.8. Distribution of area under different elevation categories

S. no.	Elevation (m)	Area (km^2)
1	250 to 500	188.69
2	500 to 750	238.21
3	750 to 1000	203.59
4	1,000 to 1,250	307.96
5	1,250 to 1,500	487.77
6	1,500 to 2,000	1,199.73
7	2,000 to 2,500	851.57
8	2,500 to 3,000	472.24
9	3,000 to 4,000	558.19
	Total	**5,087.84**

1.12.7. Slope

Slope of land is an important locality factor influencing the soil and water runoff and suitability of the area for different forestry interventions. Lands with steep slopes are prone to soil erosion and hence do not support growth of most of the plant species unless suitable stabilization measures are adopted. The land in Uttarakhand has been grouped into 10 classes of slope from 0 to more than 40 degrees. The distribution of areas under different slope classes is given in Table 1.9 and Fig. 1.11 The maximum area of Uttarakhand falls in greater than 40^o slope.

Table 1.9. Distribution of area under different slope categories

S. no.	Slope (º)	Area (km^2)
1	0 to 2.5	45.48
2	2.5 to 5	111.87
3	5 to 10	316.72
4	10 to 15	350.30
5	15 to 20	450.51
6	20 to 25	568.79
7	25 to 30	699.45
8	30 to 35	724.60
9	35 to 40	655.23
10	>40	1.164.89
	Total	**5,087.84**

1.12.8. Soil Erosion

A total six categories of the erosion classes have been mapped in Uttarakhand, *viz*., 5 to 10, 10 to 20, 20 to 40, more than 40 t ha^{-1} yr^{-1} and non-soil. Highest area of 2,830 km^2 has a slope of >40º while 513.97 km^2 falls in the non-soil category which may not be suitable for forest plantations. The distribution of areas under different erosion classes and their area is given in Table 1.10 and Fig. 1.13.

Table 1.10. Distribution of area under different soil erosion categories

S. no.	Soil erosion (t ha^{-1} yr^{-1})	Area (km^2)
1	<5	498.66
2	5-10	349.68
3	10-20	73.14
4	20-40	822.38
5	>40	2,830.01
6	Non-soil	513.97
	Total	**5,087.84**

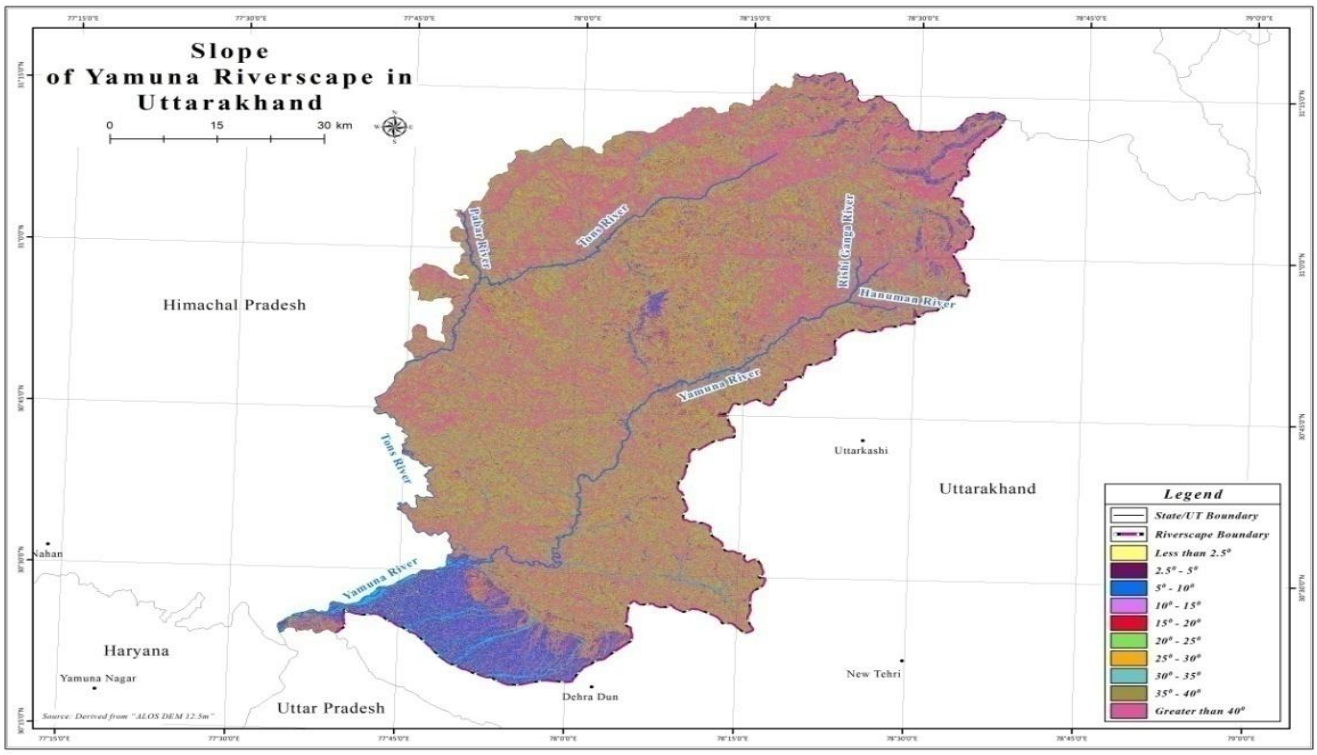


Fig.1.11. Slope in Yamuna Riverscape in the state
(Based on information from NBSSLUP, Nagpur)

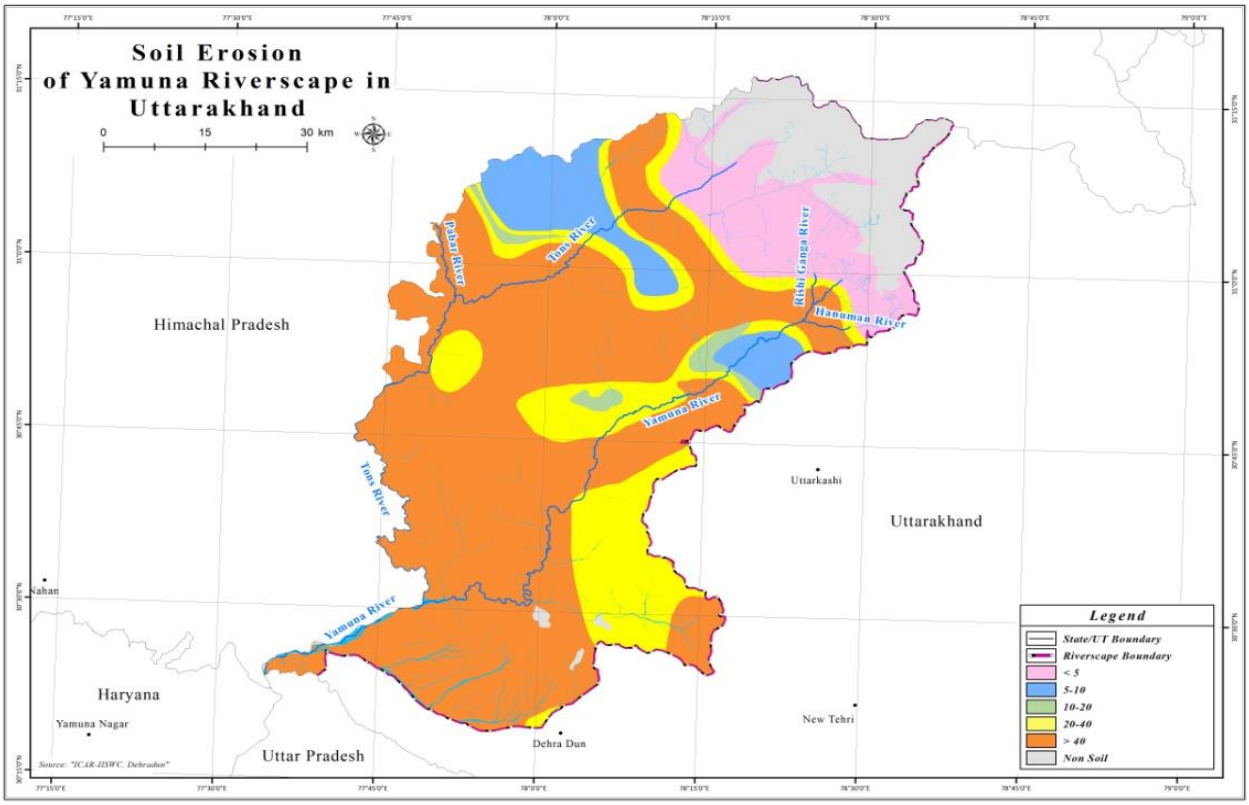


Fig.1.12. Soil erosion classes in Yamuna Riverscape
(Based on information from ICAR-IISWC, Dehradun)

1.12.9. Forest Cover

Forest cover includes all lands which have a tree canopy density of 10 % and above. Based on further variation in canopy density, the forests in Uttarakhand can be divided into five major categories, including non-forest. The maximum area of 2,174.09 km^2 of the riverscape has been classified under the non-forest category. The area wise distribution of various forest cover classes is shown in Table 1.11 and Fig.1.13.

Table 1.11. Distribution of area under different forest cover categories

S. no.	Forest cover class	Area (km^2)
1	Dense forest	1,573.33
2	Mod. dense forest	632.06
3	Non forest	2,174.09
4	Open forest	473.21
5	Scrub	235.15
	Total	**5,087.84**

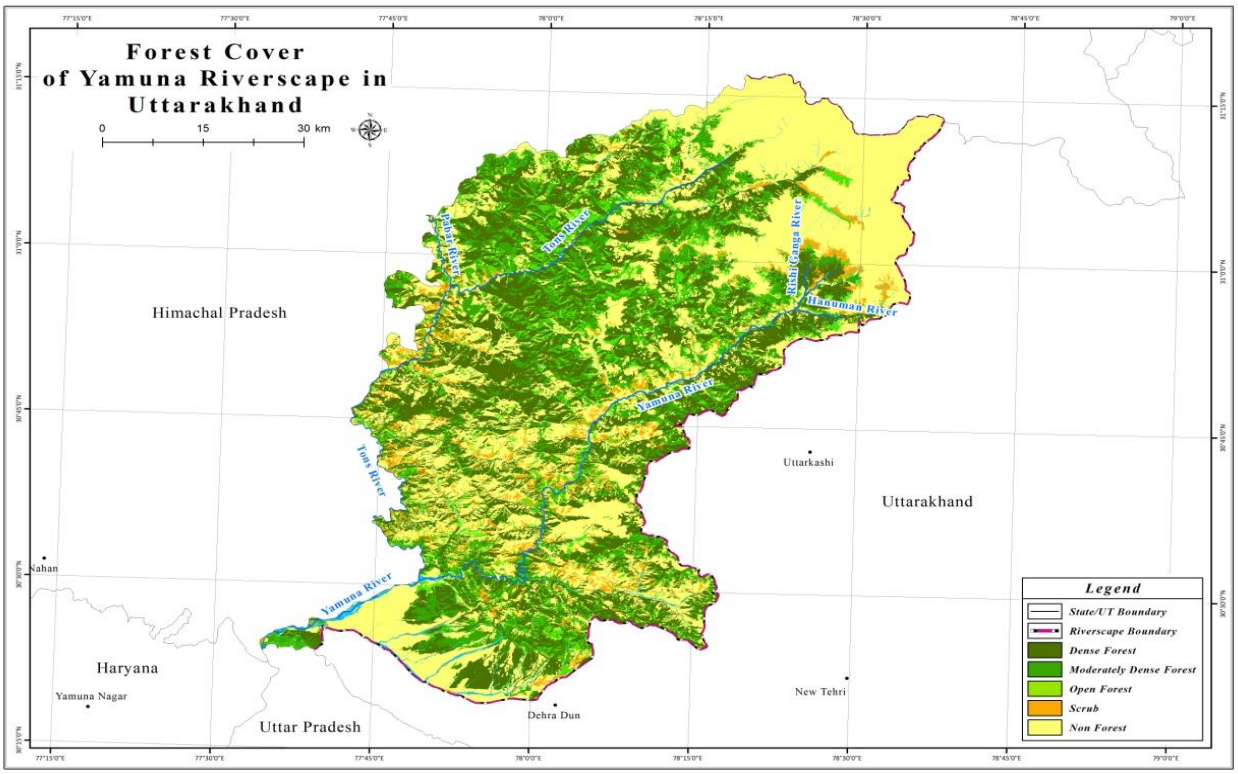


Fig.1.13. Forest cover in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

1.12.10. Forest Types

The area in the riverscape comprises of seven forest types. These include Himalayan moist temperate forest, sal mixed moist deciduous forest, sub-tropical pine forests, temperate coniferous forests, tropical dry deciduous forests, scrub and non-forest. The maximum area (2,174.09 km^2) falls under the non-forest category. The area wise distribution of various forest types in the riverscape are given in Table 1.12 and Fig.1.14.

Table 1.12. Distribution of area under different forest type categories

S. no.	Forest type	Area (km^2)
1	Himalayan moist temperate forests	951.48
2	Non forest	2,174.09
3	Sal mixed moist deciduous	74.23
4	Scrub	235.15
5	Subtropical pine forests	983.4
6	Temperate coniferous forests	482.57
7	Tropical dry deciduous forests	186.92
	Total	**5,087.84**

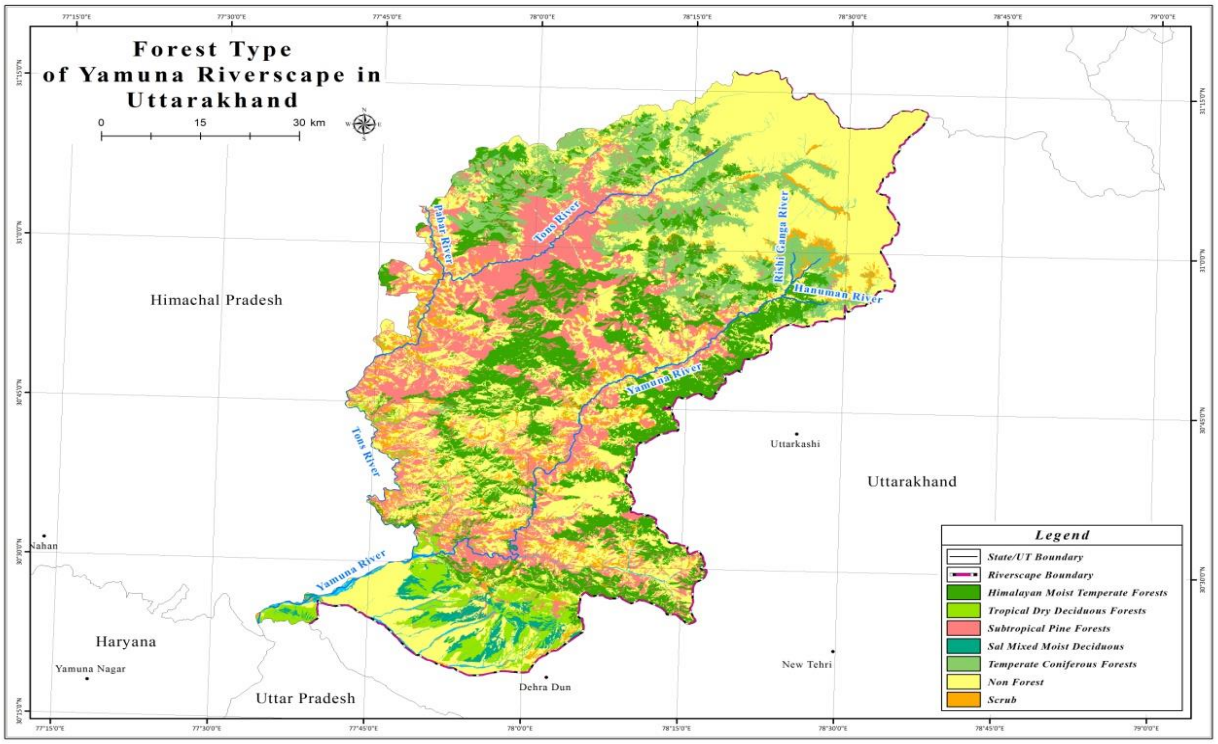


Fig.1.14. Forest types in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

1.12.11. Prioritisation of Sites for Forestry Interventions

A multi-stakeholder approach was followed for preparing the DPR on rejuvenation of Yamuna through Forestry Interventions. It included extensive consultation and review of literature, reports, primary and secondary data collection, its analysis, expert consultations with institutes, individuals and various stakeholders (Central and state government departments, State Forest Departments of seven states, research institutions/scientific departments dealing with forestry, environment, river conservation, environment; civil society, non-governmental organisations in this field, defence and paramilitary forces, other interest groups).

Priority criteria: For the purpose of preparation of DPR and for identification of priority areas for the proposed treatment/forestry interventions in the Yamuna riverscape, GIS-assisted decision making process by way of geospatial analysis and modelling was used. GIS was used to generate different layers within the riverscape like land use, soil erosion rates, and slope of the topography (Table 1.13).

Table 1.13. Criteria used in geospatial modelling for determination of priority zones for forestry intervention

Land use	Slope (º)	Erosion ($t\ ha^{-1}yr^{-1}$)	Weightage (Slope)	Weightage (Erosion)	Weightage (LULC)	Total	Priority
Dense Forest	0 to 30	10 - 20	1	4.5	5	10.5	High
Dense Forest	0 to 30	5 - 10	1	3	5	9	Medium
Dense Forest	0 to 30	<5	1	1.5	5	7.5	Medium
Dense Forest	0 to 30	>40	1	7.5	5	13.5	High
Dense Forest	0 to 30	20 - 40	1	6	5	12	High
Dense Forest	0 to 30	Non Soil	1	1.5	5	7.5	Medium
Dense Forest	30 to 40	10 - 20	2	4.5	5	11.5	High
Dense Forest	30 to 40	5 - 10	2	3	5	10	High
Dense Forest	30 to 40	<5	2	1.5	5	8.5	Medium
Dense Forest	30 to 40	>40	2	7.5	5	14.5	High
Dense Forest	30 to 40	20 - 40	2	6	5	13	High
Dense Forest	30 to 40	Non Soil	2	1.5	5	8.5	Medium
Dense Forest	Greater than 40	10 - 20	3	4.5	5	12.5	High
Dense Forest	Greater than 40	5 - 10	3	3	5	11	High
Dense Forest	Greater than 40	<5	3	1.5	5	10.5	Medium
Dense Forest	Greater than 40	>40	3	7.5	5	15.5	High
Dense Forest	Greater than 40	20 - 40	3	6	5	14	High
Dense Forest	Greater than 40	Non Soil	3	1.5	5	9.5	Medium
Open Forest	0 to 30	10 - 20	1	4.5	6	9.5	Medium
Open Forest	0 to 30	5 - 10	1	3	6	8	Medium
Open Forest	0 to 30	<5	1	1.5	6	6.5	Medium
Open Forest	0 to 30	>40	1	7.5	6	12.5	High
Open Forest	0 to 30	20 - 40	1	6	6	11	High
Open Forest	0 to 30	Non Soil	1	1.5	6	6.5	Medium
Open Forest	30 to 40	10 - 20	2	4.5	6	10.5	High
Open Forest	30 to 40	5 - 10	2	3	6	9	Medium

Open Forest	30 to 40	<5	2	1.5	6	7.5	Medium
Open Forest	30 to 40	>40	2	7.5	6	13.5	High
Open Forest	30 to 40	20 - 40	2	6	6	12	High
Open Forest	30 to 40	Non Soil	2	1.5	6	7.5	Medium
Open Forest	Greater than 40	10 - 20	3	4.5	6	12.5	High
Open Forest	Greater than 40	5 - 10	3	3	6	10	High
Open Forest	Greater than 40	<5	3	1.5	6	8.5	Medium
Open Forest	Greater than 40	>40	3	7.5	6	14.5	High
Open Forest	Greater than 40	20 - 40	3	6	6	13	High
Alpine Pasture/Scrub	0 to 30	10 - 20	1	4.5	6	11.5	High
Alpine Pasture/Scrub	0 to 30	5 - 10	1	3	6	10	Medium
Alpine Pasture/Scrub	0 to 30	<5	1	1.5	6	8.5	Medium
Alpine Pasture/Scrub	0 to 30	>40	1	7.5	6	14.5	High
Alpine Pasture/Scrub	0 to 30	20 - 40	1	6	6	13	High
Alpine Pasture/Scrub	0 to 30	Non Soil	1	1.5	6	8.5	Medium
Alpine Pasture/Scrub	30 to 40	10 - 20	2	4.5	6	12.5	High
Alpine Pasture/Scrub	30 to 40	<5	2	1.5	6	9.5	Medium
Alpine Pasture/Scrub	30 to 40	>40	2	7.5	6	15.5	High
Alpine Pasture/Scrub	30 to 40	20 - 40	2	6	6	14	High
Alpine Pasture/Scrub	30 to 40	Non Soil	2	1.5	6	9.5	Medium
Alpine Pasture/Scrub	Greater than 40	10 - 20	3	4.5	6	13.5	High
Alpine Pasture/Scrub	Greater than 40	<5	3	1.5	6	10.5	Medium
Alpine Pasture/Scrub	Greater than 40	>40	3	7.5	6	16.5	High
Alpine Pasture/Scrub	Greater than 40	20 - 40	3	6	6	15	High
Alpine Pasture/Scrub	Greater than 40	Non Soil	3	1.5	6	10.5	Medium
Agriculture	0 to 30	10 - 20	1	4.5	4	9.5	Medium
Agriculture	0 to 30	5 - 10	1	3	4	8	Medium
Agriculture	0 to 30	<5	1	1.5	4	6.5	Low
Agriculture	0 to 30	>40	1	7.5	4	12.5	High

Agriculture	0 to 30	20 - 40	1	6	4	11	High
Agriculture	0 to 30	Non Soil	1	1.5	4	6.5	Low
Agriculture	30 to 40	10 - 20	2	4.5	4	10.5	Medium
Agriculture	30 to 40	>40	2	7.5	4	13.5	High
Agriculture	30 to 40	20 - 40	2	6	4	12	High
Agriculture	Greater than 40	10 - 20	3	4.5	4	11.5	High
Agriculture	Greater than 40	>40	3	7.5	4	14.5	High
Agriculture	Greater than 40	20 - 40	3	6	4	13	High
Barren	0 to 30	10 - 20	1	4.5	3	8.5	Medium
Barren	0 to 30	5 - 10	1	3	3	7	Low
Barren	0 to 30	<5	1	1.5	3	5.5	Low
Barren	0 to 30	>40	1	7.5	3	11.5	High
Barren	0 to 30	20 - 40	1	6	3	10	Medium
Barren	0 to 30	Non Soil	1	1.5	3	5.5	Low
Barren	30 to 40	10 - 20	2	4.5	3	9.5	Medium
Barren	30 to 40	5 - 10	2	3	3	8	Medium
Barren	30 to 40	<5	2	1.5	3	6.5	Low
Barren	30 to 40	>40	2	7.5	3	12.5	High
Barren	30 to 40	20 - 40	2	6	3	11	High
Barren	30 to 40	Non Soil	2	1.5	3	6.5	Low
Barren	Greater than 40	10 - 20	3	4.5	3	10.5	Medium
Barren	Greater than 40	5 - 10	3	3	3	9	Medium
Barren	Greater than 40	<5	3	1.5	3	7.5	Medium
Barren	Greater than 40	>40	3	7.5	3	13.5	High
Barren	Greater than 40	20 - 40	3	6	3	12	High
Barren	Greater than 40	Non Soil	3	1.5	3	7.5	Medium
Gullied/Ravinous Land	0 to 30	10 - 20	1	4.5	7	12.5	High
Gullied/Ravinous Land	0 to 30	5 - 10	1	3	7	11	High

Gullied/Ravinous Land	0 to 30	<5	1	1.5	7	9.5	Medium
Gullied/Ravinous Land	0 to 30	>40	1	7.5	7	15.5	High
Gullied/Ravinous Land	0 to 30	20 - 40	1	6	7	14	High
Gullied/Ravinous Land	0 to 30	Non Soil	1	1.5	7	9.5	Medium
Others	0 to 30	10 - 20	1	4.5	1	6.5	Low
Others	0 to 30	5 - 10	1	3	1	5	Low
Others	0 to 30	<5	1	1.5	1	3.5	Low
Others	0 to 30	>40	1	7.5	1	9.5	Medium
Others	0 to 30	20 - 40	1	6	1	8	Medium
Others	0 to 30	Non Soil	1	1.5	1	3.5	Low
Others	30 to 40	10 - 20	2	4.5	1	7.5	Medium
Others	30 to 40	5 - 10	2	3	1	6	Low
Others	30 to 40	<5	2	1.5	1	4.5	Low
Others	30 to 40	>40	2	7.5	1	10.5	Medium
Others	30 to 40	20 - 40	2	6	1	9	Medium
Others	30 to 40	Non Soil	2	1.5	1	4.5	Low
Others	Greater than 40	10 - 20	3	4.5	1	8.5	Medium
Others	Greater than 40	5 - 10	3	3	1	7	Low
Others	Greater than 40	<5	3	1.5	1	5.5	Low
Others	Greater than 40	>40	3	7.5	1	11.5	High
Others	Greater than 40	20 - 40	3	6	1	10	Medium
Others	Greater than 40	Non Soil	3	1.5	1	5.5	Low
Settlement	0 to 30	10 - 20	1	4.5	2	7.5	Medium
Settlement	0 to 30	5 - 10	1	3	2	6	Low
Settlement	0 to 30	<5	1	1.5	2	4.5	Low
Settlement	0 to 30	>40	1	7.5	2	10.5	Medium
Settlement	0 to 30	20 - 40	1	6	2	9	Medium

Settlement	0 to 30	Non Soil	1	1.5	2	4.5	Low
Settlement	30 to 40	>40	2	7.5	2	11.5	High

1.12.12. Priority Class

Statistical analysis of the area estimate shows that 3,612.58 km^2 area comes in high, 701.39 km^2 in medium and 773.87 km^2 area in low priority region for Uttarakhand State as indicated in Table 1.14b. and Fig. 1.15.

Table 1.14. Priority treatment areas

S. no.	Priority	Area (km^2)
1	High	3,612.58
2	Medium	701.39
3	Low	773.87
	Total	**5,087.84**

Superimposition of the GPS locations of the areas selected for treatment on the basis of various ground based model by the state department of Uttarakhand shows that 71.0% points are in high priority 13.78% in medium priority and 15.21% in the low priority region. It has also been observed that the geospatial analysis of priority areas complements the points selected by the State Department for suitable treatment as per various ground based models.

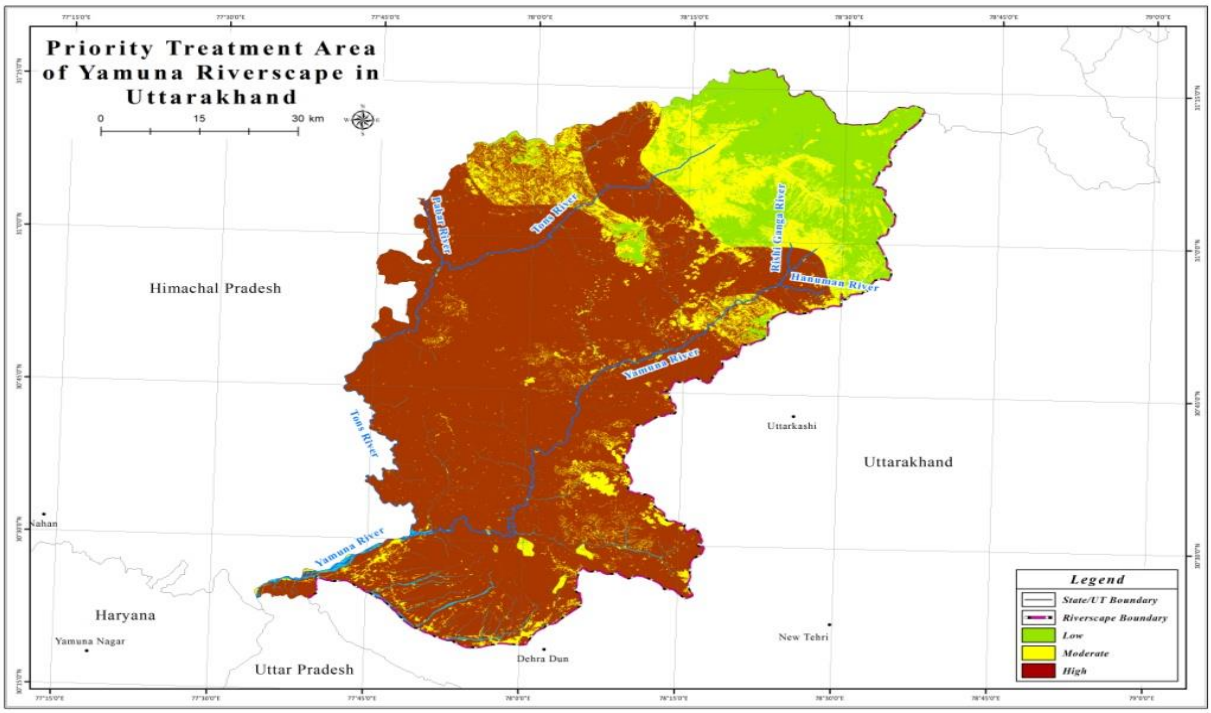


Fig.1.15. Priority treatment area in Uttarakhand

1.13. PROPOSED FORESTRY INTERVENTIONS

For addressing the challenges and problems highlighted above, various forestry interventions have been proposed in this DPR. Three landscapes in the delineated riverscape have been identified for proposing the forestry interventions:

(i) Natural landscape
(ii) Agricultural landscape
(iii) Urban or Peri-urban landscape

In the state of Uttarakhand, the entire catchment of Yamuna River and its tributaries from Yamunotri up to a little before Dakpathar are part of the riverscape in the state. Models have been developed with landscape-specific approach in the DPR

The following general prescriptions are made for all models:

a) Native species of tree, shrub and herbs will be planted. Traditional horticultural crops which have long been in cultivation in the region are also included in agricultural and urban landscapes. Mixed crops that would promote biodiversity will be raised as far as possible in preference to pure plantation. Species that provide economically useful non-wood forest produce (NWFP) will be planted to the extent of 70% or more by number. Effort would be made to produce industrial surpluses of select raw material in consultation with local nutraceutical, food processing and other NWFP-based industries.
b) Digging of pits, contour trenches, protection trenches, fencing etc will be carried out sufficiently before planting operation according to the standard practice in the plantation area.Site-specific modifications in the models are permitted provided they capture the essence of the respective models. The rates prevailing in SFD at the site and time of operation would be applicable. The DFOs at time of implementation of the project will have the power to make site-specific modifications in prescriptions to suit the site conditions within the total budget proposed in the DPR for the Division. The flexibility applies to choice of species, site, model, quantity of work and timing of activities.
c) Species will be selected in consultation with industries /market experts to plant species that would create industry-level surpluses.
d) Seed or other propagules of forest tree species will be sourced from natural forests and plantations, especially seed orchards, plus trees or seed production areas, wherever available in sufficient quantity, aiming at quality seed. Seed would not be purchased from market for plantation in natural landscape.
e) Survival of plants will be ensured by providing life-saving irrigation; the frequency of irrigation would vary with weather conditions. Casualty replacement will be done according to the existing norms of the state. If such norms are not existing, prescriptions in the respective models will be referred to.
f) During site preparation prior to plantation work, seedlings already growing in the site would be retained, nurtured (through soil working, manure, irrigation operations) and protected.
g) Complete removal of ground vegetation would not be done during rehabilitation of weed-infested areas, Partial removal of invasive weeds would be done followed by artificial regeneration to facilitate gradual replacement of the weeds with economically and ecologically useful species.

h) Biofertiliziers such as arbuscular mycorrhiza (AM), organic manures will be applied in nurseries and plantations to boost plant growth. Eco-friendly plant protection measures (e.g., physical or mechanical methods, use of natural products, etc.) will be adopted to manage weed and pest without resorting to use of synthetic products. Tall seedlings may be planted to achieve greater survival in areas with high biotic disturbances.

i) Effective protection will be provided to the planted seedlings against biotic and abiotic stresses through watch & ward, public awareness besides fence, cattle-proof trenches, etc. according to the site.

j) Quantum of soil and conservation works as prescribed in the DPR should be considered as indicative. The actual quantum and area of works as prescribed in the models should be arrived at based on field level hydrological assessments. The spring-shed Consortium model as is being adopted by Uttarakhand Govt. should be extended to SMC works.

k) For plantation in the hills, Assisted Natural regeneration (ANR) should be considered as the first option. In case, ANR model cannot be adopted for any specific reasons, then only other models should be considered for implementation.

l) The use of pine needles for activities such as creation of check dams should be encouraged. They not only provide an effective way of conserving water and soil, but also reduce the probability of forest fire and generate local livelihood opportunities.

Table 1.15. List of models in Uttarakhand

Landscape	S. no.	Model type	Model no.
Natural	1	Temperate mixed plantation	YM/UK/NL/01
	2	Sub-tropical mixed plantation	YM/UK/NL/02
	3	Southern dry slope mixed plantation	YM/UK/NL/03
	4	Rehabilitation of invasive species infested areas	YM/UK/NL/04
	5	Assisted natural regeneration	YM/UK/NL/05
	6	Shiwalik mixed plantation	YM/UK/NL/06
Agriculture	1	Planting of saplings by farmers	YM/UK/AL/01
	2	Plantation on community lands	YM/UK/AL/02
Urban/ Peri-urban	1	Eco-park development	YM/UK/UL/01
	2	River front development	YM/UK/UL/02
	3	Avenue plantation	YM/UK/UL/03
Conservation Interventions	1	SMC - Contour trenching	YM/UK/CI/01
	2	SMC - *Chal khal*	YM/UK/CI/02
	3	SMC - Check dam	YM/UK/CI/03
	4	SMC - Spur/Retaining wall	YM/UK/CI/04
	5	Wetland management	YM/UK/CI/05
	6	Mixed SMC works	YM/UK/CI/06

The list of proposed treatment sites is given in Annexure 1 of this volume of DPR (Volume II).

1.14. NATURAL LANDSCAPE

YM/UK/NL/01: Temperate mixed plantation

This model has been prescribed in temperate forest areas above 1,800 m altitude, below the alpine zone. The landscape is characterised by dense forests of chiefly conifer species. The zone experiences snow and rain several times during winter and enjoys a cool climate. The major precipitation is in the form of rainfall during monsoon season. Soil is covered with a thick layer of humus. Despite dense forests in the zone, blank patches also exist at many places. Degraded landscape is also noticed along the riverbanks. Such areas will be taken up for treatment under the project.

Under the model, 525 plants of broadleaved and conifer species and 300 plants of shrubs, medicinal plants and bamboos will be will be planted per hectare. 100 contour trenches (40 m^3 volume) and 525 pits of 45 cm x 45 cm x 45 cm size will be dug. A *Chal khal* (a local water harvesting structure with stone work) of 20 m^3 volume is also proposed to be created to conserve water and make it available for irrigation of plants. Slips of grasses will be planted on soil along contour trenches. Tree seedlings grow slow in the nursery and will be nurtured in the nursery for at least two growing seasons before planting out in the pits. Protection against fire will be provided.

Important elements of the model (ha^{-1}) are:

Tree seedlings: 525 (grown in nursery for at least two growing seasons)
Shrubs, shrubs, medicinal plants and bamboo: 300
Pit size: 45 cm x 45 cm x 45 cm
Contour trenches: 100 (40 m^3 volume)

Grasses: On soil along contours

Plant species recommended
Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows: **Tree:** *Abies pindrow, Picea smithiana, Cedrus deodara, Pinus wallichiana, Aesculus indica, Acer caesium, A. oblongum, Prunus cornuta, Betula utilis, Taxus baccata, Rhododendron lepidotum, R. campanulatum, Buxus wallichiana, Alnus nepalensis, Quercus semecarpifolia, Q. Floribunda,* etc. **Bamboo/ Ringal:** *Thamnocalamus falconeri, Sinarundinaria anceps (Arundinaria jaunsarensis),* etc. **Shrub:** *Principia utilis, Rosa moschata, Berberis lycium, Woodfordia* sp., *Cotoneaster macrophyllus, Daphnae cannabina, Ziziphus oxyphylla, Hippophae* sp., *Cornus capitata.* etc. **Medicinal plant**: *Podophyllum hexandrum, Dictamnus albus, Ferula jaeschkeana, Polygonatum verticillatum, Acorus* sp., *Nardostachys* sp., etc. **Grass/sedge:** *Arundinella setosa, Pennisetum orientale, Chrysopogon gryllus, C. fulvus, Apluda mutica, Melica persica*, Calamagrostis emodensis*,* etc.

* Landslide prone area

YM/UK/NL/02: Sub-tropical mixed plantation

This model will be applied in mid-hill region of the state at an altitude of 900-1,800m. South-facing slopes having shallow soil and sites infested with invasive weeds will not be treated with this model. The zone experiences heavy rainfall during monsoon season and modest rainfall during winter season. Most of the rainwater flows down the streams washing away top soil especially in degraded sites. The forests are dominated by *Pinus roxburghii* (chir pine). High temperature and humidity conditions prevail during summer and the forest floor during winter and summer is covered with pine needles. Grasses flush out during monsoon season.

Under the model, 325 plants of broadleaved species and 300 plants of shrubs, medicinal plants and bamboos will be will be planted per ha. 100 contour trenches (40 m^3 volume) and 325 pits of 45 cm x 45 cm x 45 cm size will be dug. *Chal khal* of 20 m^3 volume is also proposed to be dug to conserve water and make it available for irrigation of plants. Slips of grasses will be planted on soil along contour trenches. Fire is a common occurrence during summer and protection measures will be adopted.

Important elements of the model (ha^{-1}) are:

Tree seedlings: 325 (grown in nursery for at least two growing seasons)
Shrubs, shrubs, medicinal plants and bamboo: 300
Pit size: 45 cm x 45 cm x 45 cm
Contour trenches: 100 (40 m^3 volume)
Grasses: On soil along contours

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Cuppressus torulosa, Lyonia ovalifolia, Acer oblongum, Prunus cornuta, Alnus nitida, Olea glandulifera, Pterospermum* sp., *Quercus leucotrichophora,* etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Thamnocalamus falconeri, Sinarundinaria anceps,* etc.

Shrub: *Prinsepia utilis, Rosa moschata, Berberis lycium, Woodfordia* sp., *Ziziphus oxyphylla, Cornus capitata*, *Flemingia* sp., *Artemisia nilagirica***,** *Rhus parviflora***,** etc.

Medicinal plant: *Plumbago indica, Dictamnus albus, Ferula jaeschkeana, Polygonatum verticillatum, Acorus* sp., *Nardostachys* sp., etc.

Grass/sedge: *Pennisetum orientale, Arundinella setosa, A. nepalensis, Chrysopogon fulvus, Heteropogon contortus, Apluda mutica,* Vetiver grass (*Chrysopogon zizanioides), Themeda anathera,* etc.

YM/UK/NL/03: Southern dry slope mixed plantation

This model has been prescribed for southern aspects at 900-1,800 m altitude where stunted growth of vegetation is found due to hot conditions and moisture stress during summer season. The region experiences heavy rainfall during monsoon season and modest rainfall during winter season, causing soil erosion in degraded sites.

Under the model, it is proposed to grow 200 plants of tree species and 200 plants of shrubs, medicinal plants and bamboos per ha. 200 contour trenches (80 m^3 volume) and 200 pits of 45 cm x 45 cm x 45 cm size will be dug. Two *Chal khal* of 40 m^3 volume will also be dug to conserve water and make it available for irrigation of plants. Slips of grasses will be planted on soil along contour trenches. Forest fires commonly occur during the summer season and protection will be provided.

Important elements of the model (ha^{-1}) are:

Tree seedlings: 200
Shrubs, shrubs, medicinal plants and bamboo: 200
Pit size: 45 cm x 45 cm x 45 cm
Contour trenches: 200 (80 m^3 volume)
Grasses: On soil along contour trenches

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Anogeissus latifolia, Lagestroemia parviflora, Acacia catechu, Holoptelea integrifolia, Terminalia bellerica, Terminalia chebula, Bauhinia variegata, Wendlandia, Pinus roxburghii,* etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Bambusa* sp. *Thamnocalamus falconeri,* etc.

Shrub: *Trema politoria, Debregeasia longifolia, Rhus parviflora, Carissa opaca, Buddleia asiatica, Euphorbia* sp., *Rubus ellipticus, Pycantha* sp., *Prinsepia utilis, Berberis lycium, Woodfordia fruticosa, Ziziphus oxyphylla, Cornus capitata, Flemingia* sp. *Artemisia nilagirica***,** *Rhus parviflora, Indigofera cassioides,* etc.

Medicinal plant: *Withania* sp., *Asparagus racemosus.*, *Mucuna pruriens*, *Plumbago indica*, *Ferula jaeschkeana*,, *Nardostachys* sp., etc.
Grass/sedge: *Pennisetum orientale, Chrysopogon gryllus, C. fulvus, C. zizanioides, Heteropogon contortus, Apluda mutica, Calamagrostis emodensis*, Arundinella nepalensis, A. setosa, Thysanolaena maxima,* etc.

* Landslide prone area

Table 1.16. Cost norms for models (YM/UK/NL/01, YM/UK/NL/02 and YM/UK/NL/03) in Uttarakhand

Activities	YM/UK/NL/01		YM/UK/NL/02		YM/UK/NL/03	
	Man-days	Cost (Rs.)	Man-days	Cost (Rs.)	Man-days	Cost (Rs.)
Year 1 (Advance work)						
Survey and alignment of planting lines	5	1,650	5	1,650	5	1,650
Cleaning of site and making of inspection path	10	3,300	10	3,300	15	4,950
Advance soil works (digging of pits)	40	13,200	30	9,900	20	6,600
Contour trenching (100 trenches = 40 m^3, rate Rs. 120 m^{-3})	100 trenches	4,800	100 trenches	4,800	200 trenches	9,600
Chal khal (1 *chal khal* = 20 m^3), rate Rs. 500 m^{-3}	1 *chal khal*	10,000	1 *chal khal*	10,000	2 *chal khals*	20,000
Fencing		60,000		60,000		60,000
Nursery		68,000		32,500		22,500
Total		**1,60,950**		**1,22,150**		**1,25,300**
Year 2 (Planting and establishment)						
Planting in pits and trenches	30	9,900	20	6,600	15	4,900
Sowing in contour trenches	10	3,300	10	3,300	15	4,950
Seed/grass slips cost		1,000		1,000		1,500
Fire protection		2,000		2,000		2,000
Vermicompost/ FYM		1,500		1,500		1,500
Maintenance of plants (5 d mo^{-1} for eight months)	40	13,200	40	13,200	40	13,200
Contingency (irrigation, etc.)		2,000		2,000		2,000
Total		**32,900**		**29, 600**		**30,100**
Maintenance cost						
Year 3 (1st maintenance year)	30	9,900 2,000 1,500	30	9,900 2,000 1,500	30	9,900 2,000 1,500
Year 4 (2nd maintenance year)	30	9,900 2,000 1,500	30	9,900 2,000 1,500	30	9,900 2,000 1,500
Year 5 (3rd maintenance year)	30	9,900	30	9,900	30	9,900
Year 6 (4th maintenance year)	30	9,900	30	9,900	30	9,900
Year 7 (5th maintenance year)	30	9,900	30	9,900	30	9,900
Grand total		**2,50,350**		**2,08,250**		**2,11,900**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

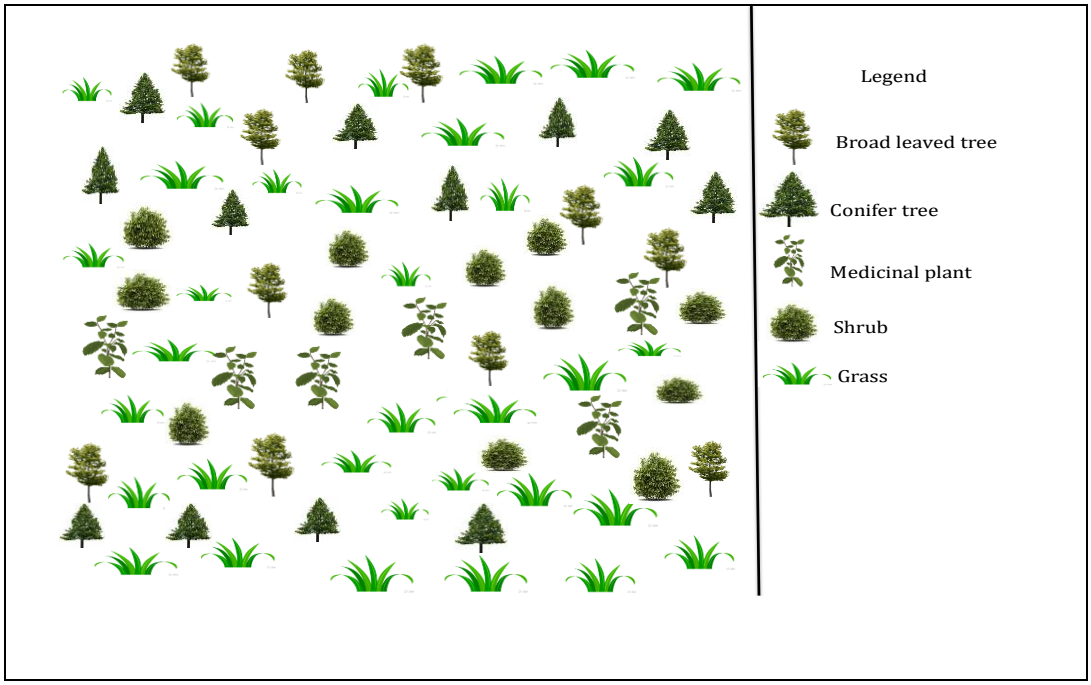


Fig.1.16. Illustration of temperate mixed plantation

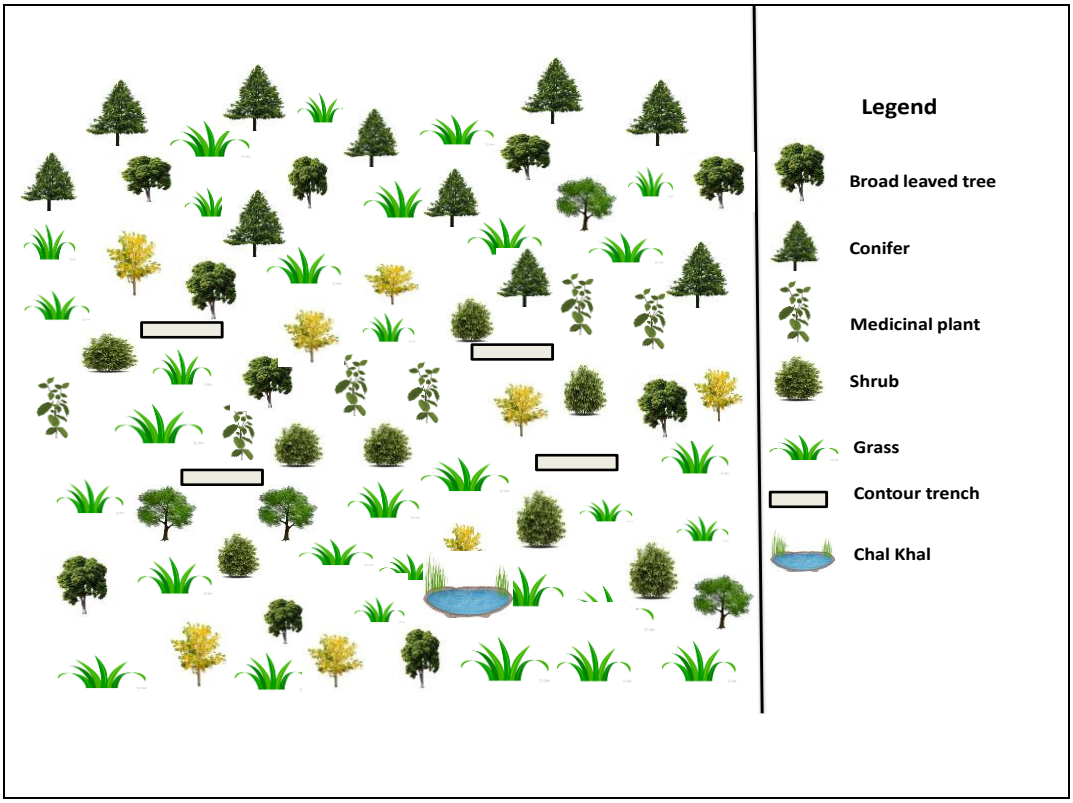


Fig.1.17. Illustration of planting in sub-tropical mixed plantation

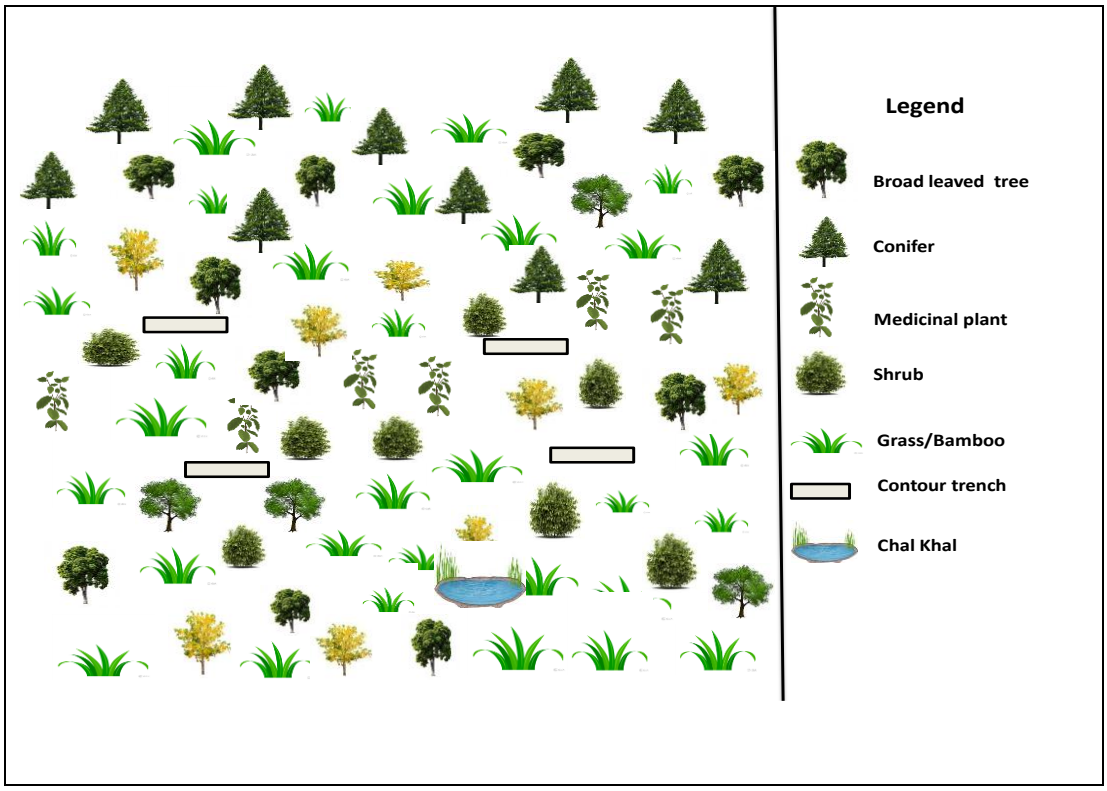


Fig.1.18. Illustration of mixed plantation in southern dry slopes

YM/UK/NL/04: Rehabilitation of invasive species infested areas

This model is proposed for areas infested with dense growth of invasive species in sub-tropical areas and mid-hills in the state of Uttarakhand. It is proposed to cut and uproot invasive species in patches in the treatment areas and plant indigenous trees, shrubs, bamboos and other species of economic utility to replace the invasive species. The area will be maintained to prevent regrowth of invasive species.

It is proposed to raise 325 plants of tree species and 300 plants of shrubs, medicinal plants and bamboos per ha. 100 contour trenches (40 m^3 volume) and 325 pits of 45 cm x 45 cm x 45 cm size will be dug. One *Chal khal* of 20 m^3 volume will also be dug to conserve water and provide this water for irrigation of plants. Slips of grasses will be planted on soil along contour trenches. Forest fires commonly occur during the summer season and protection will be provided.

Important elements of the model (ha^{-1}) are:

Tree seedlings: 325
Shrubs, shrubs, medicinal plants and bamboos: 300
Pit size: 45 cm x 45 cm x 45 cm
Contour trenches: 100 (40 m^3 volume)
Grasses: On soil along contour trenches

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Anogeissus latifolia, Lagestroemia parviflora, Acacia catechu, Dalbergia sissoo, Toona ciliata, Holoptelea integrifolia, Terminalia bellerica, Terminalia chebula, Bauhinia variegata, Wendlandia* sp., etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Bambusa* sp., *Thamnocalamus falconeri*, etc.

Shrub: *Trema politoria, Debregeasia longifolia, Rhus parviflora, Carissa opaca, Buddleia asiatica, Euphorbia* sp., *Rubus ellipticus, Pycantha* sp., *Prinsepia utilis, Berberis lycium, Woodfordia fruticosa, Ziziphus oxyphylla, Cornus capitata, Flemingia* sp., *Artemisia nilagirica*, *Rhus parviflora*, *Indigofera cassioides*, etc.

Medicinal plant: *Withania* sp., *Asparagus racemosus, Mucuna pruriens, Plumbago indica, Ferula jaeschkeana, Acorus* sp., *Nardostachys* sp., etc.

Grass/sedge: *Pennisetum orientale, Arundinella setosa, Pennisetum orientale, Chrysopogon fulvus, Heteropogon contortus, Apluda mutica, Vetiver grass, Arundinella nepalensis, A. setosa, Thysanolaena maxima, Arundo donax, Phragmites karka*, etc.

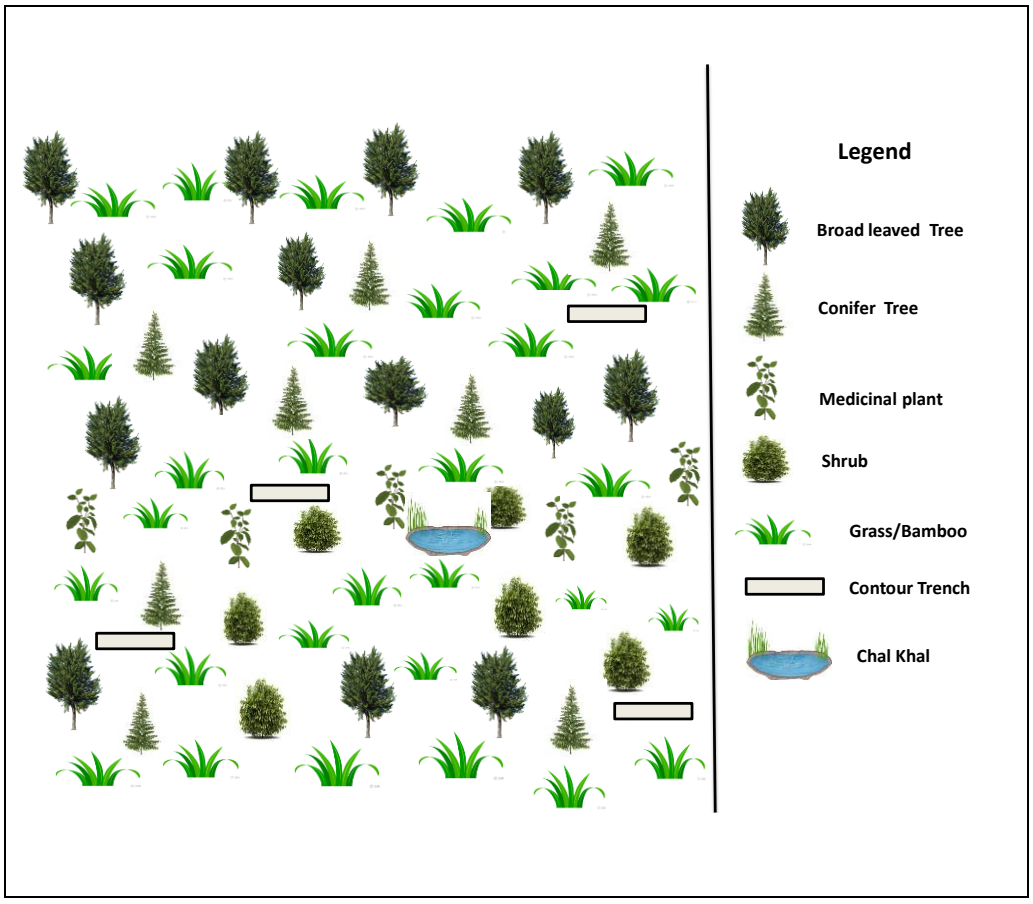


Fig.1.19. Illustration of rehabilitation of invasive species infested areas

YM/UK/NL/05: Assisted Natural Regeneration

The model aims to aid and accelerate the natural process of succession and overcome impediments to natural regeneration such as from degradation of soil, invasive action of weeds, drought, grazing/browsing, fire, human disturbance, etc.). Assisted Natural Regeneration (ANR) costs less and is speedier in its effect than artificial regeneration, and is very effective in watershed protection and soil conservation.

Under this model, protection will be provided to overcome the adverse anthropogenic factors. Removal of interfering vegetation will be done, besides digging of 200 contour trenches (80 m^3 volume) and creation of one *Chal khal* (20 m^3 volume) per ha to reduce biotic stress, promote moisture conservation. Two hundred seedlings of trees, bamboos and shrubs will be planted to supplement natural regeneration. Grasses will be planted along contours to aid soil and water conservation. Silvicultural operations such as regeneration clearing, singling, pruning, etc. will be done to support regeneration of existing plants.

Important elements of the model (ha^{-1}) are:

Tree, shrub and bamboo seedlings: 200
Pit size: 45 cm x 45 cm x 45 cm
Contour trenches: 200 (80 m^3 volume)
Grasses: On soil along contour trenches

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Toona ciliata, Lannea coromandelica, Albizia lebbeck, Acacia catechu, Dalbergia sissoo, Anogeissus latifolia, Lagestroemia parviflora, Holoptelea integrifolia, Terminalia bellerica, Bauhinia variegate,* etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Bambusa* sp. *Thamnocalamus falconeri,* etc.

Shrub: *Trema politoria, Debregeasia longifolia, Rhus parviflora, Carissa opaca, Buddleia asiatica, Euphorbia* sp., *Rubus ellipticus, Pycantha* sp., *Prinsepia utilis, Berberis lycium, Woodfordia fruticosa, Ziziphus oxyphylla, Cornus capitata, Flemingia* sp. *Artemisia nilagirica, Rhus parviflora, Indigofera cassioides,* etc.

Grass/sedge: *Pennisetum orientale, Chrysopogon fulvus, Heteropogon contortus, Apluda mutica, Thysanolaena maxima,* etc.

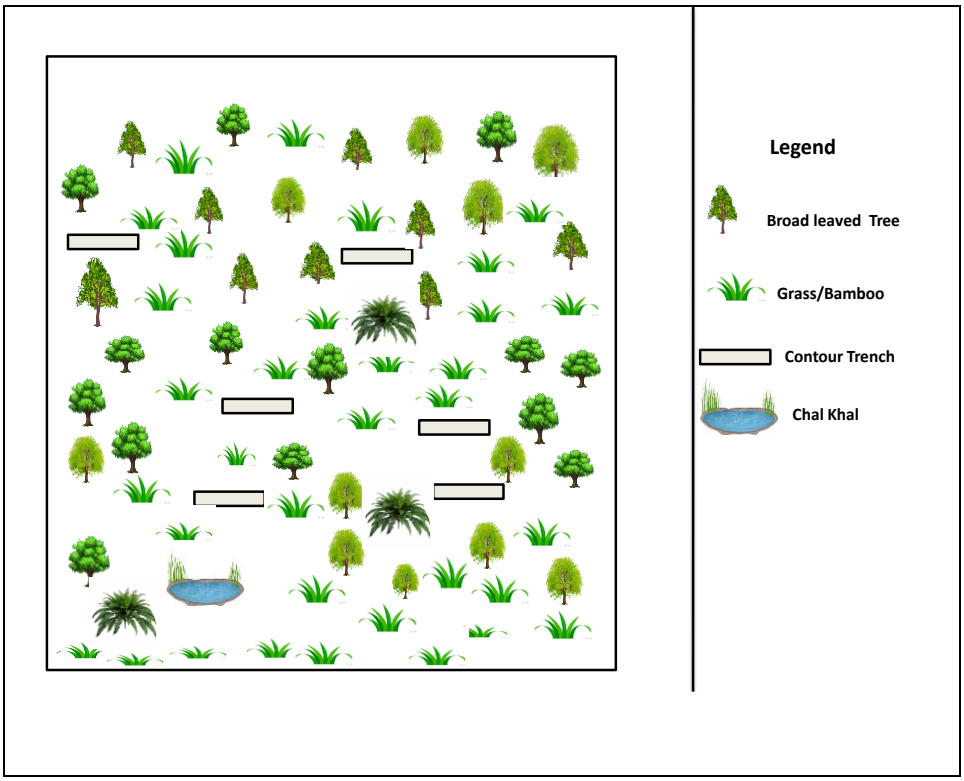


Fig.1.20. Illustration of assisted natural regeneration

Table 1.17. Cost norms for models (YM/UK/NL/04 and YM/UK/NL/05) (ha^{-1})

Activities	UK/NL/04		UK/NL/05	
	Man-days	Cost (Rs.)	Man-days	Cost (Rs.)
Year 1 (Advance work)				
Survey and alignment of planting lines	5	1,650	5	1,650
Cleaning of site and making of inspection path	5	1,650	10	3,300
Lantana removal		30,000	NA	-
Advance soil works (digging of pits)	30	9,900	10	3,300
Contour trenching (100 trench = 40 m^3, rate Rs. 120 m^{-3})	100 trenches	4,800	200 trenches	9,600
Chal khal (1 *chal khal* =20 m^3), rate Rs. 500 m^{-3}	1 *chal khal*	10,000	1 *chal khal*	10,000
Fencing		60,000		60,000
Nursery		32,500		12,000
Total		**1,50,500**		**99,850**
Year 2 (Planting and establishment)				
Planting in pits and trenches	40	13,200	20	6,600
Sowing in contour trenches	10	3,300	15	4,950
Seeds/grass slips		1,000		1,500
Fire protection/Fire watcher etc.		2,000		30,000
Vermicompost/ FYM		1,500		1,000
Maintenance of plants (5 d mo^{-1} for eight months)	40	13,200	40	13,200
Contingency (irrigation, etc.)		2,000		1,000
Silviculture operations (regeneration clearings, singling/pruning, SMC works, etc.)	NA			10,000
Total		**36,200**		**68,250**

Maintenance cost				
Year 3 (1st maintenance year)	30	9,900 2,000 1,500	30	9,900 1,000 1,000
Year 4 (2nd maintenance year)	30	9,900 2,000 1,500	30	9,900 1,000 1,000
Year 5 (3rd maintenance year)	30	9,900	30	9,900
Year 6 (4th maintenance year)	30	9,900	30	9,900
Year 7 (5th maintenance year)	30	9,900	30	9,900
Grand Total		**2,43,200**		**2,21,600**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UK/NL/06: Shiwalik mixed plantation

The Shiwalik belt has an open landscape along the riverbanks. The soil is deep and fertile with good moisture content. Animals prefer graze in this zone due to proximity to water and cause damage to the vegetation. There is a high incidence of damage to trees by lopping. Soil from road construction and other development activities collects along river causing damage to the flora.

In this model, it is planned to raise 325 plants of broadleaved trees and 300 plants of shrubs, bamboos and medicinal plants per ha. Digging of 100 contour trenches (40 m^3 volume) and creation of one *Chal khal* (20 m^3 volume) will also be undertaken. Grass will be raised along contour trenches to help in soil and water conservation. Protection will be provided to check damage from adverse anthropogenic factors and fire in the area.

Important elements of the model (ha^{-1}) are:
Tree seedlings: 325.
Shrubs, medicinal plants and bamboo: 300.
Pit size: 45 cm x 45 cm x 45 cm.
Contour trenches: 100 (40 m^3 volume).
Grasses: On soil along contour trenches.

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Anogeissus latifolia, Lagestroemia parviflora, Acacia catechu, Toona ciliata, Holoptelea integrifolia, Terminalia bellerica, Terminalia chebula, Bauhinia variegata, Alnus nepalensis, Shorea robusta,* etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Bambusa* sp. *Thamnocalamus falconeri,* etc.

Shrub: *Trema politoria, Debregeasia longifolia, Rhus parviflora, Carissa opaca, Buddleia asiatica, Euphorbia* sp., *Rubus ellipticus, Pycantha* sp., *Prinsepia utilis, Berberis lycium, Woodfordia fruticosa, Ziziphus oxyphylla, Cornus capitata, Flemengia* sp. *Artemisia nilagirica, Rhus parviflora, Indigofera cassioides,* etc.

Medicinal plant: *Withamia* sp., *Asparagus racemosus, Mucuna pruriens, Plumbago indica, Ferula jaeschkeana, Acorus* sp., *Nardostachys* sp., etc.

Grass/sedge: *Pennisetum orientale, Arundinella setosa, Chrysopogon fulvus, Heteropogon contortus, Apluda mutica, Vetiver grass, Arundinella nepalensis, A. setosa, Thysanolaena maxima, Arundo donax, Phragmites karka, Saccharum bengalense, Narenga porphyrocoma,* etc.

* Landslide area

Table 1.18. Cost norms for models (YM/UK/NL/06) in Uttarakhand (ha^{-1})

Activities	YM/UK/NL/06	
	Man-days	**Cost (Rs.)**
Year 1 (Advance work).		
Surveyand alignment of planting lines	5	1,650
Cleaning of site and making of inspection path	10	3,300
Advance soil works (digging of pits)	20	6,600
Contour trenching (100 trench = 40 m^3, rate Rs. 120 m^{-3})	100 trenches	4,800
Chal khal (1 *chal khal* =20 m^3) Rate Rs. 500 m^{-3}	1 *Chal khal*	10,000
Fencing		60,000
Nursery		32,500
Total		**1,18,850**
Year 2 (Planting and establishment)		
Planting in pits and trenches	20	6,600
Sowing in contour trenches	10	3,300
Seed/grass slips cost		1,000
Fire protection		2,000
Vermicompost/FYM		1,500
Maintenance of plants (5 d mo^{-1} for eight months)	40	13,200
Contingency (irrigation, etc.)		2,000
Total		**29,600**
Maintenance cost		
Year 3 (1st maintenance year)	30	9,900 2,000 1,500
Year 4 (2nd maintenance year)	30	9,900 2,000 1,500
Year 5 (3rd maintenance year)	30	9,900
Year 6 (4th maintenance year)	30	9,900
Year 7 (5th maintenance year)	30	9,900
Grand Total		**2,04,950**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

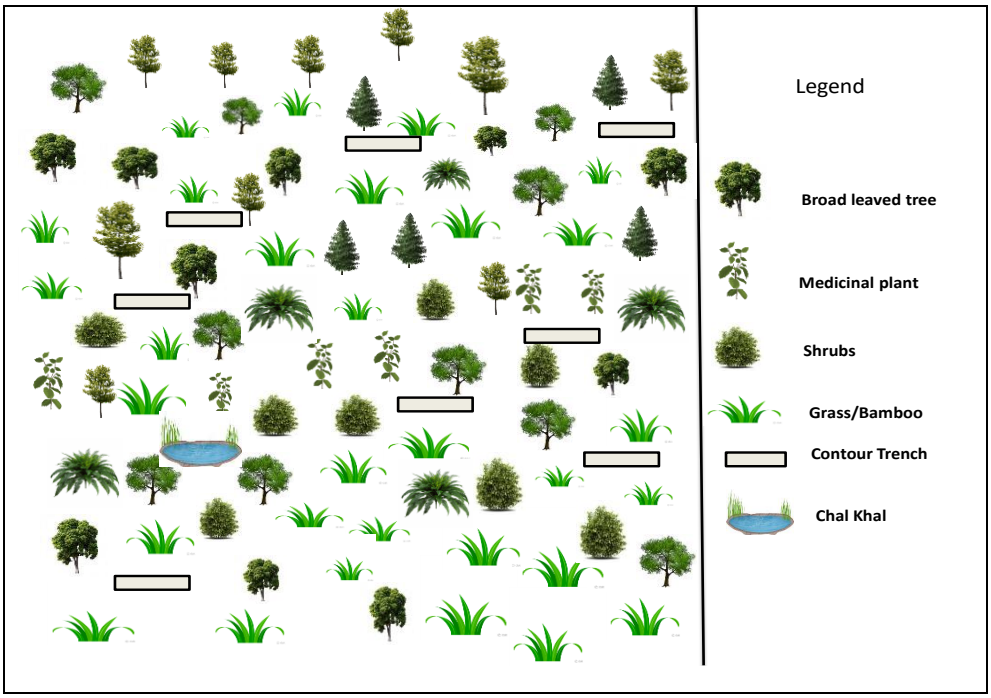


Fig.1.21. Illustration of mixed plantation in Shiwalik area

YM/UK/NL/07: Plantation by Eco-Task Force

Some sites in the state of Uttarakhand have very inhospitable topography and extremely low temperatures. These sites require continued presence and close supervision of planting and maintenance team. Ecological units of the Territorial Army, called Eco Task Force (ETF), have been carrying out afforestation works in difficult and inaccessible areas for over last three decades. These are manned by a mixture of regular army personnel and young ex-service men. ETFs are funded by state governments and the Ministry of Environment, Forest and Climate Change, GoI. The ETFs, through tree plantation, have performed admirably in restoration of harsh sites in the Mussoorie hills of Uttarakhand, It is proposed to utilise this ability of ETF in regenerating sites under this model. Inhospitable sites in difficult terrain measuring 600 ha will be assigned by SFD to Eco-Tack Force for carrying out afforestation activities. Models under natural landscape or their combinations suitable to the area, will be implemented. *This model has been dropped on the suggestion of SFD.*

Cost norm for YM/UK/NL-07 (Rs. ha^{-1})

Rs. 2,30,000 ha^{-1} is proposed tentatively. 600 ha are proposed to be treated in the state.

Table 1.19. Year-wise cost summary for YM/UK/NL-07 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,30,000	0	0	0	0	0	**2,30,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

1.15. TREATMENT MODELS FOR AGRICULTURAL LANDSCAPE

YM/UK/AL/01: Planting of saplings by farmers

This model will be implemented in agricultural land in temperate, sub-temperate and sub-tropical zone in Uttarakhand. Forestry as well as horticultural species will be planted depending upon the requirement of the landowners. Planting stock and technical knowledge will be supplied to them through appropriate mechanism under this project. Planting and maintenance of the plants will be done by the landowners themselves. Financial incentive to the growers will be provided keeping based on the survival of the plants.

Plants will be planted along the bunds in two rows at a spacing of 3 m. 264 plants will be considered equivalent to one hectare.

The model may be implemented as per the provisions of *'Hamara Ped, Hamara Dhan'* scheme of Uttarakhand SFD.

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Grewia optiva, Bauhinia variegata, Bauhinia purpurea, Celtis australis, Dalbergia sissoo, Ficus roxburghii, F. palmata, Terminalia alata, T. bellirica, Cordia dichotoma, Quercus leutrichophora, Q. dilatata, Salix alba, Juglans regia, Morus alba,* etc.

Bamboo: *Dendrocalamus strictus, Thamnocalamus falconeri, Sinarundinaria anceps,* etc.

Fruit tree: Apple, pear, peach, plum, apricot, walnut, etc.

Cost norms for model YM//UK/AL//01:

Cost of plant including carriage (Year 1): Rs. 100 plant^{-1}, and
Planting and maintenance cost during planting year (Year 1): Rs. 100 plant^{-1}.
Maintenance cost in Year 2: Rs. 25 plant^{-1}.
Maintenance cost in Year 3: Rs. 25 plant^{-1}.
Maintenance cost in Year 4: Rs. 25 plant^{-1}.
Maintenance cost in Year 5: Rs. 25 plant^{-1}.
i.e. Rs. 300 plant^{-1}or Rs 79,200 ha^{-1}.

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UK/AL/02: Plantation on Community Lands

Landholding size of farming families in the Yamuna basin is small and many families are landless. Community land serves as place for grazing by cattle and source of firewood and fodder. At many places these lands are degraded and are source of soil erosion and rapid runoff of water. Local communities have evinced interest to regenerate the sites. It is proposed to help the rural communities plant these sites with useful species of plants.

Planting will be done as per details given for model YM/UK/NL/03. Local community will be entrusted with the responsibility to plant, maintain and manage the plantation through appropriate local institution.

Cost norms: Same as the cost norms of model YM/UK/NL/03

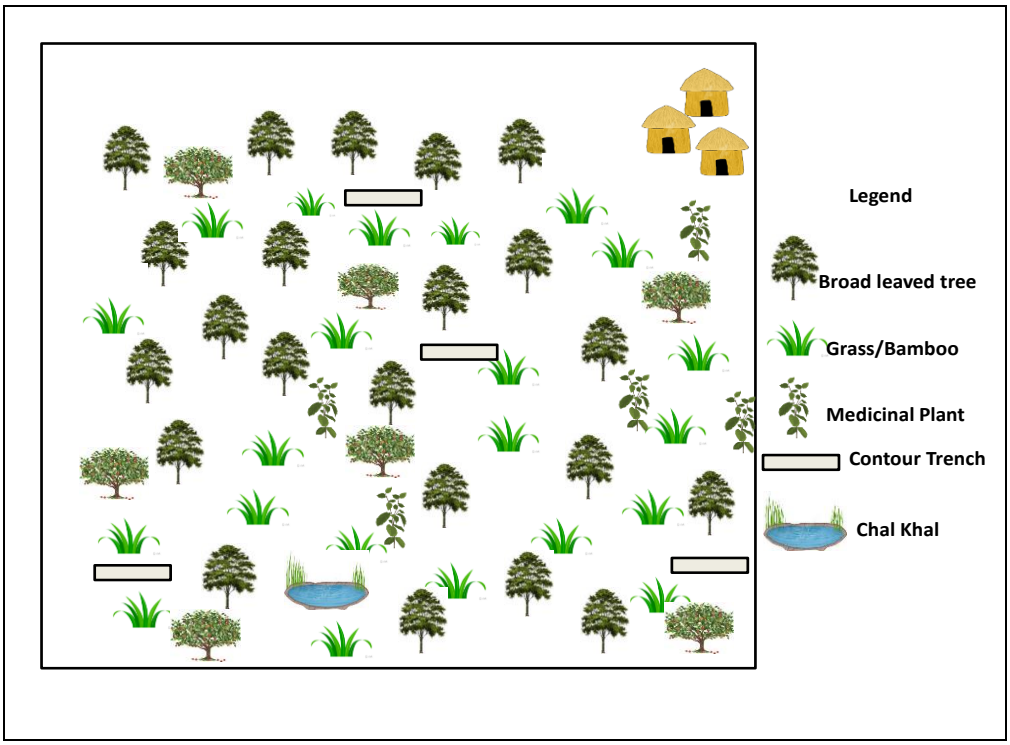


Fig.1.22. Illustration of plantation model on community lands

1.16. URBAN/PERI-URBAN LANDSCAPE

YM/UK/UL/01: Eco-park development model

Eco-park is a mini ecological park or an amusement park established without hampering the natural environment of the area. Generally, a particular area of a forest is demarcated and brought under intensive management for this purpose and the beauty offered by nature is opened to the visitors. Sometimes forest areas having special natural features are selected for eco-park development. Landscaping and beautification is proposed to be done for urban and peri-urban landscapes of frequent public visitation to bring forth aesthetics and entertainment coupled with natural awareness. The natural layout of the land will be manoeuvred in such a way that the aesthetic beauty will be enhanced without much investment. Landscaped area will be designed to afford good soil, moisture and biodiversity conservation. *Nakshatra vatika, Rashi vatika, Nav-grah vatika, Panchvati vatika, Dhanvantri vatika*, etc. will be established within the park for awareness generation, meditation and spiritual fulfilment. Site-specific activities will be carried out at different places in harmony with the site conditions. An eco-park will have better facilities than riverfront development to facilitate the visitors.

The proportion of ornamental plants will be relatively more in eco-park than in the riverfront development model. An eco-park may have vegetative and non-vegetative components:

Vegetative part*:* Miscellaneous ornamental species.

Non-vegetative part*:* Fencing, stairs, pathways, walking trails, stone pitching, rain shelter, benches, public utilities, parking area, information centre, children playing area, pond beautification, landscaping etc. as per site-specific requirement.

Plant species recommended

Indigenous species will be planted in the model. Few examples of plant types for the purpose of illustration are as follows:
Lawn grasses, hedge plants, shrubs, creepers, vines, hanging plants, grove of ornamental trees, fruit trees, forest trees and ornamental bamboos, flowering herbs/shrubs, cacti, ferns, palms, aquatic plants, medicinal plants.

YM/UK/UL/02: Riverfront development

Riverbanks near urban areas provide opportunity to integrate habitat restoration, public awareness and recreation, and provide the people a grand sight of the river along with fresh air, mental peace and spiritual fulfilment that would connect them with the river. It serves to create green infrastructure and accommodate activities of the local communities as well as visitors.

Under the model, the natural elements of the area will be enhanced while developing the riverfront. Plantation of trees, shrubs and grasses will be done to stabilise the riverbank and control soil erosion. Hard river edges are a significant concern in riverfront because they disrupt the natural fluctuations of water (Riverlife, 2012) and its interaction with riparian plant and animal communities on the riverbank. Hence, the use of civil works would be limited to the most essential ones. The infrastructure in the riverfront would be simple and integrated with the landscape.

Riverfront development envisages providing spaces and amenities for activities such as running, strolling, boating, fishing, bathing, adventure, sitting, meditation, awareness generation, etc. besides providing a pleasing and relaxing environment to the visitors in harmony with provision of ecosystem services. Increased tree canopy and livelihood would be essential concerns of riverfront development.

Riverfront plantation will stabilize the riverbank by protecting it from soil erosion by intercepting the rain drops and sunlight at various heights of canopy through multiple layers of vegetation. A multi-tier arrangement of grasses at the ground, small to medium sized herbs and shrubs as second layer of vegetation and small to medium sized trees as third vegetation layer interspersed with the topmost layer of tall trees will effectively serve the intended functions. A basic support system may also be developed for the convenience of visitors.

The riverscape of Yamuna and tributaries has different stakeholders such as farmers, *panchayats*, municipal corporations, irrigation department, institutions, forests department, defence, etc. and substantial portion is under private ownership. Suitable steps would be taken to ensure smooth coordination of the activities among different agencies. One model for riverfront development has been proposed. Site-specific activities will be carried out at different places commensurate with the site conditions.

A typical landscaping area may have vegetative and non-vegetative components.

List of components to be created according to requirement:

Vegetative part: Grove consisting of shade trees, ornamental trees and bamboos, medicinal plant garden, climbers, hedges, grasses, lawn.

Non-vegetative part: Stairs, pathways, walking trails, stone pitching, rain shelter, benches, low-cost public utilities, parking area, information centre, etc. as per site-specific requirement.

The vegetative and non-vegetative components will be arranged to enhance the aesthetic appeal. Various species will be planted according to their recommended spacing and resource use ability. Water loving and soil-binder tree species are ideal choice species for riverbank planting. The species will be accommodated as per the use value. In urban areas, planting will be done keeping in view aesthetic

improvement while planting in rural areas will be done for providing multiple benefits for meeting local needs.

Plant species recommended
Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows: **Large tree:** *Bauhinia variegata, B. purpurea, Cupressus torulosa, Terminalia bellirica, T. chebula, T. arjuna, Syzygium cumini, Pongamia pinnata, Albizia lebbeck, Acer nepalensis, Quercus* spp., etc. **Dwarf tree/shrub/bamboo:** *Cassia fistula, Thespesia populnea, Dendrocalamus strictus, Woodfordia fruticosa, Sesbania grandiflora, Rosa moschata, Adhatoda vasica,* etc. **Herb:** *Ocimum sativum, Wedelia trilobata,* etc. **Grass:** *Stylosanthes* sp., *Arundo donax, Axonopus compressus, Saccharum bengalense, S. spontaneum,* etc. **Miscellaneous ornamental plants:** Lawn grasses, hedge plants, shrubs, ornamental trees, ornamental bamboos, flowering herbs/shrubs, palms, aquatic plants.

YM/UK/UL/03: Avenue plantation

Roads provide a readily available space for planting of trees. Roadside plantations provide shade to pedestrians and vehicles, beautify surroundings, reduce the impacts of air and noise pollution, serve as natural sink for carbon and air pollutants, arrest soil erosion at the embankment slopes, prevent glare from the headlight of incoming vehicles, moderate the effect of wind, give employment to local people and help in maintaining biodiversity. It is proposed to establish avenue plantations along roads in the treatment zone and adjoining area.

Plant species recommended
Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows: **Trees:** *Cedrus deodara, Cupressus torulosa, Toona ciliata, Bauhinia variegata, B. purpurea, Terminalia bellirica, Terminalia chebula, Terminalia arjuna, Syzygium cumini, Albizia lebbeck, Alnus nepalensis,* etc.



Fig. 1.23. Illustration of eco-park development
(***Source:*** https://www.holidify.com/places/dhanaulti/eco-park-sightseeing-4506.html)



Fig. 1.24. Illustration of riverfront development
(***Source:*** https://www.dnaindia.com/ahmedabad/report-amc-vows-green-island-reservoir-at-riverfront-2624416)



Fig. 1.25. Illustration of avenue plantation
(***Source:*** http://thewoodlandnursery.in/avenue-plantation.html)

The following cost norms are prescribed:

Table 1.20. Cost norms for models (YM/UK/UL/01, YM/UK/UL/02 and YM/UK/UL/03) in Uttarakhand

Model	**Estt. cost (Rs. in lakh ha^{-1})**	**Maint. cost (Rs. in lakh ha^{-1})**	**Total cost (Rs. in lakh ha^{-1})**
Eco-park Development (YM/UK/UL/01)	25.0	7.2 (12,000 mo^{-1} or 1.44 lakh yr^{-1} for 5yrs.)	32.2
River Front Development (YM/UK/UL/02)	35.0	7.2 (12,000 mo^{-1} or 1.44 lakh yr^{-1} for 5yrs.)	42.2
Avenue Plantation (YM/UK/UL/03)	2.50	1.5 (2,500 mo^{-1} or 0.30 lakh yr^{-1} for 5yrs.)	4.0

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

1.17. TREATMENT MODELS FOR CONSERVATION INTERVENTIONS

There are several sites which are affected by the problem of soil erosion or inadequate infiltration of rainwater despite having satisfactory tree cover. Soil and moisture conservation measures will be applied in such areas. Contour trench, *chal khal* and check dam will be created under different models in such areas depending upon their suitability. In some sites where the above structures are not likely to sustain the pressure of flowing water, spur and retaining wall will be erected. Planting of trees is not proposed on these structures. The surrounding forest area will not be treated under these models. The models are intended to check soil erosion, increase ground water recharge, reduce problem of soil erosion, increase availability of drinking water for animals and improve the site quality.

1.17.1. YM/UK/CI/01: Contour trenching

Contour trenching, either staggered or continuous, is a very effective conservation practice to check soil erosion and enhance groundwater recharge for improving base flow in hilly streams. Contour trenching is proposed on uniform hill slopes or landscapes with rolling/undulating topography in plain areas.

1.17.2. YM/UK/CI/02: *Chal khal*

A *chal khal* is a small water harvesting structure traditionally used in the state of Uttarakhand. It is an artificial pond, lined with stones, that is constructed across a natural stream or water course to harvest and impound the runoff. It provides water for irrigation and drinking and facilitates vertical and lateral percolation of impounded water into the soil substrata, thereby recharging groundwater in the area.

1.17.3. YM/UK/CI/03: Check dam

Check dams are versatile conservation structures to check soil erosion caused by flowing water, enable water harvesting and improve groundwater recharge. These structures are suitable for small order ephemeral streams both in hilly and plain topographic conditions. Where the purpose of the check dam is soil conservation in small streams and gullies, the drop of head wall should not be more than 1.5 m. Proper spillway and downstream protection measures need to be provided where drop of structure exceeds 1.5 m.

1.17.4. YM/UK/CI/04: Spur/Retaining Wall

A spur is a stone or RCC (reinforced cement concrete) structure built on the bank of a river at some angle to the direction of flow of water with the objective of deflecting water away from the bank. This reduces the pressure of water striking the riverbank and helps reduce soil erosion. A retaining wall is a stone or RCC structure that holds back soil or rock from slipping down. Retaining walls are particularly useful where there is a change in level within a restricted area.

1.17.5. YM/UK/CI/05: Wetland Management

This model aims at restoration of identified wetlands in the hilly upstream catchment as well as in the floodplain. The causes of degradation of wetlands will be addressed and bio-engineering measures will be applied that combine vegetation and other naturally available materials, to produce a functioning system that would prevent soil erosion and improve habitat. Under the model, de-siltation will be carried out of wetlands and their entry-exit channels. Terrestrial and aquatic weeds will be removed and regeneration of native species of trees, shrubs, grasses and other herbs will be augmented by natural regeneration or artificial regeneration depending upon site-specific requirement. Need-based measures will also be taken to improve habitat and augment the population of native aquatic fauna and control of invasive faunal species.

1.17.6. YM/UK/CI/06: Mixed SMC Works

Some sites require a combination of activities for soil and moisture conservation and the quantity of individual activities per unit areavary greatly with site. Such activities will be carried out under this model.

Table 1.21. Cost norms for models (YM/UK/CI/01, YM/UK/CI/02, YM/UK/CI/03, YM/UK/CI/04, YM/UK/CI/05 and YM/UK/CI/06) in Uttarakhand

Model	Estt. cost (Rs. m^{-3})	Maint. cost (Rs. $m^{-3}yr^{-1}$)	Total cost (Rs. m^{-3})
YM/UK/CI/01: Contour trenching (3×0.3×0.45m = 0.40 m^3)	120	60 (10% of estt. cost or 12 yr^{-1} for 5 yrs.)	180
YM/UK/CI/02: Chal khal (5×4×1m = 20 m^3)	500	250 (10% of estt. cost or 50 yr^{-1} for 5yrs.)	750
YM/UK/CI/03: Check dam (5×1.5×2m = 15 m^3)	2,000	1,000 (10% of estt. cost or 200 yr^{-1} for 5yrs,)	3,000
YM/UK/CI/04- Spur/Retaining wall (5×1.5×2m = 15 m^3)	2,200	1,100 (10% of estt. cost or 220 yr^{-1} for 5yrs),	3,300
YM/UK/CI/05-Wetland management	6.5 lakh ha^{-1}	3.25 lakh (10% of estt. cost or 0.65 lakh yr^{-1} for 5yrs,)	9.75 lakh ha^{-1}
YM/UK/CI/06-Mixed SMC works	Site-specific requirement	Site-specific requirement	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

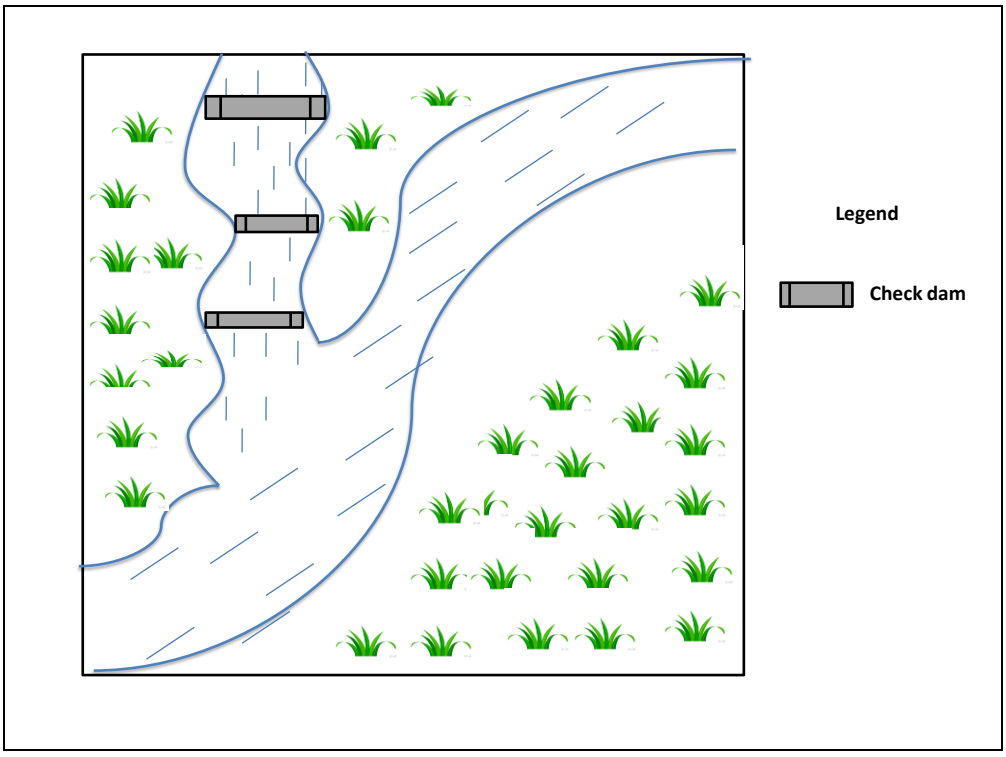


Fig. 1.26. Illustration of check dam

1.18. SUPPORTING ACTIVITIES:

Other activities such as awareness generation, capacity building, monitoring, research, nursery development, development of value chain, protection against fire, etc. are essential to facilitate the forestry interventions and are considered vital for successful and effective execution of proposed forestry interventions.

The strategies and specific interventions for these important supporting activities are provided in Volume 1 of the DPR.

A multi-tiered mechanism has been suggested for monitoring of the project (Fig. 1.27.).

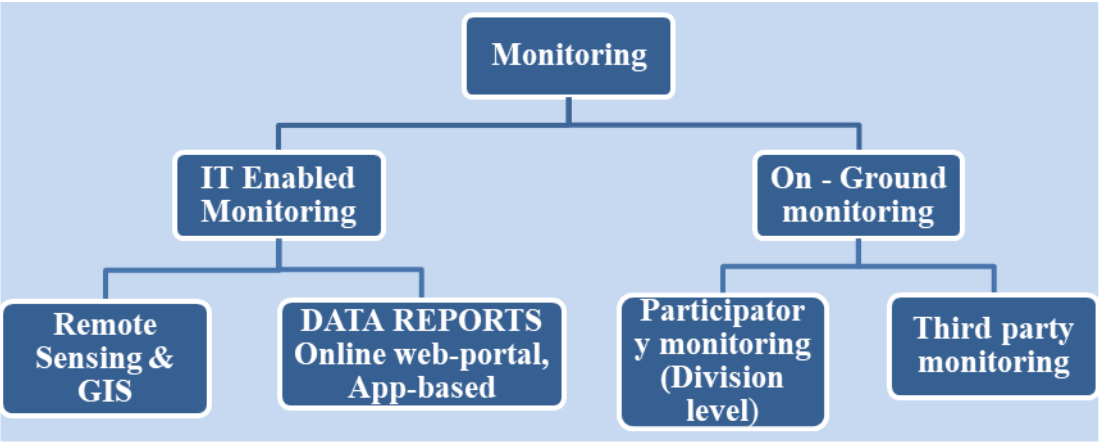


Fig. 1.27. A multi -tiered monitoring mechanism for forestry interventions for Rejuvenation of Yamuna River

1.19. BUDGET

The physical and financial projections for all the interventions, supporting activities to be undertaken for the cost, duration as well as various divisions in Uttarakhand are given in Table 1.22. to Table 1.39.

Table 1.22. Component/Activity-wise budget allocation for Uttarakhand

S. no.	Component and /or Activity	Amount (Rs. in lakh)	Allocation (%)
Implementation of Forestry Interventions in Uttarakhand		**12,371.29**	**100.00**
A	**Plantations and treatment models in three categories of landscape**	**4,043.12**	**32.68**
A.1	Natural landscapes	2,727.09	
A.2	Agriculture landscapes	343.37	
A.3	Urban and peri-urban landscapes	972.66	
B	**Conservation Interventions**	**7,390.27**	**59.74**
C	**Supporting Activities**	**937.90**	**7.58**
C.1	Awareness generation, research activities, capacity building, value-chain development, nursery establishment/improvement, fire protection, monitoring and evaluation, etc.	631.90	
C.2	Field activities, contingency and miscellaneous expenses	187.00	
C.3	Cost of PMU in Uttarakhand	119.00	

A sum of Rs. 12,371.29 lakh (i.e. Rs. 123.71 crore) has been proposed for the Implementing Agency for execution in the state of Uttarakhand (Table 1.22.). About 32.68% (i.e., Rs. 4043.12 lakh) of the budget provision has been made for plantations and treatment models in three landscapes while Rs. 7,390.27 lakh are provisioned for Conservation interventions. For supporting activities like awareness generation, research activities, capacity building, nursery establishment/improvement, fire protection, monitoring

and evaluation, etc. an amount of Rs. 631.90 lakh has been allocated. A sum of Rs. 187.00 lakh has been provided for field activities and contingency and Rs. 119.00 lakh for Project Monitoring Unit in the state (Table 1.23.). Plantation and treatment models in the three landscapes will cover an area of 5,219.23 ha and Conservation interventions will cover 3,780.45 ha area (notional) in Uttarakhand (Table 1.24.).

Indexing of cost

The budget for the project has been prepared on the basis of rates applicable during April 2020. The cost of the project may be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI).

Table 1.23. Year-wise cost summary for supporting activities (C.1 to C.3) (cost Rs. in lakh)

S. no.	Particular	1st yr	2nd yr	3rd yr	4th yr	5th yr	Total
1	Awareness generation, research activities, capacity building, nursery establishment/ Improvement, fire protection, monitoring and evaluation, etc.	129.00	135.80	129.30	124.80	113.00	**631.90**
2	Field activities, contingency and miscellaneous expenses	41.50	41.50	41.50	35.00	27.50	**187.00**
3	Cost of PMU in Uttarakhand	30.00	20.00	20.00	22.00	27.00	**119.00**
	Total	**200.50**	**197.30**	**190.80**	**181.80**	**167.50**	**937.90**

Table 1.24. Plantation/treatment area summary for Forestry Interventions in Uttarakhand (in ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II	No. of sites
Landscape	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Est.	Maint.	
Natural	656.00	390.00	656.00	70.00	1,046.00	1,116.00	1,116.00	1,116.00	1,116.00	117
Agriculture	121.18	126.02	121.18	42.57	247.20	289.77	289.77	289.77	289.77	49
Urban/ peri-urban	13.50	17.50	13.50	2.00	31.00	33.00	33.00	33.00	33.00	17
Conservation Interventions	2,002.63	1,015.24	2,002.63	762.58	3,017.87	3,780.45	3,780.45	3,780.45	3,780.45	650
Total	**2,793.31**	**1,548.76**	**2,793.31**	**877.15**	**4,342.07**	**5,219.23**	**5,219.23**	**5,219.23**	**5,219.23**	**833**

Table 1.25. Cost summary for Forestry Interventions (Rs. in lakh)

	Year1	Year 2		Year 3		Year 4	Year 5	Phase I			Phase II	Grand total
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**Total**		
Natural	713.94	564.15	368.99	119.94	261.22	180.02	152.31	1,398.03	962.55	2,360.57	366.52	2,727.09
Agriculture	71.23	100.32	10.87	24.78	29.10	26.07	26.95	196.33	92.99	289.33	54.05	343.37
Urban/ peri-urban	357.50	313.69	20.41	55.13	42.27	47.72	50.10	726.31	160.50	886.81	85.85	972.66
Conservation Interventions	2,196.86	1,443.64	229.72	1,039.07	392.09	522.09	547.80	4,679.57	1,691.70	6,371.27	1,019.00	7,390.27
Total	**3,339.53**	**2,421.79**	**629.99**	**1,238.91**	**724.68**	**775.90**	**777.17**	**7,000.24**	**2,907.74**	**9,907.98**	**1,525.41**	**11,433.40**

For interventions in Natural, Agriculture, Urban/Peri-urban landscape an expenditure of Rs. 3,443.09 lakh, 285.40 lakh and Rs. 950.06 lakh, respectively, will be incurred in Phase I (Table 1.25.).

Table 1.26. Year-wise cost summary for C.1 supporting activities (Cost Rs. in lakhs)

S. no.	Supporting Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Awareness generation	11.00	17.00	18.50	18.50	16.00	**81.00**
2	Capacity building and value-chain development	12.00	19.00	19.50	19.50	17.00	**87.00**
3	Entry point activities	50.00	0.00	0.00	0.00	0.00	**50.00**
4	Nursery improvement and fire protection	16.00	23.00	23.30	24.00	22.00	**108.30**
5	Research	20.00	16.80	18.00	12.80	10.00	**77.60**
6	Monitoring and evaluation	20.00	60.00	50.00	50.00	48.00	**228.00**
	Total	**129.00**	**135.80**	**129.30**	**124.80**	**113.00**	**631.90**

Table 1.27. Year-wise details of C.2 supporting activities for field activities, contingency and miscellaneous expenses (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Field activities, contingency and miscellaneous costs	41.50	41.50	41.50	35.00	27.50	**187.00**

Table 1.28. Year-wise details of C.3 supporting activities for PMU (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Recurring	10.00	15.00	18.00	20.00	25.00	**88.00**
2	Non-recurring	20.00	5.00	2.00	2.00	2.00	**31.00**
	Total	**30.00**	**20.00**	**20.00**	**22.00**	**27.00**	**119.00**

Table 1.29. Area in Natural Landscape (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Phase II**
Barkot Upper Yamuna	305.00	55.00	305.00	0.00	360.00	360.00	360.00	360.00	360.00
Chakrata	90.00	150.00	90.00	60.00	240.00	300.00	300.00	300.00	300.00
Dehradun	6.00	0.00	6.00	0.00	6.00	6.00	6.00	6.00	6.00
Govind Wildlife Sanctuary	10.00	0.00	10.00	0.00	10.00	10.00	10.00	10.00	10.00
Mussoorie For. Div.	30.00	35.00	30.00	0.00	65.00	65.00	65.00	65.00	65.00
Soil Conserv. Kalsi	145.00	65.00	145.00	0.00	210.00	210.00	210.00	210.00	210.00
Tons For. Div.	70.00	85.00	70.00	10.00	155.00	165.00	165.00	165.00	165.00
Total	**656.00**	**390.00**	**656.00**	**70.00**	**1,046.00**	**1,116.00**	**1,116.00**	**1,116.00**	**1,116.00**

Details of area under natural landscape for undertaking forestry interventions in 7 forest divisions and by Eco Task force have been provided in Table 1.29.

Table 1.30. Area in Agriculture Landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Chakrata	30.79	46.04	30.79	0.00	76.82	76.82	76.82	76.82	76.82
Govind Wildlife Sanctuary	60.00	67.87	60.00	42.57	127.87	170.44	170.44	170.44	170.44
Mussoorie For. Div.	16.00	0.00	16.00	0.00	16.00	16.00	16.00	16.00	16.00
Tons For. Div.	14.39	12.12	14.39	0.00	26.51	26.51	26.51	26.51	26.51
Total	**121.18**	**126.02**	**121.18**	**42.57**	**247.20**	**289.77**	**289.77**	**289.77**	**121.18**

Table 1.31. Area in Urban/peri-urban Landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Barkot Upper Yamuna	12.00	2.00	12.00	2.00	14.00	16.00	16.00	16.00	16.00
Chakrata	1.00	9.50	1.00	0.00	10.50	10.50	10.50	10.50	10.50
Govind Wildlife Sanctuary	0.00	6.00	0.00	0.00	6.00	6.00	6.00	6.00	6.00
Tons For. Div.	0.50	0.00	0.50	0.00	0.50	0.50	0.50	0.50	0.50
Total	**13.50**	**17.50**	**13.50**	**2.00**	**31.00**	**33.00**	**33.00**	**33.00**	**33.00**

Table 1.32. Area in Conservation Interventions (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Barkot Upper Yamuna	256.68	131.67	256.68	18.52	388.35	406.87	406.87	406.87	406.87
Chakrata	55.42	28.68	55.42	18.00	84.10	102.09	102.09	102.09	102.09
Dehradun	834.78	8.62	834.78	189.70	843.40	1,033.10	1,033.10	1,033.10	1,033.10
Govind Wildlife Sanctuary	0.00	10.80	0.00	7.92	10.80	18.72	18.72	18.72	18.72
Mussoorie For. Div.	160.00	83.99	160.00	45.00	243.98	288.98	288.98	288.98	288.98
Soil Conserv. Kalsi	247.25	448.28	247.25	254.07	695.53	949.60	949.60	949.60	949.60
Tons For. Div.	448.50	303.20	448.50	229.38	751.70	981.08	981.08	981.08	981.08
Total	**2,002.63**	**1,015.24**	**2,002.63**	**762.58**	**3,017.87**	**3,780.45**	**3,780.45**	**3,780.45**	**3,780.45**

Table 1.33. Cost for Natural Landscape (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Total Maint.**	**Maint.**	
Barkot Upper Yamuna	332.42	92.95	167.84	0.00	62.03	52.72	45.66	425.37	328.25	100.91	854.53
Chakrata	101.62	231.12	48.96	102.19	69.37	58.66	44.85	434.93	221.84	118.42	775.18
Dehradun	7.13	0.00	1.86	0.00	0.89	0.93	0.72	7.13	4.40	1.55	13.09
Govind Wildlife Sanctuary	9.99	0.00	7.17	0.00	1.31	1.38	1.20	9.99	11.06	2.59	23.63
Mussoorie For. Div.	32.50	52.73	17.49	0.00	20.69	9.56	9.13	85.23	56.88	21.71	163.82
Soil Conserv. Kalsi	144.78	68.15	103.91	0.00	67.93	28.93	26.85	212.93	227.62	63.45	504.00
Tons For. Div.	85.51	119.20	21.76	17.74	38.99	27.85	23.90	222.45	112.49	57.88	392.83
Total	**713.94**	**564.15**	**368.99**	**119.94**	**261.22**	**180.02**	**152.31**	**1,398.03**	**962.55**	**366.52**	**2,727.09**

Table 1.34. Cost for Agriculture Landscape (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Total Maint.	Maint.	
Chakrata	23.51	55.97	4.60	0.00	16.70	9.81	9.87	79.48	40.98	21.32	141.77
Govind Wildlife Sanctuary	31.68	37.63	4.16	24.78	9.30	13.02	13.67	94.09	40.16	28.08	162.32
Mussoorie For. Div.	8.45	0.00	1.11	0.00	1.16	1.22	1.28	8.45	4.78	1.35	14.57
Tons For. Div.	7.60	6.72	1.00	0.00	1.93	2.03	2.13	14.32	7.08	3.30	24.70
Total	**71.23**	**100.32**	**10.87**	**24.78**	**29.10**	**26.07**	**26.95**	**196.33**	**92.99**	**54.05**	**343.37**

Table 1.35. Cost for Urban/peri-urban Landscape (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Total Maint.	Maint.	
Barkot Upper Yamuna	320.00	73.50	18.14	55.13	22.23	26.67	28.01	448.63	95.05	41.18	584.85
Chakrata	25.00	82.69	1.51	0.00	9.72	10.21	10.72	107.69	32.17	21.15	161.00
Govind Wildlife Sanctuary	0.00	157.50	0.00	0.00	9.53	10.00	10.50	157.50	30.03	22.61	210.13
Tons For. Div.	12.50	0.00	0.76	0.00	0.79	0.83	0.88	12.50	3.26	0.92	16.68
Total	**357.50**	**313.69**	**20.41**	**55.13**	**42.27**	**47.72**	**50.10**	**726.31**	**160.50**	**85.85**	**972.66**

Table 1.36. Cost for Conservation Interventions (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Total Maint.	Maint.	
Barkot Upper Yamuna	551.80	288.89	57.94	46.19	91.17	100.58	105.61	886.88	355.29	159.27	1,401.44
Chakrata	241.74	134.40	25.38	110.25	40.76	54.38	57.10	486.39	177.62	104.58	768.60
Dehradun	417.95	50.30	43.88	137.08	51.36	68.32	71.74	605.32	235.30	115.90	956.52
Govind Wildlife Sanctuary	0.00	63.00	0.00	48.51	6.62	12.04	12.64	111.51	31.30	33.40	176.21
Mussoorie For. Div.	223.29	204.23	22.50	120.17	44.36	60.50	63.13	547.68	190.49	122.93	861.10
Soil Conserv. Kalsi	192.96	310.48	20.26	285.30	53.87	86.52	90.85	788.74	251.51	206.11	1,246.36
Tons For. Div.	569.12	392.35	59.76	291.57	103.94	139.75	146.74	1,253.04	450.19	276.81	1,980.04
Total	**2,196.86**	**1,443.64**	**229.72**	**1,039.07**	**392.09**	**522.09**	**547.80**	**4,679.57**	**1,691.70**	**1,019.00**	**7,390.27**

Table 1.37. Division -wise area and cost summary for different landscapes (Area in ha, Cost in lakh rupees)

	Natural			Agriculture			Urban/peri-urban			Conservation			Total		
Division	Area	Cost		Area	Cost		Area	Cost		Area	Cost		Area	Cost	
	Est.	Est.	Maint.	Est.	Est.	Maint	Est.	Est.	Maint	Est.	Est.	Maint	Est.	Est.	Maint
Barkot Upper Yamuna	360.00	425.37	328.25				16.00	448.63	95.05	406.87	886.88	355.29	782.87	1,760.87	778.59
Chakrata	300.00	434.93	221.84	76.82	79.48	40.98	10.50	107.69	32.17	102.09	486.39	177.62	489.42	1,108.49	472.61
Dehradun	6.00	7.13	4.40							1,033.10	605.32	235.30	1,039.10	612.45	239.70
Govind WL Sanct.	10.00	9.99	11.06	170.44	94.09	40.16	6.00	157.50	30.03	18.72	111.51	31.30	205.16	373.08	112.54
Mussoorie For. Div.	65.00	85.23	56.88	16.00	8.45	4.78				288.98	547.68	190.49	369.98	641.36	252.15
Soil Conserv. Kalsi	210.00	212.93	227.62							949.60	788.74	251.51	1,159.60	1,001.67	479.13
Tons For. Div.	165.00	222.45	112.49	26.51	14.32	7.08	0.50	12.50	3.26	981.08	1,253.04	450.19	1,173.09	1,502.31	573.02

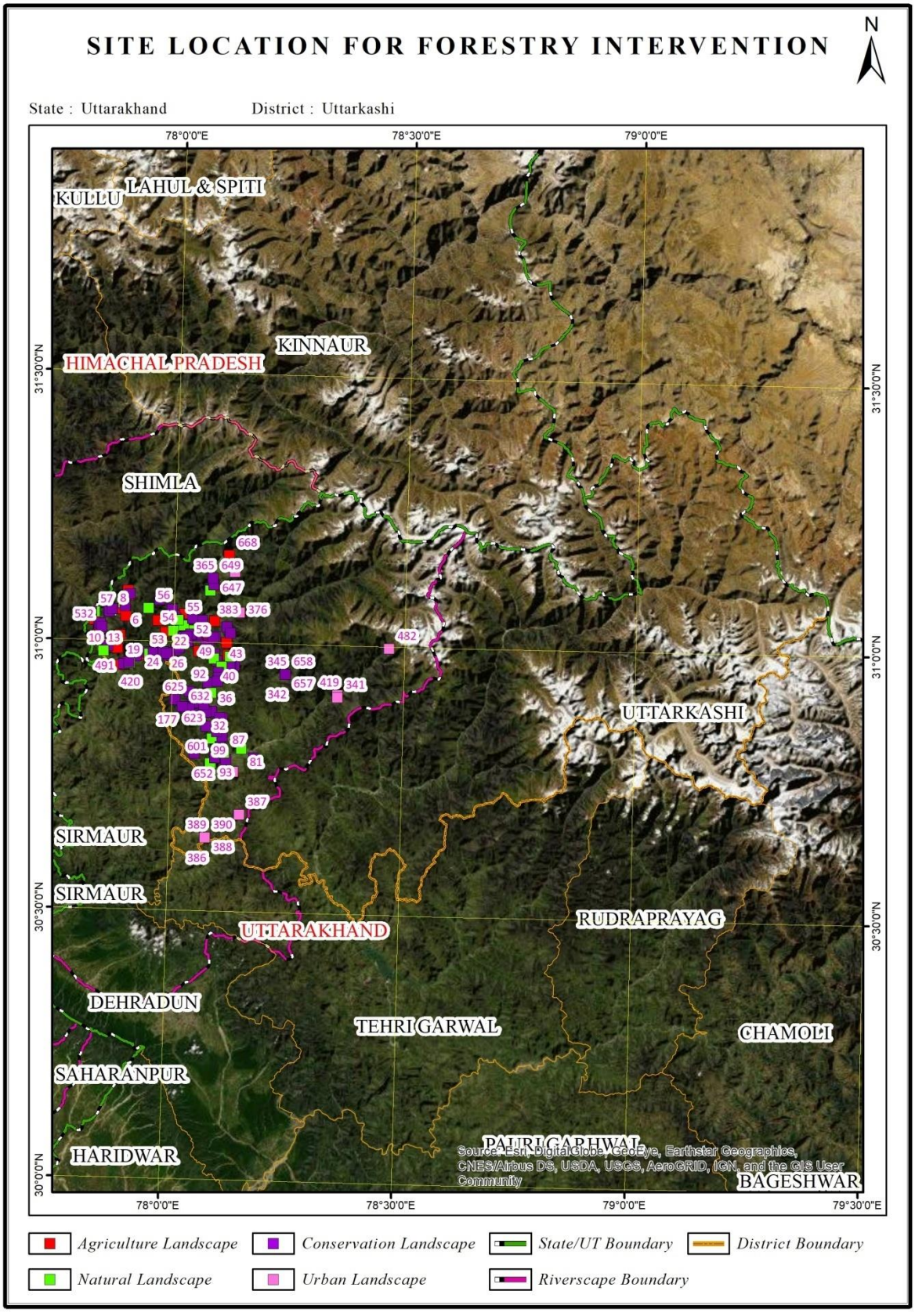
Total	**1,116.00**	**1,398.03**	**962.55**	**289.77**	**196.33**	**92.99**	**33.00**	**726.31**	**160.50**	**3,780.45**	**4,679.57**	**1,691.70**	**5,219.23**	**7,000.24**	**2,907.74**

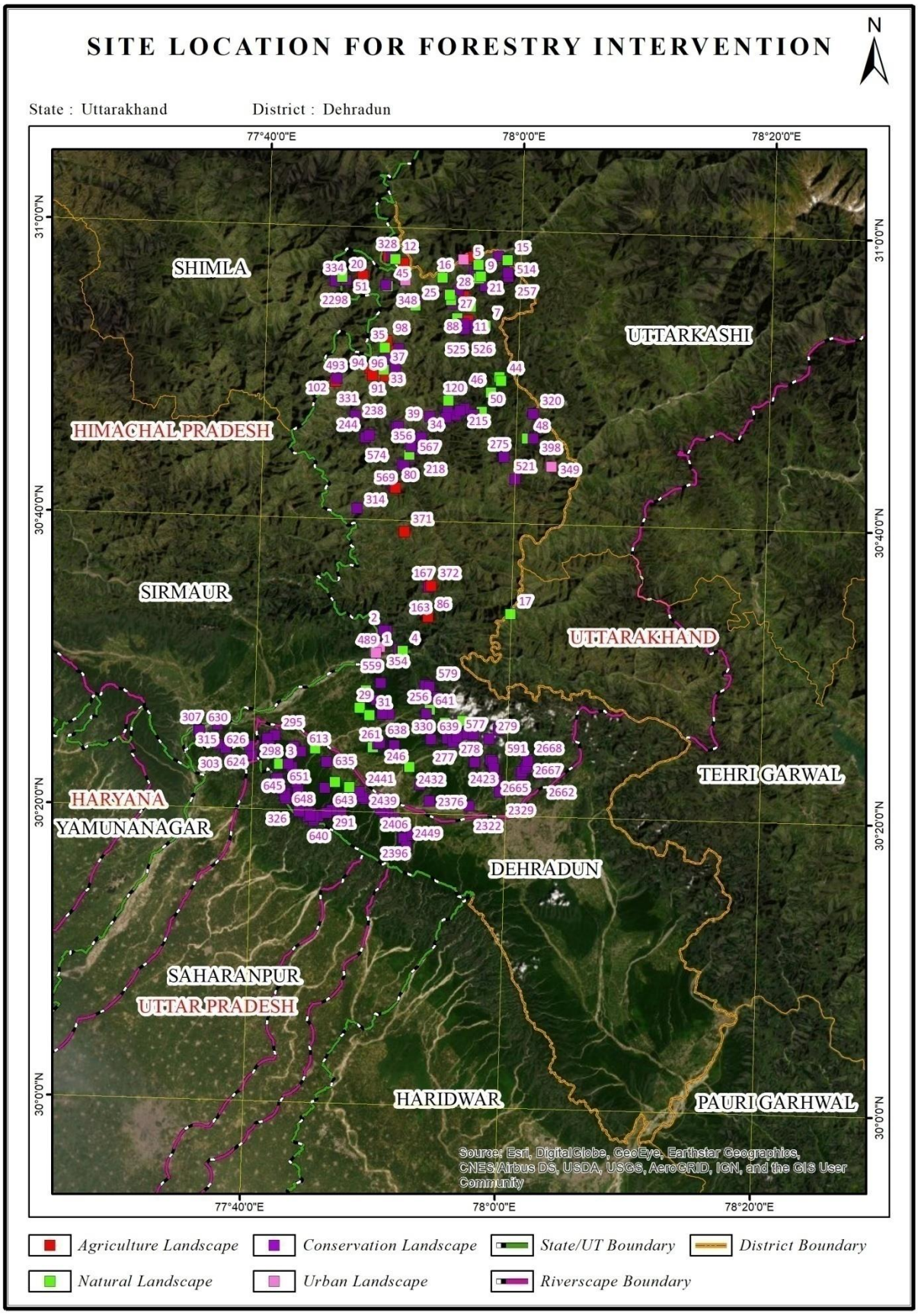
Table 1.38. Division and phase-wise area and cost summary (Area in ha and cost in lakh rupees)

	Phase I			**Phase II**	**Grand total**
Division	**Area**	**Cost**		**Cost**	
	Est.	**Est.**	**Maint.**	**Maint**	**cost**
Barkot Upper Yamuna	782.87	1,760.87	778.59	301.36	2,840.82
Chakrata	489.42	1,108.49	472.61	265.46	1,846.55
Dehradun	1,039.10	612.45	239.70	117.45	969.61
Govind Wildlife Sanctuary	205.16	373.08	112.54	86.68	572.30
Mussoorie For. Div.	369.98	641.36	252.15	145.99	1,039.50
Soil Conserv. Kalsi	1,159.60	1,001.67	479.13	269.56	1,750.36
Tons For. Div.	1,173.09	1,502.31	573.02	338.92	2,414.25
Total	**5,219.23**	**7,000.24**	**2,907.74**	**1,525.41**	**11,433.40**

Table 1.39. Model- wise area and cost summary (Area in ha and Cost in lakh rupees)

	Phase I		Phase II	Grand total
Landscape	**Area**	**Cost**	**Cost**	**Cost**
Natural	**1,116.00**	**2,360.57**	**366.52**	**2,727.09**
YM/UK/NL/01	265.00	625.08	117.01	742.10
YM/UK/NL/02	325.00	631.93	100.02	731.95
YM/UK/NL/03	20.00	39.58	6.57	46.15
YM/UK/NL/04	10.00	23.08	2.59	25.67
YM/UK/NL/05	490.00	1,029.37	138.76	1,168.13
YM/UK/NL/06	6.00	11.53	1.55	13.09
Agriculture	**289.77**	**289.33**	**54.05**	**343.37**
YM/UK/AL/01	239.77	190.78	35.52	226.31
YM/UK/AL/02	50.00	98.54	18.52	117.07
Urban/peri-urban	**33.00**	**886.81**	**85.85**	**972.66**
YM/UK/UL/01	20.50	643.19	59.10	702.28
YM/UK/UL/02	5.00	208.30	14.98	223.28
YM/UK/UL/03	7.50	35.33	11.77	47.10
Conservation	**3,780.45**	**6371.27**	**1,019.00**	**7,390.27**
YM/UK/CI/01	329.88	156.44	22.03	178.47
YM/UK/CI/02	798.48	374.17	64.28	438.45
YM/UK/CI/03	620.19	4,862.24	788.56	5,650.80
YM/UK/CI/04	1,991.40	941.54	139.96	1,081.50
YM/UK/CI/05	2.00	18.88	1.66	20.54
YM/UK/CI/06	38.50	17.99	2.51	20.50
Grand Total	**5,219.23**	**9,907.98**	**1,525.41**	**11,433.40**


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Uttarakhand
District : Uttarkashi
78°0'0"E
78°30'0"E
79°0'0"E
31°30'0"N
31°0'0"N
30°30'0"N
30°0'0"N
KULLU
LAHUL & SPITI
KINNAUR
HIMACHAL PRADESH
SHIMLA
SIRMAUR
SIRMAUR
UTTARAKHAND
UTTARKASHI
RUDRAPRAYAG
TEHRI GARWAL
CHAMOLI
DEHRADUN
SAHARANPUR
HARIDWAR
PAURI GARHWAL
BAGESHWAR
668
365
649
647
57
8
56
532
6
54
55
383
376
10
13
53
22
52
49
43
482
491
19
24
26
345
658
420
92
40
657
419
341
625
632
36
342
177
623
32
601
99
87
652
93
81
387
389
390
388
386
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Uttarakhand
District : Dehradun
77°40'0"E
78°0'0"E
78°20'0"E
31°0'0"N
30°40'0"N
30°20'0"N
30°0'0"N
SHIMLA
HIMACHAL PRADESH
SIRMAUR
HARYANA
YAMUNANAGAR
SAHARANPUR
UTTAR PRADESH
UTTARKASHI
UTTARAKHAND
TEHRI GARWAL
DEHRADUN
HARIDWAR
PAURI GARHWAL
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary

Chapter 2

HIMACHAL PRADESH

2.1. INTRODUCTION

Himachal Pradesh, meaning 'snow-laden province', is a Himalayan state located in north India. The state has a geographical area of 55,673 km^2 which constitutes 1.69% of the geographical area of the country. The state lies between 30º22'N to 33º12'N latitude and 75º45' E to 79º04' E longitude. It is bordered by the union territories of Jammu & Kashmir and Ladakh on the north, Punjab state on the west, Haryana on the south-west, Uttarakhand on the southeast, and Tibet region on the east (international border with China). At its southernmost point, it also touches the state of Uttar Pradesh (Fig. 2.1). Himachal Pradesh was carved out in 1966 from the hilly areas of neighbouring Punjab state and was granted statehood in 1971. The state has 12 districts. Himachal Pradesh today is an important tourist destinations in India.



Fig.2.1. Location map of Himachal Pradesh
(***Source:*** himachalpradeshtravel.com)

2.2. GEOGRAPHY

Himachal Pradesh is in the western Himalayas and is a mountainous state. The elevation above mean sea level varies from 320 m in Una district to 6,975 m at Leo Pargil Peak of Kinnaur district. The Dhauladhar range looks over the Kangra Valley while the Pir Panjal, the great

Himalayan and Zaskar ranges stand over Chamba, Kullu, Lahaul Spiti and Kinnaur. The mountain slopes are covered with forests and meadows. The valleys below are inter-spread with numerous streams and fields. There is a gradual increase in elevation from the west and south to north. There are certain famous passes across the range such as Kangla (5,246 m), Baralacha La (4,512 m), Kunzum La (4,551 m), Perang (5,548 m) and Pinparbati (4,802 m). The Zaskar range is the eastern most range and separates Spiti with Kinnaur from Tibet. It has 8 peaks over 6,500 m. There are many glaciers over the Zaskar and Great Himalayan ranges.

2.3. GEOLOGY

The Geological Survey of India (2012) has published a detailed account of geology and minerals in the state of Himachal Pradesh. The state of Himachal Pradesh is covered by rocks ranging in age from Precambrian to Recent. Himachal Pradesh has rich mineral wealth. As per investigation of Geological Survey of India, the minerals available in Himachal Pradesh include limestone, pyrites, clays, mica, iron pyrites, salt, gypsum, slate, antimony and lead. The distribution of these minerals is scattered all over the state and includes lime stone in Bilaspur, Sirmaur and Kangra districts; salt and slates in Mandi district; gypsum in Rajban and Bharli in Sirmaur districts; Lahaul and Spiti and Subatu in Solan districts; pyrite in Sirmaur, iron ore in Mandi and Kangra; and uranium in Kullu and Hamirpur districts (GSI, 2012).

2.4. TOPOGRAPHY AND SOILS

2.4.1. Topography

Physiographically, Himachal Pradesh has been identified into four divisions (March, 2000) and is described briefly below:

a. Outer Himalaya or the Shiwalik Hills consists of low hills of Shiwalik zone with an elevation of 600 to 1,200 m. The Shiwaliks represents the youngest part of the Himalaya, they are prone to erosion and their morphology comprises of highly dissected and rugged residual terrain, etc. The duns or valleys are drained by network of streams and rivers. This zone is about 50 km wide in the west and about 80 km wide in Kangra valley and again tapers to smaller width in Nalagarh and Kyarda Duns in east. The crest lines are known by many names like Hathi Dhar, Sikandar Dhar, etc.

b. Lesser Himalaya can be divided into two zones, the *Lower Himalayas* towers abruptly from the north of the duns with steeper southern facing slopes than northern characterized by deep gorges and sharp rides. This zone mainly includes the Dhauladhar. The *Middle Himalayas* lying further north are steeper and the peaks remain under permanent snow cover perennially like the Pir Panjal ranges. The average elevation ranges from 1,000 to 4,000 m and width from 60 to 80 km. The Dhauladhar and Pir Panjal ranges are conspicuous and quite distinct in the west and form the southern and northern watershed of Ravi Basin. Some minor ranges of lesser Himalaya are Mussoorie Range and Shimla Hills in the Yamuna basin east of the great Himalayan Divide.

c. Great Himalaya has the highest mountain ranges that run across the north-eastern border of Himachal through Lahaul Spiti and Kinnaur districts. The elevation of the great Himalaya ranges between 5,000 and 7,000 m, and it has several passes having elevations of 4,500 m. This soaring snow-clad mountain chain is a store house of many glaciers and acts as a source of many himalayan rivers; it also plays an important role in governing the climatic condition of the state as it acts as a barrier against the northward movement of the southwest monsoon. It forms the northern watershed of the Chandrabhaga (Chenab) basin and separates it from Spiti basin and

further east it forms watershed between Spiti and Beas basins. It is cut across by Sutlej before it enters the Utter Pradesh Himalaya with extension to Badrinath/Kedarnath.

d. Trans-Himalaya or **Zanskar Range** is the easternmost range of Himachal Pradesh. The average elevation is 3,000m and its peaks rise over 6,500m. It forms the northern watershed of the Spiti and Sangla valleys in Kinnaur and roughly forms the Indo-Tibetan boarder. The Sutlej cuts across the Zaskar Range forming a deep gorge. The topography comprises of wide snowfields, cirques, glaciers, U-shaped and hanging valleys moraines, etc.

2.4.2. Soils

The soils of the state can broadly be divided into nine groups on the basis of their development and physico-chemical properties. The soil found in the districts of Mandi, Kangra, Bilaspur, Una, Solan, Hamirpur and Sirmaur is generally brown, alluvial and grey brown podzolic, Kullu and Shimla have greywooded podzolic soils, while Kinnaur, Lahaul and Spiti and some parts of Chamba district have humus mountain skeletal soils.

2.5. CLIMATE

Himachal Pradesh can be divided into three regions: (i) the Shiwalik ranges (the height from plain up to 915 m), (ii) the colder zone (the height is about 4,500 m) and (iii) the axis and crystalline core of the whole system (height above 4,500 m but below 5,500 m). The climatic conditions, therefore, vary from the semi-tropical to semi-arctic. Physiographically, the state can be divided into five zones based on altitudes and moisture regime conditions. These vary from wet humid sub-temperate situation to dry temperate alpine high lands. Besides, the seasonal variations, the climate of Himachal Pradesh varies at different altitudes. The average rainfall is 152 cm.

2.6. WATER RESOURCES AND HYDROLOGY

2.6.1. River System

There is a network of perennial rivers in Himachal Pradesh, which have glaciers as their sources. Majority of the drainage of the state belongs to Indus River System. The Satluj, Beas, Ravi, Chenab, Spiti, Parbati, Pabbar, Tons and Giri are the main rivers of Himachal Pradesh (Fig. 2.2).

Yamuna River is the largest tributary of the Ganga. The Yamuna is the eastern-most river of Himachal Pradesh. Its famous tributaries are Tons, Pabbar and Giri or Giri Ganga. The Giri Ganga rises from near Kupar peak just above Jubbal town in Shimla district, and Pabbar from Chandra Nahan Lake near the Chansal peak in Rohru tehsil of Shimla district. It leaves the state near Tajewala and enters into the Haryana state. The main geomorphic features of the Yamuna valley are interlocking spurs, gorges, steep rock benches and terraces. The latter have been formed by the river over the past thousands of years. The area drained by the Yamuna system includes Giri-Satluj water divide in Himachal Pradesh to the Yamuna Bhilagana water divide in Garhwal. The south-eastern slopes at the Shimla ridge are drained by the Yamuna system. The utilization of water of the river system is being done for transportation of timber logs, irrigation and a hydel power generation.

2.6.2. Important Tributaries of Yamuna

The following are the important tributaries of Yamuna in the state of Himachal Pradesh:

Jalal River

Jalal River is the small tributary of the Giri River in Himachal Pradesh. It rises from Dharti ranges adjoining Pachhad and joins Yamuna at Dadahu from the right side. It also joins the river

Giri Ganga at Dadahu. The origin and entire course of this river lies in the lower Himalayas. This is the rainfed river and has abrupt flow during the rainy season. Several human settlements have come up along the Jalal River such as Bagthan and Dadahu.

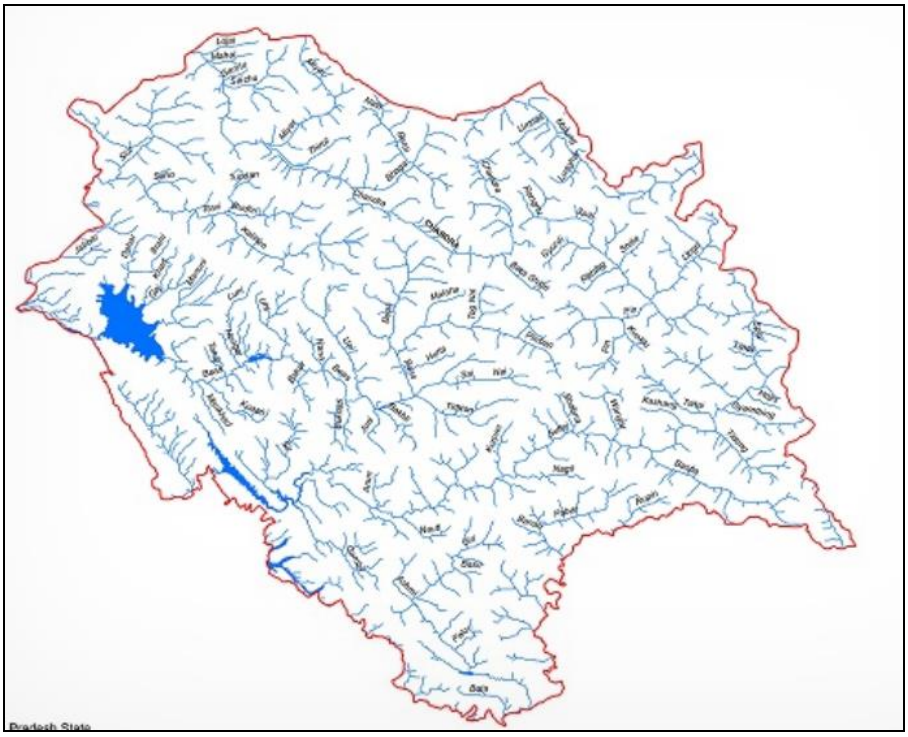


Fig. 2.2. Major rivers in Himachal Pradesh
(***Source:*** South Asia Network on Dams, Rivers and People)

Markanda River

Markanda is a small river of Nahan area of Sirmaur district (Fig. 2.3). It rises from the southern face of the lower Himalayas on the western extremity of the Kiarda Dun (Paonta) valley. The lower Himalayan hills of Nahan occur on the right flank of the Markanda valley while the low rolling Shiwalik hills are on its left flank. It is a rainfed river and has very low flow in the winter and summer months but rises abruptly in the monsoon.

Andhra River

This is a tributary of the Pabbar River which, in turn, drains into the Tons River. This river rises from a small glacier tenated in a cirque of the lower hills of the main Himalayas in the area to the north-west of Chirgaon in Shimla district. Thereafter, it flows in a general direction towards south-east and merges with the Pabbar River at Chigaon.

Giri River

The River Giri is an important tributary of the Yamuna River (Fig.2.4). It drains a part of south-eastern Himachal Pradesh. The Giri or Giri Ganga as it is famous in the Jubbal, Rohru hills that rises from Kupar peak just above Jubbal town after flowing through the middle of Shimla hills, flows down in the south-eastern direction and divides the Sirmaur district into equal parts that are known as Cis- and Trans-Giri region and joins Yamuna upstream of Paonta below

Mokkampur. The river Ashni joins Giri near Sadhupul (Chail) while river Jalal which originates from Dharthi ranges adjoining Pachhad joins it at Dadahu. The water from the Giri River is led through a tunnel to the power house of Girinagar and after that it is led into the Bata River.



Fig. 2.3. Markanda River during non-monsoon season
(***Source:*** https://www.40kmph.com/)



Fig. 2.4. Giri River
(***Source:*** http://imagegallery.paintedstork.com/v/travel/himachal_pradesh/shimla/giri_river.jpg.html)



Fig. 2.5. Renuka Lake, Sirmaur district
(***Source:*** https://hpsirmaur.nic.in/)

Ashni River

The Ashni River is a tributary of the Giri River which, in turn, drains into the Yamuna River. This river flows along a deep V shaped valley whose side elopes vary from steep to precipitous. It has carved a steep gorge across the off shoots of the Nag Tibba ridge. Numerous small spring feed the Ashni River at various places along its course.

Bata River

This river originates in the boulders below the Nahan ridge in the South-Western corner of Himachal Pradesh as the Jalmusa-Ka-Khala. It is mainly fed by the rainwater that is cycled as underground water before finally coming up on the surface as a spring. The river flows below the surface for a part of its length in its upper reaches, thereafter, the water flows on the surface. Large and wide terraces have been formed by it. The small tributaries which join the Bata River in the Paonta valley are Khara-Ka-Khala flowing in a southerly direction from the Nahan ridge, and Kanser-Khala originating from the Southern slopes of the Nahan.

Pabbar River

The Pabbar River is a tributary of the Tons River, which, in turn, drains into river Yamuna. This rises near Rohruin Shimla district. The mainstream is fed by the Chandra Nahan lake and springs originating from underground waters. It joins the Tons River at the base of the Chakrata mass near the border of Uttar Pradesh and Himachal Pradesh. The Pabbar River flows 67.32 km in Himachal Pradesh and Uttarakhand at Sataun and Tiuni, respectively.

Patsari River

It is a small spring fed tributary of the Pabbar River. This river rises from the lower Himalayan hills near Kharapathar in Shimla district of Himachal Pradesh. This river joins the Pabbar River near the mountain hamlet of Patsari about 10 km upstream of Rohru. Its bed is strewn with boulders of various sizes. Small villages and hamlets have come up along this river.

Tons River

This river is an important tributary of the Yamuna River and joins it at Kalsi in the north-western part of Dehra Dun valley (approximately 48 km away from Dehra Dun). It rises as the following two feeder streams - the Supin River rises from in the northern part of the Tons catchment near the Himachal Pradesh and Uttarakhand border and the Rupin River rises from a glacier at the head of the famous Har-Ki-Dun valley in the north-north eastern part of the Tons catchment. These two feeder streams merge near the mountain hamlet of Naitwar and the channel downstream of Naitwar is known as Tons river. The river flows along a V-shaped valley. A number of settlements have come up along the Tons River such as Tiuni, Naitwar and Mori.

There are many dams located in the state. Asan Barrage is related to Yamuna River and is situated on the border of this state with Uttarakhand at the confluence of the Eastern Yamuna Canal and the Asan River.

2.6.3. Hydrology

Central Ground Water Board, Ministry of Water Resources, Government of India provides a detailed account of groundwater resources in the state (Bhatti, 2018). The following information summarises the situation of groundwater resources:

The Yamuna is the only river contributing water to Ganga basin. The southwestern monsoon contributes about 70% of rainfall during monsoon period from July to September and about 30% occurs during non-monsoon period due to western disturbances and in the form of thunderstorm. Generally, rainfall increases from south to north. Western disturbances also shower rainfall in winters. All the 128 National Hydrograph Stations are located only in 7 out of the 12 districts in Himachal Pradesh.

The major part of Himachal Pradesh is hilly and mountainous with few small intermontane valleys covering about 15% of the area. These valleys comprise of alluvial deposits, which form extensive aquifers and, thus, represent porous formations (Table 2.1). Major valleys in the state are Indora-Nurpur and Kangra-Palampur valleys in district Kangra, Una valley in district Una, Bal valley in district Mandi, Nalagarh valley in district Solan and Paonta valley in district Sirmaur. The primary porosity and permeability in the Tertiary formation is low to moderate and hence, these aquifers do not form high yielding aquifers. The older rock formations of Proterozoic to Mesozoic eras. These rock formations serve as poor aquifers. However, due to tectonic movements, they have been traversed by faults, thrust and joints which have enhanced their ground water potential. The quality of ground water in hard rocks and alluvial areas is by and large good and suitable for domestic and irrigational use.

Table 2.1. Hydrogeological formations and their yield potential in Himachal Pradesh

Age	Rock formation	District	Hydrogeological characteristics
Porous formations			
Recent to sub recent	Boulder, cobble, pebble, sand, silt, clay	Kangra, Una, Solan Sirmaur, Mandi and Kullu	High yield 30-75 $m^3 hr^{-1}$
Fissured formations			
Tertiary	Boulder conglomerate sandstone, clay	Kanga, Solan, Simaur Bilaspur, Una, Mandi, and Hamirpur	Moderate to low yield < 30 $m^3 hr^{-1}$
Proterozoic to mesozoic	Shale, slate, phyllite, limestone, dolomite, sandstone, quartzite, granite, schist	Lahaul and Spiti, Kinnaur, Chamba, Mandi, Simla, Kanga, Simaur, Solan and Kullu	Moderate to low yield < 5 to 30 $m^3 hr^{-1}$

2.6.4. Other Water Bodies and Aquifers

There are 113 wetlands covering an area of 8,221 ha present inside the recorded forest area in HP (Table 2.2). Among natural and man-made in-land wetlands, highest no of 44 (> 1/3) is contributed by the rivers/streams (Fig. 2.5).

Table 2.2. Wetlands inside the recorded forest area (or green wash) in Himachal Pradesh

Wetland category	No. of wetland	Total wetland area (ha)
Inland wetlands-natural		
Lake/pond	4	17
Waterlogged	2	3
River/stream	44	6,207
Sub-total	**50**	**6,227**
Inland wetlands-man-made		
Reservoir/barrage	9	1,936
Tank/pond	4	6
Waterlogged	1	3
Sub-total	**14**	**1,945**
Wetlands (<2.25 ha)	49	49
Total	**113**	**8,221**
Total recorded forest (or green wash) area (in ha)		**14,02,498**
% of Wetland area inside recorded forest (or green wash) area		**0.59%**

The major rivers of the state are Chandra Bhaga (Chenab), Ravi, Beas, Satluj and Yamuna. The catchments of these rivers are fed by snow and rainfall and are protected by extensive cover of natural vegetation. Rainfall, though abundant, often is not available precisely as and when required for domestic or irrigation purpose. This situation has demanded supplementation and conservation the rainfall by construction of wells, storage reservoirs and by bonding the streams. All the traditional water harvesting practice developed as per the water resources and terrain conditions prevalent in the state. These practices differ depending upon the terrain. But water resources are depleting due to ever increasing population. Now, there is an urgent need for the revival of traditional water harvesting practices by adding modern technology inputs, which may solve the water problems to a larger extent. The artificial recharge structures which are feasible in varied hydro-geological condition are gabion structures, check dams, cement plug/nala bund, subsurface dykes, recharge shaft and irrigation wells (CGWB, 2013).

The areas suitable for artificial recharge in Himachal Pradesh are shown in Fig. 2.6. In Yamuna basin, the rechargeable areas for aquifers fall in the districts of Shimla, Solan and Sirmaur only.



Fig. 2.6. Areas suitable for artificial recharge in HP
(***Source:*** CGWB, 2013)

2.6.5. Issues about Water Resources Polluted River Stretches

Water quality of rivers in Himachal Pradesh is measured at 58 locations on 22 rivers, and among them 12 locations are non-compliant to the Water Quality Criteria with respect to BOD. These 12 locations are on 8 rivers. The names of 8 polluted rivers are; Beas, Tons, Sirsa, Swan, Sukhana, Suketi khad, Markanda and Binwa. These rivers are classified in priority class I, IV and V based on the level of BOD. The details of polluted river stretches are provided in Table 2.3 (CPCB, 2015).

Table 2.3. Polluted river stretches relevant to Yamuna basin in Himachal Pradesh

S. no.	River	Stretch identified	Towns identified	Approx. length of the stretch (km)
1	Tons	Killor to Tilwari	Danda, Haripur	10
2	Markanda	Kala Amb to Narayanpur	Kala Amb, Ogli	4

(*Source:* CPCB, 2015)

The health of Himachal rivers, based on the extent of threat that they face, has been assessed. The key threats identified are those of development which interfere with river flows, hampering riverine ecology and changing the nature of the river and dependencies around it. These include: hydro-power development, sand mining, pollution due to tourism, urbanisation and industrialisation and climatic changes. The threat projections for the five river basins made as– critical, moderate or low. According to the report, the Beas, Satluj, Yamuna and Ravi are the most threatened river basins (Himdhara, 2017).

Himachal Pradesh has excess river water and the water of Yamuna and its tributaries is flowing down to other states. The state government has decided to sign an MoU to sell the Yamuna water from the state's share at Hathnikund Barrage (earlier Tajewala) corridor to Delhi to obtain Rs. 21 crore year^{-1} from the sale of water (PTI, 2019).

2.7. FORESTS AND VEGETATION

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period October to December 2017, the forest cover in the state is 15,433.52 km^2 which is 27.72% of the state's geographical area (Table 2.4 and Fig. 2.7). In terms of forest canopy density classes, the state has 3,112.71 km^2 under very dense forest (VDF), 7,125.93 km^2 under moderately dense forest (MDF) and 5,194.88 km^2 under open forest (OF). Forest Cover in the state has increased by 333.52 km^2 as compared to the previous assessment reported in ISFR 2017 (FSI, 2019b). The protected area network in the state has five national parks, 28 wildlife sanctuaries and three conservation reserves which cover 15.10% of geographical area of the state.

Table 2.4. Forest and tree cover

Very dense forest (km^2)	Moderately dense forest (km^2)	Open forest (km^2)	Total forest (km^2)	Tree cover (km^2)	Total forest and tree cover (km^2)
3,112.71	7,125.93	5,194.88	15,433.52	829	16,262.52

(***Source:*** FSI, 2019)

The forests in the state can be broadly classified into coniferous forests and broad-leaved forests. Distribution of species follows altitudinal zonation. The vegetation varies from dry scrub forests at lower altitudes to alpine pastures at higher altitudes. In between these two extremes, distinct vegetational zones of mixed deciduous forests, bamboo, chir pine, oak, deodar, kail, fir and spruce are found (ISFR, 2019). Deodar, spruce, fir, chir and blue pine, rhododendron, alder, maple, oaks, walnut, etc. are important species in the forest. A total of 82.21 km^2 area is under wetlands.

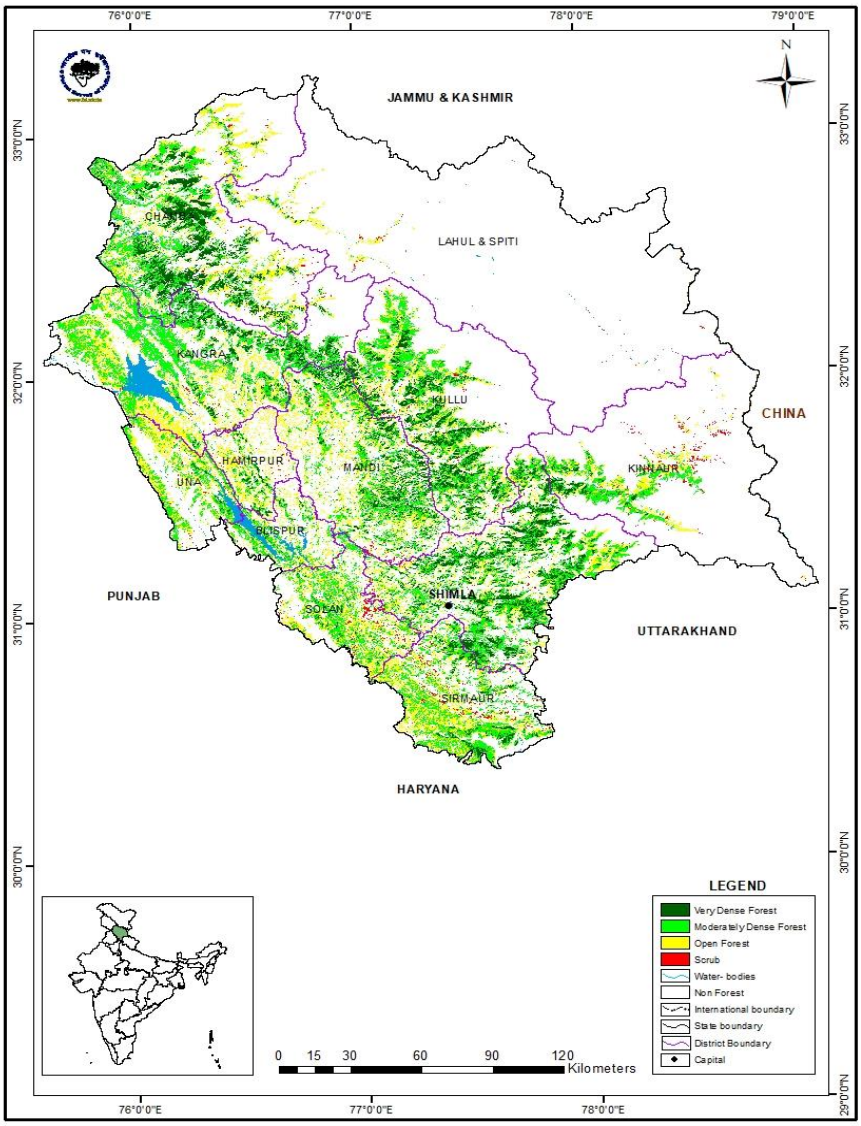


Fig. 2.7. Forest cover map of Himachal Pradesh

The major part of the forest cover (more than 80%) is confined in altitude between 500 to 3,000m (Table 2.5). The significant fact is that both VDF and MDF are more in high altitude class of 2,000 to 3,000m while scrub is more common in moderate altitude of 1,000 to 2,000m.

Table 2.5. Altitude-wise forest cover (km^2) in Himachal Pradesh

Altitude zone (m)	Geographical area (km^2)	VDF	MDF	OF	Total	Scrub
0-500	2,925	13	458	360	831 (5.39%)	14
500-1,000	7,625	220	1,912	1,589	3,721 (24.10%)	62
1,000-2,000	9,628	694	1,679	1,552	3,925 (25.43%)	124
2,000-3,000	8,101	1,814	2,225	1,057	5,096 (33.02%)	28
3,000-4,000	6,848	372	848	625	1,845 (11.96%)	70
>4,000	20,546	0	4	12	16 (0.10%)	17
Total	**55,673**	**3,113**	**7,126**	**5,195**	**15,434**	**315**

(***Source:*** FSI, 2019)

2.8. WILDLIFE

Himachal Pradesh has around 463 species of bird, 77 mammalian, 44 reptile and 80 fish species. Snow leopard, leopards, ibex, yak, ghoral and musk deer, Himalayan black and brown bear, the Himalayan tahr and monkey are the most important wild animals. Great Himalayan National Park, a UNESCO World Heritage site and Pin Valley National Park are the national parks located in the state. The 19th livestock census 2012 has reported a total livestock population of 4.84 M**.**

2.9. AGROECOSYSTEM

Agriculture contributes nearly about 45% to the net state domestic product. It is the main source of income as well as employment in Himachal. About 93% of the state population depends directly upon agriculture. The main cereals grown in the state are wheat, maize, rice and barley. Kangra, Mandi and Paonta valley of Sirmaur district (to some extent) are the major producers of the first three cereals, while barley is mostly cultivated in Shimla (Table 2.6). Fruit cultivation has also proved to be an economic boon to the state. There are huge tracts of land suitable only for growing fruits. Their employment potential is more than the conventional farming. The yield per acre in terms of income is also much higher. Apple gives the maximum income. Fruit growing in the state is fetching over Rs. 3 B annually. Special efforts are being made to promote cultivation of crops like olives, figs, hops, mushrooms, flowers, pistachio nuts, sarda melon, kiwi and saffron. The state has also earned the name of Apple State of India. Off-season vegetable cultivation is quite popular. The percentage of marginal and small operational holdings is very high, i.e., 84.5%.

Table 2.6. Land use pattern

Land use type	Area ('000 ha)	Percentage
Geographical area	5,567	
Reporting area for land utilization	4,576	100.00
Forests	1,126	24.61
Not available for land cultivation	1,127	24.64
Permanent pastures and other grazing lands	1,511	33.01
Land under misc. tree crops and groves	64	1.39
Culturable wasteland	122	2.66
Fallow land other than current fallows	22	0.49
Current fallows	54	1.18
Net area sown	550	12.02

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2014-15)

2.10. DEMOGRAPHY

As per the 2011 census, Himachal Pradesh has a population of 6.86 M accounting for 0.57% of India's population. The rural and urban population constitutes 89.97 and 10.03%, respectively. Tribal population is 5.71% of the state's population. The population density of the state is 123 persons km^{-2} which is much lower than the national average.

2.11. INDUSTRY

Small scale units account for 99 % of the total units registered in the state The state has two large cement factories. Agro-processing, electronics, pharmaceuticals, mechanical, hosiery, wood-

based industries are the dominant types of industries. Parwanoo, Barotiwala, Baddi, Nalagarh, Paonta Sahib, etc. are some of the industrial areas of the state at present.

2.12. RIVERSCAPE ANALYSIS

2.12.1. Remote Sensing and GIS Methodology

Image processing and GIS tools used in the present assessment were ERDAS Imagine, Geomedia Professional, ArcGIS along with other software packages. The GIS softwares provide the tool needed to store, analyze and display geographic information (Fig. 2.8).

2.12.2. Satellite Data Used

Landsat-8 satellite data for the month of February to April 2019 has been used for preparation of Land use/ Land cover map of the riverscape. The Row, Path along with Date of Pass of the satellite data used in the current study for the parts of states of and covering the riverscape is given in Table 2.7a.

Table 2.7a. List of data downloaded for the study

State	Path	Row	Date of pass	Satellite
Himachal Pradesh	146	038	27-03-2019	Landsat-8
Himachal Pradesh	146	039	23-02-2019	Landsat-8
Himachal Pradesh	147	038	18-03-2019	Landsat-8
Himachal Pradesh	147	039	18-03-2019	Landsat-8

2.12.3. Ancillary Data

Almost all of the ancillary information has been taken from various Government of India sources. Information about the state and district boundaries for the riverscape taken up for analysis was obtained from the Survey of India. Basin boundary, catchment boundary, sub-catchment boundary, watershed boundary and micro-watershed boundaries where obtained from Soil and Land Use Survey of India, New Delhi. Village and tehsil boundaries were obtained from the published document 'Administrative Atlas of Himachal Pradesh' by Census of India (2011). Forest type and Forest density data were obtained in digital format from Forest Survey of India. Soil map and depth information was obtained from published maps of National Bureau of Soil Survey and Land Use Planning, Nagpur. Soil erosion data which is the backbone of multi-criterion analysis was obtained in GIS format from the Indian Institute of Soil & Water Conservation, Dehradun. Topographical sheets on 1:50,000 scale obtained from Survey of India have been used for Geo-reference only. Bhuvan data was also referred, wherever required for the preparation of land use map.

2.12.4. Bank-Line and Highest Flood Level

For the identification of the riverscape the year 2013 was denoted as the highest flood level year based on literature review and stakeholder's consultation on various levels. Then, a post-monsoon satellite image of the year 2013 was used to create the bank-line of the main stem and considered tributaries of the Yamuna River (Giri, Tons, Jalal, Pabbar and Markanda).

2.12.5. Spatial Extent

The influence zone or riverscape for the state of Himachal state occupies geographical area of 5,660.36 km^2 which comprises 12.84% of the geographical area of the entire riverscape. Details of the riverscape under consideration for the DPR are shown in the Table 2.7b.

Table 2.7b. Spatial extent of project-area in the state

State	Geographical coordinates		Total geographical area (km^2)	Per cent of total riverscape area
	Lat. N	Long. E		
Himachal Pradesh	30° 21' 47.190" to 31° 25' 35.568"	77° 04' 26.310" to 78° 18' 25.459"	5,660.36	12.84

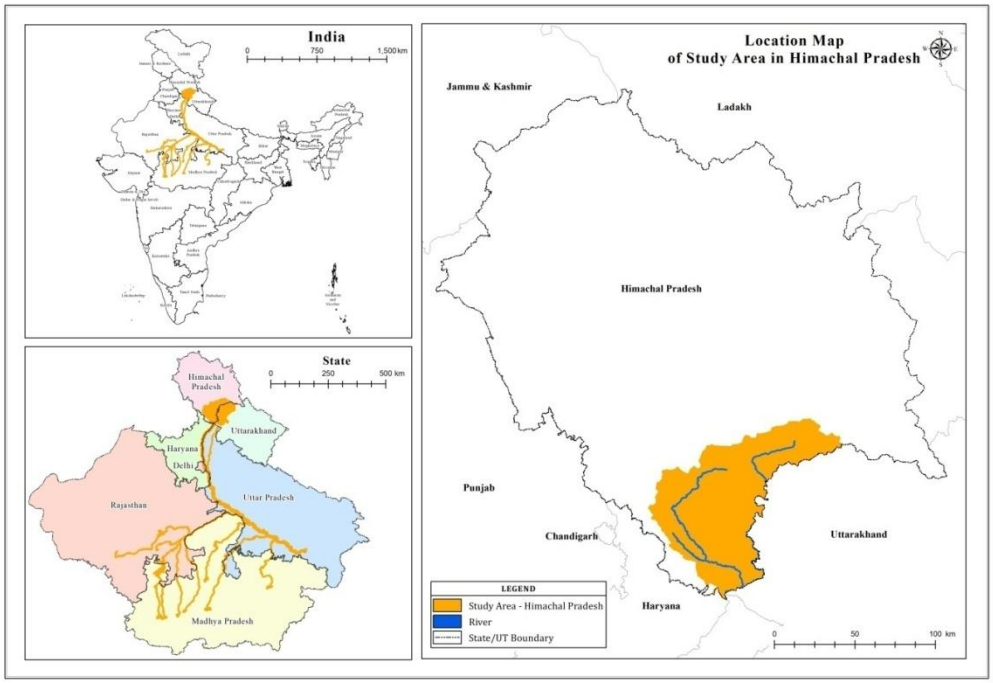


Fig. 2.8. Location map of study area in Himachal Pradesh

2.12.6. Land Use and Land Cover (LULC)

LULC is essential for the proper planning, management and monitoring programmes. It provides the better understanding of land utilization aspects. A total of 14 major land use and land cover types, i.e., Agriculture, Barren, Cloud Shadow, Cloud, Dense Forest, Mod. Dense Forest, Open Forest, Plantation, River (dry)/River, Sand River (Perennial), Scrub Settlement, Snow/Glaciers, Waterbody have been in the riverscape. The distribution of area under different land cover and land use classes is given in Table 2.8. and Fig. 2.9.

The land use and land cover data indicate that forests along with scrub form the most widespread land use covering 56.1% of the area in the riverscape under DPR. This is followed by Agriculture and plantation which measures 24.5%. After these are snow/ glaciers, river (dry)/river sand, river (perennial), waterbody, clouded area together constitute13.4%. The share of barren land is 5.3%, while settlements cover just 0.8% of the riverscape.

Table 2.8. Distribution of area under different land use and land cover categories in the Yamuna Riverscape

S. no.	Land use and land cover	Area (km^2)
1	Agriculture	1,381.83
2	Barren	298.85
3	Cloud shadow	22.54
4	Cloud	57.88
5	Dense forest	749.07
6	Mod. dense forest	872.97
7	Open forest	774.24
8	Plantation	3.6
9	River (dry)/river sand	33.53
10	River (perennial)	24.78
11	Scrub	778.37
12	Settlement	43.64
13	Snow/glaciers	618.76
14	Waterbody	0.3
	Total	**5,660.36**

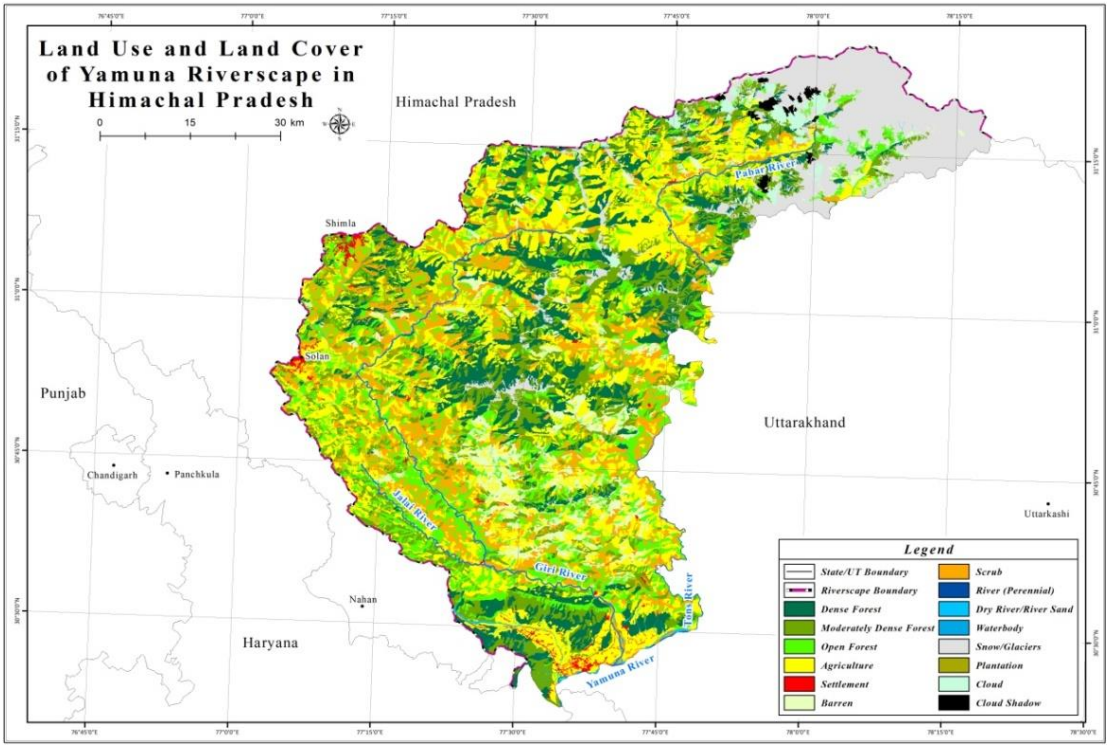


Fig. 2.9. Land use and land cover in Yamuna Riverscape
(Based on information from FSI, Dehradun)

2.12.7. Slope

Slope is an important landscape metric which helps to describe the landforms, model surface runoff and access the suitability of the area for forestry interventions. Lands with steep slopes are prone to soil erosion and hence do not support growth of most of the plant species unless suitable stabilization measures are adopted. The land in Himachal Pradesh has been grouped into 10 classes of slope from 0^o to more than 40^o. The distribution of areas under different slope classes is given in Table 2.9. and Fig.2.10. The maximum area of Himachal falls in more than 40^o slope.

Table 2.9. Distribution of area under different slope categories

S. no.	Slope classes (in ^{o})	Area (Km^2)	Percentage of total area
1	0 - 2.5	39.88	0.09
2	2.5 to 5	95.36	0.22
3	5 to 10	299.19	0.68
4	10 to 15	406.17	0.92
5	15 to 20	587.59	1.33
6	20 to 25	753.29	1.71
7	25 to 30	893.32	2.03
8	30 to 35	862.87	1.96
9	35 to 40	712.27	1.62
10	>40	1,010.42	2.29
	Total	**5,660.36**	**8.94**

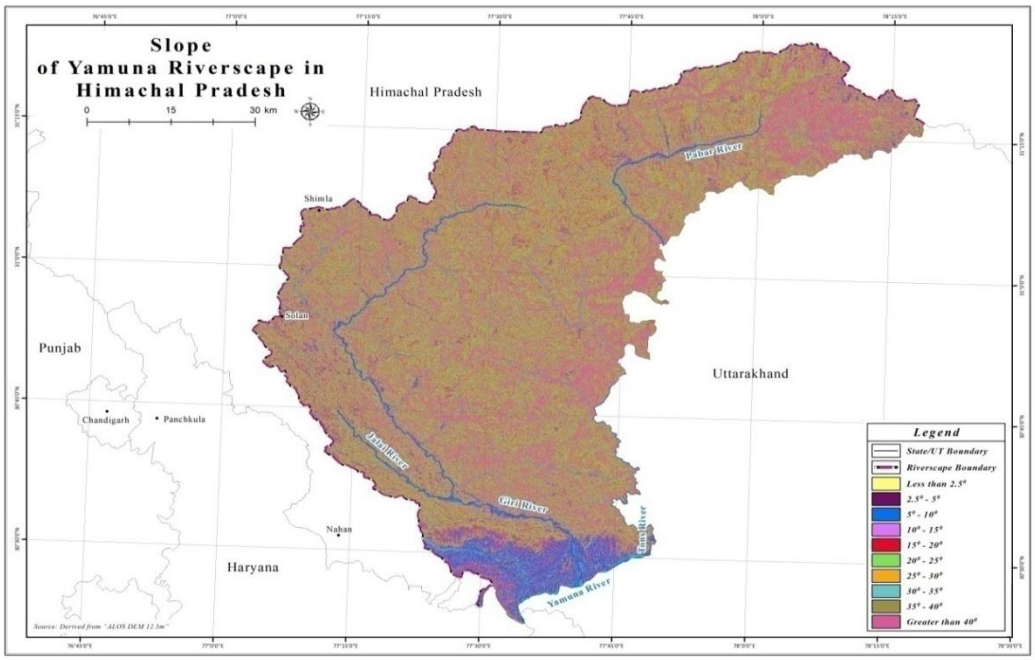


Fig. 2.10. Different slope categories in Yamuna Riverscape
(Based on information from NBSSLUP, Nagpur)

2.12.8. Soil Erosion

A total of five categories of the erosion classes have been mapped in Himachal, *viz*., 5 to 10, 10 to 20, 20 to 40, more than 40 t ha^{-1} yr^{-1}. An area of 331 km^2 falls in the non-soil category. These areas may not be suitable for forest plantations. The distribution of areas under different erosion classes is given in Table 2.10 and Fig.2.11.

Table 2.10. Distribution of area under different soil erosion categories in Yamuna riverscape

S. no.	Soil erosion (t $ha^{-1}yr^{-1}$)	Area (km^{-2})	Percentage of total area
1	5 to 10	7.59	0.02
2	10 to 20	704.51	1.60
3	20 to 40	1,011.16	2.29
4	>40	3,605.85	8.18
5	Non-soil	331.25	0.75
	Total	**5,660.36**	**12.84**

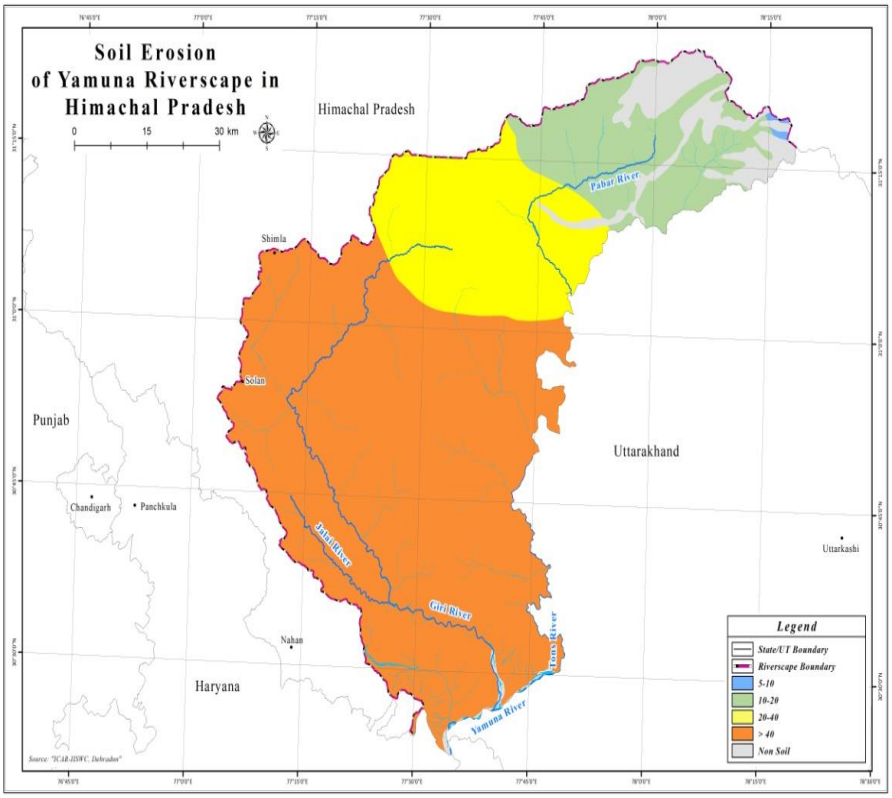


Fig. 2.11. Soil erosion classes in Yamuna Riverscape
(Based on information from ICAR-IISWC, Dehradun)

2.12.9. Forest Cover

The distribution of areas under forest cover is given in Table 2.11 and Fig. 2.12. Five classes, viz., Dense Forest, Moderate Dense Forest, Non-Forest, Open Forest and Scrub, of which the distribution of moderately dense forest is maximum while the non-forest area is 44% of the total forest cover.

Table 2.11. Distribution of area under different forest covers in Yamuna Riverscape

S. no.	Forest cover	Area (km^2)
1	Dense forest	749.07
2	Moderate dense forest	872.97
3	Non-forest	2,485.71
4	Open forest	774.24
5	Scrub	778.37
	Total	**5,660.36**

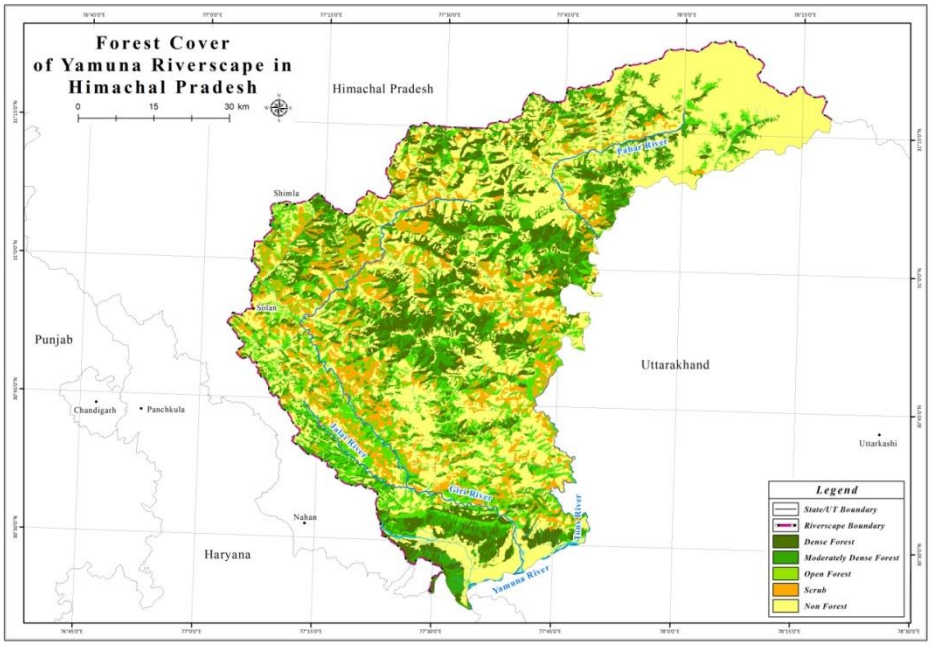


Fig. 2.12. Forest cover in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

2.12.10. Forest Types

The vegetation varies from scrub at lower altitudes to alpine forest at higher altitudes. In between these two extremes, distinct vegetational zones of deciduous forests are found (Table 2.12. and Fig. 2.13). A total of 11 forest types is mapped in Himachal Pradesh of which most abundant is Non-forest area (2485.71 km^2 or 43.91%) followed by Himalayan Moist Temperate Forests (21%), Scrub (13.75%), Subtropical Pine Forests (11.73%).

2.12.11. Prioritisation of sites for Forestry Interventions

A multi-stakeholder approach was followed for preparing the DPR on rejuvenation of Yamuna through Forestry Interventions. It included extensive consultation and review of literature, reports, primary and secondary data collection, its analysis, expert consultations with institutes, individuals and various stakeholders (Central and state government departments, State Forest Departments of seven states, research institutions/scientific departments dealing with forestry,

environment, river conservation, environment; civil society, non-governmental organisations in this field, defence and paramilitary forces, other interest groups).

Table 2.12. Distribution of area under different forest type in Yamuna Riverscape

S. no.	Forest type	Area (km^2)	% of total riverscape area
1	Dry alpine forests	8.6	0.15
2	Himalayan dry temperate forests	69.2	1.22
3	Himalayan moist temperate forests	1,175.16	20.76
4	Moist alpine forests	3.06	0.05
5	Non forest	2,485.71	43.91
6	Sal mixed moist deciduous	0.02	3.53
7	Scrub forest	778.37	13.75
8	Sub-alpine forests	55.17	0.97
9	Subtropical pine forests	663.9	11.73
10	Temperate Coniferous forests	0.11	0.002
11	Tropical dry deciduous forests	157.05	2.77
12	Tropical moist deciduous forests	264.01	4.66
	Total	**5660.36**	

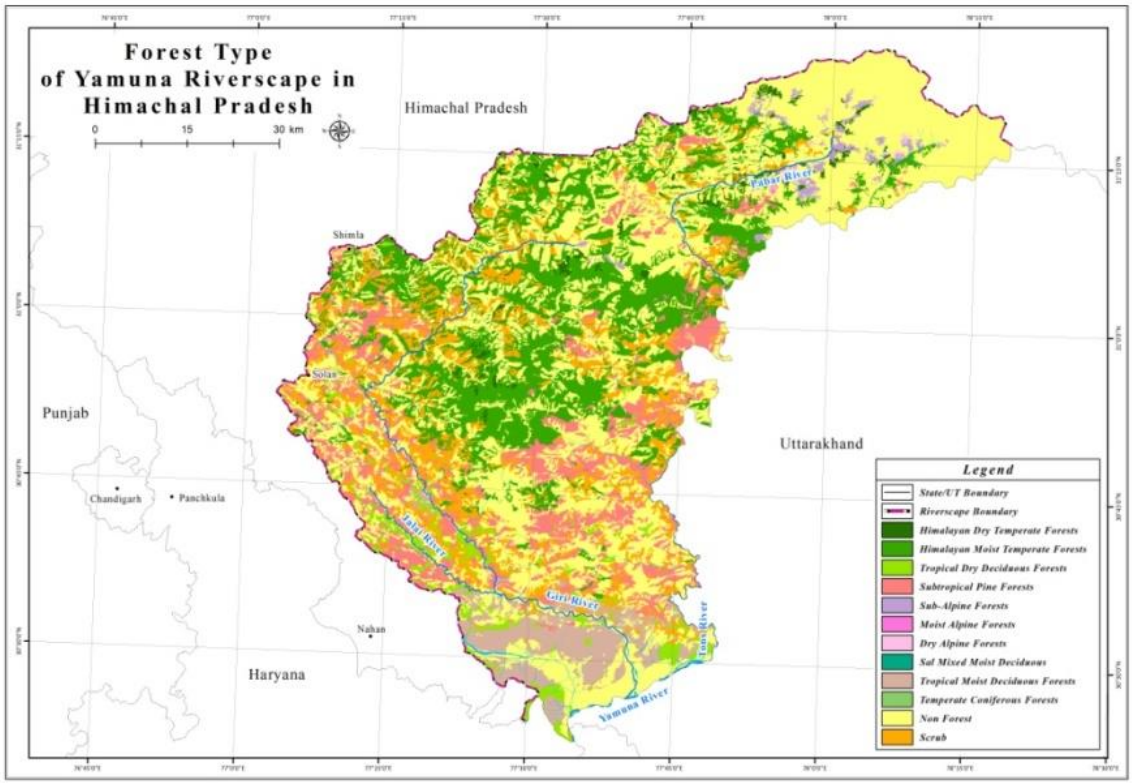


Fig. 2.13. Forest types in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

Priority criteria

For the purpose of preparation of DPR and for identification of priority areas for the proposed treatment/forestry interventions in the Yamuna riverscape, GIS-assisted decision making process by way of geospatial analysis and modelling was used. GIS was used to generate different layers within the riverscape like land use, soil erosion rates, and slope of the topography (Refer Uttarakhand Chapter Table 1.14a).

2.12.12 Priority Classes

Statistical analysis of the area estimates shows that 4,673.31 km^2 area falls in high priority region, 465.92 km^2 area is in medium priority and 521.13 km^2 area is in low priority region for Himachal Pradesh State as given in Table 2.13 and Fig. 2.14.

Table 2.13. Priority treatment areas in the Yamuna Riverscape

S. no	Priority	Area (km^2)	Percentage of total area
1	High	4,673.31	10.6
2	Medium	465.92	1.06
3	Low	521.13	1.18
Total		**5,660.36**	**12.84**

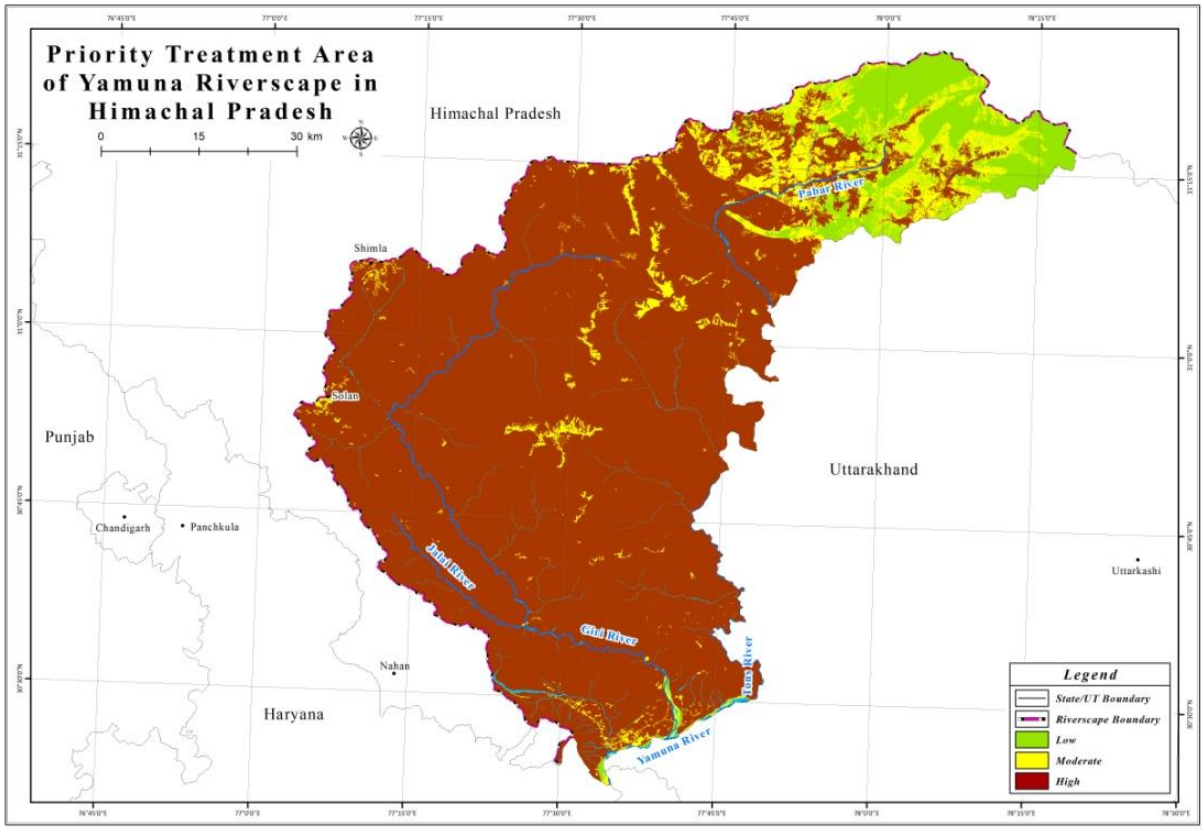


Fig. 2.14. Priority treatment area in Yamuna Riverscape

2.13. PROPOSED FORESTRY INTERVENTIONS

For addressing the challenges and problems highlighted above, various forestry interventions have been proposed in this DPR. Three landscapes in the delineated riverscape have been identified for proposing the forestry interventions:

(iv) Natural landscape.
(v) Agricultural landscape.
(vi) Urban of Peri-urban landscape.

In the state of Himachal Pradesh, the entire catchment of Yamuna River and its tributaries (Giri, Jalal, Pabbar, Tons and Markanda) form part of the riverscape in the state. Models have been developed with landscape-specific approach in the DPR.

The following general prescriptions are made for all models:

a) Native species of tree, shrub and herbs will be planted. Traditional horticultural crops which have long been in cultivation in the region are also included in agricultural and urban landscapes. Mixed crops that would promote biodiversity will be raised as far as possible in preference to pure plantation. Species that provide economically useful non-wood forest produce (NWFP) will be planted to the extent of 70% or more by number. Effort would be made to produce industrial surpluses of select raw material in consultation with local nutraceutical, food processing and other NWFP-based industries.
b) Digging of pits, contour trenches, protection trenches, fencing etc will be carried out sufficiently before planting operation according to the standard practice in the plantation area. Site-specific modifications in the models are permitted provided they capture the essence of the respective models. The rates prevailing in SFD at the site and time of operation would be applicable. The DFOs at time of implementation of the project will have the power to make site-specific modifications in prescriptions to suit the site conditions within the total budget proposed in the DPR for the Division. The flexibility applies to choice of species, site, model, quantity of work and timing of activities.
c) Species will be selected in consultation with industries /market experts to plant species that would create industry-level surpluses.
d) Seed or other propagules of forest tree species will be sourced from natural forests and plantations, especially seed orchards, plus trees or seed production areas, wherever available in sufficient quantity, aiming at quality seed. Seed would not be purchased from market for plantation in natural landscape.
e) Survival of plants will be ensured by providing life-saving irrigation; the frequency of irrigation would vary with weather conditions. Casualty replacement will be done according to the existing norms of the state. If such norms are not existing, prescriptions in the respective models will be referred to.
f) During site preparation prior to plantation work, seedlings already growing in the site would be retained, nurtured (through soil working, manure, irrigation operations) and protected.
g) Complete removal of ground vegetation would not be done during rehabilitation of weed-infested areas, Partial removal of invasive weeds would be done followed by artificial regeneration to facilitate gradual replacement of the weeds with economically and ecologically useful species.
h) Biofertilizers such as arbuscular mycorrhiza (AM), Organic manures will be applied in nurseries and plantations to boost plant growth. Eco-friendly plant protection measures (e.g., physical or mechanical methods, use of natural products, etc.) will be adopted to manage weed and pest without resorting to use of synthetic products. Tall seedlings may be planted to achieve greater survival in areas with high biotic disturbances.
i) Effective protection will be provided to the planted seedlings against biotic and abiotic stresses through watch & ward, public awareness besides fence, cattle-proof trenches, etc. according to the site.

Table 2.14. List of models in Himachal Pradesh

Landscape	Model		Model no.
	S. no.	Model type	
Natural	1	Temperate mixed plantation	YM/HP/NL/01
	2	Sub-tropical mixed plantation	YM/HP/NL/02
	3	Riverine mixed plantation	YM/HP/NL/03
	4	Rehabilitation of invasive species infested areas	YM/HP/NL/04
	5	Assisted natural regeneration	YM/HP/NL/05
	6	Plantation by Eco-Task Force	YM/HP/NL/06
Agriculture	1	Planting of saplings by farmers	YM/HP/AL01
	2	Plantation on community land	YM/HP/AL/02
Urban/ Peri-urban	1	Eco-park development	YM/HP/UL/01
	2	Riverfront development with chainlink fence	YM/HP/UL/02
Conservation Interventions	1	Contour trenching	YM/HP/CI/01
	2	Percolation pond	YM/HP/CI/02
	3	Check dam	YM/HP/CI/03
	4	Spur/Retaining wall	YM/HP/CI/04
	5	Wetland management	YM/HP/CI/05
	6	Mixed SMC works	YM/HP/CI/06

The list of proposed treatment sites is given in Annexure 2 of this volume of DPR (Volume II).

A total of 15 models have been proposed for Himachal Pradesh. Of them, 14 models are broadly similar to Uttarakhand state where 17 models have been proposed. One new model *viz*. Riverine mixed plantation has been proposed for Himachal Pradesh that will not be implemented in Uttarakhand. The model SMC – *Chal khal* of Uttarakhand has been replaced by SMC – Percolation pond in Himachal Pradesh because the term *chal khal*, implying a type of a traditional percolation tank in Uttarakhand, is not used in Himachal Pradesh. The cost norms of the models in natural and agricultural landscapes in the two states are different while cost norms for urban landscape and conservation interventions are same.

To provide details of models for the state at one place for easy reference, all the models proposed for the state have been described in this chapter despite repetition in this volume of the DPR.

2.14. NATURAL LANDSCAPE

YM/HP/NL/01: Temperate mixed plantation

This model has been prescribed for temperate forest areas above 1800 m altitude below the alpine zone. The landscape is characterised by dense forests of chiefly conifer species. The zone experiences snow and rain several times during winter and enjoys a cool climate. The major precipitation is in the form of rainfall during monsoon season. Soil is covered with a thick layer of humus. Despite dense forests in the zone, blank patches also exist at many places. Degraded landscape is also noticed along the riverbanks. Such areas will be taken up for treatment under the project.

Under the model, 525 plants of broadleaved and conifer species and 300 plants of shrubs, medicinal plants and bamboos will be will be planted per ha. 100 contour trenches (40 m^3 volume) and 525 pits of 45 cm x 45 cm x 45 cm size will be dug. Slips of grasses will be planted on soil along contour trenches. Tree seedlings grow slow in the nursery and will be nurtured in the nursery for at least two growing seasons before planting out in the pits. Protection against fire will be provided.

Important elements of the model (ha^{-1}) are:

Tree seedlings: 525 (grown in nursery for at least two growing seasons).

Shrubs, shrubs, medicinal plants and bamboo: 300.
Pit size: 45 cm x 45 cm x 45 cm.
Contour trenches: 100 (40 m^3 volume).
Grasses: On soil along contours.

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Abies pindrow, Picea smithiana, Cedrus deodara, Pinus wallichiana, Aesculus indica, Acer caesium, Acer oblongum, Prunus cornuta, Betula utilis, Taxus baccata, Rhododendron lepidotum, R. campanulatum, Buxus wallichiana, Alnus nepalensis, Anthopogon* sp., *Quercus semecarpifolia, Q. Floribunda,* etc.

Bamboo/ Ringal: *Thamnocalamus falconeri, Sinarundinaria anceps,* etc.

Shrub: *Principia utilis, Rosa moschata, Berberis lycium, Woodfordia* sp., *Cotoneaster macrophyllus, Daphnae cannabina, Ziziphus oxyphylla, Hippophae* sp., *Cornus capitata,* etc.

Medicinal plant: *Podophyllum hexandrum, Dictamnus albus, Ferula jaeschkeana, Polygonatum verticillatum, Acorus* sp., *Nardostachys* sp., etc.

Grass/sedge: *Arundinella setosa, Pennisetum orientale, Chrysopogon gryllus, C. fulvus, Apluda mutica, Melica persica*, Calamagrostis emodensis*,* etc.

* Landslide prone area

YM/HP/NL/02: Sub-tropical mixed plantation

This model will be applied in mid-hill region of the state at an altitude of 900-1,800 m. South-facing slopes having shallow soil and sites infested with invasive weeds will not be treated with this model. The zone experiences heavy rainfall during monsoon season and modest rainfall during winter season. Most of the rainwater flows down the streams washing away top soil especially in degraded sites. The forests are dominated by *Pinus roxburghii* (chir pine). High temperature and humidity conditions prevail during summer and the forest floor during winter and summer is covered with pine needles. Grasses flush out during monsoon season.

Under the model, 325 plants of broadleaved species and 300 plants of shrubs, medicinal plants and bamboos will be will be planted per ha. 100 contour trenches (40 m^3 volume) and 325 pits of 45 cm x 45 cm x 45 cm size will be dug. Slips of grasses will be planted on soil along contour trenches. Fire is a common occurrence during summer and protection measures will be adopted.

Important elements of the model (ha^{-1}) are:
Tree seedlings: 325 (grown in nursery for at least two growing seasons).
Shrubs, shrubs, medicinal plants and bamboo: 300.
Pit size: 45 cm x 45 cm x 45 cm.
Contour trenches: 100 (40 m^3 volume).
Grasses: On soil along contours.

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Cuppressus torulosa, Lyonia ovalifolia, Acer oblongum, Prunus cornuta, Buxus wallichaiana, Alnus nitida, Olea glandulifera, Pterospermum* sp., *Quercus leucotrichphora,* etc.

Bamboo/Ringal: *Dendrocalamus* sp., *Thamnocalamus falconeri, Sinarundinaria anceps,* etc.

Shrub: *Prinsepia utilis, Rosa muscheta, Berberis lycium, Woodfordia* sp., *Ziziphus oxyphylla, Hipphophae* sp., *Cornus capitata, Flemengia* sp., *Artemisia nilagirica, Rhus parviflora,* etc.

Medicinal plant: *Plumbago indica, Dictamnus albus, Ferula jaeschkeana, Polygonatum verticillatum, Acorus* sp., *Nardostachys* sp., etc.

Grass/sedge: *Pennisetum orientale, Arundinella setosa, Chrysopogon fulvus, A. nepalensis, Heteropogon*

contortus, Apluda mutica, Vetiveria sp. etc.

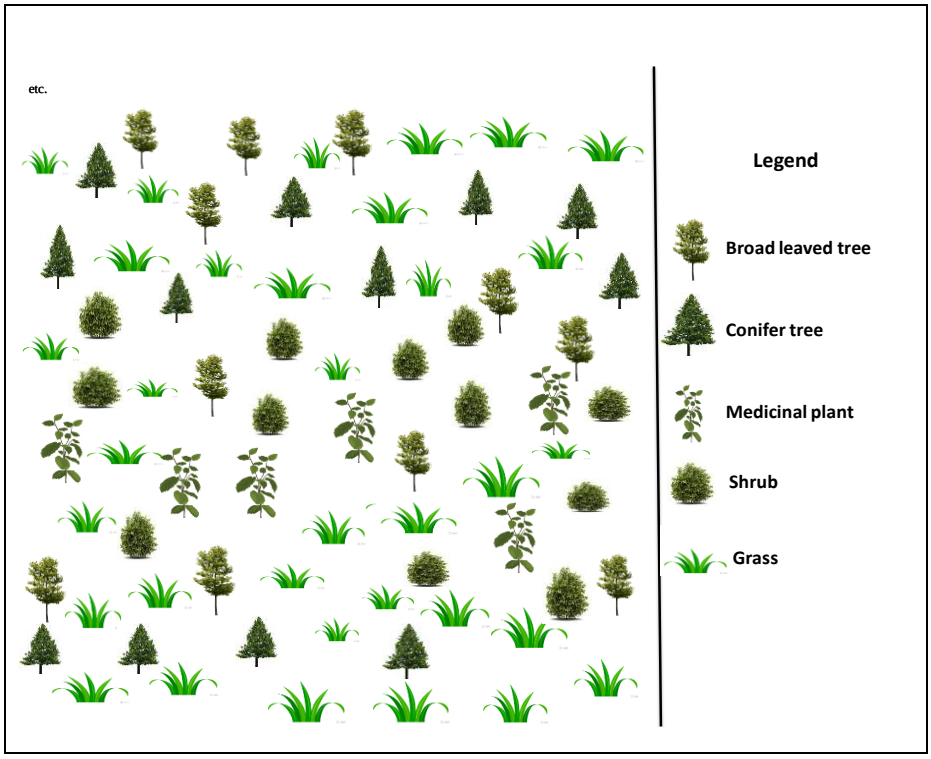


Fig. 2.15. Illustration of model in temperate mixed plantation

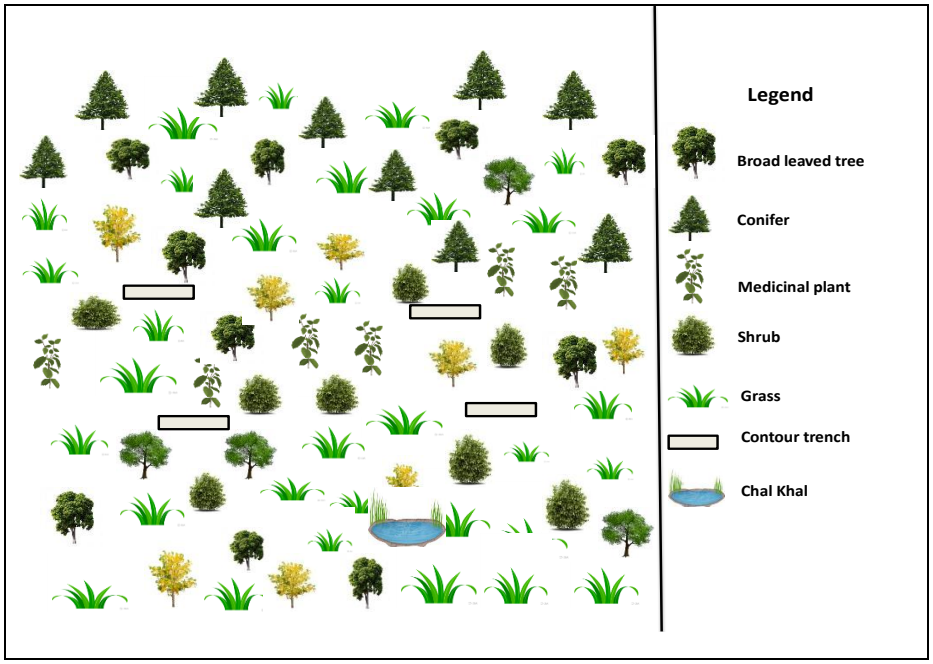


Fig. 2.16. Illustration of model on subtropical mixed plantation

YM/HP/NL/03: Riverine mixed plantation

This model will be applied in riverine areas having an open landscape along the riverbanks. The soil is deep and fertile with good moisture content. Animals prefer graze in this zone due to proximity to water and cause damage to the vegetation. There is a high incidence of damage to trees by lopping and interference to vegetation due to tourists. Soil from road construction and other development activities collects along river causing damage to the flora.

Broadleaved tree species will be planted. Under the model, 500 plants of tree species and 500 plants of shrubs, medicinal plants and bamboos will be will be planted per ha. 100 contour trenches (40 m^3 volume) and 500 pits of 45 cm x 45 cm x 45 cm size will be dug. Slips of grasses will be planted on soil along contour trenches. Fire is a common occurrence during summer and protection measures will be adopted.

Tree: *Dalbergia sissoo, Acacia catechu, Toona ciliata, Holoptelea integrifolia, Terminalia bellerica, Terminalia chebula, Bauhinia variegata. Wendlandia, Alnus nepalensis, A. nitida, Shorea robusta. Anogeissus latifolia, Lagestroemia parviflora,* etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Bambusa* sp. and *Thamnocalamus falconeri,* etc.

Shrub: *Trema politoria, Debregeasia longifolia, Rhus parviflora, Carissa opaca, Buddleia asiatica, Euphorbia* sp., *Rubus ellipticus, Pycantha* sp., *Prinsepia utilis, Berberis lycium, Woodfordia fruticosa, Ziziphus oxyphylla, Cornus capitata, Flemengia* sp., *Artemisia nilagirica***,** *Rhus parviflora* and *Indigofera cassioides,* etc.

Medicinal plant: *Withania* sp., *Asparagus racemosus, Mucuna pruriens, Plumbago indica, Ferula jaeschkeana, Acorus* sp. and *Nardostachys* sp., etc.

Grass/sedge: *Pennisetum orientale, Arundinella setose, Pennisetum orientale, Chrysopogon fulvus, Heteropogon contortus, Apluda mutica, Vetiver grass. Arundinella nepalensis, A. setosa, Thysanolaena maxima, Arundo donax, Phragmites karka, Saccharum bengalense* and *Narenga porphyrocoma,* etc.

***Landslide area**

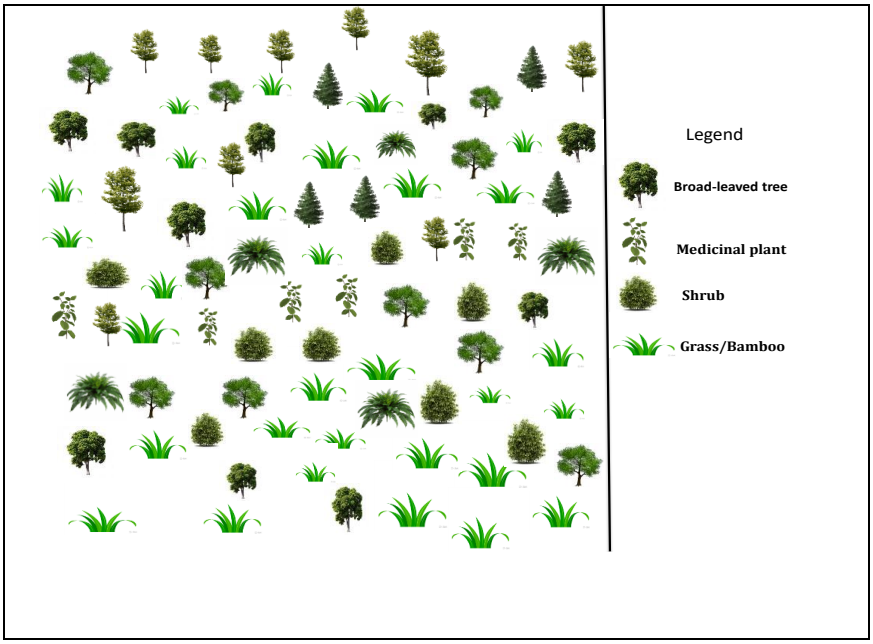


Fig.2.17. Illustration of model on riverine mixed plantation

Table 2.15. Cost norms for models (YM/HP/NL/01, YM/HP/NL/02 and YM/HP/NL/03)

Activities	YM/HP/NL/01		YM/HP/NL/02		YM/HP/NL/03	
	Man-days	Cost (Rs.)	Man-days	Cost (Rs.)	Man-days	Cost (Rs.)
Year 1 (Advance work)						
Survey and alignment of planting lines	5	1,250	4	1,250	5	1,250
Cleaning of site and making of inspection path	10	2,500	10	2,500	10	2,500
Advance soil works (digging of pits)	50	12,500	40	10,000	40	10,000
Fencing		50,000		50,000		50,000
Nursery		77,000		34,000		40,000
Total		**1,43,250**		**97,750**		**103,750**
Year 2 (Planting and establishment)						
Planting in pits	50	12,500	40	10,000	40	10,000
Fire protection		2,000		2,000		2,000
Vermicompost/ FYM		1,500		1,500		1,500
Maintenance of plants (5 d mo^{-1} for 8 months)	40	10,000	40	10,000	40	10,000
Contingency		2,000		2,000		2,000
Total		**28,000**		**25,500**		**25,500**
Maintenance cost						
Year 3 (1st maintenance year)	30	7,500 2,000 1,500	30	7,500 2,000 1,500	30	7,500 2,000 1,500
Year 4 (2nd maintenance year)	30	7,500 2,000 1,500	30	7,500 2,000 1,500	30	7,500 2,000 1,500
Year 5 (3rd maintenance year)	30	7,500	30	7,500	30	7,500
Year 6 (4th maintenance year)	30	7,500	30	7,500	30	7,500
Year 7 (5th maintenance year)	30	7,500	30	7,500	30	7,500
Grand total		**2,15,750**		**1,67,750**		**1,73,750**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/HP/NL/04: Rehabilitation of invasive species-infested areas

This model is proposed for areas infested with dense growth of invasive species in subtropical areas and mid-hills in the state of Uttarakhand. It is proposed to cut and uproot invasive species in patches in the treatment areas and plant indigenous trees, shrubs, bamboos and other species of economic utility to replace the invasive species. The area will be maintained to prevent regrowth of invasive species.

It is proposed to raise 500 plants of tree species and 125 plants of shrubs, medicinal plants and bamboos per ha. 100 contour trenches (40 m^3 volume) and 500 pits of 45 cm x 45 cm x 45 cm size will be dug. Slips of grasses will be planted on soil along contour trenches. Forest fires commonly occur during the summer season and protection will be provided.

Important elements of the model (ha^{-1}) are:
Tree seedlings: 400
Shrubs, shrubs, medicinal plants and bamboos: 300
Pit size: 45 cm x 45 cm x 45 cm
Contour trenches: 100 (40 m^3 volume)
Grasses: On soil along contour trenches

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Anogeissus latifolia, Lagestroemia parviflora, Acacia catechu, Dalbergia sissoo, Toona ciliata, Holoptelea integrifolia, Terminalia bellerica, Terminalia chebula, Bauhinia variegata, Wendlandia,* etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Bambusa* sp., *Thamnocalamus falconeri,* etc.

Shrub: *Trema politoria, Debregeasia longifolia, Rhus parviflora, Carissa opaca, Buddleia asiatica, Euphorbia* sp., *Rubus ellipticus, Pycantha* sp., *Prinsepia utilis, Berberis lycium, Woodfordia fruticosa, Ziziphus oxyphylla, Cornus capitata, Flemingia* sp., *Artemisia nilagirica, Rhus parviflora, Indigofera cassioides,* etc.

Medicinal plant: *Withania* sp., *Asparagus racemosus, Mucuna pruriens, Plumbago indica, Ferula jaeschkeana, Acorus* sp., *Nardostachys* sp., etc.

Grass/sedge: *Pennisetum orientale, Arundinella setosa, Chrysopogon fulvus, Heteropogon contortus, Apluda mutica, Vetiveria, Arundinella nepalensis, A. setosa, Thysanolaena maxima, Arundo donax, Phragmites karka,* etc.

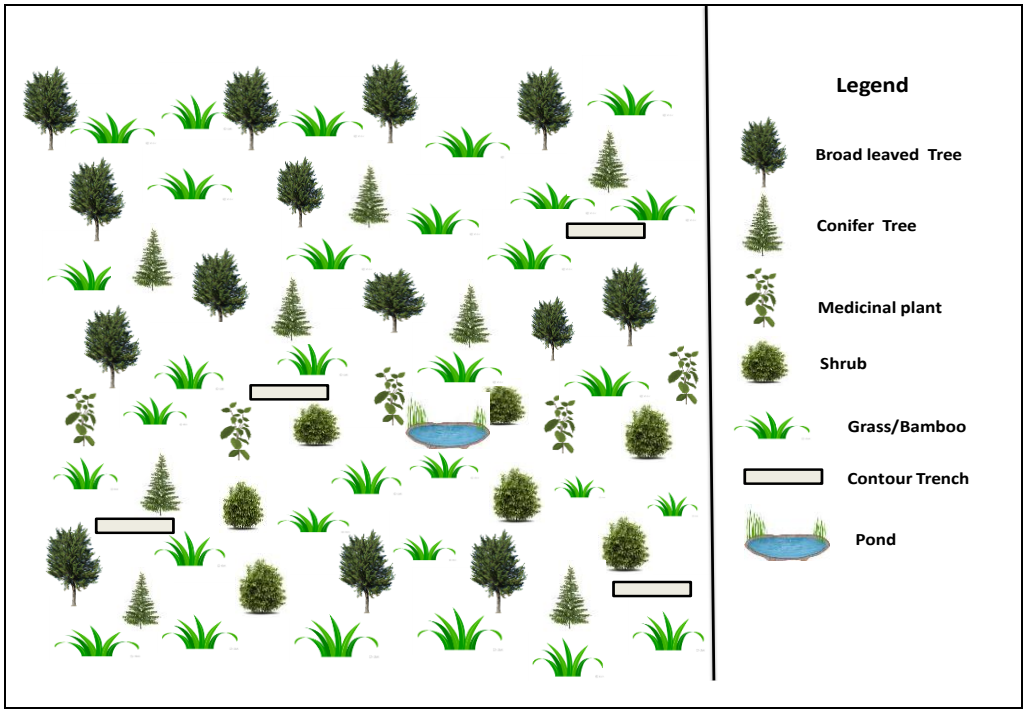


Fig. 2.18. Illustration of model on rehabilitation of invasive species infested areas

YM/HP/NL/05: Assisted Natural Regeneration

The model aims to aid and accelerate the natural process of succession and overcome impediments to natural regeneration such as from degradation of soil, invasive action of weeds, drought, grazing/browsing, fire, human disturbance, etc.). Assisted Natural Regeneration (ANR) costs less and is speedier in its effect than artificial regeneration, and is very effective in watershed protection and soil conservation.

Under this model, protection will be provided to overcome the adverse anthropogenic factors. Removal of interfering vegetation will be done, besides digging of 100 contour trenches (40 m^3 volume) per ha to reduce biotic stress and promote moisture conservation. 200 seedlings of trees, bamboos and shrubs will be planted to supplement natural regeneration. Grasses will be planted along contours to aid soil and water conservation. Silvicultural operations such as regeneration clearing, singling, pruning, etc. will be done to support regeneration of existing plants.

Important elements of the model (ha^{-1}) are:
Tree, shrub and bamboo seedlings: 200.
Pit size: 45 cm x 45 cm x 45 cm.
Contour trenches: 100 (40 m^3 volume).
Grasses: On soil along contour trenches.

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Toona ciliata, Lannea coromandelica, Albizia lebbeck, Acacia catechu, Dalbergia sissoo, Anogeissus latifolia, Lagestroemia parviflora, Holoptelea integrifolia, Terminalia bellerica, Bauhinia variegate,* etc.

Bamboo/ Ringal: *Dendrocalamus* sp., *Bambusa* sp., *Thamnocalamus falconeri,* etc.

Shrub: *Trema politoria, Debregeasia longifolia, Rhus parviflora, Carissa opaca, Buddleia asiatica, Euphorbia* sp., *Rubus ellipticus, Pycantha* sp., *Prinsepia utilis, Berberis lycium, Woodfordia fruticosa, Ziziphus oxyphylla, Cornus capitata, Flemingia* sp. *Artemisia nilagirica, Rhus parviflora, Indigofera cassioides,* etc.

Grass/sedge: *Pennisetum orientale, Chrysopogon fulvus, Heteropogon contortus, Apluda mutica, Thysanolaena maxima,* etc.

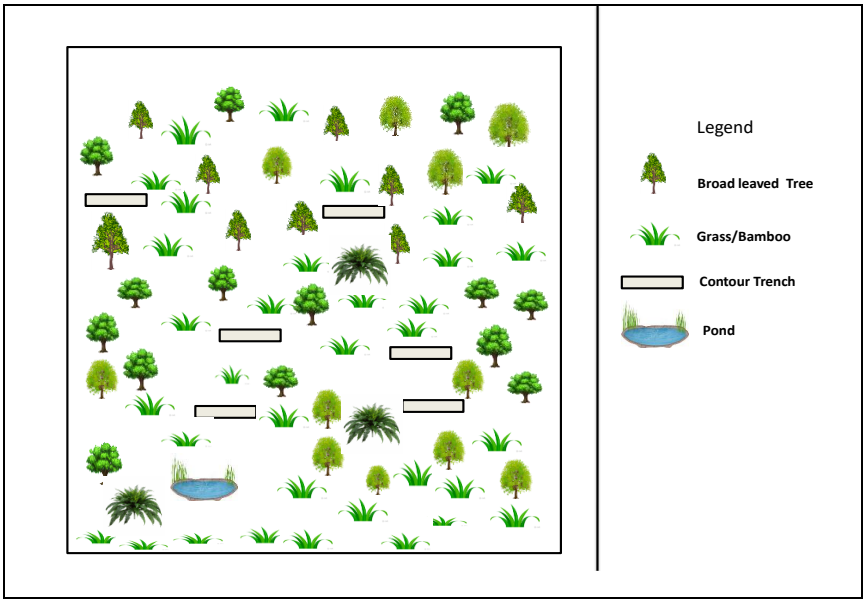


Fig. 2.19. Illustration of model on assisted natural regeneration

Table 2.16. Cost norms for models (YM/HP/NL/04 and YM/HP/NL/05)

Activities	YM/HP/NL/04		YM/HP/NL/05	
	Man-days	**Cost (Rs.)**	**Man-days**	**Cost (Rs.)**
Year 1 (Advance work)				
Survey and alignment of planting lines	5	1,250	5	1,250
Cleaning of site and making of inspection path	5	1,250	10	2,500
Lantana removal		35,000	NA	
Advance soil works (digging of pits)	40	10,000	15	3,750
Contour trenching (100 trenches = 40 m^3, rate Rs.120 m^{-3})	100 trenches	4,800	100 trenches	4,800
Fencing		50,000		50,000
Nursery		45,500		12,500
Total		**1,47,800**		**74,800**
Year 2 (Planting and establishment)				
Planting in pits and trenches	40	10,000	15	3,750
Sowing in contour trenches	10	2,500	10	2,500
Seeds/grass slips		1,000		1,000
Fire protection/fire watcher		2,000		30,000
Vermicompost/FYM		1,500		1,000
Maintenance of plants (5 $d.mo^{-1}$ for 8 months)	40	10,000	40	10,000
Contingency (irrigation, etc.)		2,000		1,000
Silviculture operations (regeneration clearings, singling/pruning, SMC works, etc.)		NA		10,000
Total		**29,000**		**59,250**
Maintenance cost				
Year 3 (1st maintenance year)	30	7,500 2,000 1,500 2000	30	7,500 1,000 1,000
Year 4 (2nd maintenance year)	30	7,500 2,000 1,500 2,000	30	7,500 1,000 1,000
Year 5 (3rd maintenance year)	30	7,500 2,000	30	7,500
Year 6 (4th maintenance year)	30	7,500	30	7,500
Year 7 (5th maintenance year)	30	7,500	30	7,500
Grand total		**2,27,300**		**1,75,550**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UK/NL/06: Plantation by Eco-Task Force

Some sites in the state of Uttarakhand have very inhospitable topography and extremely low temperatures. These sites require continued presence and close supervision of planting and maintenance team. Ecological units of the Territorial Army, called Eco Task Force (ETF), have been carrying out afforestation works in difficult and inaccessible areas for over last three decades. These are manned by a mixture of regular army personnel and young ex-service men. ETFs are funded by state governments and the Ministry of Environment, Forest and Climate Change, GoI. The ETFs, through tree plantation, have performed admirably in restoration of

harsh sites in the Mussoorie hills of Uttarakhand, It is proposed to utilise this ability of ETF in regenerating sites under this model. Inhospitable sites in difficult terrain measuring 600 ha will be assigned by SFD to Eco-Tack Force for carrying out afforestation activities. Models under natural landscape or their combinations suitable to the area, will be implemented.

Cost norm for YM/HP/NL-06 (Rs. ha^{-1})

Rs. 2,30,000 ha^{-1} is proposed tentatively. 600 ha is proposed to be treated in the state.

Table 2.17. Year-wise cost summary for YM/HP/NL-06 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,30,000	0	0	0	0	0	**2,30,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

2.15. TREATMENT MODELS FOR AGRICULTURAL LANDSCAPE

YM/HP/AL/01: Planting of saplings by farmers

This model will be implemented in agricultural land in temperate, sub-temperate and sub-tropical zone in Uttarakhand. Forestry as well as horticultural species will be planted depending upon the requirement of the landowners. Planting stock and technical knowledge will be supplied to them through appropriate mechanism under this project. Planting and maintenance of the plants will be done by the landowners themselves. Financial incentive to the growers will be provided keeping based on the survival of the plants.

Plants will be planted along the bunds in two rows at a spacing of 3 m. 264 plants will be considered equivalent to one hectare.

The model may be implemented as per the provisions of 'Hamara Ped, Hamara Dhan' scheme of Uttarakhand SFD.

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Grewia optiva, Bauhinia variegata, Bauhinia purpurea, Celtis australis, Dalbergia sissoo, Ficus roxburghii, Ficus palmata, Terminalia alata, T. bellirica, Cordia dichotoma, Quercus leutrichophora, Q. dilatata, Salix alba, Juglans regia, Morus alba,* etc.

Bamboo: *Dendrocalamus strictus, Thamnocalamus falconeri, Sinarundinaria anceps,* etc.

Fruit tree: Apple, pear, peach, plum, apricot, walnut, etc.

Cost norms for model YM// HP /AL//01:

Cost of plant including carriage (Year 1): Rs. 50/plant, and

Planting and maintenance cost during planting year (Year 1): Rs. 50 plant^{-1}.

Maintenance cost in Year 2: Rs. 25 plant^{-1}

Maintenance cost in Year 3: Rs. 25 plant^{-1}

Maintenance cost in Year 4: Rs. 25 plant^{-1}

Maintenance cost in Year 5: Rs. 25 plant^{-1}

Maintenance cost in Year 6: Rs. 25 plant^{-1}

i.e., Rs. 225 plant^{-1} or Rs 59,400 ha^{-1}

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/ HP /AL/02: Plantation on Community Lands

Landholding size of farming families in the Yamuna basin is small and many families are landless. Community land serves as place for grazing by cattle and source of firewood and fodder. At many places these lands are degraded and are source of soil erosion and rapid runoff of water. Native communities have evinced interest to regenerate the sites. It is proposed to help the rural communities plant these sites with useful species of plants.

Planting will be done as per details given for model YM/HP/NL/03. Local community will be entrusted with the responsibility to plant, maintain and manage the plantation through appropriate local institution.

Cost norms: Same as the cost norms of model YM/HP/NL/03

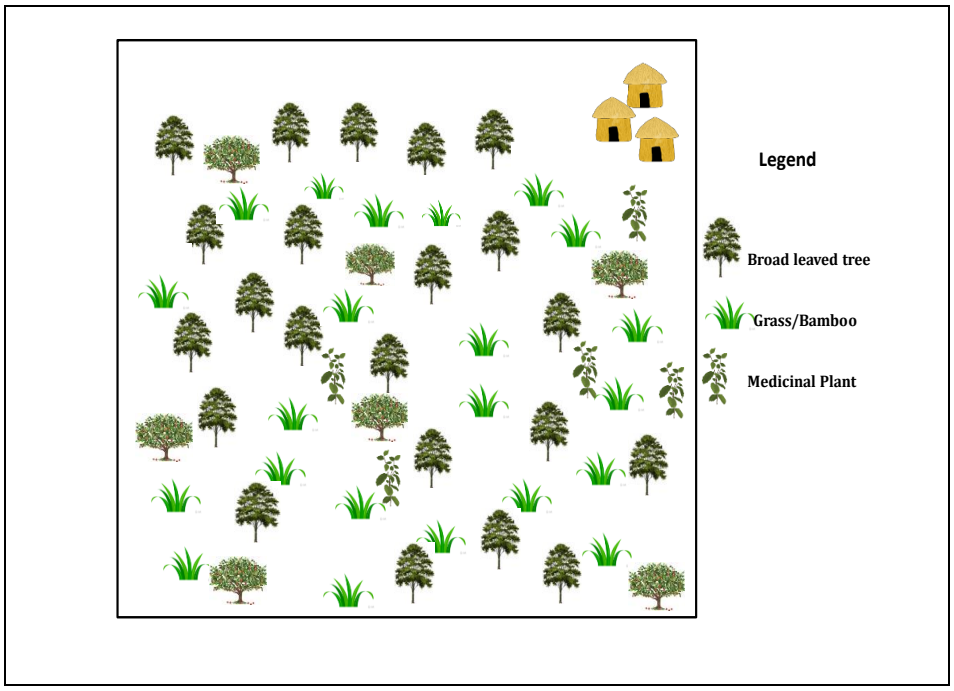


Fig. 2.20. Illustration of model on Model on plantations on community land

2.16. URBAN/PERI-URBAN LANDSCAPE

YM/HP/UL/01: Eco-park development model

Eco-park is a mini ecological park or an amusement park established without hampering the natural environment of the area. Generally, a particular area of a forest is demarcated and brought under intensive management for this purpose and the beauty offered by nature is opened to the visitors. Sometimes forest areas having special natural features are selected for eco-park development. Landscaping and beautification is proposed to be done for urban and peri-urban landscapes of frequent public visitation to bring forth aesthetics and entertainment coupled with natural awareness. The natural layout of the land will be manoeuvred in such a way that the aesthetic beauty will be enhanced without much investment. Landscaped area will be designed to afford good soil, moisture and biodiversity conservation. *Nakshatra vatika, Rashi vatika, Nav-grah vatika, Panchvati vatika, Dhanvantri vatika,* etc. will be established within the park for awareness generation, meditation and spiritual fulfilment. Site-specific activities will be carried

out at different places in harmony with the site conditions. An eco-park will have better facilities than riverfront development to facilitate the visitors.

The proportion of ornamental plants will be relatively more in eco-park than in the riverfront development model. An eco-park may have vegetative and non-vegetative components:

Vegetative part*:* Miscellaneous ornamental species.

Non-vegetative part*:* Fencing, stairs, pathways, walking trails, stone pitching, rain shelter, benches, public utilities, parking area, information centre, children playing area, pond beautification, landscaping etc. as per site-specific requirement.

Plant species recommended

Indigenous species will be planted in the model. Few examples of plant types for the purpose of illustration are as follows:

Lawn grasses, hedge plants, shrubs, creepers, vines, hanging plants, grove of ornamental trees, fruit trees, forest trees and ornamental bamboos, flowering herbs/shrubs, cacti, ferns, palms, aquatic plants, medicinal plants.

YM/HP/UL/02: Riverfront development with chainlink fence

This model is prescribed in areas adjacent to the river where chainlink fence is required to afford protection to the plantation, prevent falling of pedestrians into the river and act as barrier to throwing of waste by people into the river. Some activities on development of riverfront on the lines of YM/UK/UL/02 may also be carried.

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Large tree: *Bauhinia variegata, B. purpurea, Cupressus torulosa, Terminalia bellirica, Terminalia chebula, Terminalia arjuna, Syzygium cumini, Pongamia pinnata, Albizia lebbeck, Acer* spp, *Juglans regia, Quercus* spp., etc.

Dwarf tree/shrub/bamboo: *Rhododendron* spp., *Cassia fistula, Thespesia populnea, Dendrocalamus strictus, Woodfordia fruticosa, Sesbania grandiflora, Rosa moschata, Adhatoda vasica,* etc.

Herb: *Ocimum sativum, Wedelia trilobata,* etc.

Grass: *Stylosanthes* sp., *Arundo donax, Axonopus compressus, Saccharum bengalense, S. spontaneum,* etc.

Miscellaneous ornamental plants: Lawn grasses, hedge plants, shrubs, ornamental trees, ornamental bamboos, flowering herbs/shrubs, palms, aquatic plants.

The following cost norms are prescribed:

Table 2.18. Cost norms for models (YM/HP/UL/01 and YM/HP/UL/02)

Model	Estt. cost (Rs. in lakh ha^{-1})	Maint. cost (Rs. in lakh ha^{-1})	Total cost (Rs. in lakh ha^{-1})
Eco-Park development (YM/HP/UL/01)	25.00	7.20 (12,000 mo^{-1} or 1.44 lakh yr^{-1} for 5 yrs.)	32.20
River Front development with chainlink fence (YM/HP/UL/02)	Site-specific requirement	Site-specific requirement	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 2.21. Illustration of eco-park development model
(***Source:*** https://www.holidify.com/places/dhanaulti/eco-park-sightseeing-4506.html)

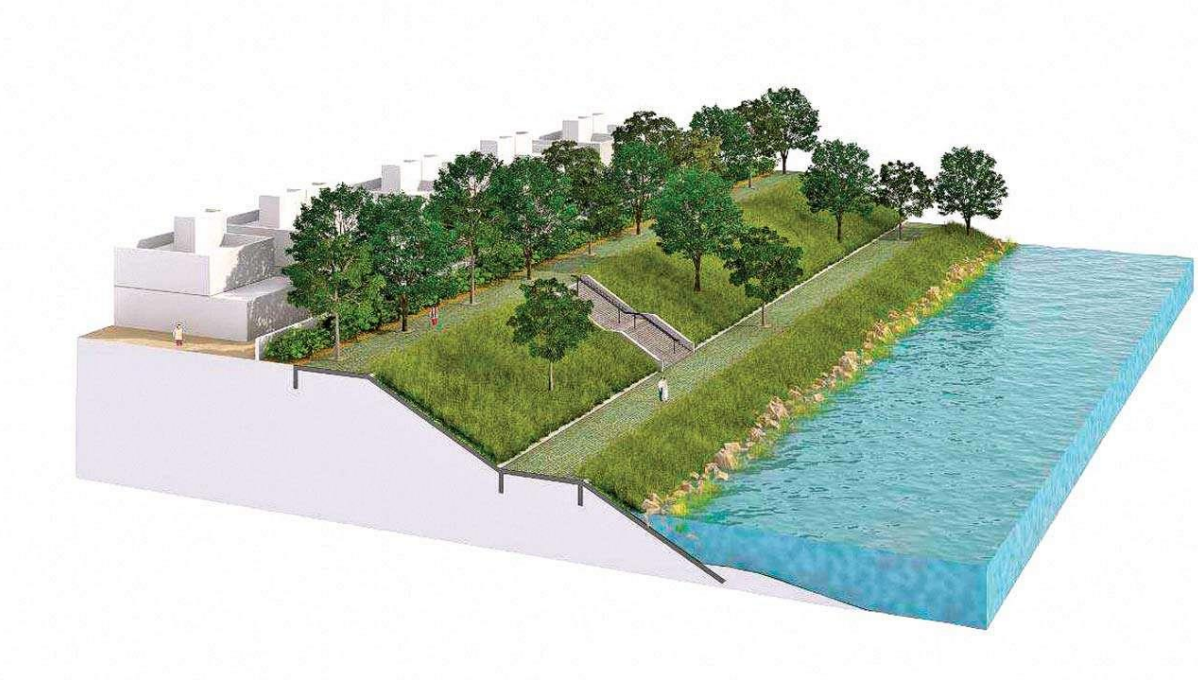


Fig. 2.22. Illustration of riverfront development model
(***Source:*** https://www.dnaindia.com/ahmedabad/report-amc-vows-green-island-reservoir-at-riverfront-2624416)

2.17. TREATMENT MODELS FOR CONSERVATION INTERVENTIONS

There are several sites which are affected by the problem of soil erosion or inadequate infiltration of rainwater despite having satisfactory tree cover. Soil and moisture conservation measures will be applied in such areas. Contour trench, percolation tank and check dam will be created under different models in such areas depending upon their suitability. In some sites where the above structures are not likely to sustain the pressure of flowing water, spur and retaining wall will be erected. Planting of trees is not proposed on these structures. The surrounding forest area will not be treated under these models. The models are intended to check soil erosion, increase ground water recharge, reduce problem of soil erosion, increase availability of drinking water for animals and improve the site quality.

YM/HP/CI/01: Contour trenching

Contour trenching, either staggered or continuous, is a very effective conservation practice to check soil erosion and enhance groundwater recharge for improving base flow in hilly streams. Contour trenching is proposed on uniform hill slopes or landscapes with rolling/undulating topography in plain areas.

YM/HP/CI/02: Percolation tank

A percolation tank is a small water harvesting structure traditionally used in the state of Uttarakhand. It is an artificial pond, lined with stones, that is constructed across a natural stream or water course to harvest and impound the runoff. It provides water for irrigation and drinking and facilitates vertical and lateral percolation of impounded water into the soil substrata, thereby recharging groundwater in the area.

YM/HP/CI/03: Check dam

Check dams are versatile conservation structures to check soil erosion caused by flowing water, enable water harvesting and improve groundwater recharge. These structures are suitable for small order ephemeral streams both in hilly and plain topographic conditions. Where the purpose of the check dam is soil conservation in small streams and gullies, the drop of head wall should not be more than 1.5 m. Proper spillway and downstream protection measures need to be provided where drop of structure exceeds 1.5 m.

YM/HP/CI/04: Spur/Retaining wall

A spur is a stone or RCC (reinforced cement concrete) structure built on the bank of a river at some angle to the direction of flow of water with the objective of deflecting water away from the bank. This reduces the pressure of water striking the riverbank and helps reduce soil erosion. A retaining wall is a stone or RCC structure that holds back soil or rock from slipping down. Retaining walls are particularly useful where there is a change in level within a restricted area.

YM/HP/CI/05: Wetland Management

This model aims at restoration of identified wetlands in the hilly upstream catchment as well as in the floodplain. The causes of degradation of wetlands will be addressed and bio-engineering measures will be applied that combine vegetation and other naturally available materials, to produce a functioning system that would prevent soil erosion and improve habitat. Under the model, de-siltation will be carried out of wetlands and their entry-exit channels. Terrestrial and aquatic weeds will be removed and regeneration of native species of trees, shrubs, grasses and other herbs will be augmented by natural regeneration or artificial regeneration depending upon

site-specific requirement. Need-based measures will also be taken to improve habitat and augment the population of native aquatic fauna and control of invasive faunal species.

YM/HP/CI/06: Mixed SMC Works

The context and prescriptions of this model are same as those for YM/UK/CI/06 'Mixed SMC works'. The cost norms applicable to the model in Himachal Pradesh are given in Table 2.19.

Table 2.19. Cost norms for models (YM/HP/CI/01, YM/HP/CI/02, YM/HP/CI/03, YM/HP/CI/04, YM/HP/CI/05 and YM/HP/CI/06)

Model	Estt. cost (Rs. m^{-3})	Maint. cost (Rs. $m^{-3}yr^{-1}$)	Total cost (Rs. m^{-3})
YM/HP/CI/01: Contour trenching (3×0.3×0.45m = 0.40 m^3)	120	60 (10% of estt. cost or 12 yr^{-1} for 5 yrs.)	180
YM/HP/CI/02: Percolation tank (5×4×1m = 20 m^3)	500	250 (10% of estt. cost or 50 yr^{-1} for 5yrs.)	750
YM/HP/CI/03: Check dam (5×1.5×2m = 15 m^3)	2,000	1,000 (10% of estt. cost or 200 yr^{-1} for 5yrs,)	3,000
YM/HP/CI/04: Spur/Retaining wall (5×1.5×2m = 15 m^3)	2,200	1,100 (10% of estt. cost or 220 yr^{-1} for 5yrs),	3,300
YM/UK/CI/05-Wetland management	6.5 lakh ha^{-1}	3.25 lakh (10% of estt. cost or 0.65 lakh yr^{-1} for 5yrs,)	9.75 lakh ha^{-1}
YM/HP/CI/06-Mixed SMC works	Site-specific requirement	Site-specific requirement	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

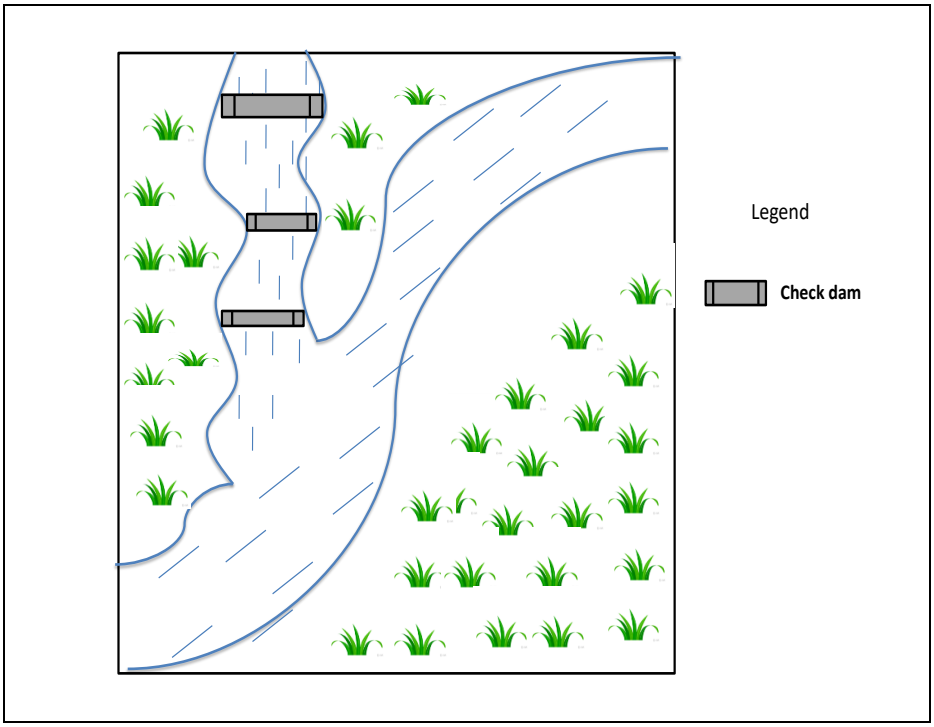


Fig. 2.23. Illustration of check dam construction

2.18. SUPPORTING ACTIVITIES

Other activities such as awareness generation, capacity building, monitoring, research, nursery development, development of value chain, protection against fire, etc. are essential to facilitate the forestry interventions and are considered vital for successful and effective execution of proposed forestry interventions.

The strategies and specific interventions for these important supporting activities are provided in Volume 1 of the DPR.

A multi-tiered mechanism has been suggested for monitoring of the project (Fig. 2.24.).

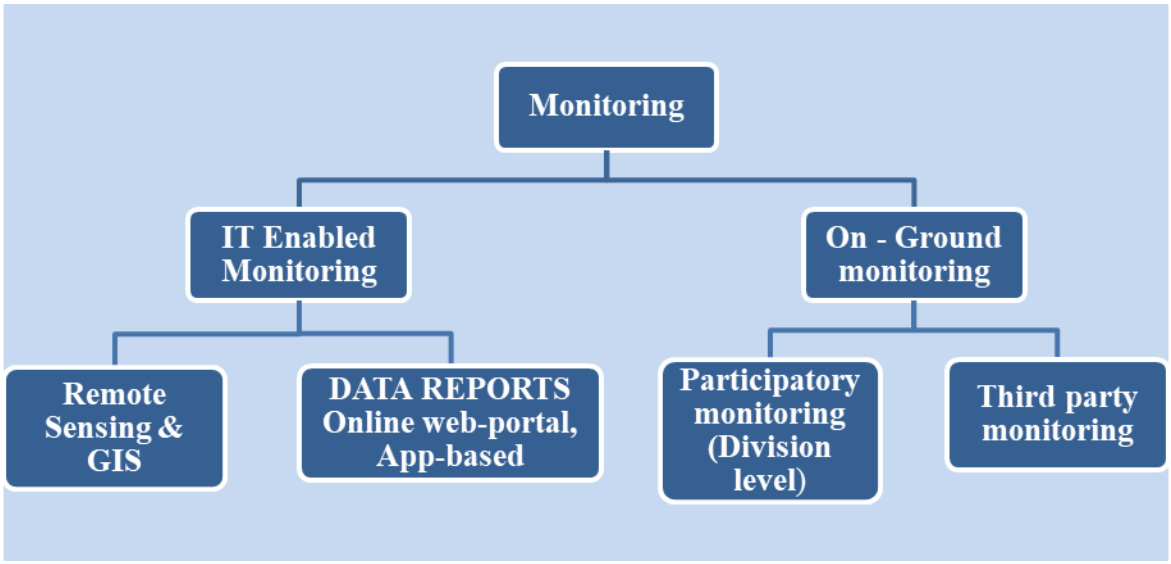


Fig. 2.24. A multi -tiered monitoring mechanism for forestry interventions for Rejuvenation of Yamuna River

2.19. BUDGET

The physical and financial projections for all the interventions, supporting activities to be undertaken for the cost, duration as well as various divisions in Himachal Pradesh are given in Table 2.20. to 2.37.

A sum of Rs. 10,520.38 lakh (i.e., Rs. 105.20 crore) has been proposed for the Implementing Agency for execution in the state of Himachal Pradesh (Table 2.20.). About 65.35% (i.e., Rs. 6,874.94 lakh) of the budget provision has been made for plantations and treatment models in three landscapes while Rs. 2,900.94 lakh are provisioned for Conservation interventions. For supporting activities like awareness generation, research activities, capacity building, nursery establishment/improvement, fire protection, monitoring and evaluation, etc. an amount of Rs. 744.50 lakh has been allocated. A sum of Rs. 145.00 lakh has been provided for field activities and contingency and Rs. 100.00 lakh for Project Monitoring Unit in the state (Table 2.21.).

Table 2.20. Component/Activity-wise budget allocation for Himachal Pradesh

S. no.	Component and /or activity	Amount (Rs. in lakh)	Allocation (%)
Implementation of forestry interventions in riverscape area		**10,520.38**	**100.00**
A.	**Plantations and treatment models in three categories of landscape**	**6874.94**	**65.35**
A.1	Natural landscapes	6588.34	
A.3	Agriculture landscapes	56.51	
A.4	Urban and Peri-Urban landscapes	230.09	
B.	**Conservation interventions**	**2900.94**	**27.57**
	Total	**9775.88**	
C.	**Supporting activities**	**744.50**	**7.08**
C.1	Awareness generation, research activities, capacity building, nursery establishment/improvement, fire protection, monitoring and evaluation, etc.	**499.50**	
C.2	Field activities, contingency and miscellaneous expenses	**145.00**	
C.3	Cost of PMU in Himachal Pradesh	**100.00**	

Table 2.21. Year-wise cost summary for supporting activities (cost Rs. in lakh)

S. no.	Particular	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	Total
	Supporting Activities						
1	Awareness generation, research activities, capacity building, nursery establishment/ improvement, fire protection, monitoring and evaluation, etc.	**112.00**	**106.00**	**107.00**	**92.50**	**82.00**	**499.50**
2	Field activities, contingency and miscellaneous expenses	34.00	34.00	34.00	25.00	18.00	**145.00**
3	Cost of PMU in Himachal Pradesh	28.00	16.00	16.00	18.00	22.00	**100.00**
	Total	**174.00**	**156.00**	**157.00**	**135.50**	**122.00**	**744.50**

Indexing of cost

The budget for the project has been prepared on the basis of rates applicable during April 2020. The cost of the project may be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI).

Table 2.22. Plantation/treatment area summary for Forestry Interventions (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II	No. pf sites
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	
Natural	1,370.50	1,487.90	1,370.50	358.00	2,858.40	3,216.40	3,216.40	3,216.40	2,616.40	149
Agriculture	28.00	25.00	28.00	25.00	53.00	78.00	78.00	78.00	78.00	2
Urban	14.39	0.00	14.39	0.00	14.39	14.39	14.39	14.39	5.25	6
Conservation	904.75	525.42	904.75	128.42	1,430.17	1,558.59	1,558.59	1,558.59	3,053.19	394
Total	**2,317.64**	**2,038.32**	**2,317.64**	**511.42**	**4,355.96**	**4,867.38**	**4,867.38**	**4,867.38**	**5,752.84**	**551**

Plantation and treatment models in the three landscapes will cover an area of 3,308.79 ha and Conservation interventions will cover 1,558.59 ha area (notional) in the state. (Table 2.22.)

Table 2.23. Cost summary for Forestry Interventions (Rs. in lakh)

	Year1	Year 2		Year 3		Year 4	Year 5	Phase I			Phase II	Grand total
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**Total**		
Natural	2,010.52	1,364.18	437.21	337.06	947.10	438.63	293.36	3,711.76	2,116.29	5,828.05	760.30	6,588.34
Agriculture	9.71	6.93	2.54	7.28	4.00	6.11	6.29	23.92	18.94	42.86	13.65	56.51
Urban	176.95	0.00	9.14	0.00	10.85	10.07	11.97	176.95	42.03	218.98	11.11	230.09
Conservation	1,001.14	661.87	105.28	163.28	178.89	208.68	220.99	1826.29	713.84	2,540.12	360.82	2,900.94
Total	**3,198.32**	**2,032.98**	**554.16**	**507.62**	**1,140.84**	**663.50**	**532.60**	**5,738.91**	**2,891.10**	**8,630.01**	**1,145.87**	**9,775.88**

For interventions in Natural, Agriculture and Urban/peri-urban landscape an expenditure of Rs. 6,588.34 lakh, 56.51 lakh and 230.09 lakh, respectively, will be incurred (Table 2.23.).

Table 2.24. Year-wise cost summary for C.1 supporting activities (Cost Rs. in lakhs)

S. no.	Supporting Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Awareness generation	8.00	16.00	16.00	16.00	16.00	**72.00**
2	Capacity building and value-chain development	10.00	16.00	16.00	16.00	16.00	**74.00**
3	Entry point activities	40.00	0.00	0.00	0.00	0.00	**40.00**
4	Nursery improvement and fire protection	14.00	14.00	15.00	15.00	15.00	**73.00**
5	Research	10.00	10.00	10.00	10.00	5.00	**45.00**
6	Monitoring and evaluation	30.00	50.00	50.00	35.50	30.00	**195.50**
	Total	**112.00**	**106.00**	**107.00**	**92.50**	**82.00**	**499.50**

Table 2.25. Year-wise cost summary for C.2 Field activities, contingency and miscellaneous expenses (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Field activities, contingency and miscellaneous costs	34.00	34.00	34.00	25.00	18.00	**145.00**

Table 2.26. Year-wise details of C.2 PMU (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Recurring	8.00	12.00	14.00	16.00	20.00	**70.00**
2	Non-recurring	20.00	4.00	2.00	2.00	2.00	**30.00**
	Total	**28.00**	**16.00**	**16.00**	**18.00**	**22.00**	**100.00**

Table 2.27. Area in Natural Landscape unit-(ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Phase II**
Chopal	0.00	30.00	0.00	0.00	30.00	30.00	30.00	30.00	30.00
Eco Task Force	600.00	0.00	600.00	0.00	600.00	600.00	600.00	600.00	0.00
Nahan	617.00	955.10	617.00	65.00	1,572.10	1,637.10	1,637.10	1,637.10	1,637.10
Renuka	120.00	365.00	120.00	193.00	485.00	678.00	678.00	678.00	678.00
Rohru	0.00	69.80	0.00	0.00	69.80	69.80	69.80	69.80	69.80
Solan	33.50	42.00	33.50	100.00	75.50	175.50	175.50	175.50	175.50
Theog	0.00	26.00	0.00	0.00	26.00	26.00	26.00	26.00	26.00
Total	**1,370.50**	**1,487.90**	**1,370.50**	**358.00**	**2,858.40**	**3,216.40**	**3,216.40**	**3,216.40**	**2,616.40**

Details of area under natural landscape for undertaking forestry interventions in 6 forest divisions and by Eco task force have been provided in Table 2.27.

Table 2.28. Area in Agriculture Landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Chopal	25.00	25.00	25.00	25.00	50.00	75.00	75.00	75.00	75.00
Solan	3.00	0.00	3.00	0.00	3.00	3.00	3.00	3.00	3.00
Total	**28.00**	**25.00**	**28.00**	**25.00**	**53.00**	**78.00**	**78.00**	**78.00**	**78.00**

Table 2.29. Area in Urban Landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Nahan	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
Renuka	2.00	0.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Rohru	11.39	0.00	11.39	0.00	11.39	11.39	11.39	11.39	2.25
Total	**14.39**	**0.00**	**14.39**	**0.00**	**14.39**	**14.39**	**14.39**	**14.39**	**5.25**

Table 2.30. Area in Conservation Intervention (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Phase II**
Chopal	59.16	85.80	59.16	0.00	144.96	144.96	144.96	144.96	144.96
Nahan	96.27	21.01	96.27	4.05	117.28	121.33	121.33	121.33	818.81
Paonta Sahib	31.80	0.00	31.80	95.82	31.80	127.62	127.62	127.62	127.62
Rajgarh	87.66	33.06	87.66	15.00	120.72	135.72	135.72	135.72	135.72
Renuka	341.20	138.46	341.20	6.35	479.66	486.01	486.01	486.01	486.01
Rohru	129.55	37.92	129.55	0.72	167.47	168.19	168.19	168.19	168.19
Shimla	5.00	0.00	5.00	2.70	5.00	7.70	7.70	7.70	7.70
Solan	146.34	205.91	146.34	3.78	352.25	356.03	356.03	356.03	1,153.15
Theog	7.77	3.26	7.77	0.00	11.03	11.03	11.03	11.03	11.03
Total	**904.75**	**525.42**	**904.75**	**128.42**	**1,430.17**	**1,558.59**	**1,558.59**	**1,558.59**	**3,053.19**

Table 2.31. Cost for Natural landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**total Maint.**	**Maint.**	**Grand total**
Chopal	0.00	45.12	0.00	0.00	9.26	3.82	4.01	45.12	17.09	9.05	71.27
Eco Task Force	1,380.00	0.00	0.00	0.00	0.00	0.00	0.00	1,380.00	0.00	0.00	1,380.00
Nahan	482.69	753.97	374.64	53.60	687.98	218.85	174.96	1,290.26	1,456.42	437.89	3,184.57
Renuka	107.03	388.01	49.85	176.37	188.49	163.48	79.89	671.40	481.71	219.55	1,372.66
Rohru	0.00	104.99	0.00	0.00	21.55	8.89	9.33	104.99	39.77	21.06	165.82
Solan	40.81	32.99	12.72	107.09	31.80	40.28	21.69	180.88	106.48	64.90	352.26
Theog	0.00	39.11	0.00	0.00	8.03	3.31	3.48	39.11	14.81	7.85	61.77
Grand Total	**2,010.52**	**1,364.18**	**437.21**	**337.06**	**947.10**	**438.63**	**293.36**	**3,711.76**	**2,116.29**	**760.30**	**6,588.34**

Table 2.32. Cost for Agriculture landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	total Maint.	Maint.	Grand total
Chopal	6.60	6.93	1.73	7.28	3.64	5.73	6.02	20.81	17.12	13.06	50.99
Solan	3.11	0.00	0.80	0.00	0.36	0.38	0.27	3.11	1.82	0.59	5.52
Grand Total	**9.71**	**6.93**	**2.54**	**7.28**	**4.00**	**6.11**	**6.29**	**23.92**	**18.94**	**13.65**	**56.51**

Table 2.33. Cost for Urban landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	total Maint.	Maint.	Grand total
Nahan	25.00	0.00	1.51	0.00	1.59	1.67	1.75	25.00	6.52	1.84	33.35
Renuka	50.00	0.00	3.02	0.00	3.18	3.33	3.50	50.00	13.03	3.68	66.71
Rohru	101.95	0.00	4.60	0.00	6.09	5.07	6.72	101.95	22.48	5.59	130.03
Grand Total	**176.95**	**0.00**	**9.14**	**0.00**	**10.85**	**10.07**	**11.97**	**176.95**	**42.03**	**11.11**	**230.09**

Table 2.34. Cost for Conservation intervention (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	total Maint.	Maint.	Grand total
Chopal	47.00	36.04	2.63	0.00	2.76	6.08	8.25	83.04	19.71	12.45	115.20
Nahan	116.07	82.68	12.19	24.81	21.63	25.31	26.58	223.55	85.70	44.82	354.08
Paonta Sahib	38.80	0.00	4.07	54.90	4.28	10.26	10.77	93.70	29.38	24.99	148.07
Rajgarh	62.47	60.65	6.72	0.55	14.18	15.47	16.24	123.67	52.60	27.08	203.35
Renuka	456.47	316.71	48.27	38.92	84.37	92.67	97.31	812.09	322.62	152.81	1,287.53
Rohru	60.23	11.62	6.46	4.41	8.18	9.05	9.50	76.26	33.18	12.77	122.21
Shimla	27.80	0.00	2.92	16.54	3.06	4.95	5.20	44.34	16.14	9.58	70.06
Solan	155.76	145.61	18.15	23.15	35.41	39.61	41.60	324.52	134.77	69.33	528.62
Theog	36.54	8.57	3.87	0.00	5.03	5.28	5.54	45.11	19.72	6.99	71.82
Total	**1,001.14**	**661.87**	**105.28**	**163.28**	**178.89**	**208.68**	**220.99**	**1,826.29**	**713.84**	**360.82**	**2,900.94**

Table 2.35. Division-wise area and cost summary for different landscapes (Area in ha and cost in lakh rupees)

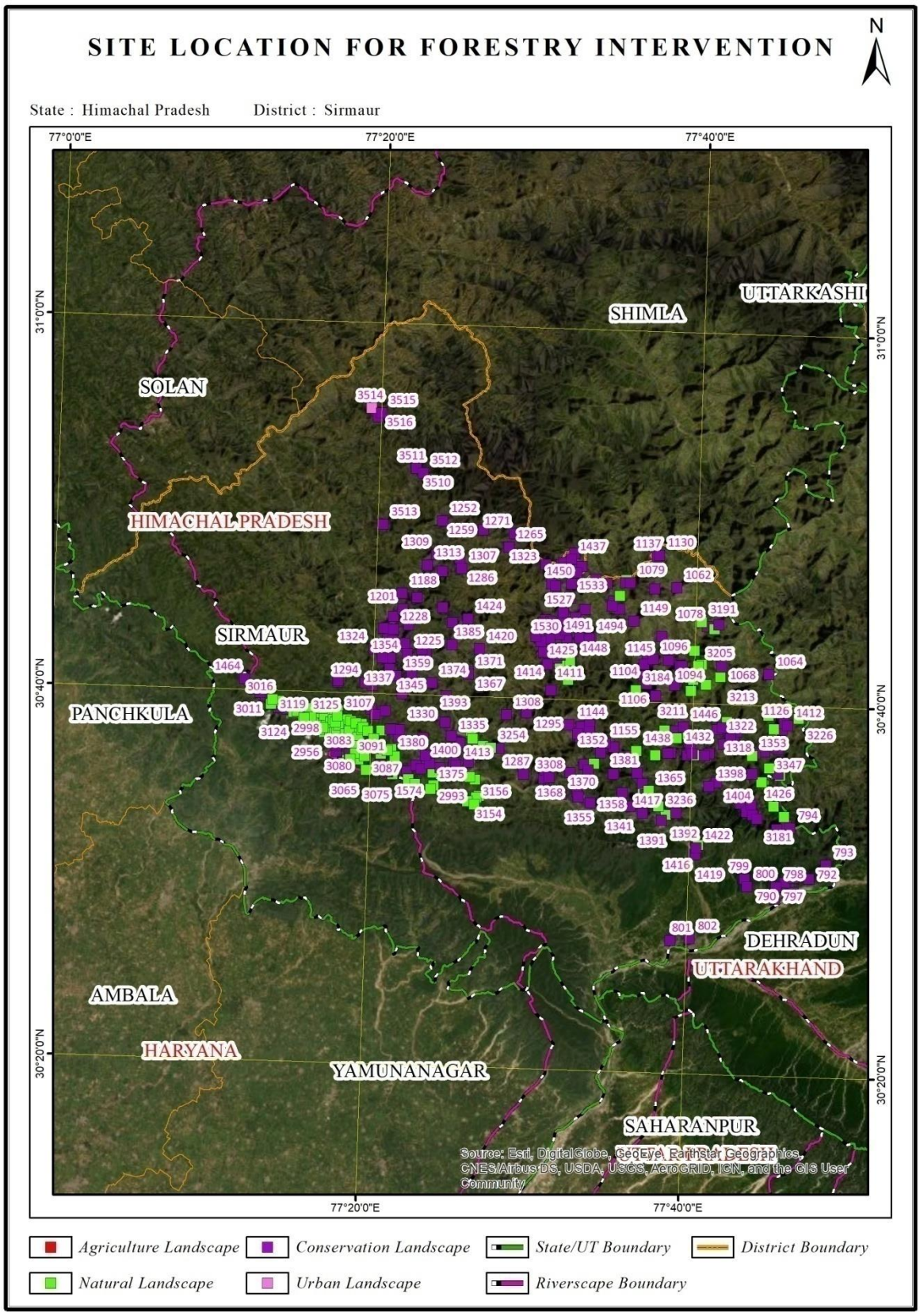
	Natural			Agriculture			Urban/peri-urban			Conservation			Total		
Division	**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**	
	Est.	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**
Chopal	30.00	45.12	17.09	75.00	20.81	17.12	0.00	0.00	0.00	144.96	83.04	19.71	249.96	148.97	53.92
Eco Task Force	600.00	1380.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.00	1,380.00	0.00
Nahan	1,637.10	1,290.26	1,456.42	0.00	0.00	0.00	1.00	25.00	6.52	121.33	223.55	85.70	1,759.43	1,538.81	1,548.64
Paonta Sahib	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	127.62	93.70	29.38	127.62	93.70	29.38
Rajgarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	135.72	123.67	52.60	135.72	123.67	52.60
Renuka	678.00	671.40	481.71	0.00	0.00	0.00	2.00	50.00	13.03	486.01	812.09	322.62	1,166.01	1,533.49	817.37
Rohru	69.80	104.99	39.77	0.00	0.00	0.00	11.39	101.95	22.48	168.19	76.26	33.18	249.38	283.20	95.43
Shimla	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.70	44.34	16.14	7.70	44.34	16.14
Solan	175.50	180.88	106.48	3.00	3.11	1.82	0.00	0.00	0.00	356.03	324.52	134.77	534.53	508.51	243.08
Theog	26.00	39.11	14.81	0.00	0.00	0.00	0.00	0.00	0.00	11.03	45.11	19.72	37.03	84.22	34.54
Total	**3,216.40**	**3,711.76**	**2,116.29**	**78.00**	**23.92**	**18.94**	**14.39**	**176.95**	**42.03**	**1,558.59**	**1,826.29**	**713.84**	**4,867.38**	**5,738.91**	**2,891.10**

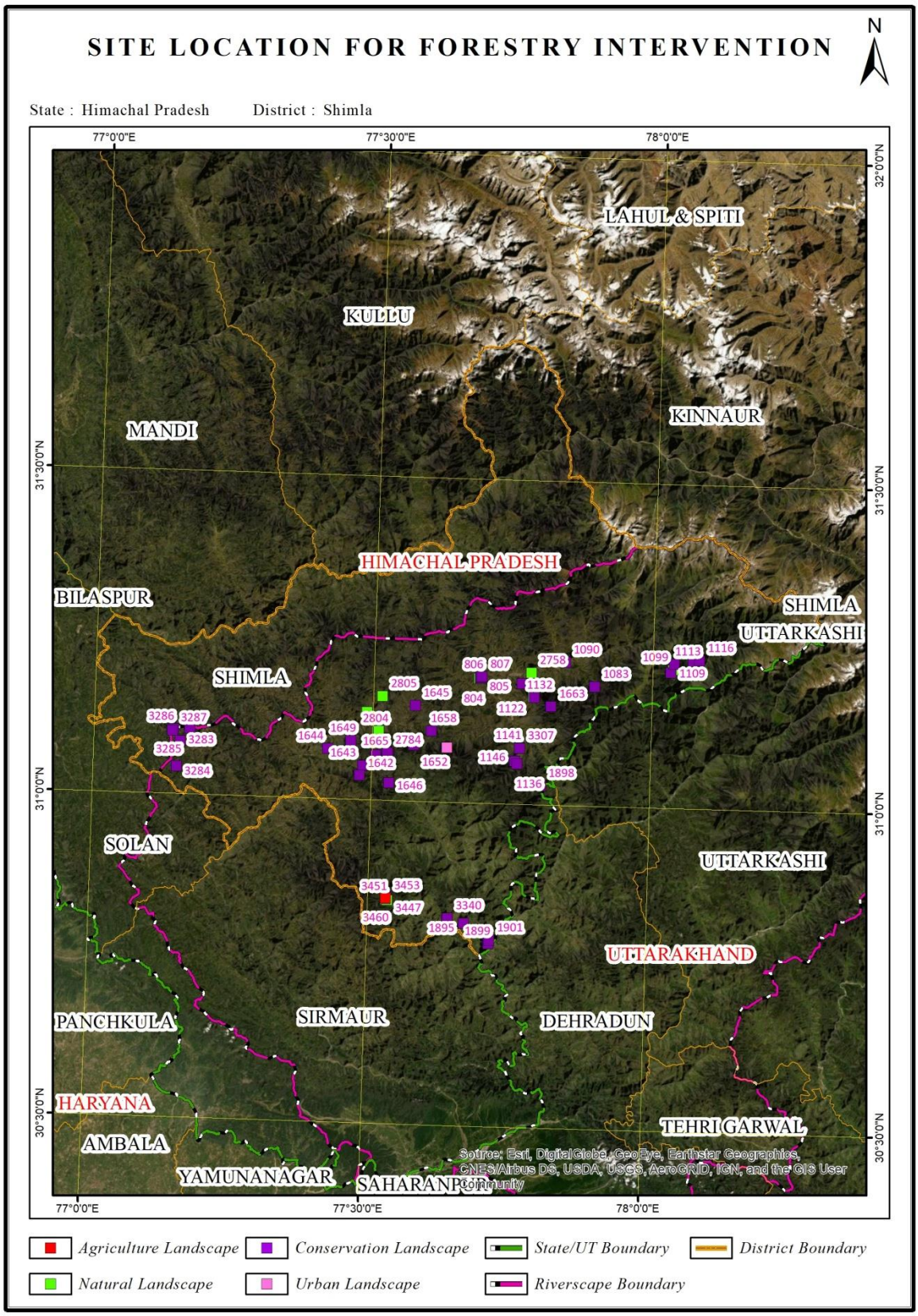
Table 2.36. Division and phase-wise area and cost summary (Area in ha and cost in lakh rupees)

	Phase I			Phase II	Grand total
Division	**Area**	**Cost**		**cost**	
	Est.	**Est.**	**Maint.**	**Maint**	**cost**
Chopal	249.96	148.97	53.92	34.56	237.45
Eco Task Force	600.00	1,380.00	0.00	0.00	1,380.00
Nahan	1,759.43	1,538.81	1,548.64	484.55	3,572.00
Paonta Sahib	127.62	93.70	29.38	24.99	148.07
Rajgarh	135.72	123.67	52.60	27.08	203.35
Renuka	1,166.01	1,533.49	817.37	376.03	2,726.90
Rohru	249.38	283.20	95.43	39.42	418.05
Shimla	7.70	44.34	16.14	9.58	70.06
Solan	534.53	508.51	243.08	134.81	886.41
Theog	37.03	84.22	34.54	14.83	133.58
Total	**4,867.38**	**5,738.91**	**2,891.10**	**1,145.87**	**9,775.88**

Table 2.37. Model-wise area and cost summary (Area in ha and cost in lakh rupees)

	Phase I		Phase II	Grand total
Landscape	**Area**	**Cost**	**Cost**	**Cost**
Natural	**3,216.40**	**5,828.05**	**760.30**	**6,588.34**
YM/HP/NL/01	245.80	509.76	74.17	583.93
YM/HP/NL/02	264.00	405.15	98.58	503.73
YM/HP/NL/03	35.00	57.08	9.23	66.31
YM/HP/NL/04	49.00	107.40	9.62	117.01
YM/HP/NL/05	2,022.60	3,368.66	568.70	3,937.36
YM/HP/NL/06	600.00	1,380.00	0.00	1,380.00
Agriculture	**78.00**	**42.86**	**13.65**	**56.51**
YM/HP/AL/01	75.00	37.92	13.06	50.99
YM/HP/AL/02	3.00	4.94	0.59	5.52
Urban	**14.39**	**218.98**	**11.11**	**230.09**
YM/HP/UL/01	5.25	165.46	9.65	175.11
YM/HP/UL/02	9.14	53.52	1.46	54.98
Conservation	**1,558.59**	**2,540.12**	**360.82**	**2,900.94**
YM/HP/CI/01	5.40	2.57	0.34	2.91
YM/HP/CI/02	173.03	28.19	12.29	40.48
YM/HP/CI/03	247.04	1,952.90	274.75	2,227.66
YM/HP/CI/04	990.33	471.14	62.52	533.66
YM/HP/CI/05	2.00	18.88	1.66	20.54
YM/HP/CI/06	140.80	66.43	9.26	75.69
Total	**4,867.38**	**8,630.01**	**1,145.87**	**9,775.88**


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Himachal Pradesh
District : Sirmaur
77°0'0"E
77°20'0"E
77°40'0"E
31°0'0"N
30°40'0"N
30°20'0"N
SHIMLA
UTTARKASHI
SOLAN
HIMACHAL PRADESH
SIRMAUR
PANCHKULA
AMBALA
HARYANA
YAMUNANAGAR
DEHRADUN
UTTARAKHAND
SAHARANPUR
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Himachal Pradesh
District : Shimla
77°0'0"E
77°30'0"E
78°0'0"E
32°0'0"N
31°30'0"N
31°0'0"N
30°30'0"N
LAHUL & SPITI
KULLU
MANDI
KINNAUR
HIMACHAL PRADESH
BILASPUR
SHIMLA
UTTARKASHI
SOLAN
UTTARKASHI
UTTARAKHAND
PANCHKULA
SIRMAUR
DEHRADUN
HARYANA
TEHRI GARWAL
AMBALA
YAMUNANAGAR
SAHARANPUR
806 807 2758 1090 1099 1113 1116
805 1132 1083 1109
804 1663
2805 1645 1122
2804 1658
1644 1649 1665 2784 1141 3307
1643 1642 1652 1146
1646 1136 1898
3286 3287
3283
3285
3284
3451 3453
3447
3460
3340
1895 1899 1901
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary

Chapter 3

HARYANA

3.1. INTRODUCTION

Haryana surrounds the country's capital New Delhi on north, west and south and has a geographical area of 44,212 km^2 constituting 1.34% of the geographical area of the country. The state is landlocked and is bordered by Himachal Pradesh to the north-east, by river Yamuna along its eastern border with Uttar Pradesh, by Punjab and Rajasthan to the west and south, respectively. Ghagghar-Hakra River flows along its northern border with Punjab. A large area of Haryana is included in the economically important National Capital Region for the purposes of planning and development. The state has 6 administrative divisions and 22 districts (Fig. 3.1).



Fig.3.1. Districts of Haryana

(***Source:*** https://haryana.gov.in/map-of-haryana/index.html)

3.2. GEOGRAPHY

Haryana state is in northern part of the country and is ranked 22nd in terms of area. The state lies between latitude 27°39'N to 30°55'N and longitude 74°27'E to 77°36'E. Physiographically, greater part of the state lies in in the Indo-Gangetic plain while some parts in the northern belt lie in Shiwalik hills. The altitude varies between 200 to 1,200 m above sea level. Geographically, the state is divided into five major parts:

1. The Bangar and the undulating sandy plain comprising the sand dunes and the tals (230-350 m altitude),
2. the alluvial plain or the Ghaggar-Yamuna plain comprising Bangar, Khadar (fertile floodplains), Naili and Bet (below 300 m altitude). Khadar is also called Nali or Naili, especially in northern Haryana where the prairie tract between the Ghaggar River and the southern limits of the Saraswati channel depression gets flooded during the rains,
3. the Aravalli outliers (300-600 m altitude),
4. the Shiwaliks comprising the hills (over 400 m altitude) and
5. the foothill zone comprising the piedmont plain (300-400 m altitude). (https://haryana.gov.in/geography)

The Bangar is characterized by wind-blown sand and does not lie in Yamuna basin of the state. The plain areas are formed by the *doabs* (implies the tract of land lying between two converging or confluent rivers or lies next to a river) of the important rivers and are fertile in nature. The major plains are Yamuna–Ghaggar plain (Delhi doab), Sutlej–Ghaggar doab, Ghaggar–Hakra doab, and Hakra–Yamuna doab. The Shivalik hills cover the northern and consist of deciduous forest. The southern region is covered by Aravalli range which borders the Rajasthan state. The semi-desert dry sand plain called bangar tract covers the south-west part of the state. The hills and ranges of the state are the Shiwalik range – North Haryana; the Aravalli range passes through the states of Haryana, Rajasthan, Gujarat and Delhi; Morni hills – Panchkula district; Dhosi hills – Mahendragarh district, represent an extinct volcano and Tipra hills – Himalayan range.

3.3. GEOLOGY

The Geological Survey of India (GSI, 2012) has published a detailed account of geology and minerals in the state of Haryana. The said publication reads: The geology of Haryana is predominated by the Quaternary alluvium and aeolian sediments covering nearly 95% of the area. The rest of the area comprises Proterozoic and Tertiary rocks exposed in the southern and northeastern extremities, respectively of the state. The minerals occurring in this state are primarily china clay, limestone, dolomite, quartz/silica sand, etc. Other minerals, such ascopper, tin and tungsten are also important. Granite, slate, marble, quartzite and sandstone are notable building stones.

3.4. TOPOGRAPHY AND SOILS

3.4.1. Topography

Three major geomorphological units, namely, structural and denudational hills, alluvial plain and aeolian plain can be identified. Most of the surface area of the state is constituted of the Late Quaternary deposits. The Shiwaliks vary in altitude from 400 m to 1,200 m and form the southernmost part of the Himalaya. The southern boundary of these ranges exhibits steep scarp while their northern sides show gentler northerly slope. These ranges are intensively affected by water erosion which has produced rugged and, at places, badland topography. Alluvial plain unit represents the surface of Late Quaternary sediments deposited by fluvial processes.

3.4.2. Soils

The soils in the state of Haryana are classified into the following five broad categories:

a. Reddish Chestnut Soils: These soils are found in Naraingarh tehsil of Ambala district with an annual rainfall of 1,000-1,500 mm. Soil erosion due to water is a serious problem here. The soils are mildly acidic to neutral in reaction with a pH range of 6.5-7.5, deficient in available nitrogen, phosphorus, potassium, zinc and iron.

b. Tropical Arid Brown Soil (Weakly Solonized): These soils are round in areas of Ambala, Yamuna Nagar and Kamal district, where normal annual rainfall is 750 to 1,000 mm. Water logging, drainage, salinity and alkalinity are quite serious problems. The pH range is 7.0-8.5, and the soils are deficient in nitrogen, phosphorus and zinc.

c. Arid Brown Soils (Solonized): These soils are found in parts of Faridabad, Gurgaon, Rohtak, Sonepat, Panipat and Kamal district where annual rainfall varies from 500 to 750 mm. Salinity and alkalinity are serious problems with a pH range of 7.5-8.5. Wind and water erosion problems also exist. The soils are calcareous in nature. The soils are very deficient in nitrogen, phosphorus and zinc. These soils also respond to potassium and sulphur application.

d. Gray Desert Soils: These soils are found in parts of Rohtak, Bhiwani, Hissar, Sirsa, Jind, Kaithal, Mahendergarh, Rewari and Gurugram where the annual rainfall varies from 300-500 mm. Salinity and alkalinity are the serious problem particularly in irrigated areas. Wind erosion is also a common feature in the tract. Soils are calcareous and usually have a massive pan at depth of 0.75 to 1.25 m. Almost all soils are deficient in nitrogen, phosphorus and zinc with a pH range of 8.0-8.6.

e. Desert Soils: These soils are found in southern parts of Hissar. Sirsa, Bhiwani, Gurgaon, Mahendergarh and Rewari district, where annual rainfall is less than 300 mm. Wind erosion is a serious problem here. Soils are deficient in nitrogen, phosphorus and potassium with a pH range of 8.5-9.0.

3.5. Climate

The climate of the state varies from sub-tropical, semi-arid to sub-humid, continental and monsoonal. Summers are very hot (up to an absolute temperature of 47^{o}C) and winters are moderately cold (absolute minimum of 1^{o}C). May and June are the hottest and the December and January coldest months. Rainfall recorded in the state is low and erratic in most parts excepting some areas of the Karnal and Ambala districts. Siwalik Hills region receives highest rainfall and the Aravalli Hills region records the least rainfall. The average annual rainfall in the state is about 650 mm and varies from less than 300 in southwestern parts to over 1,000 mm in the Siwalik Hills region. Monsoon season normally spans from July to September while some rain is also received during December-February.

3.6. WATER RESOURCES AND HYDROLOGY

3.6.1. River System

A number of short, narrow, incised, seasonal water courses originate on this surface and disappear at the northern margin of the central alluvial plains or join the fourth order trunk streams. Ghaggar is the main river of the area and originates in the outer Siwalik belt, north of the Morni hills. Other important ephemeral streams are Markanda and Dangri which also disappear on entering the central alluvial plain. In the marginal alluvial plain, there are two seasonal streams namely Krishnawati and Dohan which have wide floodplains in this unit. These streams carry little sediment loads from the local plains and disappear in the contact zone with the central alluvial plain (GSI, 2012).

The Yamuna, tributary of the Ganga, flows along the state's eastern boundary (Fig. 3.2). Northern Haryana has several north-east to south-west flowing rivers originating from the Shiwalik Hills of the Himalaya, such as Ghaggar-Hakra (palaeochannel of vedic Sarasvati river), The seasonal Markanda River, known as the Aruna in ancient times, originates from the lower Shiwalik Hills, enters Haryana west of Ambala, and swells into a raging torrent during monsoons. It is notorious for its devastating power, carries its surplus water on to the Sanisa Lake where the Markanda joins the Sarasuti and later the Ghaggar (Fig. 3.3). Southern Haryana has several south-east to north-west flowing seasonal rivulets originating from the Aravalli Range in and around the hills in Mewat region, including Sahibi River (called Najafgarh drain in Delhi).



Fig.3.2. Yamuna River in Haryana
(***Source:*** http://www.haryana21.com/)

Major canals are the Western Yamuna Canal, Sutlej Yamuna Link Canal (from Sutlej river, tributary of the Indus) and Indira Gandhi Canal. Major dams are Kaushalya Dam in Panchkula district, Hathnikund Barrage and Tajewala Barrage on the Yamuna in Yamunanagar district, Pathrala barrage on Somb river in Yamunanagar district, ancient Anagpur Dam near Surajkund in Faridabad district, and Ottu Barrage on Ghaggar-Hakra River in Sirsa district (Fig. 3.4).

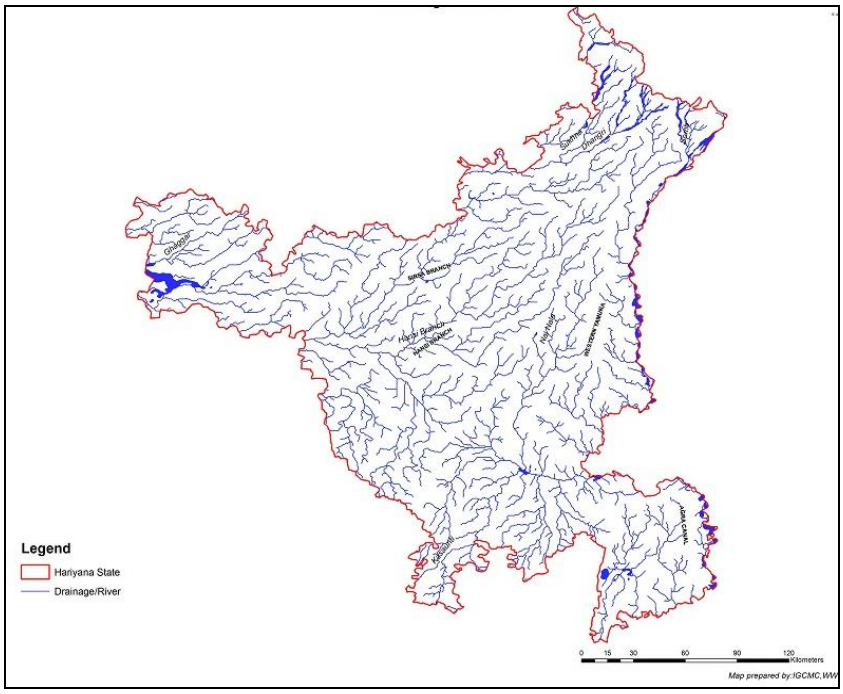


Fig.3.3. River map of Haryana
(***Source:*** South Asia Network on Dams, Rivers and People)



Fig. 3.4. Hathnikund Barrage on Yamuna River
(Source: https://www.hindustantimes.com/)

3.6.2. Other Water Sources and Aquifers

The total natural and man-made wetlands in Haryana State are low in number (78) as well as area (1,885 ha). Even, small wetlands (< 2.25 ha) are also low in number (35; FSI, 2019b). However, comparatively, the per cent area under wetland inside recorded forest (or green wash) area is better than other states of the Yamuna basin (3.33%, Table 3.1).

Table 3.1. Wetlands inside the recorded forest area (or green wash) in Haryana

Wetland category	No. of wetland	Total wetland area (ha)
Inland wetlands-natural		
Lake/Pond	5	671
Waterlogged	2	7
River/Stream	9	1,022
Sub-Total	**16**	**1,700**
Inland wetlands-man-made		
Tank/Pond	16	61
Waterlogged	11	89
Sub-total	27	150
Wetland (<2.25 ha)	35	35
Total	**78**	**1,885**
Total recorded forest (or green wash) area (in ha)		**56,581**
Per cent of wetland area inside recorded forest (or green wash) area		**3.33%**

In Haryana, the normal annual rainfall varies from more than 1,000 mm in the north east to less than 300 mm in the south west. Drought is a common feature in the south western parts of the state. In the north eastern parts of the state, fairly thick and regionally extensive confined/unconfined aquifers exist down to a depth of more than 300m with yield prospects of about 150 $m^3 h^{-1}$. The alluvium down to 450 m below land surface has been explored in this part. In the south-western and the central parts of the state, moderately thick and regionally extensive confined/unconfined aquifers exist. The ground water here is generally saline at all levels except some local patches. The yield prospects in this area are less than 50 $m^3 h^{-1}$. In the remaining areas moderately thick and regionally extensive aquifers exist and their yield prospects are 50-150 $m^3 h^{-1}$ mainly due to limitation of depth as underlying ground water is saline. In the hard rock areas, the ground water potentials are limited and there the yield prospects are 5 to 20 $m^3 h^{-1}$ within weathered residuum and fractured zones (CGWB, 2013).

The quality of non-committed surplus surface water in the Haryana state has been estimated to be only 679.26 MCM against the requirement of 54,175 MCM. The main recharge structures suitable in the state are recharge shaft, horizontal trench with or without injection wells and check dams. Based on the post monsoon depth to water level and long-term ground water level trends, it has been estimated that 37,029 km^2 area is feasible for artificial recharge (Fig. 3.5). In the Yamuna basin, the rechargeable areas for aquifers fall in the districts of Yamunanagar, Sonipat, Ambala and Faridabad only.

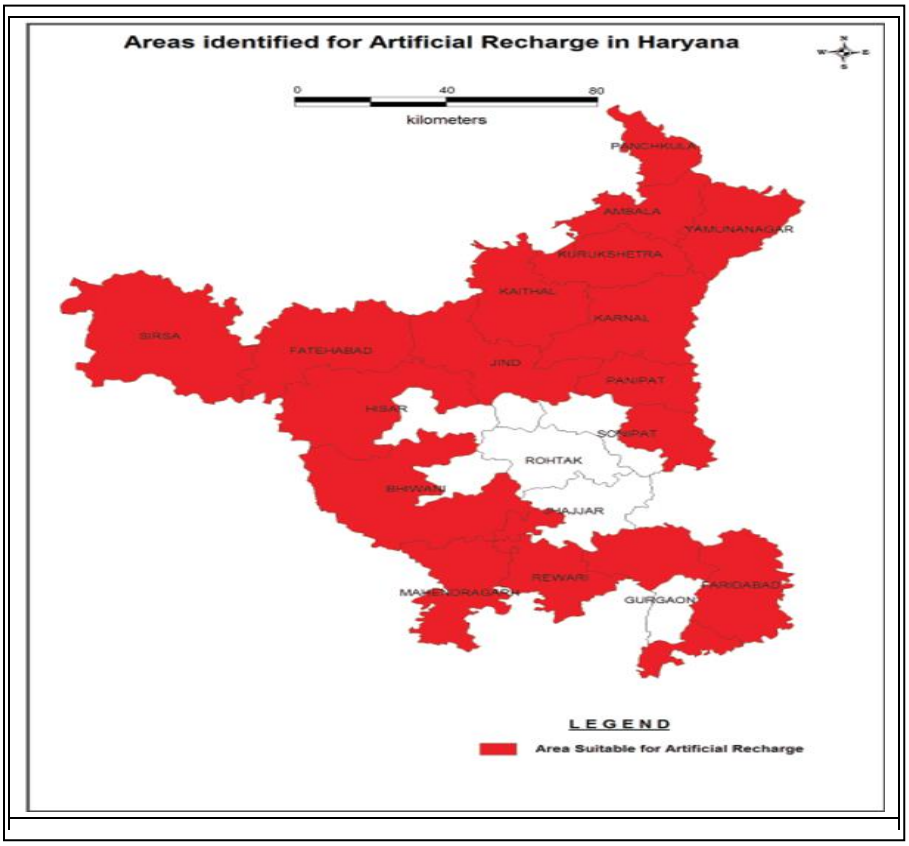


Fig. 3.5. Areas suitable for artificial recharge in Haryana
(***Source:*** CGWB, 2013)

3.6.3. Hydrology

Central Ground Water Board, Ministry of Water Resources, Government of India provides a detailed account of groundwater resources in the state. The following information summarises the situation of groundwater resources:

Based on yield potential characteristics of aquifers, the state can be divided into three zones. The first comprises of 26,090 km^2 in parts of Sirsa, Hissar, Bhiwani, Mahendergarh and Jind districts, where tube wells can yield 50 m^3 hr^{-1}. The second falls in parts of Hissar, Kurukshetra, Karnal, Bhiwani and Gurgaon districts, covering an area of 7,100 km^2 and tube wells in this zone, can yield between 50-150 m^3 hr^{-1}. The third extends by 9,200 km^2 in parts of Ambala, Kuruskshetra, Karnal and Sonepat districts, where the yield varies between 150-200 m^3hr^{-1}. An area of 1,660 km^2 in parts of Gurgaon, Bhiwani and Mahendergarh districts is underlain by consolidated formations, where the yield prospects of aquifers are limited (http://cgwb.gov.in/gw_profiles/st_Haryana.htm).

3.6.4. Issues about Water Resources

Excessive diversion of water from river to canals, siltation of rivers and water bodies due to soil erosion from forest, agricultural land and other areas, pollution from sewage, agricultural chemicals, industrial effluents and mining activities are some of the greatest issues confronting the ecological flow and water quality in the rivers in the state. The ground water resources are, thus, overexploited and face quality concerns too.



Fig. 3.6. Sand mining in Yamuna River
(***Source:*** https://sandrp.in/2020/01/22/haryana-riverbed-mining-2019-yamuna-robbed-of-minerals-flow)

The rivers in Haryana are monitored at 8 locations on 2 rivers. Among these 7 locations are not complying with Water Quality Criteria (CPCB, 2015). These river locations are situated on two rivers, *viz*., Ghaggar and Yamuna. The polluted rivers in Haryana are in 2 priority classes (Class-II and IV). The details of polluted river stretches of Yamuna are provided in Table 3.2.

Table 3.2. Polluted river stretches in Haryana

River name	Stretch identified	Towns identified	Approx. length of the stretch (km)
Yamuna	Panipat to Sonipat, Delhi to Faridabad	Panipat, Sonipat, Faridabad, Ballabhgarh, Palwal	45

A study was carried out in Jhajjar district of Haryana state to understand the burden of diseases due to consumption of contaminated drinking water (Gupta and Mishra, 2018). About 630 respondents in different villages were interviewed for the quality of water they consumed from different sources for its overall impact on their health. The study considered both geogenic and anthropogenic contamination in drinking water sources and found that nearly 15% of the sampled population suffered with water-related health issues, of which 6% faced frequent episodes of stomach infection, and 9% were detected with mild to moderate dental fluorosis. Several cases of stones, severe joint pain, and backbone pain were also observed. The average medical expenses incurred by the villagers are in the range of Rs. 1,000–2,000 per month (approximately $17–$34 per month) for treatment owing to drinking of polluted and

contaminated groundwater. Overall finding of the study indicates that non-availability of treated water supply, usage of groundwater with high to very high concentration of geogenic contaminants in groundwater such as fluoride and salinity, and use of water from open surface water resources are causing health problems to people in Jhajjar district. Use of contaminated water is causing economic burden to the villagers in terms of expenditure on health or water treatment by various means, which can be addressed by implementing various *in-* and *ex-situ* water management and treatment techniques.

A study of CGWB carried out in 2017 in 22 districts (Charkhi Dadri was carved out in 2016) of Haryana revealed that 78 out of the 128 blocks in the state were 'over-exploited' - 12 more dark zones than in 2013. Haryana chief hydrologist, Rakesh Kumar told that Faridabad, Gurugram, Mahendragarh, Bhiwani, Dadri, Palwal, Mewat, Kurukshetra, Kaithal, Panipat and Sirsa districts are the worst-affected. The water level in these areas has been falling one meter every year, he added (Kondal, 2019).

The Union Ministry of Water Resources estimates that unless remedial measures are taken, acute scarcity of groundwater availability may grip many parts of the country in the near future (Mathew, 2019). Our aquifers are either getting polluted or getting dry. Similarly, due to climate change, rainfall pattern has become increasingly skewed and erratic.

3.7. FORESTS AND VEGETATION

Haryana is primarily an agricultural state and 80% of the total geographical area is under agriculture. As per the Champion and Seth (1968) Classification of Forest Types, the forests in Haryana belong to three forest type groups, i.e., Tropical Dry Deciduous Forest, Tropical Thorn Forest and Sub-tropical Pine Forests which are divided into 10 forest types. Recorded Forest Area (RFA) in the state is 1,559 km^2 of which 249 km^2 is Reserved Forests, 1,158 km^2 is Protected Forests and 152 km^2 is Unclassed Forests. Special emphasis is being given to soil and moisture conservation works in the hills to conserve water and deliver it to adjacent farmlands for increasing their productivity and enhancing incomes. Herbal parks have been developed in every district to bring people closer to the natural ecosystem (FSI, 2019b).

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period October to December 2017, the forest cover in the State is 1,602.44 km^2 which is 3.62% of the state's geographical area (Fig. 3.7). In terms of forest canopy density classes, the state has 28.00 km^2 under Very Dense Forest (VDF), 450.90 km^2 under Moderately Dense Forest (MDF) and 1,123.54 km^2 under Open Forest (OF) (Table 3.3). Forest Cover in the state has increased by 14.44 km^2 as compared to the previous assessment reported in ISFR 2017 (FSI, 2019).

Table 3.3. Forest cover of Haryana

Class	**Area (km^2)**	**Per cent of GA**
Very dense forest	28.00	0.06
Moderately dense forest	450.90	1.02
Open forest	1,123.54	2.54
Total	**1,602.44**	**3.62**
Scrub	154.29	0.35

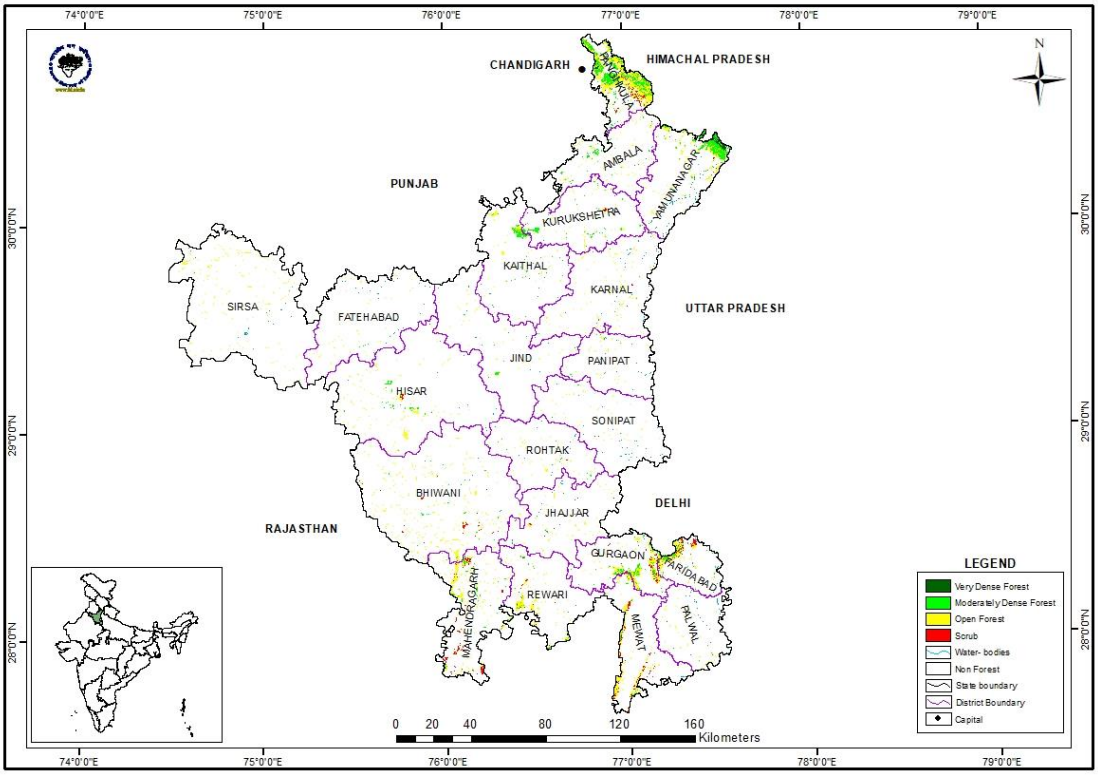


Fig.3.7. Forest cover map of Haryana
(***Source:*** FSI, 2019)

There is sharp inverse relationship between altitude and forest cover in Haryana and maximum and significantly more forest cover is reported from 0-500m of altitude zone (82.46%; Table 3.4). Similar trends were observed for scrub.

Table 3.4. Altitude-wise forest cover (km^2) in Haryana

Altitude zone (m)	Geographical area	Very dense	Moderately dense	Open	Total	Scrub
0-500	43,838	16	336	969	1,321 (82.46%)	142
500-1,000	330	12	94	133	239 (14.92%)	11
1,000-2,000	44	0	21	21	42 (2.62%)	1
Total	**44,212**	**28**	**451**	**1,123**	**1,602**	**154**

The forest types of Haryana include tropical dry deciduous forests in north-east part, tropical moist deciduous in the Shiwalik region and tropical thorn forest in the western region. *Butea monosperma, Cassia fistula, Aegle marmelos, Acacia catechu, Dalbergia sissoo, Anogeissus latifolia, Diospyros melanoxylon,* etc. are common in tropical dry deciduous forests. *Terminalia* species, *Madhuca latifolia, Emblica officinalis, Bombax ceiba, Schleichera oleosa, Shorea robusta*, etc. are prominent in the moist deciduous region. Tropical thorn forests are rich in *Acacia nilotica, Zizyphus nummularia, Azadirachta indica, Phoenix sylvestris, Butea monosperma, Prosopis cineraria*, etc.

3.8. WILDLIFE

Haryana state has 2 national parks, 8 wildlife sanctuaries, 2 wildlife conservation areas, 4 animal & bird breeding centers, 1 deer park and 50 herbal parks which are managed by the State Forest Department, Haryana. Wildlife and forest areas of Haryana lie mainly in the foothills of Shiwalik hills range in the north and Aravalli hill range in the South Haryana. Aravalli Mountains in Haryana are part of the Sariska to Delhi leopard wildlife corridor (including 'Western-southern Haryana spur' which entails Satnali-Dadam-Tosha hill (ranges). Neelgai, jackal, wild boar, monkey, lemur, hornbill, peacock, etc. are constituents of wildlife of the state. Over 500 bird species have been recorded in the state which is almost 40% of total bird species in the country (FSI, 2019b). Wildlife is best preserved in their natural habitat. Wildlife wing of the forest department has adopted a two-pronged strategy for wildlife conservation: protection and awareness generation. The department is giving emphasis on habitat protection as well as protection against poaching.



Fig. 3.8. Kalesar National Park in Yamunanagar district
Source: https://en.wikipedia.org/wiki/Kalesar_National_Park,
https://theblogrill.com/a-one-day-trip-from-delhi-kalesar-national-park

3.9. AGROECOSYSTEM

Haryana is primarily an agricultural state having more than 80% area under cultivation (Table 3.5). About 70% of residents are engaged in agriculture. Haryana contributed significantly to the Green Revolution in India in the 1970s that made the country self-sufficient in food production. Haryana is among the four largest food-grain producing states in India. Wheat, sugarcane, rice, cotton, rapeseed and mustard are the key agricultural products of the state. Wheat and rice are the major crops. There are two main types of crops in Haryana: Rabi and Kharif. The major Kharif crops of Haryana are rice, jowar, bajra, maize, cotton, jute, sugarcane, sesame and groundnut. The major Rabi crops are wheat, tobacco, gram, linseed, rapeseed and mustard. The state has also significantly contributed to the field of agricultural education in the country. An agricultural university is located at Hissar. The 19th Livestock census 2012 has reported a total livestock population of 8.82 M.

Table 3.5. Land use pattern of Haryana

Land use type	Area (in '000 ha)	Percentage
Geographical area	4,421	
Reporting area for land utilization	4,371	100.00
Forests	37	0.86
Not available for land cultivation	653	14.94
Permanent pastures and other grazing lands	25	0.57
Land under misc. tree crops and groves	9	0.20
Culturable wasteland	17	0.39
Fallow land other than current fallows	22	0.51
Current fallows	86	1.97
Net area sown	**3,522**	**80.56**

Tree planting in agricultural fields (agroforestry) is practised in the north and eastern part of Haryana. Eucalyptus, poplar, sissoo, etc. are commonly grown by farmers in their cultivated land. Although, the maximum portion of the geographical area consists of agricultural fields, over a time, the state has achieved a unique status in the field of agroforestry which has enabled the forest deficient state to support a large number of wood-based industries based on farm-grown timber. Poplar and eucalypts trees are the major agroforestry species which have become the main resource for improvement of livelihood of farmers in northern and central parts of the state. A large quantity of agroforestry wood, especially poplar wood, is traded and used in industrial firms in northern Haryana. Yamunanagar is a large market of agroforestry wood and its processing.

Haryana has a tremendous irrigation infrastructure. Irrigation in Haryana uses water either from underground sources or from surface through canals. About 75% of the area is irrigated through tube wells and an extensive system of canals. Currently in Haryana, the most important method for groundwater irrigation is the use of tube wells with pump.

3.10. DEMOGRAPHY

As per the 2011 census, Haryana has a population of 25.35 M (2.1% of India's population). It comprises 13,494,734 males and 11,856,728 females. The rural and urban population constitutes 34.87 and 65.13%, respectively. The population density of the state is 573 km^{-2} which is higher than the national average. The literacy rate of Haryana is 67.9% which is comparatively higher than the national average 64.8% (Census India 2011).

3.11. INDUSTRIES

Haryana is a preferred destination for auto majors and auto-component manufacturers. The state is one of India's largest automobile hubs and accounts for two-thirds of passenger cars, 50% of tractors and 60% of motorcycles manufactured in the country. The state has also emerged as a base for the knowledge industry, including IT and biotechnology.

Districts such as Panipat, Gurugram, Faridabad, Hisar and Sonepat have developed into robust textile centers in Haryana. Readymade garments of cotton are one of the major exports of Haryana. Yamunanagar district produces machinery for sugar and paper industries and equipment for petro-chemical plants. The city is also known for its plywood production which is attributed to the easy accessibility of poplar wood produced in agroforestry in North India. The district has one of India's largest railway carriage and wagon repair workshops.

3.12. RIVERSCAPE ANALYSIS

3.12.1. Remote Sensing and GIS Methodology

Image processing and GIS tools used in the present assessment were ERDAS Imagine, Geomedia Professional, Arc GIS along with other software packages. The GIS softwares provide the tool needed to store, analyze and display geographic information (Fig, 3.9).

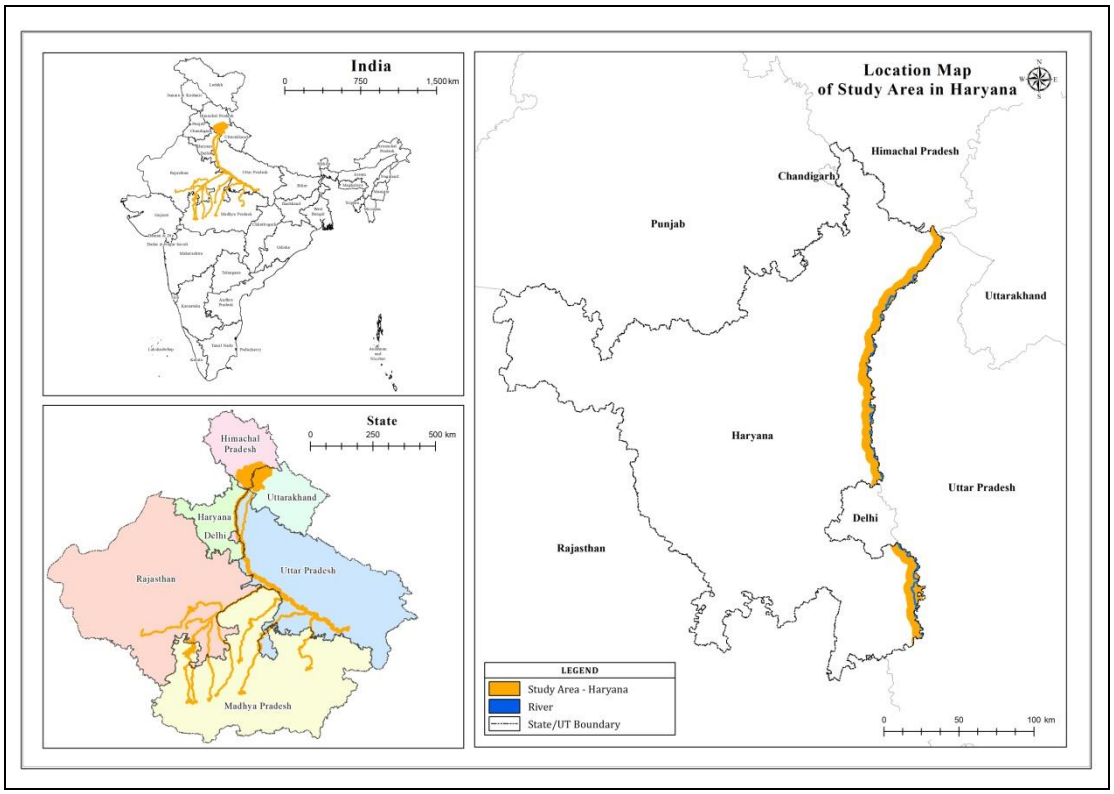


Fig. 3.9. Location map of study area in Haryana

3.12.2. Satellite Data Used

Landsat-8 satellite data for the month of Feb to April 2019 has been used for preparation of Land use/ Land cover map of the riverscape. The Row, Path along with Date of Pass of the satellite data used in the current study for the parts of states of and covering the riverscape is given in Table 3.6a.

Table 3.6a List of data downloaded for the study

State	Path	Row	Date of pass	Satellite
Haryana	146	039	23-02-2019	Landsat-8
Haryana	146	040	23-02-2019	Landsat-8
Haryana	146	041	28-04-2019	Landsat-8
Haryana	147	039	18-03-2019	Landsat-8

3.12.3. Ancillary Data

Almost all of the ancillary information has been taken from various Government of India sources. Information about the state and district boundaries for the riverscape taken up for analysis was obtained from the Survey of India. Basin boundary, Catchment boundary, Sub-Catchment boundary, Watershed boundary and Micro-watershed boundaries where obtained from Soil and Land Use Survey of India, New Delhi. Village and Tehsil boundaries were obtained from the published document "Administrative Atlas of Haryana" by Census of India (2011). Forest Type and Forest Density data were obtained in digital format from Forest Survey of India. Soil map and soil depth information was obtained from published maps of National Bureau of Soil Survey & Land Use Planning, Nagpur. Soil erosion data which is the backbone of multi-criterion analysis was obtained in GIS format from the Indian Institute of Soil & Water Conservation, Dehradun. Topographical sheets on 1:50,000 scale obtained from Survey of India have been used for Geo-reference only. Bhuvan data was also referred, wherever required for the preparation of land use map.

3.12.4. Bank-line and Highest Flood Level

For the identification of the riverscape, the year 2013 was denoted as the highest flood level year based on literature review and stakeholders' consultation on various levels. Then, a post-monsoon satellite image of the year 2013 was used to create the bank-line of the main stem of the Yamuna River.

Table 3.6b. Spatial extent of project-area in the state

Geographical coordinates		**Total geographical area (km^2)**	**Percent of total geographical area (%)**	**Length of river (km)**
Lat. N	**Long. E**			
27° 52' 32.331" to 30° 26' 44.618"	77° 05' 53.504" to 77° 36' 05.641"	1634.56	3.71	313.12

The area of the riverscape, covering six districts is 1,634.56 km^2 which comprises 3.71% of the geographical area of the entire riverscape. The length of river is 313.12 km (Table 3.6b).

3.12.5. Land Use and land Cover

Land use and land cover data indicate that agriculture is the most widespread land use covering 82.5% of the area in the riverscape. The perennial river and river sand covers 2.56% and 1.41% area, respectively. Dense forest, Moderate dense forest, open forest, plantation and barren area covers 1.62%, 1.62%, 1.29%, 0.22% and 0.72%, respectively (Table 3.7).

3.12.6. Soil Erosion

A total of five erosion classes have been mapped in Yamuna riverscape area in the state. The distribution of areas under different soil erosion classes is provided in Table 3.8. and Fig. 3.11. The highest area is covered in class-1 (<5 t ha^{-1} $year^{-1}$) i.e. 954.94 km^2 and lowest in greater than 40. Data indicates that with increasing soil erosion classes, area covered under them decreased.

Table 3.7. Distribution of area under different land use and land cover categories in the Yamuna riverscape, Haryana

S. no.	Land use and land cover	Area (km^2)
1	Agriculture	1,344.45
2	Barren	11.84
3	Canal	3.88
4	Cloud	0.22
5	Dense Forest	26.42
6	Industrial Area	0.58
7	Mining/Mining Dump	5.98
8	Mod. Dense Forest	26.54
9	Open Forest	21.02
10	Plantation	3.64
11	River (Dry)/River Sand	23.05
12	River (Perennial)	41.92
13	Scrub	40.7
14	Settlement	79.2
15	Waterbody	5.12

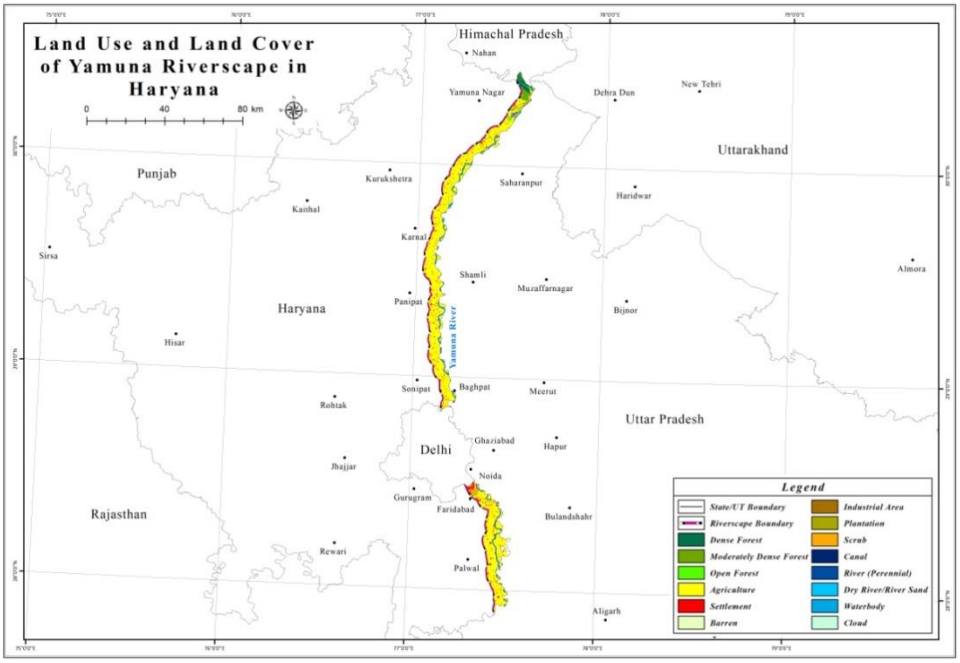


Fig.3.10. Land use and land cover in Yamuna riverscape
(Based on information from SLUSI, New Delhi)

Table 3.8. Soil erosion area under different soil erosion classes of River Yamuna in Haryana

S. no.	Soil erosion class (t ha^{-1} yr^{-1})	Area (km^2)	Percentage of total area
1	<5	954.94	2.17
2	5-10	383.46	0.87
3	10-20	67.97	0.15
4	20-40	12.47	0.03
5	>40	0.06	0.00
6	Non Soil	215.66	0.49

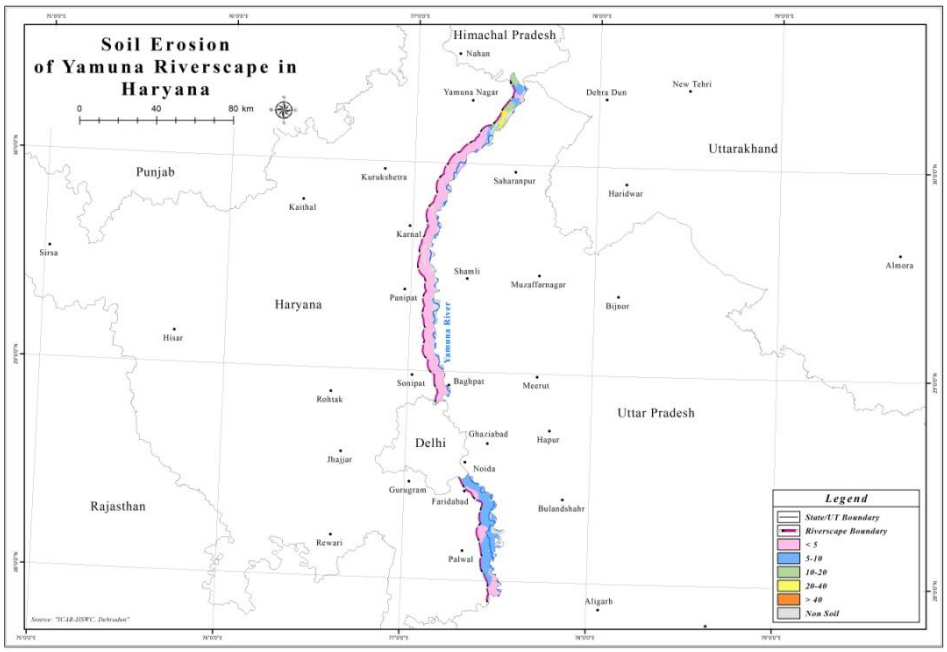


Fig.3.11. Soil erosion classes in riverscape area in Haryana
(Based on information from ICAR-IISWC, Dehradun)

3.12.7. Soil Depth

Soil depth is a key factor for seedling establishment and growth. The soil depth is deciding factor for plantation success, cost of soil working and site selection. Distribution of area under the different soil depth of Yamuna rivererscape in Haryana has been shown in Table 3.9. Three soil depth classes *viz*., moderately deep, non soil, and very deep have been mapped. The maximum percentage of area falls in very deep class (3.07%), followed by non soil and moderately deep.

Table 3.9. Distribution of area under the different soil depth of River Yamuna in Haryana

Soil depth	Area (in km^2)	Percentage of total area
Moderately deep	60.90	0.14
Non-soil	219.03	0.50
Very deep	1354.63	3.07

3.12.8. Forest Cover

Forest cover under five categories is depicted in Table 3.10. and Fig. 3.12. Non forest cover is highest (1519.88 km^2) and least area (40.7 km^2) under scrub.

Table 3.10. Forest cover of River Yamuna, Haryana

S. no.	Forest cover	Area (km^2)
1	Dense forest	26.42
2	Mod. dense forest	26.54
3	Non-forest	1,519.88
4	Open forest	21.02
5	Scrub	40.7

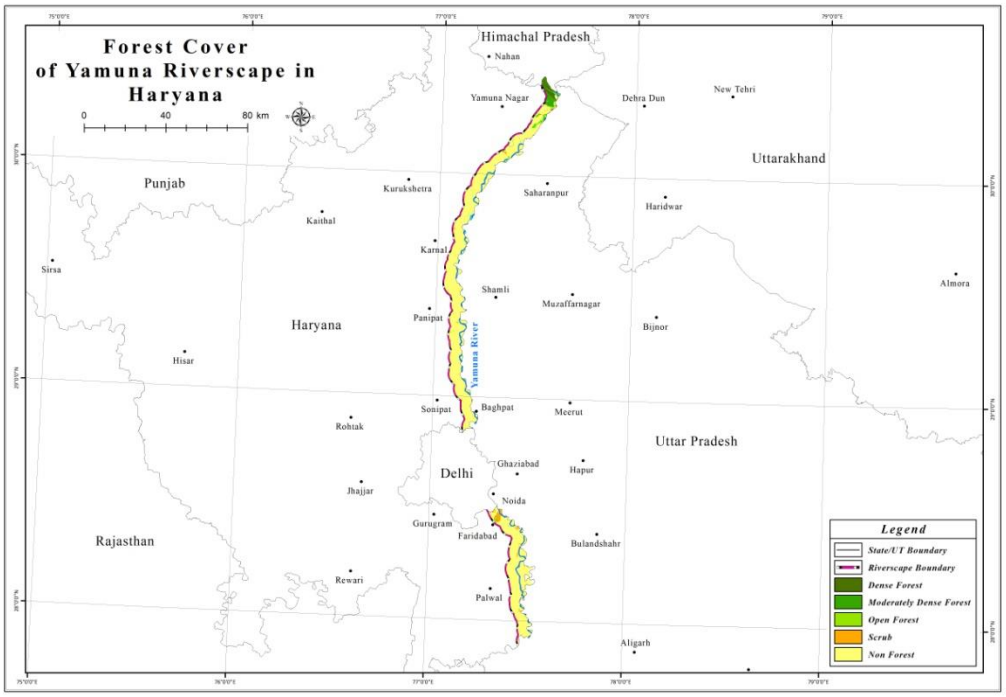


Fig. 3.12. Forest cover in the riverscape
(Based on information from FSI, Dehradun)

3.12.9. Forest Type

The forest in Haryana is categorised into four forest types (Table 3.11 and Fig. 3.13). The Non-forests cover highest area i.e. 1519.88 km^2 as large area of land use in state is agriculture. The tropical dry deciduous forest and scrub cover 73.31 km^2 and 40.70 km^2 area, respectively.

Table 3.11. Forest types of Yamuna Riverscape in Haryana

S. no.	Forest Type	Area (km^2)
1	Non-forest	1,519.88
2	Scrub	40.7
3	Tropical dry deciduous forests	73.31
4	Tropical moist deciduous forests	0.67

(***Source:*** FSI, 2019)

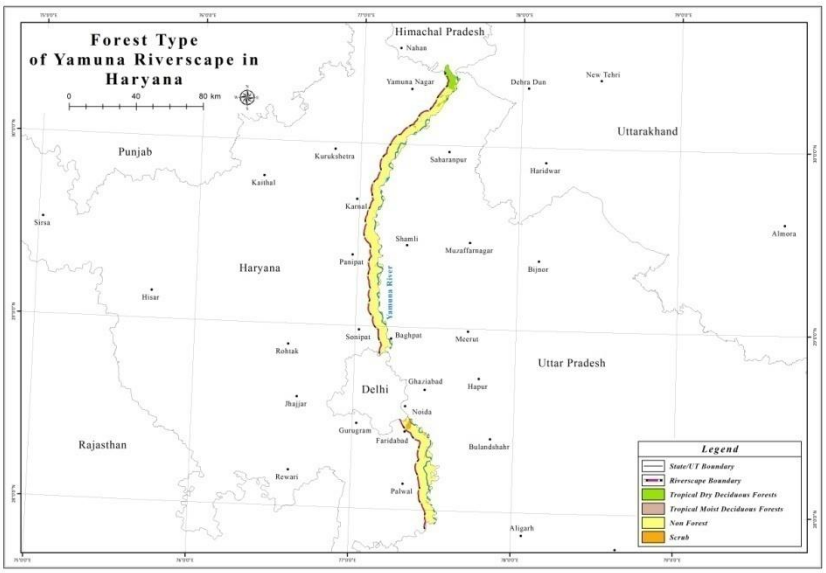


Fig. 3.13. Forest types in the riverscape area
(Based on information from FSI, Dehradun)

3.12.10. Prioritisation of sites for Forestry Interventions

A multi-stakeholder approach was followed for preparing the DPR on rejuvenation of Yamuna through Forestry Interventions. It included extensive consultation and review of literature, reports, primary and secondary data collection, its analysis, expert consultations with institutes, individuals and various stakeholders (Central and state government departments, State Forest Departments of seven states, research institutions/scientific departments dealing with forestry, environment, river conservation, environment; civil society, non-governmental organisations in this field, defence and paramilitary forces, other interest groups).

Priority criteria

For the purpose of preparation of DPR and for identification of priority areas for the proposed treatment/forestry interventions in the Yamuna riverscape, GIS-assisted decision making process by way of geospatial analysis and modelling was used. GIS was used to generate different layers within the riverscape like land use, soil erosion rates, and slope of the topography (Refer Table 1.15a. Uttarakhand chapter).

3.12.11. Priority Classes

Statistical analysis of the area estimates show that 30.74 km^2 is in high priority region, 432.47 km^2 area is in medium priority and 1,171.35 km^2 area is in low priority region for Haryana State (Table 3.12 and Fig. 3.14)

Table 3.12. Priority treatment areas

S. no.	Priority class	Area (km^2)	Percentage of total riverscape area (%)
1	High	30.74	0.07
2	Low	1171.35	2.66
3	Medium	432.47	0.98

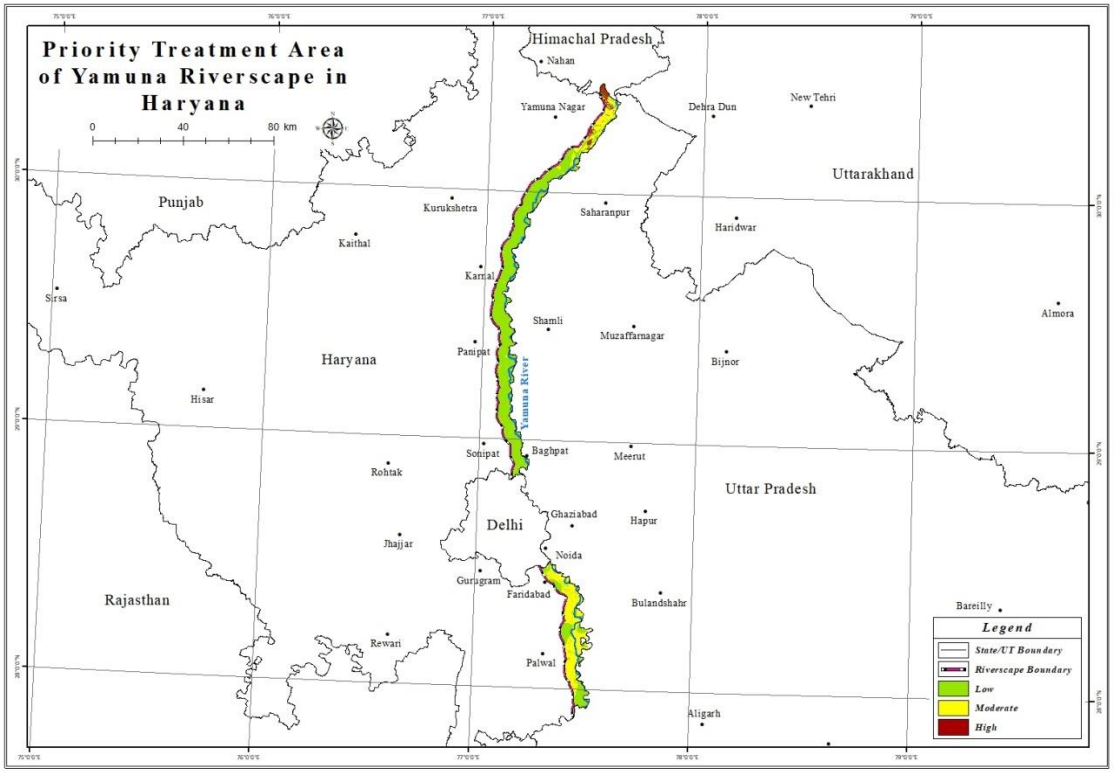


Fig. 3.14. Priority treatment area in Yamuna Riverscape

3.13. PROPOSED FORESTRY INTERVENTIONS

For addressing the challenges and problems highlighted above, various forestry interventions have been proposed in this DPR. Three landscapes in the delineated riverscape have been identified for proposing the forestry interventions:

(i) Natural landscape
(ii) Agricultural landscape
(iii) Urban/Peri-urban landscape

In the state of Haryana, the 5 km buffer zone along both banks of Yamuna River is part of the riverscape in the state.

Models have been developed with landscape-specific approach in the DPR. The following general prescriptions are made for all models:

a) Native species of tree, shrub and herbs will be planted. Traditional horticultural crops which have long been in cultivation in the region are also included in agricultural and urban landscapes. Mixed crops that would promote biodiversity will be raised as far as possible in preference to pure plantation. Species that provide economically useful non-wood forest produce (NWFP) will be planted to the extent of 70% or more by number. Effort would be made to produce industrial surpluses of select raw material in consultation with local nutraceutical, food processing and other NWFP-based industries.
b) Digging of pits, contour trenches, protection trenches, fencing etc will be carried out sufficiently before planting operation according to the standard practice in the plantation area.

c) Site-specific modifications in the models are permitted provided they capture the essence of the respective models. The rates prevailing in SFD at the site and time of operation would be applicable. The DFOs at time of implementation of the project will have the power to make site-specific modifications in prescriptions to suit the site conditions within the total budget proposed in the DPR for the Division. The flexibility applies to choice of species, site, model, quantity of work and timing of activities.
d) Species will be selected in consultation with industries /market experts to plant species that would create industry-level surpluses.
e) Seed or other propagules of forest tree species will be sourced from natural forests and plantations, especially seed orchards, plus trees or seed production areas, wherever available in sufficient quantity, aiming at quality seed. Seed would not be purchased from market for plantation in natural landscape.
f) Survival of plants will be ensured by providing life-saving irrigation; the frequency of irrigation would vary with weather conditions. Casualty replacement will be done according to the existing norms of the state. If such norms are not existing, prescriptions in the respective models will be referred to.
g) During site preparation prior to plantation work, seedlings already growing in the site would be retained, nurtured (through soil working, manure, irrigation operations) and protected.
h) Complete removal of ground vegetation would not be done during rehabilitation of weed-infested areas, Partial removal of invasive weeds would be done followed by artificial regeneration to facilitate gradual replacement of the weeds with economically and ecologically useful species.
i) Biofertilizers such as arbuscular mycorrhiza (AM), organic manures will be applied in nurseries and plantations to boost plant growth. Eco-friendly plant protection measures (e.g. physical or mechanical methods, use of natural products, etc.) will be adopted to manage weed and pest without resorting to use of synthetic products. Tall seedlings may be planted to achieve greater survival in areas with high biotic disturbances.

Effective protection will be provided to the planted seedlings against biotic and abiotic stresses through watch & ward, public awareness besides fence, cattle-proof trenches, etc. according to the site.

3.14. NATURAL LANDSCAPE

YM/HY/NL/01: Enrichment plantation in weed infested areas

This model will be applied in moist forest areas in Shiwalik hills in northern part of Haryana. The area is an important wildlife habitat. The terrain has gentle slope with moderately fertile soil. Some sites are infested with moderate to dense growth of various shrub species, including *Lantana,* having low ecological and economic utility. The roots of the bushes hold soil, and *en masse* uprooting of bushes for planting of trees would be undesirable as it would promote soil erosion. In such areas, native forest species would be brought back in a phased manner by enrichment planting. Moisture conservation activities are also proposed to be carried out to create more favourable environment for artificial and natural regeneration of indigenous species.

Table 3.13. Models for Yamuna in Haryana state

	Natural landscape
YM/HY/NL/01	Enrichment plantation in weed infested areas
YM/HY/NL/02	Plantation in open forest
YM/HY/NL/03	Sowing on contour trenches
YM/HY/NL/04	Vegetative barrier
	Agricultural landscape
YM/HY/AL/01	Planting of saplings by farmers
YM/HY/AL/02	Silvipasture on community land
	Urban/Peri-Urban landscape
YM/HY/UL/01	Strip plantation along roads
YM/HY/UL/02	Strip plantation along canals
YM/HY/UL/03	Floodplain treatment
YM/HY/UL/04	Institutional plantation
YM/HY/UL/05	Plantation in unprotected institutional areas
	Conservation interventions
YM/HY/CI/01	Water storage bodies
YM/HY/CI/02	Managing water flow, soil moisture and sedimentation
YM/HY/CI/02/A	RCC structure
YM/HY/CI/02/B	CC stud
YM/HY/CI/02/C	Dry stone structure
YM/HY/CI/02/D	Stone cratewire structure
YM/HY/CI/02/E	Crate wire (simple)
YM/HY/CI/02/F	Guide bandh
YM/HY/CI/03	Rehabilitation of soil and moisture conservation structures
YM/HY/CI/04	Riparian wildlife management

In this model, small pockets, 200 in number per hectare, of about 20-25 m^2 area would be cleared of shrubs by uprooting them. Seedlings of indigenous tree species, wherever found growing while creating these gaps, will be retained, and soil working would be carried by making *thawla* around them. Passages connecting such gaps would also be cleared to allow movement of workers between the gaps. One trench of size 3 m length, 45 cm width and 45 cm depth will be dug in each gap. A pit of 45 cm x 45 cm x 45 cm would be dug about one metre downhill the trench at the middle of the length of the trench. Enrichment planting of tall trees of indigenous species will be done in the pits. Direct sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Slips of grasses would be planted at six points along the trench. The tall trees will be fenced all around with six-stick fence made of local material. The treated patches will be kept free of weeds and of shoots projecting from adjacent untreated area. Plants and fence will be maintained for seven years. The requirement for maintenance and watch ward will reduce gradually.

Species to be planted

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Bauhinia racemosa, Butea monosperma, Acacia catechu, Ougenia ougeinensis, Lagerstroemia parviflora, Anogeissus latifolia, Terminalia tomentosa, T. bellerica, Dalbergia sissoo. Bombax ceiba, Holoptelea integrifolia,* etc.

Bamboo: *Dendrocalamus strictus*

Important elements (ha^{-1}):

i. Clearing of 50% area: 3,000 m^2 total area (200 patches of about 20-25 m^2 area each and inspection paths connecting the patches) will be cleared by uprooting shrubs.
ii. Two hundred contour trenches of size 3 m x 0.45 m x 0.45 m.
iii. Two hundred pits of 0.45 m x 0.45 m x 0.45 m.
iv. Planting of plants in pits.
v. Six-stick fencing around the tall plants.
vi. Sowing of tree seeds at 3 places per trench and planting of 6 slips of grasses per trench. More than one seed may be sown per spot to ensure seedling establishment at each spot.
vii. Application of manure/vermicompost to plants in the pits.
viii. Beating up of tall plants 10% in first year.
ix. Maintenance for 5 years after planting year including weeding and hoeing, removal of shoots of plants projecting from adjacent areas in the treated patches, maintenance of fence. Intensity of aftercare will decrease year by year.

Table 3.14. Cost norm for YM/HY/NL/01

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Year 1 (Advance work)		
Survey and alignment		1,000
Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep) all around		26,130
Uprooting of shrubs from patches totalling 30% area and placing on periphery of patches as brushwood fence	3,000 m^2	990
Digging of trenches 200 nos. (3 m x 0.45 m x 0.45)	200 trenches	17,500
Digging of pits 600 pits (0.45 m x 0.45 m x 0.45 m)	600 pits	2,650
Raising of nursery stock (including 10% extra for culling)	600 seedlings	26,400
Total		**74,670**
Year 2 (Planting activity)		
Planting in pits	600 plants	1,000
Sowing of seed on protection trench (incl. cost of seed)	Lumpsum	900
Direct sowing on contour trenches (incl. cost of quality seed)	400 tree seeds, 800 grass seeds/slips	2,900
Manure/ vermicompost application	Lumpsum	900
Maintenance of plants (for 9 months)		4,000
Watch and ward (for 9 months)		7,500
Contingency	Lumpsum	750
Total		**17,950**

Maintenance cost			
Year 3	10% beating up	20 plants	2,400
	Weeding and hoeing (4 times yr^{-1})	Lumpsum	3,000
	Irrigation (6 times)	Lumpsum	18,000
	Watch and ward	One year	9,990
	Contingency	Lumpsum	200
	Total		**33,590**
Year 4	Weeding, hoeing (3 times yr^{-1})	Lumpsum	2,250
	Irrigation (2 times)	Lumpsum	6,000
	Watch and ward	One year	9,990
	Total		**18,240**
Year 5	Weeding and hoeing (2 times yr^{-1})	Lumpsum	1,200
	Watch and ward	One year	9,990
	Total		**11,190**
Year 6			**9,990**
Year 7			**9,990**

Table 3.15. Year-wise cost summary for YM/HY/NL/01

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	74,670
Year 2 (Planting and establishment)	17,950
Year 3 (1st maintenance)	33,590
Year 4 (2nd maintenance)	18,240
Year 5 (3rd maintenance)	11,190
Year 6 (4th maintenance)	9,990
Year 7 (5th maintenance)	9,990
Total	**1,75,620**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

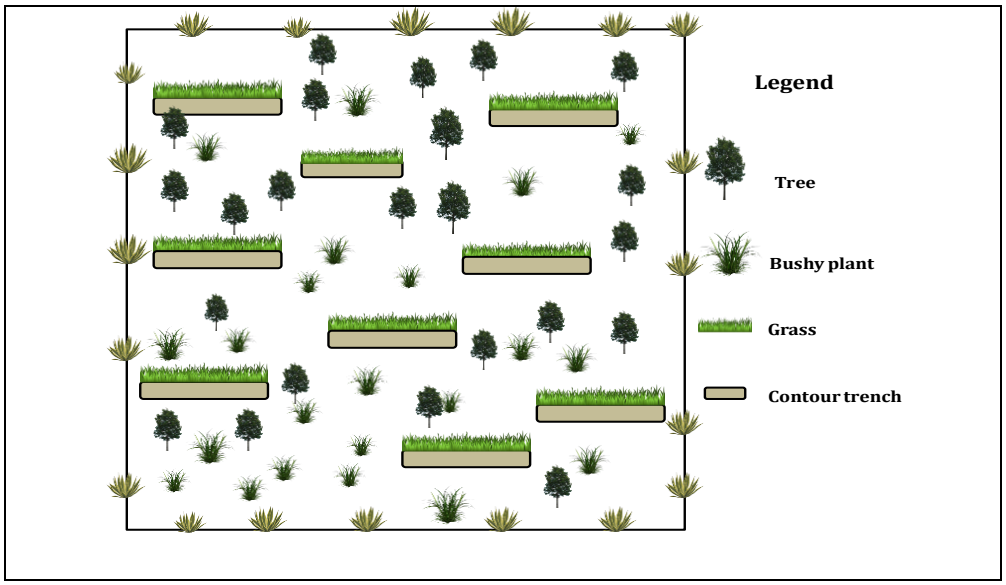


Fig.3.15. Enrichment plantation weed infested area

YM/HY/NL/02: Plantation in open forest

This model will be applied in forest areas which have poor crown cover. The terrain of the proposed sites is mostly flat and the soil is poor in nutritional status. Some seedlings and trees already exist in such sites, but their density is quite low. Such saplings and trees will be retained and supported through soil working activities. Planting of tree saplings will be done in pits of 0.45 m x 0.45 m x 0.45 m size at density of 1,000 plants/ha and maintained for five years after the planting year. Kachcha water pond(s) of total 50,000 L storage capacity will be created as a part of this model outside the plantation area for free access of grazing animals. This pond will be surrounded by a strip of grass covering 150 m^2 area, fenced with brushwood. *Kachcha* water pond(s), with base of stone or some impermeable or semi-permeable material, of total 25,000 L will be created inside the plantation to store water for a longer period of time for irrigation of plants; after two years the stone at the base will be removed to facilitate ground water recharge.

Species to be planted

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Acacia catechu, Acacia nilotica, Albizia lebbeck, Azadirachta indica, Prosopis cineraria, Salvadora persica, Holoptelea integrifolia, Bauhinia racemosa, Butea monosperma, Ougeinia oojeinensis, Lagerstroemia parviflora, Anogeissus latifolia, Terminalia alata, T. bellirica,* etc.

Bamboo: *Dendrocalamus strictus,* etc.

Biofence: *Zizyphus nummularia, Carissa opaca, Acacia catechu, Acacia nilotica, Agave sisalana,* etc.

Grass: *Chrysopogon fulvus, Heteropogon contortus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris,* etc.

Important elements (ha^{-1}):

i. Fencing and protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep) all around (Cost of barbed wire fence and cost of protection trench may be given separately).
ii. Biofence of fast-growing thorny plants all around.
iii. One thousand pits of 0.45 m x 0.45 m x 0.45 m size.
iv. Planting of seedlings in pits.
v. Application of manure / vermicompost to plants in the pits.
vi. Beating up of plants 20% in first year, 15% in second year and 5% in third year.
vii. Maintenance for 5 years after planting including weeding and hoeing, maintenance of fence, watch and ward.
viii. *Kachcha* pond 50,000 L outside the plantation area in nearby place.
ix. *Kachcha* water pond of 25,000 L having base of stone or some impermeable or semi-permeable material.

Table 3.16. Cost norm for YM/HY/NL/02

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Year 1 (Advance work)		
Survey and alignment		1,000
Cleaning of site and making inspection path	1 ha	2,540
Fencing of site (barbed wire/stone wall)		58,000
Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep) all around		26,130
Cost of nursery stock of trees (including 10% extra for culling)	1,000 +100 plants	33,000
Cost of grass seed for outer pond at 50 cm x 50 cm spacing	600 seeds	2,400
Digging of pits 0.45 m x 0.45 m x 0.45 m size	1,000 pits	8,820
Digging of *Kachcha* water pond inside plantation with stone pitching at base	25 m^3	5,000
Digging of *Kachcha* water pond outside plantation with *Kachcha* base	50 m^3	7,500
Total		**1,44,390**
Year 2 (Planting activity)		
Transportation of tree seedlings and planting in pits	1,000 plants	8,000
Planting of grass in pits around outer pond	600 seeds/slips	600
Erecting brushwood fence around grass strip		800
Seed sowing on protection trench		900
Manure/ vermicompost	Lumpsum	2,000
Maintenance of plants (for 9 months)		4,000
Watch and ward (for 9 months)		7,500
Contingency	Lumpsum	1,000
Total		**24,800**

Maintenance cost			
Year 3	20% beating up (Plant + planting)	200 plants	7,000
	Weeding and hoeing (4 times yr^{-1})	Lumpsum	3,000
	Irrigation (6 times)	Lumpsum	9,000
	Watch and ward	One year	9,990
	Contingency	Lumpsum	500
	Total		**29,490**
Year 4	15% beating up (Plant + planting)	150 plants	5,250
	Irrigation (2 times)	Lumpsum	3,000
	Weeding and hoeing (3 times yr^{-1})	Lumpsum	2,250
	Watch and ward	One year	9,990
	Total		**20,490**
Year 5	5% beating up (Plant + planting)	50 plants	1,750
	Weeding and hoeing (2 times yr^{-1}), removal of stone base from pond	Lumpsum	2,000
	Watch and ward	One year	9,990
	Total		**13,740**
Year 6			**9,990**
Year 7			**9,990**

Table 3.17. Year-wise cost summary for YM/HY/NL/02

Year	Rs. ha^{-1}
Year 1 (Advance work)	1,44,390
Year 2 (Planting and establishment)	24,800
Year 3 (1st maintenance)	29,490
Year 4 (2nd maintenance)	20,490
Year 5 (3rd maintenance)	13,740
Year 6 (4th maintenance)	9,990
Year 7 (5th maintenance)	9,990
Total	**2,52,890**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

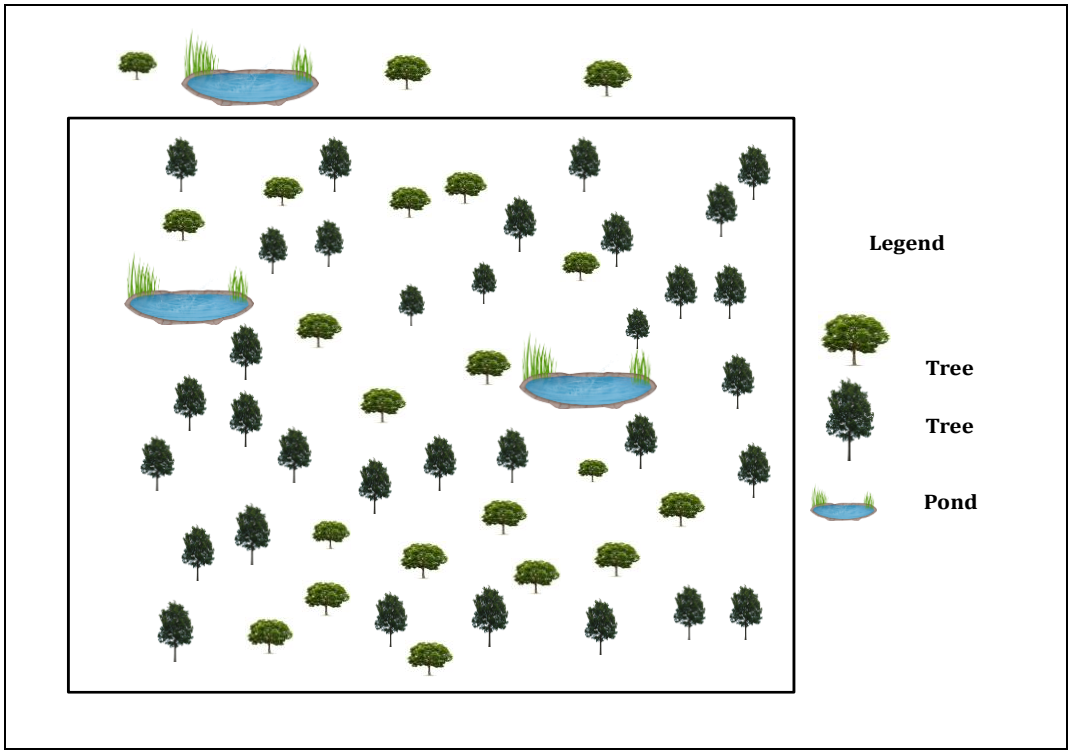


Fig.3.16. Plantation in open forest

YM/HY/NL/03: Sowing on contour trenches

There are several areas along the river where general forest cover is good, yet contour trenches are required to be dug to conserve water and improve ground water recharge for promoting natural regeneration of the native vegetation. Seeds of thorny native tree/shrub species and grasses will be sown on the loose soil heaped along contour trenches to stabilize the contour trench, besides helping in artificial regeneration. Tree saplings *per se* will not be planted.

Species recommended

Native species of the area will be sown in the model. Few examples of species for the purpose of illustration are as follows:

Tree/shrub: *Acacia catechu, Acacia nilotica, Ziziphus nummularia, Carissa opaca,* etc.

Grass: *Chrysopogon fulvus, Heteropogon contortus, Andropogon pumilus, Brachiaria ramosa,*

Chloris dolichostachya, Cenchrus ciliaris, Poa annua, Arundo donax, etc.

Important elements (ha^{-1}):

Contour trenches: 200 contour trenches ha^{-1}of 3 m length, 45 cm width and 45 cm depth in staggered arrangement

Dibbling: Seed of grasses and thorny species will be sown on the soil along contour trench

Fencing: Not required

Table 3.18. Cost norm for YM/HY/NL/03

Particular	**Quantity ha^{-1}**	**Rs. ha^{-1} or 200 contour trenches ha^{-1}**
Year 1 (Advance work)		
Survey and inspection paths, cleaning of spots of contour trenches,	1 ha	2,000
Survey and alignment of contour trenches (3 m x 0.60 m x 0.45 m)	200 contour trenches	600
Digging of contour trenches (3 m x 0.60 m x 0.60 m)	200 contour trenches	17,500
Advance soil work		**20,100**
Year 2 (Planting activity)		
Sowing of seed on contour trenches incl. cost of seed		1,200
Maintenance of contour trenches and seedlings (for 9 months)		1,200
Total		**2,400**
Year 3		**2,070**
Year 4		**1,550**
Year 5		**1,550**
Year 6		**1,550**
Year 7		**1,550**

Table 3.19. Year-wise cost summary for YM/HY/NL/03

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	20,100
Year 2 (Planting and establishment)	2,400
Year 3 (1st maintenance)	2,070
Year 4 (2nd maintenance)	1,550
Year 5 (3rd maintenance)	1,550
Year 6 (4th maintenance)	1,550
Year 7 (5th maintenance)	1,550
Total	**30,770**

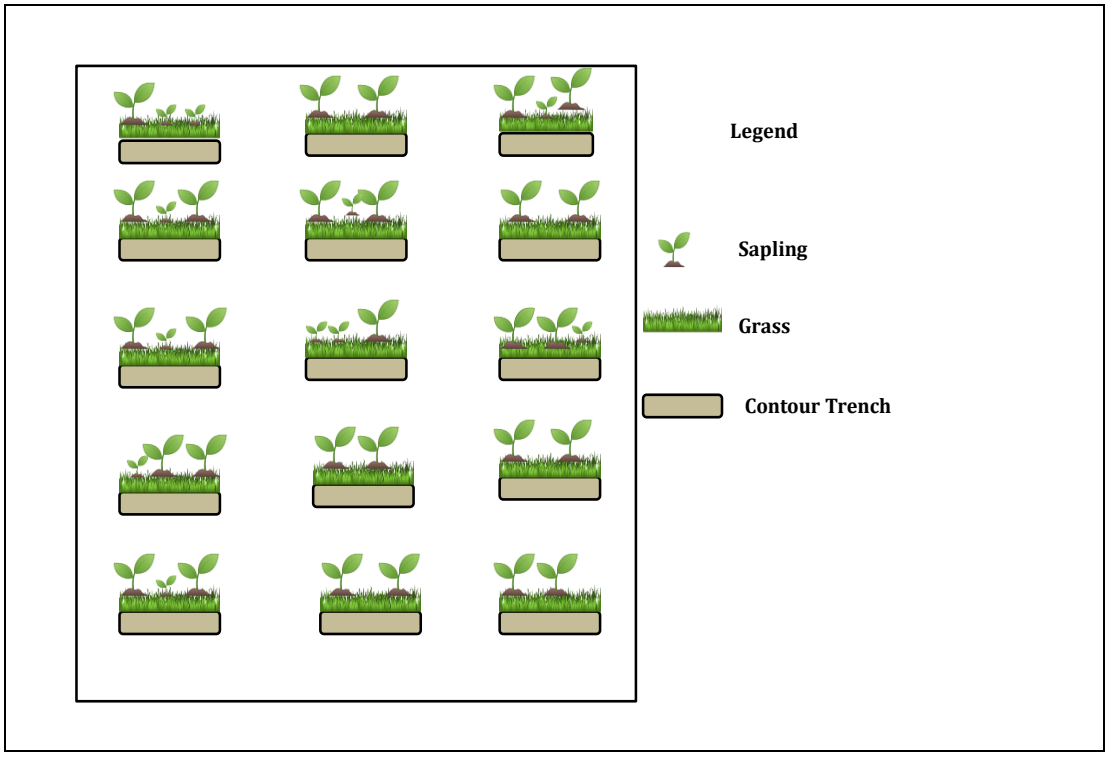


Fig.3.17. Sowing on contour trenches

YM/HY/NL/04: Vegetative barrier

In hilly areas such as in north Haryana, the width of river and tributaries is relatively less. The water level during rainy season rises high and the high momentum of flowing water that comes in contact with river bank tends to exert erosive force on the soft loose soil present there. Presence of perennial vegetation with hydrophilic nature, deep rooted, ability for rapid establishment, low height, spreading tendency, helps in holding the soil and reducing the erosive action of water. A narrow strip of plants such as *Ipomeoa batatas, Vitex negundo*, bhabhar grass, monopodial bamboo, cane, etc. would be planted.

Species recommended

Native species of the area will be sown in the model. Few examples of species for the purpose of illustration are as follows:

Shrub/bamboo/grass/others: *Phragmites karka, Arundo donax, Saccharum bengalense, Saccharum spontaneum, Ipomoea batatas, Vitex negundo, Scirpus affinis, Cyperus eleusinoides, Cyperus exaltatus, Themeda arundinacea, Vetiveria zizanioides, Melocanna*, etc.

Important elements (1000 m^{-1} of stream length):

Fencing: Not required

Advance soil work: Planting will be done by digging small sized pits, 30 cm x 30 cm x 30 cm size at the time of planting. Pits will not be dug in advance of the planting time.

No. of plants: 2,000 plants per kilometre of stream length (1,000 plants per kilometre on each side).

Maintenance: for one year after planting year.

Table 3.20. Cost norm for YM/HY/NL/04

Particular	Quantity 1,000 m	Rs./1,000
Year 1 (Advance work)		
Making inspection path, cleaning of spots for vegetative barrier	1,000 m	3,000
Cost of nursery stock (including 10% extra for culling)	1,000+100 nos.	33,000
Advance soil work		**36,000**
Year 2 (Planting activity)		
Digging of pits in soft, moist soil (0.30 m x 0.30 m x 0.30 m size)	1,000 pits	2,650
Planting in pits		6,000
Maintenance		1,200
Watch and ward (for 9 months)		2,500
Total		**12,350**
Year 3 (Maintenance 1st year) including 20% beating up		**8,000**
Year 4 (Maintenance 2nd year) including 5% beating up		**4,000**
Total for 1000 m length		**60,350**

Conversion of cost from km basis to ha basis

	km^{-1}	ha^{-1}
Year 1 (Advance work)	36,000	1,20,000
Year 2 (Planting activity)	12,350	41,167
Year 3 (Maintenance 1st year) including 20% beating up	8,000	26,667
Year 4 (Maintenance 2nd year) including 5% beating up	4,000	13,333
Total for 1000 m length or per ha (assuming 0.30 ha = 1000 m length)	60,350	2,01,167

Table 3.21. Year-wise cost summary for YM/HY/NL/04

Year	Rs. ha^{-1}
Year 1 (Advance work)	1,20,000
Year 2 (Planting and establishment)	41,167
Year 3 (1st maintenance)	26,667
Year 4 (2nd maintenance)	13,333
Total	**2,01,167**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

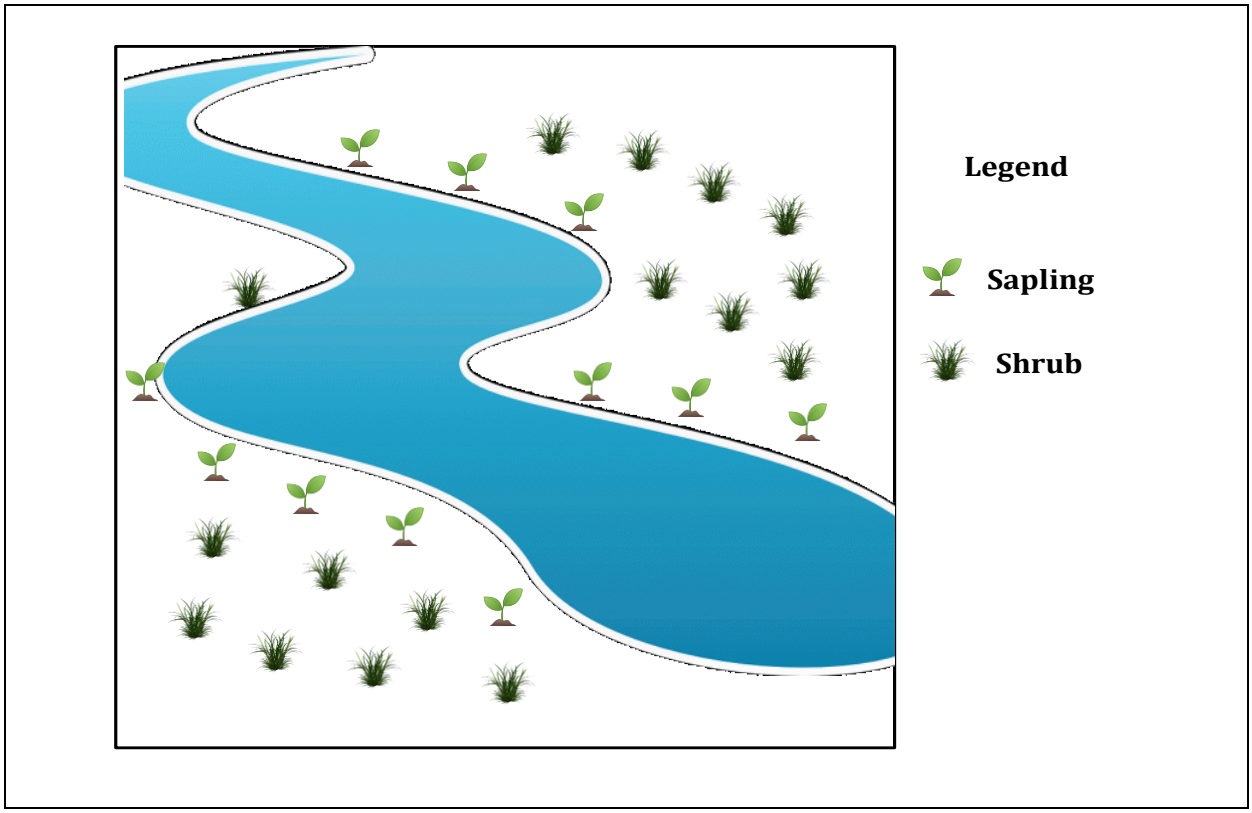


Fig. 3.18. Vegetative Barrier

3.15. AGRICULTURAL LANDSCAPE

YM/HY/AL/01: Planting of saplings by farmers

Tree planting is expected to benefit the river and general environment of the area in many ways in the long run. Saplings of plants are proposed to be distributed to farmers for planting in their private agricultural land in the riverscape. The aftercare of plants will be done by the farmers.

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Albizia lebbeck, Prosopis cineraria, Azadirachta indica, Salvadora persica, Holoptelea integrifolia, Melia azedarach, Terminalia alata, T. bellirica, Cordia dichotoma,* etc.

Bamboo: *Dendrocalamus strictus,* etc.

Fruit tree: *Ziziphus mauritiana, Zizyphus jujuba, Emblica officinalis, Punica granatum, Citrus* spp., *Morus alba,* etc.

Cost norm for YM/HY/AL/01

Cost of tree sapling, including carriage to village: Rs. 50 plant^{-1}.
Planting and maintenance cost during planting year: Rs. 50 plant^{-1}.
Maintenance cost in 1st year: Rs. 25 plant^{-1}.
Maintenance cost in 2nd year: Rs. 25 plant^{-1}.
Maintenance cost in 3rd year: Rs. 20 plant^{-1}.

Maintenance cost in 4th year: Rs. 15 plant^{-1}.
Establishment cost: Rs. 100 plant^{-1}or Rs 50,000 ha^{-1} (notional density: 500 plants ha^{-1}).
Maintenance cost: Rs. 85 plant^{-1}or Rs 42,500 ha^{-1}.
Total cost: Rs. 185 plant^{-1}or Rs. 92,500 ha^{-1}.

Table 3.22. Year-wise cost summary for YM/HY/AL/01 (Rs. ha^{-1}**)**

Year 1	Year 2	Year 3	Year 4	Year 5	Total
50,000	12,500	12,500	10,000	7,500	**92,500**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/HY/AL/02: Silvipasture on community land

Tree planting on community land is very important for utilizing this land resource and providing economic and environmental benefits to the rural society. While planting trees, planting of grasses is of immense importance to arrest soil erosion. Grasses establish and grow fast, cover the ground rapidly and start providing environmental goods and services earlier than trees do. Grasses, in comparison with trees, need less aftercare and show greater survival on marginal lands. Silvi-pasture model for highly degraded land/waste lands of ICAR-Indian Grassland and Fodder Research Institute, Jhansi (http://www.igfri.res.in/Proven%20Technologies6.aspx) will be adopted with necessary local modification. Tree saplings and grass slips will be planted on community land. Site will be prepared before monsoon season. 400 pits of 45 cm x 45 cm x 45 cm size will be dug per ha. Seedlings of trees will be planted during the monsoon season. Remaining area will be intercropped with high-yielding fodder grasses at 50 cm row-to-row. One weeding will be done to benefit establishment of pasture. Suitable organic manures will be applied. Harvesting of pasture grasses will be done 2-3 times (from September to December) depending on monsoon and growth of pasture up to initial 5 years following the cut and carry system. After attaining growth of tree, grazing may be allowed for small ruminant. After 3rd year 20-40 % lopping of trees may be done.

Kachcha water pond(s) of total 50,000 L storage capacity will be created as a part of this model outside the plantation area for free access of grazing animals. This pond will be surrounded by a strip of grass covering 150 m^2 area, fenced with brushwood. *Kachcha* water pond(s), with base of stone or some impermeable or semi-permeable material, of total 25000 L will be created inside the plantation to store water for a longer period of time for irrigation of plants; after two years the stone at the base will be removed to facilitate ground water recharge.

Species to be planted

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Azadirachta indica, Prosopis cineraria, Dalbergia sissoo, Moringa oleifera, Morus alba, Salvadora persica, Pongamia pinnata, Melia azedarach, Holoptelea integrifolia, Bauhinia racemosa, Ougeinia oojeinensis,* etc.

Biofence: *Ziziphus nummularia, Carissa opaca, Acacia catechu, Acacia nilotica, Agave sisalana* etc.

Grass: *Pennisetum purpureum* (Napier grass), *Pennisetum pedicellatum* (Dinanath grass), *Chrysopogon fulvus* (Dhawalu grass), *Cenchrus ciliaris* (Anjan grass), *Dichanthium annulatum* (Kel grass), *Bothriochloa pertusa* (Phulwa grass), *Setaria sphacelata* (Nandi grass), *Sehima nervosum* (Sen grass), *Heteropogon contortus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya,* etc.

Important elements of the model (ha^{-1}):
Fencing: Barbed wire fence.
Pit size: 45 cm x 45 cm x 45 cm.
400 trees ha^{-1}.
Interspaces will be intercropped with pasture grasses at 50 cm x 50 cm.
Chowkidar will protect the plantation.

Table 3.23. Cost norm for YM/HY/AL/02

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Advance work		
Survey and alignment		500
Cleaning of site and making inspection path	1 ha	3,500
Fencing of site (barbed wire/stone wall)		58,000
Cost of quality nursery stock of trees (including 10% extra for culling)	400 +40 plants	13,200
Cost of seed/nursery stock of pasture grasses and legumes	Lumpsum	2,000
Digging of pits 0.45 m x 0.45 m x 0.45 m size	400 pits	3,530
Ploughing of site for planting grass		2,000
Digging of *Kachcha* water pond inside plantation with stone pitching at base	25 m^3	5,000
Digging of *Kachcha* water pond outside plantation with *Kachcha* base	50 m^3	7,500
Total		**95,230**
Planting activity		
Planting in pits	400 plants	1,250
Seed sowing on protection trench		1,000
Sowing / planting of grass in plantation area	Lumpsum	2,000
Planting of grass in pits around outer pond	600 slips	600
Erecting brushwood fence around grass strip		600
Manure/ vermicompost	Lumpsum	2,000
Maintenance of plants (for 9 months)		7,500
Contingency	Lumpsum	2,000
Total		**16,950**

Maintenance cost			
Year 3 (Maintenance 1st year)	20% beating up of tree seedlings	80 tree seedlings	2,640
	Weeding and hoeing (4 times yr^{-1})	Lumpsum	5,000
	Irrigation (6 times)	Lumpsum	18,000
	Watch and ward	One year	9,990
	Contingency	Lumpsum	500
	Total		**36,130**
Year 4 (Maintenance 2nd year)	15% beating up	60 tree seedlings	1,980
	Weeding, hoeing, fence repair (3 times yr^{-1})	Lumpsum	3,750
	Irrigation (2 times)	Lumpsum	6,000
	Watch and ward	One year	9,990
	Total		**21,720**
Year 5	5% beating up	20 plants	660
	Weeding, hoeing, fence repair (2 times yr^{-1}), removal of stone base from pond	Lumpsum	3,000
	Watch and ward	One year	9,990
	Total		**13,650**
Year 6			**9,990**
Year 5			**9,990**

Table 3.24. Year-wise cost summary for YM/HY/AL/02

Year	Rs. ha^{-1}
Year 1 (Advance work)	95,230
Year 2 (Planting and establishment)	16,950
Year 3 (1st maintenance)	36,30
Year 4 (2nd maintenance)	21,720
Year 5 (3rd maintenance)	13,650
Year 6 (4th maintenance)	9,990
Year 7 (5th maintenance)	9,990
Total	**2,03,660**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

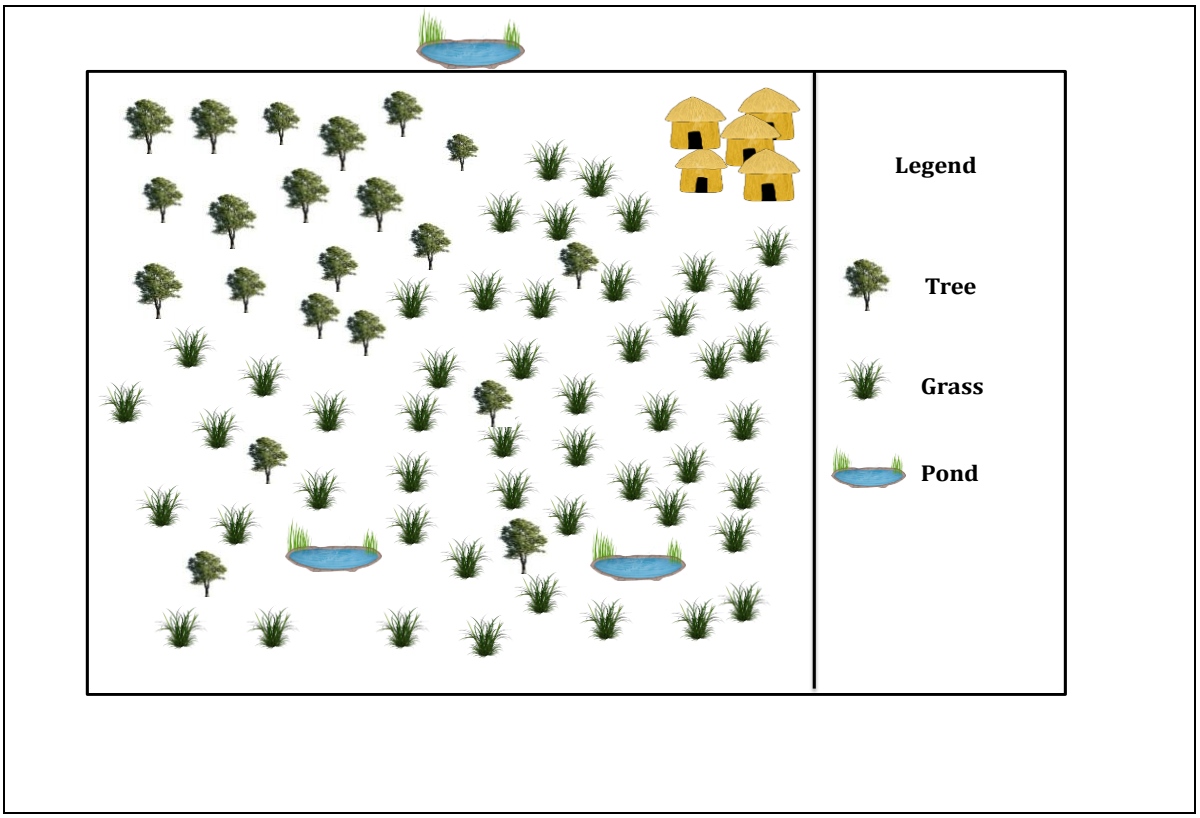


Fig. 3.19. Silvipasture on community land

3.16. URBAN/PERI-URBAN LANDSCAPE

YM/HY/UL/01: Strip plantation along roads

Under this model, plantations will be raised along roads. In most of the sites multi-row strips will be created along the road. The area will be fenced and tall seedlings will be planted. In flat areas free from problem of water logging, a wide variety of local tree species is available for planting. Trees with tall and spreading crown will be avoided in row adjacent to the road. In depressions along roads where rainwater accumulates during rainy season for more than two weeks, mounds will be prepared and seedlings will be planted on mounds. Water-logging tolerant tree species will be planted in depressions. 500 plants will be planted per ha.

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Trees: *Dalbergia sissoo, Syzygium cumini, Terminalia arjuna, Terminalia alata, Terminalia bellirica, Lagerstroemia parviflora, Acacia nilotica, Albizia lebbeck, Azadirachta indica, Prosopis cineraria, Salvadora persica, Bombax ceiba, Holoptelea integrifolia, Bauhinia purpurea, Ougeinia oojeinensis*, etc.

Important elements of the model (ha^{-1}):

Fencing: Barbed wire fence.

Plants per ha: 250 plants in pits x 2 sides of road (500 plants per kilometre length of road).

Size of plants: Tall seedlings.

Watch and ward: Provided upto five years after planting year.

Table 3.25. Cost norm for YM/HY/UL/01

Particular	**Quantity ha^{-1}**	**Rs. ha^{-1}**
Year 1 (Advance work)		
Survey and alignment		500
Cleaning of site and making inspection path	1 ha	3,500
Tree guards	500	20,000
Cost of tall seedlings (including 10% extra for culling)	500 +50 plants	66,000
Digging of pits 0.45 m x 0.45 m x 0.45 m size	500 pits	8,000
Total		**98,000**
Year 2 (Planting activity)		
Planting	500 plants	2,500
Manure/ vermicompost	Lumpsum	2,000
Weeding, hoeing, maintenance of mounds 2 rounds		1,000
Irrigation (2 times)	Lumpsum	6,000
Watch and ward (for 9 months)		3,750
Contingency	Lumpsum	2,000
Total		**17,250**

Maintenance cost			
Year 3	20% beating up	100 plants	13,500
	Weeding, hoeing, maintenance of mounds (4 times yr^{-1})	Lumpsum	1,250
	Irrigation (6 times)	Lumpsum	18,000
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**38,250**
Year 4	15% beating up	75 plants	10,125
	Weeding, hoeing, maintenance of mounds (3 times yr^{-1})	Lumpsum	940
	Irrigation (2 times)	Lumpsum	6,000
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**22,565**
Year 5	5% beating up	25 plants	3,375
	Weeding, hoeing, maintenance of mounds (2 times yr^{-1})	Lumpsum	625

	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**9,500**
Year 6			**5,000**
Year 7			**5,000**

Table 3.26. Year-wise cost summary for YM/HY/UL/01

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	98,000
Year 2 (Planting and establishment)	17,250
Year 3 (1st maintenance)	38,250
Year 4 (2nd maintenance)	22,565
Year 5 (3rd maintenance)	9,500
Year 6 (4th maintenance)	5,000
Year 7 (5th maintenance)	5,000
Total	**1,95,565**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

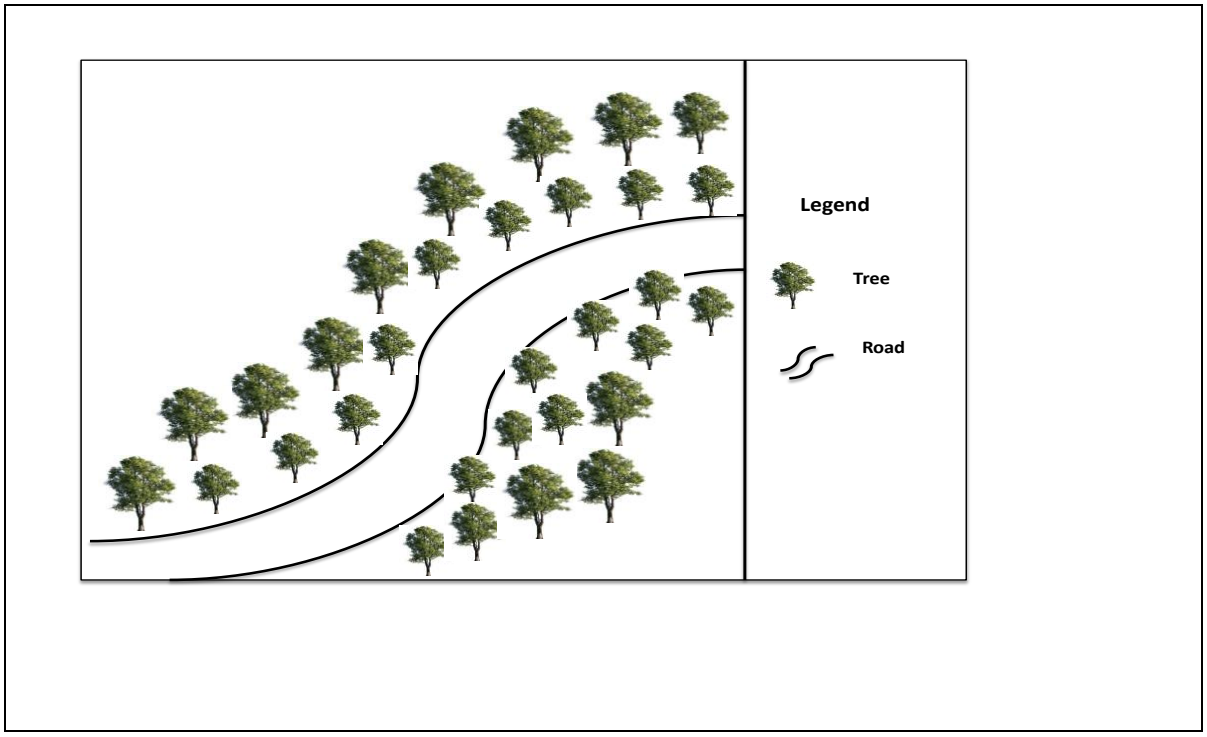


Fig. 3.20. Strip Plantation along roads

YM/HY/UL/02: Strip plantation with mounds

Under this model, plantations will be raised along roads and canals. In most of the sites multi-row strips will be created along the canal. The area will be fenced and tall seedlings of water-logging tolerant trees and slips of grass species will be planted. 500 tree seedlings will be planted per ha.

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Acacia nilotica, Syzygium cumini, Terminalia arjuna, Terminalia alata, Terminalia bellirica, Bombax ceiba, Albizia lebbeck, Azadirachta indica, Prosopis cineraria, Salvadora persica, Holoptelea integrifolia, Bauhinia purpurea,* etc.

Important elements of the model (ha^{-1}):

Fencing: Barbed wire fence.

Plants per ha: 250 plants in mound x 2 sides of road (500 plants per kilometre length of road).

Size of plants: Tall seedlings.

Watch and ward: Provided upto four years after planting year.

Table 3.27. Cost norm for YM/HY/UL/02

Particular	**Quantity ha^{-1}**	**Rs. ha^{-1}**
Year 1 (Advance work)		
Survey and alignment		500
Cleaning of site and making inspection path	1 ha	3,500
Fencing of site (barbed wire)		58,000
Cost of tall seedlings (including 10% extra for culling)	500 +50 plants	66,000
Digging of mounds	500 pits	4,410
Total		**1,32,410**
Year 2 (Planting activity)		
Planting	500 plants	2,500
Manure/ vermicompost	Lumpsum	2,000
Weeding and hoeing		535
Irrigation (2 times)	Lumpsum	6,000
Watch and ward (for 9 months)		3,750
Contingency	Lumpsum	2,000
Total		**16,785**

Maintenance cost			
Year 3	20% beating up	100 plants	13,500
	Weeding and hoeing (4 times yr^{-1})	Lumpsum	1,100
	Irrigation (6 times)	Lumpsum	18,000
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**38,100**
Year 4	15% beating up	75 plants	10,125
	Weeding and hoeing (3 times yr^{-1})	Lumpsum	825
	Irrigation (2 times)	Lumpsum	6,000
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**22,450**
Year 5	5% beating up	25 plants	3,375
	Weeding and hoeing (2 times yr^{-1})	Lumpsum	525
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**9,400**
Year 6			**5,000**
Year 7			**5,000**

Table 3.28. Year-wise cost summary for YM/HY/UL/02

Year	Rs. ha^{-1}
Year 1 (Advance work)	1,32,410
Year 2 (Planting and establishment)	16,785
Year 3 (1st maintenance)	38,100
Year 4 (2nd maintenance)	22,450
Year 5 (3rd maintenance)	9,400
Year 6 (4th maintenance)	5,000
Year 7 (5th maintenance)	5,000
Total	**2,29,145**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig.3.21. Strip plantation with mounds
(***Source:*** https://www.wikiwand.com/en/Irrigation_in_India)

YM/HY/UL/03: Floodplain treatment

Floodplain sites are available near rivers where sandy soil, loose in texture, is found with gravel and boulder. The soil is soil is very poor in fertility and is frequently inundated by water from the river. Grazing incidence is common. Raising of trees is quite difficult in such conditions. Under this model, water-tolerant or water-loving grasses such *Saccharum* and thorny or browsing-resistant shrubs/small trees such as *Acacia catechu*, will be established by planting slips of the grass species and dibbling of seeds on such sites. The area will not be fenced. The existing vegetation will not be removed. The seedlings already growing in the area will be protected from animals by surrounding them with pile of brushwood. 8,000 plants of grass will be planted per ha. Pits will be dug at time of planting (not in advance).

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Grasses: *Scirpus affinis, Cyperus eleusinoides, Cyperus exaltatus, Arundo donax, Saccharum bengalense, Saccharum spontaneum,* etc.

Trees, shrubs: *Acacia catechu, Vitex negundo,* etc.

Important elements of the model (ha^{-1}):

Fencing: Not required.

Plants per ha: 8,000 plants of grass; dibbling of seeds of shrubs/small thorny trees at 4,000 points.

Table 3.29. Cost norm for YM/HY/UL/03

Particular	**Quantity ha^{-1}**	**Rs. ha^{-1}**
Year 1 (Advance work)		
Survey and alignment		500
Cleaning of site and making inspection path	1 ha	700
Cost of nursery stock of grass	8,000 plants	32,000
Total		**33,200**
Year 2 (Planting activity)		
Digging of pits 0.20 m x 0.20 m x 0.30 m size	8,000 pits	10,000
Planting of grass in pits	8,000 plants	8,000
Dibbling of seed (including cost of seed)	4,000 spots	2,500
Maintenance of plants for 9 months, including heaping of brushwood around existing seedlings, if available		3,600
Contingency	Lumpsum	500
Total		**24,600**

Maintenance cost			
Year 3	Weeding and hoeing trees and grass (4 times yr^{-1})	Lumpsum	4,000
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**9,500**
Year 4	Weeding and hoeing (2 times yr^{-1})	Lumpsum	1,000
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**6,500**
Year 5	Weeding and hoeing trees (one time yr^{-1})	Lumpsum	500
	Watch and ward	One year	5,000
	Contingency	Lumpsum	500
	Total		**6,000**
Year 6			**5,000**
Year 7			**5,000**

Table 3.30. Year-wise cost summary for YM/HY/UL/03

Year	Rs. ha^{-1}
Year 1 (Advance work)	33,200
Year 2 (Planting and establishment)	24,600
Year 3 (1st maintenance)	9,500
Year 4 (2nd maintenance)	6,500
Year 5 (3rd maintenance)	6,000
Year 6 (4th maintenance)	5,000
Year 7 (5th maintenance)	5,000
Total	**89,800**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 3.22. Flood plain treatment
(***Source:*** Project Team**)**

YM/HY/UL/04: Institutional plantation

Several government, private, social and religious organisations are located in the treatment zone of the DPR. Space is available in some of these for planting trees. Trees in their estates or surroundings may improve aesthetic appearance of the area, improve environment and reduce soil erosion. Ornamental, shade and fruit plants will be planted in such areas. Plants will be supplied to the institutions for planting and maintenance by themselves.

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Syzygium cumini, Holoptelea integrifolia, Bauhinia purpurea, Ougeinia oojeinensis, Terminalia arjuna, Terminalia alata, Terminalia bellirica, Lagerstroemia parviflora, Albizia lebbeck, Azadirachta indica, Ficus religiosa, Ailanthus excelsa, Bombax ceiba,* etc.

Cost norm for YM/HY/UL/04:
Cost of tree sapling, including carriage to the institution: Rs. 50 plant^{-1}
Planting and maintenance cost during planting year: Rs. 50 plant^{-1}Establishment cost: Rs. 100 plant^{-1}or Rs. 50,000 ha^{-1}
Maintenance cost: Nil
Total cost: Rs. 100 plant^{-1}or Rs. 50,000 ha^{-1}

Table 3.31. Year-wise cost summary for YM/HY/UL/04 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
50,000	0	0	0	0	50,000

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 3.23. Institutional plantations
(***Source:*** MoEF&CC website**)**

YM/HY/UL/05: Plantation in unprotected institutional areas

Some institutional areas are outside the limit of institution's watch and ward. Plantation on such sites require to be provided some protection under the project for their establishment. Such areas will be planted and maintained with support of the project with active involvement of the concerned institution. One hectare will be equivalent to planting of 500 plants.

Cost norm for YM/HY/UL/05
Cost of tree sapling, including carriage to the institution: Rs. 50 plant^{-1}
Planting and maintenance cost during planting year: Rs. 100 plant^{-1}.
Establishment cost: Rs. 150 plant^{-1} or Rs. 75,000 ha^{-1}.
Maintenance cost: Rs. 60, Rs, 40, Rs. 40 and Rs. 40 plant^{-1} for Year 2, 3, 4 and 5 respectively
Maintenance cost will be paid based on the number of surviving plants.

Total cost: Rs. 330 plant^{-1} or Rs. 1,65,000 ha^{-1}

Table 3.32. Year-wise cost summary for YM/HY/UL/05 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
75,000	30,000	20,000	20,000	20,000	**1,65,000**

3.17. CONSERVATION INTERVENTIONS

YM/HY/CI/01: Water storage structures

Ponds and water percolation tanks will be created in forest areas where sites have been proposed by the forest department. The stored water will increase ground water recharge, reduce problem of soil erosion, provide drinking water for animals and improve the site quality. Planting work will not be done.

Table 3.33. Cost norm for YM/HY/CI/01

Model code	Model name	Estt. cost (Rs. m^{-3})	Main. cost (Rs/ m^3 yr^{-1})	Total cost (Rs. m^{-3})
YM/HY/CI/01	*Kachcha* pond	Rs. 100 m^{-3} (manual digging) (1 m^3=1,000 L)	Rs. 25 m^{-3} (Rs. 5 m^3 yr^{-1} x 5 yrs)	**Rs. 125 m^{-3}**

Table 3.34. Year-wise cost summary for YM/HY/CI/01 (Rs. m^{-3})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
100	5	5	5	5	5	**125**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/HY/CI/02: Managing water flow, soil moisture and sedimentation

There are several sites where problem of soil erosion is present. The soil is loose showing incidence of erosion of the upper soil layer and/or gully formation. Stone (boulder) checkdam and guidebunds will be created. In some sites where stone checkdam is not likely to sustain the pressure of flowing water, stone cratewire will be erected. At few places, unstable checkdams or slopes are existing which require stabilisation with cratewire support. Cratewire will be provided in those areas. At many places the forceful impact of water flowing in the river, or falling down the slope, is quite severe which has resulted in, or likely to soon result in, erosion or localized collapse of the river bank. Such places require CC stud and RCC structure to prevent or check problem of severe landslide, stream bank collapse or soil erosion. Planting of trees will not be done on these structures. Grass will be planted on guide bandh.

Table 3.35. Cost norm for YM/HY/CI/02/A to YM/HY/CI/02/F

Structure	Estt. cost (Rs./ m^3)	Maint. cost (Rs./ m^3)	Total cost (Rs./ m^3)
YM/HY/CI/02/A RCC structure	3,500	875 (175 yr^{-1} for 5 yrs)	**4,375**
YM/HY/CI/02/B CC stud	3,000	750 (150 yr^{-1} for 5 yrs)	**3,750**
YM/HY/CI/02/C Dry stone structure	1,000	250 (50 yr^{-1} for 5 yrs)	**1,250**
YM/HY/CI/02/D Stone cratewire structure	2,000	500 (100 yr^{-1} for 5 yrs)	**2,500**
YM/HY/CI/02/E Crate wire mesh	200	50 (10 yr^{-1} for 5 yrs)	**250**

YM/HY/CI/02/F Guide bandh	200	50 (10 yr^{-1} for 5 yrs)	**250**

Table 3.36. Year-wise cost summary for YM/HY/CI/02/A to YM/HY/CI/02/F

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/HY/CI/02/A RCC structure (Rs./ m^3)						
3,500	175	175	175	175	175	**4,375**
YM/HY/CI/02/B CC stud (Rs./ m^3)						
3,000	150	150	150	150	150	**3,750**
YM/HY/CI/02/C Dry stone structure (Rs./ m^3)						
1,000	50	50	50	50	50	**1,250**
YM/HY/CI/02/D Stone cratewire structure (Rs./ m^3)						
2,000	100	100	100	100	100	**2,500**
YM/HY/CI/02/E Crate wire mesh (Rs./ m^2)						
200	10	10	10	10	10	**250**
YM/HY/CI/02/F Guide bandh (Rs./ m^3)						
200	10	10	10	10	10	**250**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 3.24. Stone crate wire structure
(*Source:* ICAR-IISWC, Dehradun)

YM/HY/CI/03: Rehabilitation of soil and moisture conservation structures

This model will be deployed in all such sites in forest areas in the riverscape area of Yamuna where no other model is proposed to be used. Soil and moisture conservation is crucial to river rejuvenation as it increases percolation of water in the soil and reduces surface runoff and soil erosion thereby prolonging retention of water in the catchment area, improvement of environmental flow and improvement of quality of water. This indirectly ameliorates site quality which in turn results in improvement of natural regeneration, plant survival and growth, and enhancement of forest productivity and biodiversity conservation. Soil and moisture

conservation structures have direct, definite and immediate effect on water quality and quantity. The soil and moisture structures in several forest areas are quite old or inadequate and need repair/strengthening. This model aims to strengthen the soil and water conservation measures in different areas in the riverscape at a modest scale through need-based repair/ development of low-cost structures such as contour trenches, contour bunds, loose boulder check dams, earthen check dams, brushwood check dams, ponds, gully plugs, etc. The forest area in the riverscape in the state, which is not proposed to be treated by any other treatment model, is about 15,000 ha. This extent of area will be treated under this model.

Table 3.37. Cost norm for YM/HY/CI/03

Model	Year 1 (Rs. ha^{-1})	Year 2 to 5 (Rs. ha^{-1})	Total cost (Rs. ha^{-1})
YM/HY/CI/03 Rehabilitation of soil and water conservation structures	3,600 ha^{-1}	2,000 (400 yr^{-1} for 5 yrs)	**5,600 ha^{-1}**

Table 3.38. Year-wise cost summary for YM/HY/CI/03 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
3,600	400	400	400	400	400	**5,600**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/HY/CI/04: Riparian wildlife management

For providing a good habitat for wildlife, various activities have been proposed as part of aforesaid models. Under this model on riparian wildlife management, water ponds will be created in wildlife-rich area for providing drinking water for the wild animals. Fodder grasses and wild fruit tree species will be planted in the surrounding area to provide a wholesome environment for the animals. Amount will be provided according to the activities to be undertaken.

Species recommended

Native species of the area will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Azadirachta indica, Prosopis cineraria, Dalbergia sissoo, Moringa oleifera, Morus alba, Salvadora persica, Pongamia pinnata, Melia azedarach, Holoptelea integrifolia, Bauhinia racemosa, Ougeinia oojeinensis,* etc.

Grass: *Pennisetum purpureum* (Napier grass), *Pennisetum pedicellatum* (Dinanath grass), *Chrysopogon fulvus* (Dhawalu grass), *Cenchrus ciliaris* (Anjan grass), *Dichanthium annulatum* (Kel grass), *Bothriochloa pertusa* (Phulwa grass), *Setaria sphacelata* (Nandi grass), *Sehima nervosum* (Cen grass), *Heteropogon contortus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya,* etc.

Table 3.39. Cost norm for YM/HY/CI/04

Model	Estt. cost (Rs. ha^{-1})	Maint. cost (Rs. ha^{-1})	Total cost (Rs. ha^{-1})
YM/HY/CI/04 Riparian wildlife management	6.50 lakh ha^{-1}	3.25 lakh (10% of estt. cost or 0.65 yr^{-1} for 5 yrs)	9.75 lakh ha^{-1}

Table 3.40. Year-wise cost summary for YM/HY/CI/04 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
6,50,000	65,000	65,000	65,000	65,000	65,000	**9,75,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

3.18. SUPPORTING ACTIVITIES

Many supporting activities like research activities, programs for capacity building and awareness generation, development of value chain, Nursery establishment/Improvement, Fire protection, Monitoring and evaluation, etc. that are vital for effective implementation of the forestry interventions have also been proposed in the DPR (Table 3.41).

The strategies and specific interventions for these important supporting activities are provided in Volume 1 of the DPR.

A multi-tiered mechanism has been suggested for monitoring of the project (Fig. 3.25).

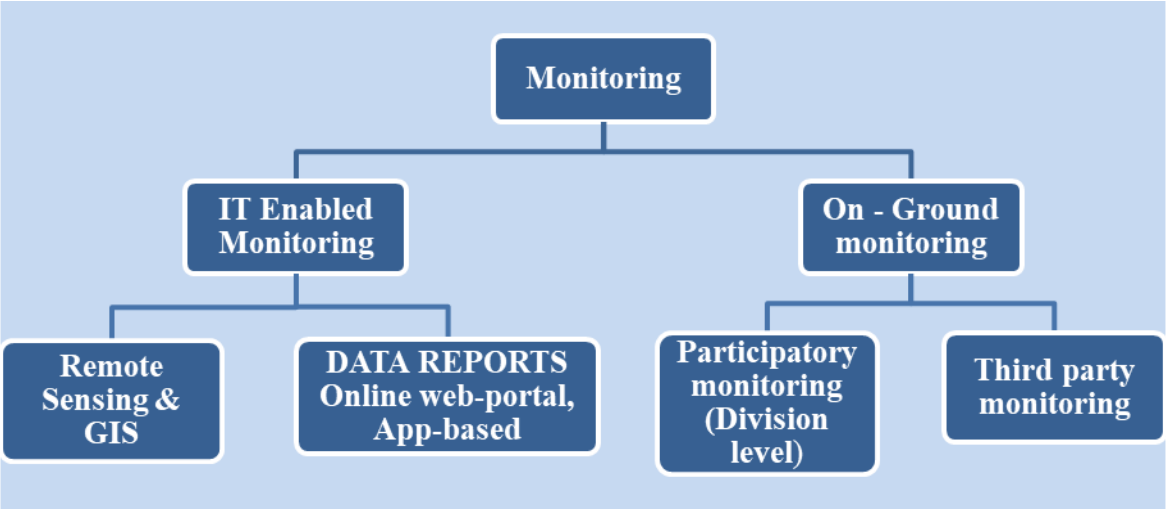


Fig. 3.25. A multi -tiered monitoring mechanism for forestry interventions for Rejuvenation of Yamuna river

3.19. BUDGET ESTIMATE

The physical and financial projections for all the forestry interventions, supporting activities to be undertaken for the cost, duration as well as various divisions in Haryana are given in Tables 3.41 to 3.58.

The total budget proposed for the Implementing Agency in Haryana is Rs. 6,712.77 lakh (Table 3.41). A sum of Rs. 1,891.52 lakh (about 28.18% of the budget) has been provisioned for plantations and treatment models in three landscapes while budget allocation for Conservation interventions is Rs. 4,415.53 lakh (or 65.78% of the total budget). For supporting activities like awareness generation, research activities, capacity building, nursery establishment/improvement, fire protection, monitoring and evaluation, etc. budgetray allocation is Rs. 280.00 lakh. A sum of Rs. 55.72 lakh has been allocated for undertaking supportive field activities and miscellaneous costs and Rs. 70.00 lakh for Project Management Unit in the state

Table 3.41. Component/Activity-wise budget allocation for Haryana

S. no.	Component and /or Activity	Amount (Rs. in lakh)	Allocation (%)
Implementation of forestry interventions in riverscape area in Haryana		**6,712.77**	**100.00**
A.	**Plantations and treatment models in three categories of landscape**	**1,891.52**	**28.18**
A.1	Natural landscapes	432.45	
A.2	Agriculture landscapes	1,124.38	
A.3	Urban and Peri-urban landscapes	334.69	
B.	**Conservation interventions**	**4,415.53**	**65.78**
	Total	**6,307.04**	
C.	**Supporting activities**	**405.72**	**6.04**
C.1	Awareness generation, research activities, capacity building, value-chain development, nursery establishmen/Improvement, fire protection, monitoring and evaluation, etc.	**280.00**	
C.2	Field activities, contingency and miscellaneous expenses	**55.72**	
C.3	Cost of PMU in Haryana	**70.00**	

Table 3.42. Year-wise cost summary for supporting activities (cost Rs. in lakh)

S. no.	Particular	1st yr	2nd yr	3rd yr	4th yr	5th yr	Total
	Supporting activities						
1	Awareness generation, research activities, capacity building, nursery establishment/ Improvement, fire protection, monitoring and evaluation, etc.	**62.00**	**66.50**	**64.50**	**45.50**	**41.50**	**280.00**
2	Field activities, contingency and miscellaneous expenses	13.00	13.00	13.00	9.00	7.72	**55.72**
3	Cost of PMU in Haryana	16.00	13.00	14.00	13.50	13.50	**70.00**
	Total	91.00	92.50	91.50	68.00	62.72	405.72

Indexing of cost

The budget for the project has been prepared on the basis of rates applicable during April 2020. The cost of the project may be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI).

Table 3.43. Plantation/treatment area summary for Forestry Interventions (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II	No. of sites
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	
Natural	261.00	0.00	261.00	0.00	261.00	261.00	228.00	261.00	228.00	28
Agriculture	778.46	186.00	778.46	10.00	964.46	974.46	974.46	974.46	285.00	41
Urban/ peri-urban	152.00	45.00	134.00	0.00	179.00	179.00	179.00	197.00	148.00	31
Conservation	1,854.58	1,603.91	1,854.58	0.00	3,458.49	3,458.49	3,458.49	3,458.49	3,458.49	83
Total	**3,046.04**	**1,834.91**	**3,028.04**	**10.00**	**4,862.95**	**4,872.95**	**4,839.95**	**4,890.95**	**4,119.49**	**183**

Plantation and treatment models in the three landscapes will cover an area of 661 ha and Conservation interventions will cover 3,458.49 ha area (notional) in Haryana (Table 3.43)

Table 3.44. Cost summary for Forestry Interventions (Rs. in lakh)

	Year1	Year 2		Year 3		Year 4	Year 5	Phase I			Phase II	Grand total
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**Total**		
Natural	197.32	0.00	49.53	0.00	71.98	42.40	24.88	197.32	188.78	386.10	46.34	432.45
Agriculture	429.48	112.37	106.33	10.50	157.62	139.55	109.04	552.36	512.53	1,064.89	59.49	1,124.38
Urban/ peri-urban	114.96	35.27	39.31	0.00	48.18	42.78	37.99	150.23	168.25	318.48	16.20	334.69
Conservation	2,338.60	1,001.96	141.94	0.00	201.64	211.72	222.31	3,340.56	777.60	4,118.16	297.37	4,415.53
Total	**3,080.37**	**1,149.60**	**337.11**	**10.50**	**479.41**	**436.44**	**394.21**	**4,240.47**	**1,647.17**	**5,887.64**	**419.40**	**6,307.04**

For interventions in Natural, Agriculture, Urban/Peri-urban landscape an expenditure of Rs. 386.10 lakh, 1,064.89 lakh and 318.48 lakh, respectively, will be incurred in Phase I while total allocation for both the phases in respective landscapes is Rs. 432.45 lakh, 1,124.38 lakh and 334.69 lakh, respectively (Table 3.44). The allocation for Conservation interventions is Rs. 4,118.16 lakh and Rs. 4415.53 lakh for Phase I and for entire project respectively.

Table 3.45. Year-wise cost summary for C.1 Supporting Activities (Cost Rs.in lakh)

S. no.	Supporting Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Awareness generation	6.00	10.00	10.00	10.00	10.00	**46.00**
2	Capacity building and value-chain development	6.00	11.50	10.50	9.50	9.50	**47.00**
3	Entry point activities	21.00	0.00	0.00	0.00	0.00	**21.00**
4	Nursery improvement and fire protection	4.00	5.00	5.00	4.00	4.00	**22.00**
5	Research	20.00	35.00	35.00	20.00	16.00	**126.00**
6	Monitoring and evaluation	5.00	5.00	4.00	2.00	2.00	**18.00**
	Total	**62.00**	**66.50**	**64.50**	**45.50**	**41.50**	**280.00**

Table 3.46. Year-wise cost summary for C.2 Field activities, contingency and miscellaneous expenses (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Field activities, contingency and miscellaneous costs	13.00	13.00	13.00	9.00	7.72	**55.72**

Table 3.47. Year-wise details of C.3 PMU (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Recurring	6.00	10.00	12.00	12.00	12.00	**52.00**
2	Non-recurring	10.00	3.00	2.00	1.50	1.50	**18.00**
	Total	**16.00**	**13.00**	**14.00**	**13.50**	**13.50**	**70.00**

Details of area under natural landscape for undertaking forestry interventions in the forest divisions have been provided in Table 3.48.

Table 3.48. Area in Natural Landscape (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Phase II**
Faridabad	15.00	0.00	15.00	0.00	15.00	15.00	15.00	15.00	15.00
Karnal	10.00	0.00	10.00	0.00	10.00	10.00	10.00	10.00	10.00
Panipat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yamunanagar	236.00	0.00	236.00	0.00	236.00	236.00	203.00	236.00	203.00
Total	**261.00**	**0.00**	**261.00**	**0.00**	**261.00**	**261.00**	**228.00**	**261.00**	**228.00**

Table 3.49. Area in Agriculture Landscape (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Faridabad	65.00	23.00	65.00	0.00	88.00	88.00	88.00	88.00	88.00
Karnal	172.46	8.00	172.46	10.00	180.46	190.46	190.46	190.46	42.00
Panipat	40.00	0.00	40.00	0.00	40.00	40.00	40.00	40.00	0.00
Sonipat	501.00	155.00	501.00	0.00	656.00	656.00	656.00	656.00	155.00
Total	**778.46**	**186.00**	**778.46**	**10.00**	**964.46**	**974.46**	**974.46**	**974.46**	**285.00**

Table 3.50. Area in Urban/peri-urban Landscape (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Faridabad	22.00	5.00	10.00	0.00	15.00	15.00	15.00	27.00	15.00
Karnal	9.00	0.00	9.00	0.00	9.00	9.00	9.00	9.00	9.00
Palwal	11.00	10.00	10.00	0.00	20.00	20.00	20.00	21.00	20.00
Sonipat	100.00	25.00	95.00	0.00	120.00	120.00	120.00	125.00	89.00
Yamunanagar	10.00	5.00	10.00	0.00	15.00	15.00	15.00	15.00	15.00
Total	**152.00**	**45.00**	**134.00**	**0.00**	**179.00**	**179.00**	**179.00**	**197.00**	**148.00**

Table 3.51. Area in Conservation Intervention (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Default areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Faridabad	97.50	162.00	97.50	0.00	259.50	259.50	259.50	259.50	259.50
Palwal	30.19	0.00	30.19	0.00	30.19	30.19	30.19	30.19	30.19
Yamunanagar	1,726.89	1,441.91	1,726.89	0.00	3,168.80	3,168.80	3,168.80	3,168.80	3,168.80
Total	**1,854.58**	**1,603.91**	**1,854.58**	**0.00**	**3,458.49**	**3,458.49**	**3,458.49**	**3,458.49**	**3,458.49**

Table 3.52. Cost for Natural Landscape (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	total Maint.	Maint.	
Faridabad	21.66	0.00	3.91	0.00	4.88	3.56	2.51	21.66	14.85	3.92	40.43
Karnal	14.44	0.00	2.60	0.00	3.25	2.37	1.67	14.44	9.90	2.61	26.95
Panipat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yamunanagar	161.23	0.00	43.02	0.00	63.85	36.47	20.70	161.23	164.04	39.81	365.07
Total	**197.32**	**0.00**	**49.53**	**0.00**	**71.98**	**42.40**	**24.88**	**197.32**	**188.78**	**46.34**	**197.32**

Table 3.53. Cost for Agriculture Landscape (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	total Maint.	Maint.	
Faridabad	61.90	23.00	11.57	0.00	30.19	25.96	16.86	84.90	84.58	27.31	196.78
Karnal	97.09	8.00	23.76	10.50	31.51	28.53	24.02	115.58	107.82	17.35	240.75
Panipat	20.00	0.00	5.25	0.00	5.51	4.63	3.65	20.00	19.04	0.00	39.04
Sonipat	250.50	81.38	65.76	0.00	90.41	80.42	64.51	331.88	301.10	14.84	647.81
Total	**429.48**	**112.37**	**106.33**	**10.50**	**157.62**	**139.55**	**109.04**	**552.36**	**512.53**	**59.49**	**1,124.38**

Table 3.54. Cost for Urban/peri-urban Landscape (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	total Maint.	Maint.	
Faridabad	15.80	5.15	1.81	0.00	5.17	4.83	2.53	20.95	14.33	2.60	37.88
Karnal	8.82	0.00	1.63	0.00	3.80	2.35	1.04	8.82	8.82	1.18	18.81
Palwal	3.82	3.49	2.58	0.00	3.76	1.85	1.52	7.31	9.71	3.45	20.47
Sonipat	75.00	19.69	31.50	0.00	30.32	28.94	30.39	94.69	121.15	6.38	222.22
Yamunanagar	11.52	6.95	1.79	0.00	5.13	4.81	2.51	18.47	14.24	2.59	35.31
Total	**114.96**	**35.27**	**39.31**	**0.00**	**48.18**	**42.78**	**37.99**	**150.23**	**168.25**	**16.20**	**334.69**

Table 3.55. Cost for Conservation intervention (Rs. In lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Total Maint.**	**Maint.**	
Default areas	288.00	0.00	33.60	0.00	35.28	37.04	38.90	288.00	144.82	40.84	473.66
Faridabad	63.00	272.16	3.31	0.00	17.76	18.65	19.58	335.16	59.30	37.93	432.39
Palwal	48.30	0.00	2.54	0.00	2.66	2.80	2.94	48.30	10.93	3.08	62.31
Yamunanagar	1,939.30	729.80	102.50	0.00	145.94	153.23	160.89	2,669.10	562.55	215.51	3,447.16
Total	**2,338.60**	**1,001.96**	**141.94**	**0.00**	**201.64**	**211.72**	**222.31**	**3,340.56**	**777.60**	**297.37**	**4,415.53**

Table 3.56. Division-wise area and cost summary for different landscapes (Area in ha and cost in lakh rupees)

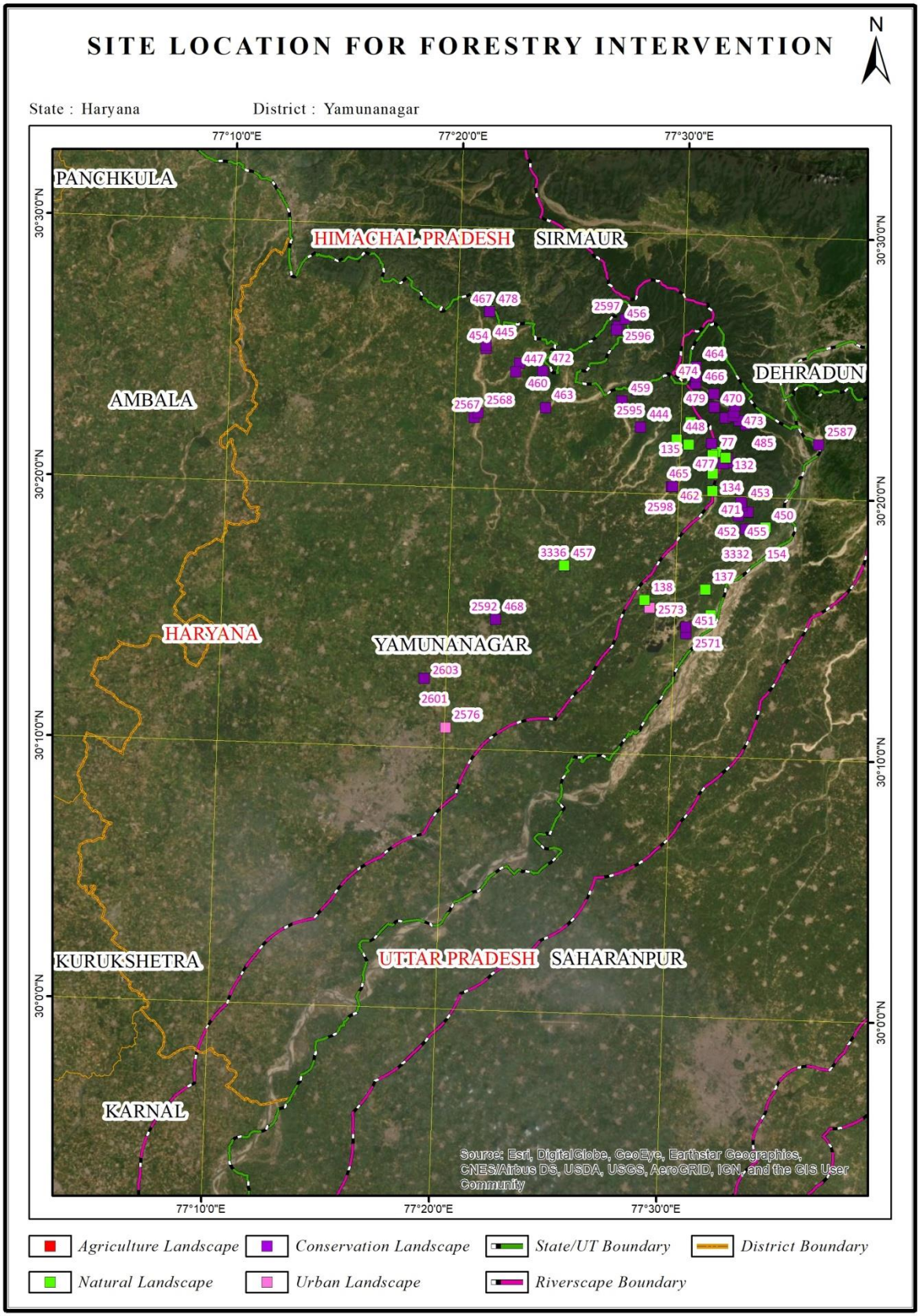
	Natural			Agriculture			Urban/peri-urban			Conservation			Total		
Division	**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**	
	Est.	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**
Default areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	288.00	144.82	0.00	288.00	144.82
Faridabad	15.00	21.66	14.85	88.00	84.90	84.58	27.00	20.95	14.33	259.50	335.16	59.30	389.50	462.66	173.05
Karnal	10.00	14.44	9.90	190.46	115.58	107.82	9.00	8.82	8.82	0.00	0.00	0.00	209.46	138.84	126.53
Palwal	0.00	0.00	0.00	0.00	0.00	0.00	21.00	7.31	9.71	30.19	48.30	10.93	51.19	55.61	20.64
Panipat	0.00	0.00	0.00	40.00	20.00	19.04	0.00	0.00	0.00	0.00	0.00	0.00	40.00	20.00	19.04
Sonipat	0.00	0.00	0.00	656.00	331.88	301.10	125.00	94.69	121.15	0.00	0.00	0.00	781.00	426.56	422.24
Yamunanagar	236.00	161.23	164.04	0.00	0.00	0.00	15.00	18.47	14.24	3,168.80	2,669.10	562.55	3,419.80	2,848.80	740.83
Total	**261.00**	**197.32**	**188.78**	**974.46**	**552.36**	**512.53**	**197.00**	**150.23**	**168.25**	**3,458.49**	**3,340.56**	**777.60**	**4,890.95**	**4,240.47**	**1,647.17**

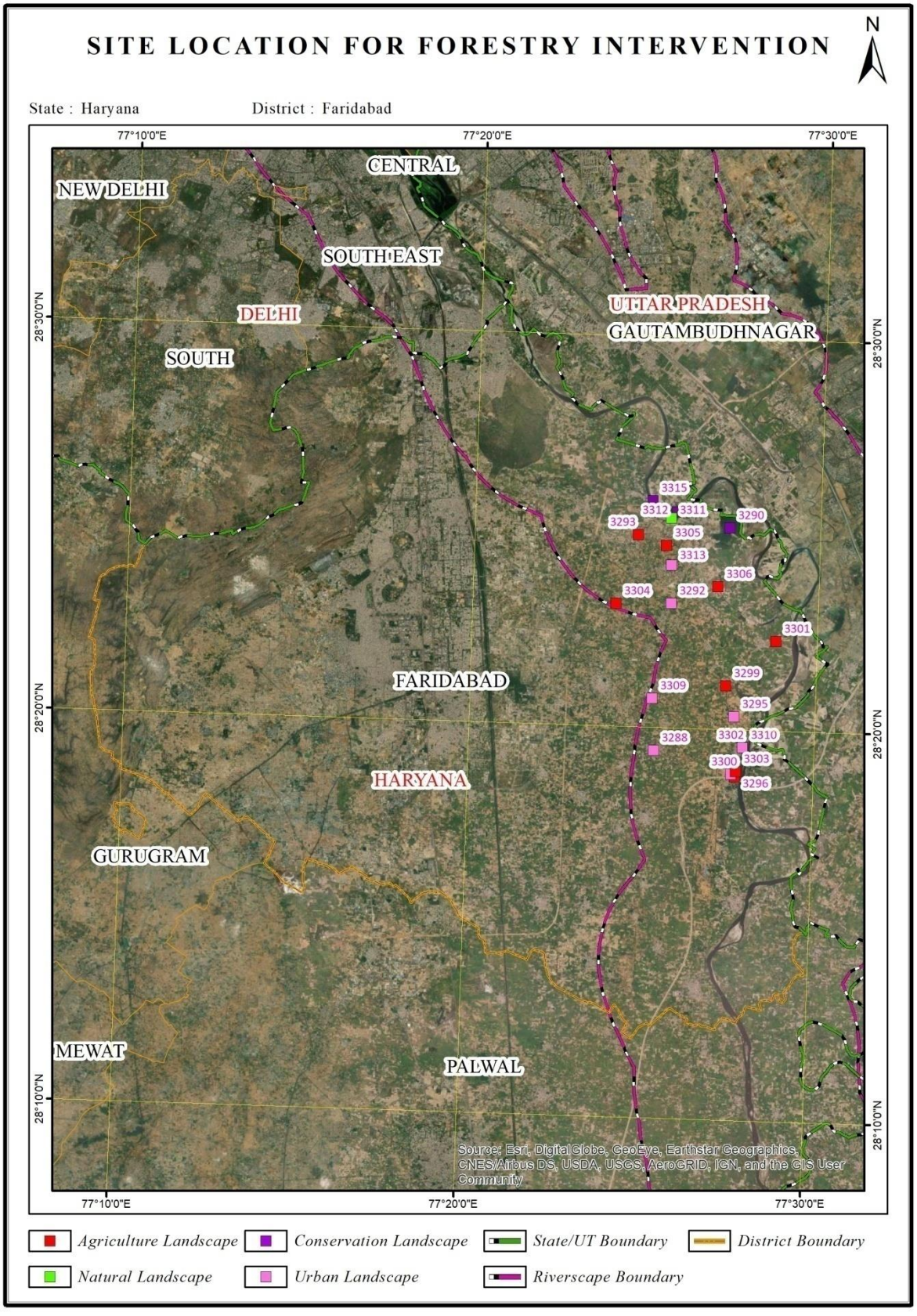
Table 3.57. Division-wise area and cost summary for different landscapes (Area in ha and cost in lakh rupees)

	Phase I			Phase II	Grand total
Division	Area	Cost		cost	
	Est.	Est.	Maint.	Maint	cost
Default areas		288.00	144.82	40.84	473.66
Faridabad	389.50	462.66	173.05	71.76	707.47
Karnal	209.46	138.84	126.53	21.14	286.51
Palwal	51.19	55.61	20.64	6.53	82.78
Panipat	40.00	20.00	19.04	0.00	39.04
Sonipat	781.00	426.56	422.24	21.22	870.03
Yamunanagar	3,419.80	2,848.80	740.83	257.92	3,847.55
Total	**4,890.95**	**4,240.47**	**1,647.17**	**419.40**	**6,307.04**

Table 3.58. Model- wise area and cost summary (Area in ha and cost in lakh rupees)

	Phase I		Phase II	Grand total
Landscape	**Area**	**Cost**	**Cost**	**Cost**
Natural	**261.00**	**386.10**	**46.34**	**432.45**
YM/HY/NL/01	139.00	229.72	36.33	266.05
YM/HY/NL/02	29.00	70.58	7.58	78.16
YM/HY/NL/03	60.00	17.15	2.43	19.58
YM/HY/NL/04	33.00	68.66	0.00	68.66
Agriculture	**974.46**	**1,064.89**	**59.49**	**1,124.38**
YM/HY/AL/01	844.46	816.91	14.84	831.74
YM/HY/AL/02	130.00	247.98	44.65	292.64
Urban/peri-urban	**197.00**	**318.48**	**16.20**	**334.69**
YM/HY/UL/01	29.00	56.71	4.43	61.14
YM/HY/UL/02	10.00	22.92	1.94	24.86
YM/HY/UL/03	20.00	16.52	3.45	19.97
YM/HY/UL/04	13.00	6.50	0.00	6.50
YM/HY/UL/05	125.00	215.83	6.38	222.22
Conservation	**3,458.49**	**4,118.16**	**297.37**	**4,415.53**
YM/HY/CI/01	1,637.76	100.29	8.71	109.00
YM/HY/CI/02/A	438.46	859.73	59.54	919.28
YM/HY/CI/02/B	1,048.73	2,055.94	152.76	2,208.70
YM/HY/CI/02/C	209.69	411.42	21.41	432.83
YM/HY/CI/02/D	88.73	174.08	9.06	183.14
YM/HY/CI/02/E	10.63	20.85	1.08	21.93
YM/HY/CI/02/F	22.50	44.15	2.30	46.44
YM/HY/CI/03		432.82	40.84	473.66
YM/HY/CI/04	2.00	18.88	1.66	20.54
Total	**4,890.95**	**5,887.64**	**419.40**	**6,307.04**


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Haryana
District : Yamunanagar
77°10'0"E
77°20'0"E
77°30'0"E
30°30'0"N
30°20'0"N
30°10'0"N
30°0'0"N
PANCHKULA
HIMACHAL PRADESH
SIRMAUR
AMBALA
DEHRADUN
HARYANA
YAMUNANAGAR
KURUKSHETRA
UTTAR PRADESH
SAHARANPUR
KARNAL
467 478
2597 456
454 445
2596
447 472
464
474 466
460
459
463
479 470
2567 2568
2595 444
473
448
2587
135
77
485
477 132
465
134 453
462
2598
471
450
452 455
3336 457
3332 154
137
138
2592 468
2573
451
2571
2603
2601
2576
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Haryana
District : Faridabad
77°10'0"E
77°20'0"E
77°30'0"E
28°30'0"N
28°20'0"N
28°10'0"N
CENTRAL
NEW DELHI
SOUTH EAST
DELHI
SOUTH
UTTAR PRADESH
GAUTAMBUDHNAGAR
FARIDABAD
HARYANA
GURUGRAM
MEWAT
PALWAL
3315
3312
3311
3290
3293
3305
3313
3306
3304
3292
3301
3299
3309
3295
3288
3302
3310
3303
3300
3296
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary

Chapter 4

DELHI

4.1. INTRODUCTION

Delhi, the National Capital Territory (NCT) of India, has a geographical area of 1,483 km^2, which is 0.05 % of the geographical area of the country. Out of the total area, 558.32 km^2 is designated rural and 924.68 km^2 is urban. It has a length of 51.90 km and width of 48.48 km. The state lies between 28°22'N to 28°54'N latitude and 76°48'E to 77°23'E longitude. It shares border with Haryana on three sides and Uttar Pradesh on the East. A part of the boundary with Uttar Pradesh is formed by the river Yamuna. In 1993, the Union Territory of Delhi was formally declared as National Capital Territory of Delhi. Delhi's urban area is now considered to extend beyond the NCT boundaries and includes the neighbouring satellite cities of Ghaziabad, Faridabad, Gurugram and Noida and this area is now called National Capital Region (NCR). The state comprises 11 districts (Fig.4.1). Apart from these districts, there are five municipalities within the National Capital Territory: three municipal corporations, one municipal council and one cantonment board.



Fig. 4.1. Districts of Delhi
(*Source:* mapsofindia.com)

4.2.GEOGRAPHY

Two natural features of Delhi are the Ridge and River Yamuna. The landscape of Delhi can geographically be divided into three major regions, *viz*., the low-lying Yamuna flood plains, the Aravalli Ridge and the great Gangetic plains that cover most part of the city. The altitude of Delhi ranges from 180 to 316 m above mean sea level. The Yamuna is a perennial source of water at the gateway to the vast Indo-Gangetic plains. Large portions

of the Ridge have been colonized by the increasing population; while the Yamuna has large riverbedarea encroached by cultivators at many places. The area under Delhi consists of the Ridge and its forest, undulating surfaces, plains and flood plains, the Najafgarh drain and the River Yamuna. The distinct physiographic units of NCT of Delhi are: 1. Kohi (Ridge), 2. Dabar (basin area), 3. Bangar (upper alluvial plain), 4. Old Khadar (old flood plain) and 5. New Khadar (new flood plain). The Ridge is a part of the Aravalli range which enters Delhi from the south, forking into two and expanding into a wide tableland. One part stems from Mehrauli to the bank of the Yamuna, while the other passes by the historic Tughlakabad fort to culminate at present day South Delhi. The Ridge forms the principal watershed in the area, the eastern drainage passing into the Yamuna and the western into the Najafgarh basin. The width of the ridge varies from 50-100 m at Wazirabad to as wide as 2.5 km near Chanakyapuri. The higher elevation of ridge goes up to 250 m above the mean sea level and is about 15 to 20 m above the surrounding plains.

The area lying between the Ridge and the Yamuna flood plain, is a basin in west Delhi (also known as Dabar). Banger, or the upper alluvial plain, composed of older fluvial deposits spread in the north-western section of the state, is more elevated and drier than the Khadar. The Old Khadar, or the lower alluvial plain, is adjacent to the New Khadar on the west of Yamuna and is broken into northern and southern sections by an extension of Ridge. The uneven terrain prone to floods, has remnants of fluvial features such as ox-bow lakes, meander cores, swamps and marshes. New Khadar or the current flood plain is a low-lying area with recent river deposits. It forms a narrow strip along the west bank and a wider belt adjoining the east of river Yamuna. It is characterized by wide silt, which is broken by hollows holding standing water.

4.3. GEOLOGY AND SOILS

4.3.1 Geology

The geological formations of NCT Delhi date from the Proterozoic to the Quarternary ages. The generalized succession of the rock formations reported are the Quaternary era represented by recent soils, alluvium, blow sand and nodular limestone; pegamites and the basic intrusives belonging to post Delhi intrusives; and the Alwar quartzites of the Delhi system. The area is a part of the Indo-Gangetic plain.

4.3.2 Soils

The greatest part of Delhi lies in the alluvium, but the small hills and ridges in and around New Delhi consist of Alwar quartzites. The older alluvium comprises silt, clay with minor lenticular fine sand and kankar beds. The newer alluvium mainly consists of unoxidised sands, silts and clay occurring in the older and active flood plains of Yamuna River.

4.4. CLIMATE

The climate is subtropical**,** with a mild winter often interspersed with heavy fog, a very hot season from mid-March to June-end. Major rainfall is received during monsoon season. The western disturbances too bring a fair amount of rainfall. Extreme dryness with hot summers and cold winters are characteristics of the climate. January is the coldest month with the mean daily maximum temperature at 21.3°C and the mean daily minimum temperature at 7.3°C.

May and June are the hottest months with the mean daily maximum temperature 39.6°C and the mean daily minimum temperature 28.3°C. From April the hot wind known locally as '*loo*' blows. Relative humidity is very high during monsoon season. The average rainfall of Delhi is around 650 mm.

4.5. RIVER SYSTEM AND HYDROLOGY

4.5.1. River System

The Yamuna, a sacred river in Hinduism, is the only major river flowing through Delhi. The Hindon River separates Ghaziabad from the eastern part of Delhi. Yamuna flows in a north-south direction through Delhi and there is evidence that it has changed its course from the medieval periods. Delhi Jal Board (DJB) supplies 650 million gallons per day (MGD), whereas the estimated consumption requirement is 963 MGD. The shortfall is met by private and public tube wells and hand pumps. At 240 MGD, the Bhakra storage is DJB's largest water source, followed by the Yamuna and Ganga rivers. The Najafgarh Drain, flows in a North-east direction and joins the Yamuna near Wazirabad. The quality of water in Yamuna upstream of Wazirabad barrage in Delhi is reasonably good; below this, the discharge of wastewater through 15 drains between Wazirabad barrage and Okhla barrage renders the river severely polluted.

Hindon River, a tributary of Yamuna, originates in the Saharanpur district, Uttar Pradesh from the UpperShiwaliks. The river is entirely rainfed and has an approximate catchment area of 7,083 km^2. It flows between Ganga and Yamuna rivers for 400 km through Muzaffarnagar, Meerut, Baghpat, Ghaziabad and Gautam Buddha Nagar districts before it joins Yamuna river just outside Delhi (Jain *et al.*, 2007).

The Sahibi River, also called the Sabi River, is an ephemeral, rain-fed river flowing through Rajasthan, Haryana (where its canalised portion is called the 'Outfall Drain No 8') and Delhi states in India (Jain, 2009). It drains into Yamuna in Delhi, where its channelled course is also called the Najafgarh drain which also serves as Najafgarh drain bird sanctuary. Sahibi is a seasonal river which is 300 km long and flows from Aravalli hills in Rajasthan to Haryana, of which 100 km is in Haryana.

4.5.2. Water Bodies and Aquifers

The number of inland natural- and man-made water bodies is quite low in Delhi both in terms of number as well as area (Table 4.1., FSI, 2019). There are one lake/pond and 16 small wetlands (<2.25 ha).

National Capital Territory, Delhi occupies an area of 1,483 km^2 out of this about 145 km^2 is the ridge area comprising of weathered quartzite rock. Due to increase in population, the water demand is increasing, and ground water is also used for (CGWB, 2013) irrigation of the cultivable land. The over-exploitation of groundwater resources leading to the declining of ground water levels especially in southern and south western parts of the state. Feasible areas for artificial recharge to ground water have been identified based on depth to water level (>3m.bgl) areas showing declining trend of water level and having surplus surface water availability. The area identified for artificial recharge to ground water is 699.86 km^2 in NCT Delhi (Fig.4.2). In Yamuna basin, the rechargeable areas for aquifers fall in the districts of North East Delhi, Shahadra, East Delhi, South East Delhi and Central Delhi only.

Table 4.1. Wetlands inside the recorded forest area (or green wash) in Delhi

Wetland category	No. of wetlands	Total wetlands area (ha)
Inland wetlands-natural		
Lake/Pond	1	2
Riverine wetland	0	0
Waterlogged	0	0
River/Stream	0	0
Sub-total	1	2
Inland wetlands-man-made		
Reservoir/Barrage	0	0
Tank/Pond	0	0
Waterlogged	0	0
Sub-total	0	0
Wetlands (<2.25 ha)	16	16
Total	**17**	18
Total recorded forest (or green wash) area (in ha)		10,204
Per cent of wetland area inside recorded forest (or green wash) area		0.18%

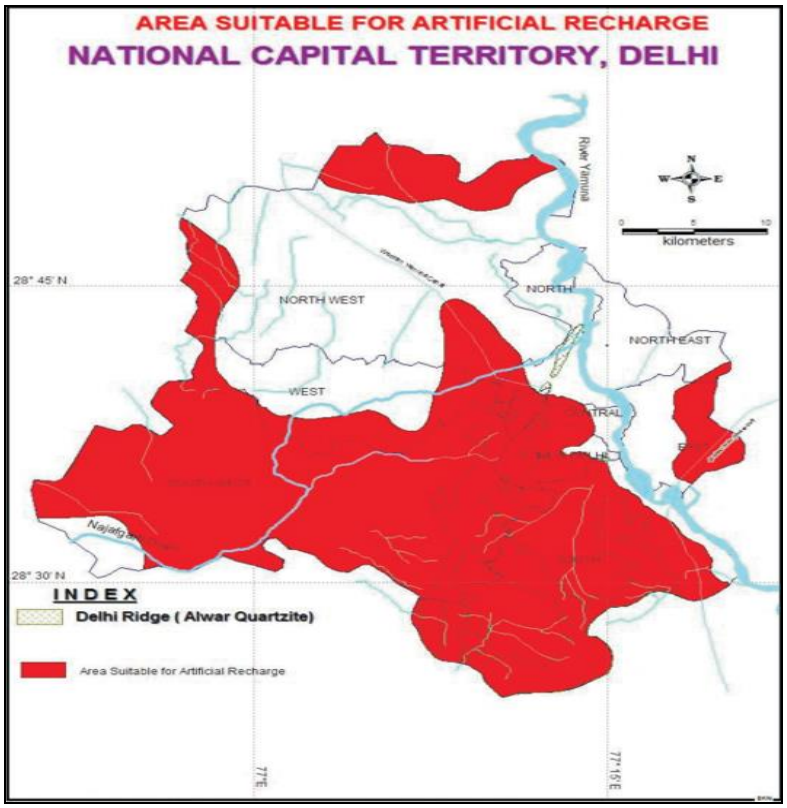


Fig. 4.2. Areas suitable for artificial recharge in NCT Delhi
(***Source:*** CGWB, 2013)

4.5.3. Hydrology

Delhi's groundwater level is falling, and its population density is increasing. The normal annual rainfall of NCT Delhi is 611.8 mm. The rainfall increases from the South-West to the North-East. About 81% of the annual rainfall is received during the monsoon months July, August and September. The rest of the annual rainfall is received in the form of winter rain. The ground water availability in the territory is controlled by the hydro-geological situation characterized by occurrence of alluvial formation and quartzite hard rocks. The hydro-geological set up and the following distinct physiographic units influence the ground water occurrence: 1. Alluvial plain on eastern and western sides of the ridge, 2. Yamuna flood plain deposits, 3. isolated and nearly closed Chhatarpur alluvial basin and 4. NNE-SSW trending Quartzitic Ridge.

The depth to water level recorded in NCT Delhi during May 2015 ranges from 1.20 to 62.22 m below ground level (m bgl). About 50% wells of south district show more than 40 m bgl water level and 19% wells have 20 to 40 m bgl water level. In New Delhi and southwest districts, water level in the range of 10 to 20 m bg is shown by 57 and 35% wells, respectively. In north, east and northwest districts, 29, 40 and 46% wells show water levels in the range of 5 to10 m bgl, respectively. In east, north, northeast, northwest, and west districts 30, 57, 50, 29 and 12% of wells show water level in the range of 2 to 5 m bgl, respectively. The entire Yamuna flood plain is also falling in the 2 to 5 m bgl category (Bej, 2018).



Fig. 4.3.Yamuna Biodiversity Park
(***Source:*** https://www.tripadvisor.in)

4.5.4. Issues about Water Resources

The 22 km stretch of Yamuna in Delhi contributes 80% of the pollution load while this part is hardly 2% of the entire length of the river (Table 4.2). River Yamuna was monitored in Delhi at 5 locations for polluted river stretch. Among these, 3 locations were not complying with Water Quality Criteria (CPCB, 2015).

Table 4.2. Polluted river stretches in Delhi

River name	Stretch identified	Town identified	Approx. length of the stretch (km)
Yamuna	Waizrabad to Asgarpur village	Delhi	22

Besides, Delhi is facing scarcity of water and declining quality of water, surface as well as sub-surface. According to a 2018 *NITI Aayog* report, Delhi is among 21 Indian cities that are poised to run out of groundwater by 2020. Illegal constructions near reservoirs, over-extraction of groundwater, pollution in water bodies and wastage of residential water supply are some of factors affecting water resources in Delhi (Nagpal, 2019).

Delhi has signed an agreement with Himachal Pradesh on December 21, 2019 according to which Himachal Pradesh will supply 368 cusecs water to Delhi from November to February and 268 cusecs from March to June every year. After creation of upstream storage facility, the water supply would be increased to 421 cusecs throughout the year. The water would be delivered at Hathnikund Barrage (earlier Tajewala), Haryana (ToI, 2019).

Millions of people living along the banks of the Hindon and its tributaries are consuming groundwater that has been contaminated by hazardous toxins. They are aware of the dangers of doing so but cannot afford to install water purifying systems. According to the Central Pollution Control Board's data, Uttar Pradesh has 12 polluted river stretches from a total of 351 polluted river stretches identified across India. The impact of the polluted water is not just restricted to western Uttar Pradesh. It goes as far as the National Capital as well. Farmers use water from the Hindon for agriculture and the produce is sent to Delhi. Several chemicals such as cadmium, chromium, nickel, cobalt, arsenic, lead, mercury and other heavy metals were found in the water samples which can have an impact on the health of human beings and other living organisms in the area (Joshi, 2019).

4.6. FORESTS AND VEGETATION

As per the Champion and Seth Classification of Forest Types (1968), the forests in Delhi belong to the Type Group 5, Tropical Dry Deciduous Forest and Type Group 6 Tropical Thorn Forests. Around 67.35% of the total forest cover comes under plantation/ TOF and 32.65% constitute the natural forest, which covers 57.67 km^2 of Delhi's forests. The Recorded Forest Area (RFA) in the State is 102 km^2 of which 78 km^2 is Reserved Forest and 24 km^2 is Protected Forest. In Delhi, no forest land has been diverted for non-forestry purposes under the Forest Conservation Act, 1980 in the last four years. Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Nov 2017, the Forest Cover in the State is 195.44 km^2 which is 13.18 % of the State's geographical area (Fig.4.5; FSI, 2019). In terms of forest canopy density classes, the state has 6.72 km^2 under Very Dense Forest (VDF), 56.42 km^2 under Moderately Dense Forest (MDF) and 132.30 km^2 under Open Forest (OF) (Table 4.3). Forest Cover in the state has increased by 3.03 km^2 as compared to the previous assessment reported in ISFR 2017 (FSI, 2019b).



Fig.4.4. Severity of pollution: Foam-filled Yamuna in Delhi
(***Source:*** https://abcnews.go.com/International/toxic-foam-pollutes-indias-sacred-yamuna-river)

Table 4.3. Forest Cover in Delhi

Class	**Area**	**Per cent of GA**
Very dense forest	6.72	0.45
Medium density forest	56.42	3.81
Open forest	132.30	8.92
Total	195.44	13.18
Scrub	0.30	0.02

The entire forest cover of Delhi falls in 0-500m altitude including scrub. Nearly two third of the forest cover (132.30km^2) is open forest (Table 4.4).

Table 4.4. Altitude-wise forest cover (km^2) in Delhi

Altitude zone (m)	**Geographical area**	**VDF**	**MDF**	**OF**	**Total**	**Scrub**
0-500	1,483	6.72	56.42	132.30	195.44 (100%)	0.30
Total	1,483	6.72	56.42	132.30	195.44	0.30

Vegetation of Delhi is typical Northern Tropical Thorn Forest Type (Champion & Seth, 1968). Among trees *Acacia nilotica, A. leucophloea, A. catechu, A. modesta,Butea monosperma* (Dhak), *Cassia fistula, Salvadora persica. Anogeissus latifolia* are common with abundance of *Prosopis juliflora*. Important shrubs include *Capparis sepiaria* and *Zizyphus mauritiana*. Frequent herbaceous flora is *Calotropis procera, Withania somnifera, Achyranthes aspera* and *Tridax*. Main grasses are *Cenchrus ciliaris, Aristida, Eragrostis, Saccharum spontaneum, Diehanthium, Cynodondactylon,* etc. (forest.delhigovt.nic.in).

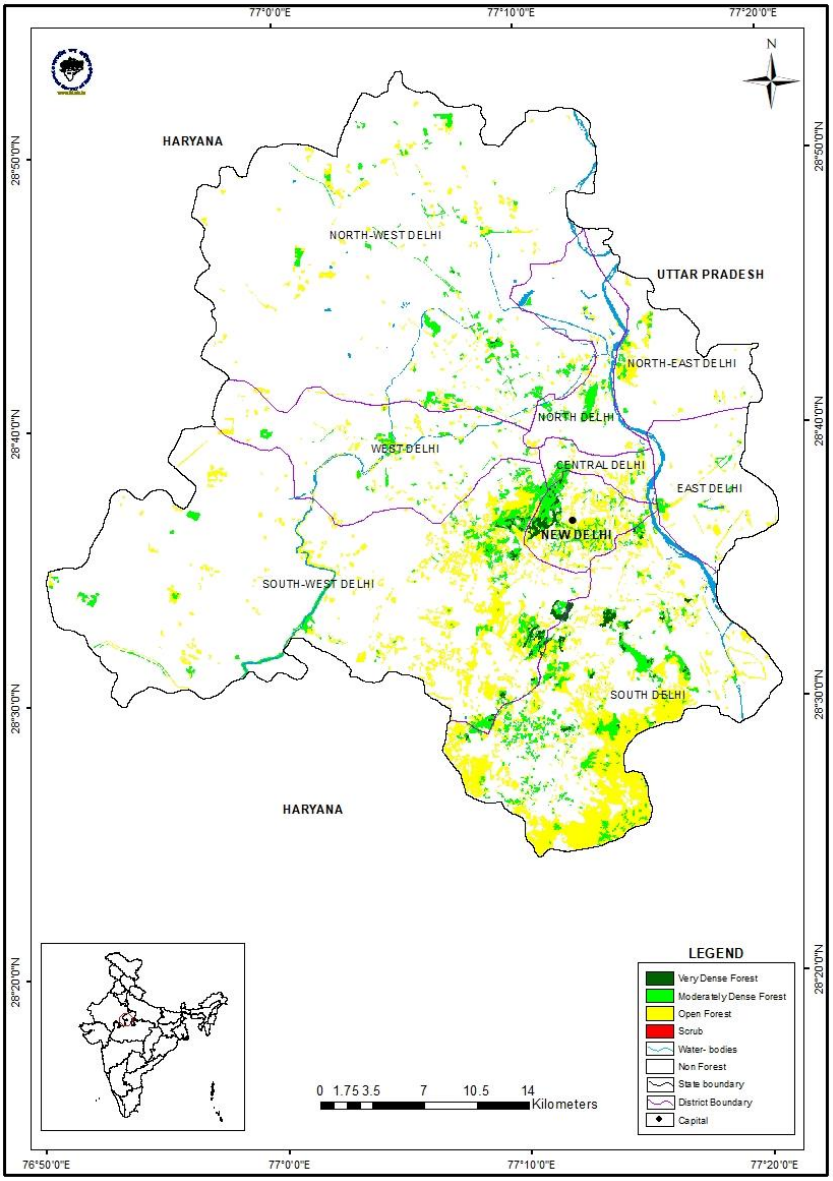


Fig. 4.5. Forest cover map of Delhi
(***Source:*** FSI, 2019)

4.7. WILDLIFE

The Protected Area Network in the State has one wildlife sanctuary, *viz*, Asola-Bhatti Wildlife Sanctuary which covers 1.96% of geographical area of the state (FSI, 2019). The sanctuary covering 32.71 km^{2}area is located on the Southern *Delhi* Ridge of Aravalli hill range on *Delhi*-Haryana border in Southern *Delhi.* The riverine tract along the Yamuna, the dry scrubland forests of the northern Ridge and the swampy marshes of the city offer a wide range of bird habitat. Pintail Ducks, Barheaded Geese and Shovellers can be seen swimming in water bodies along with the resident Spotbill Ducks and Painted Storks. Some of the animals found are the Indian Hare, Indian Gerbils, Indian Bull Frog, Long-eared Hedgehog, Five Stripped Palm Squirrel, Rhesus Macaque, mongoose, nilgai, mice, foxes, jackals. According to the 1908 Imperial Gazetteer, at one time Delhi also

had foxes, blackbuck, Indian gazelles, crocodiles and even leopards. However, the birdlife is still abundant, and the green areas have a thriving population of birds. Delhi zoo has large variety of animals from across India and a few species from abroad.



Fig. 4.6. Avifauna in wetlands
(*Source:* https://lbb.in/delhi/bird-watching-yamuna-biodiversity-park)

4.8. AGRO-ECOSYSTEM

Agriculture in Delhi suffers many problems, however, primarily concerning soil and water quality and quantity, produce dispersion and depleting land availability. While the highest quality soil lies along the Yamuna, limited access to the river dictates that most agricultural production occurs along the periphery of the city, in lower quality soil. The soil of Delhi is highly contaminated with heavy metals and pesticides as a result of industrial effluents, untreated sewage water and vehicular emissions. This creates concern for crop production and food safety. Conversely, contamination of soil through agricultural pesticides, fertilizer residue and farmland waste create unhealthy runoff, contaminating the water of the Yamuna and the Najafgarh drain. A thick layer of sludge that has settled at the bottom of the Najafgarh and Yamuna, prevents the water bodies from replenishing ground water. This is highly concerning for farmers, as groundwater is a primary source of irrigation for crops.

The total cropped area during 2000-01 was 52, 816 ha which reduced to 34,750 ha in 2015-16. The main reasons for reduction in agriculture area in Delhi are fast urbanisation and shift in occupational pattern, especially during the last two decades. The area under food-grain crops has decreased substantially, but area under vegetables production has increased. Just like cropped area, the gross area under irrigation has also witnessed a decline. It has reduced from 31,107 ha during 2008-09 to 29,723 ha during 2016-17, indicating a decline of 5.39%.

Paddy, jowar and bajra during Kharif and wheat and mustard crops during the Rabi seasons are the major crops in Delhi. The cultivation of vegetables is a continuous process throughout the year. Delhi government is now encouraging farmers to take up vegetable production and floriculture.The 19th Livestock census 2012 has reported a total livestock population of 0.36 M in the state.

Table 4.5. Table land use pattern in Delhi

Land use type	Area (in '000 ha)	Percentage
Geographical area	148	
Reporting area for land utilization	147.49	100.00
Forests	1.48	1.00
Not available for land cultivation	93.20	63.18
Permanent pastures and other grazing lands	0.06	0.04
Land under misc. tree crops and groves	1.18	0.80
Culturable wasteland	9.89	6.71
Fallow land other than current fallows	8.06	5.47
Current fallows	11.73	7.96
Net area sown	21.89	14.84

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2014-15).



Fig. 4.7. Agriculture in the floodplains of River Yamuna
(***Source:*** Project Team**)**

4.9. DEMOGRAPHY

As per the 2011 census Delhi has a population of 16.79 M accounting to 1.38% of India's population (Census India 2011). The density of population in Delhi worked was 11,320 persons km^{-2} as against the national average of 382 persons km^{-2}. Delhi has a skewed female-to-male ratio, with 868 women for every 1,000 men. The city has a literacy rate of 86% (91% for men and 81% for women). About 97.50% of the population of Delhi lives in urban areas and the remaining 2.5% in rural areas.

4.10. INDUSTRIES

Delhi is the centre of international politics and trade in India. The state has an attractive real estate market and is a preferred tourist destination. Owing to its location, connectivity and rich cultural history, Delhi has always been a prime tourist attraction of the country. The Delhi Metro is the seventh busiest metro rail network in the world with 178.9 M people having used the service in 2017. The key industries include information technology, telecommunications, hotels, media, banking and tourism. National Capital Region (NCR) is India's biggest milk market. The organised milk market in the region, estimated at five Mld^{-1}, is growing at 6-8% annually.

4.11. RIVERSCAPE ANALYSIS

4.11.1. Remote Sensing and GIS Methodology

Image processing and GIS tools used in the present assessment were ERDAS Imagine, Geomedia Professional, ArcGIS along with other software packages. The GIS software provide the tool needed to store, analyse and display geographic information.

4.11.2. Satellite Data Used

Landsat-8 satellite data for the month of Feb to April 2019 has been used for preparation of Land use/ Land cover map of the riverscape. The Row, Path along with Date of Pass of the satellite data used in the current study for the parts of states of and covering the riverscape is given in Table 4.6a.

Table 4.6a. List of data downloaded for the study

State	Path	Row	Date of pass	Satellite
Delhi NCR	146	040	23-02-2019	Landsat-8

4.11.3. Ancillary Data

Almost all of the ancillary information has been taken from various Government of India sources. Information about the state and district boundaries for the riverscape taken up for analysis was obtained from the Survey of India. Basin boundary, Catchment boundary, Sub-Catchment boundary, Watershed boundary and Micro-watershed boundaries where obtained from Soil and Land Use Survey of India, New Delhi. Village and Tehsil boundaries were obtained from the published document 'Administrative Atlas of Delhi' by Census of India (2011). Forest Type and Forest Density data were obtained in digital format from Forest Survey of India. Soil map and soil depth information was obtained from published maps of National Bureau of Soil Survey & Land Use Planning, Nagpur. Soil erosion data which is the backbone of multi-criterion analysis was obtained in GIS format from the Indian Institute of Soil & Water Conservation, Dehradun. Topographical sheets on 1:50,000 scale obtained from Survey of India have been used for Geo-reference only. Bhuvan data was also referred, wherever required for the preparation of land use map.

4.11.4. Bank-line and Highest Flood Level

For the identification of the riverscape the year 2013 was denoted as the highest flood level year based on literature review and stakeholder's consultation on various levels. Then, a post-monsoon satellite image of the year 2013 was used to create the bank-line of the main stem of the Yamuna River.

4.11.5. Spatial Extent

The riverscape zone for Delhi state lies between latitudes, longitudes and occupies geographical area of 342.79 km^2. Details of the influence zone under consideration from the viewpoint of DPR are shown in Fig. 4.8. and spatial extent are presented in Table 4.6b. The area of the riverscape comprises 23.09 per cent of the geographical area of the state. The area in the riverscape is 342.79 km^2 which comprises 0.78% of the geographical area of entire riverscape.

Table 4.6b. Spatial extent of the project area in the state

Geographical area (km^2)	Geographical coordinates (from-to)		Area in riverscape (km^2)	Percent of geographical area of total riverscape	Percent of geographical area of the state
	Lat. ^{o}N	Long. ^{o}E			
1484	28° 28' 44.718" to 28° 51' 47.979"	77° 09' 43.097" to 77° 20' 04.807"	342.79	0.78	23.09

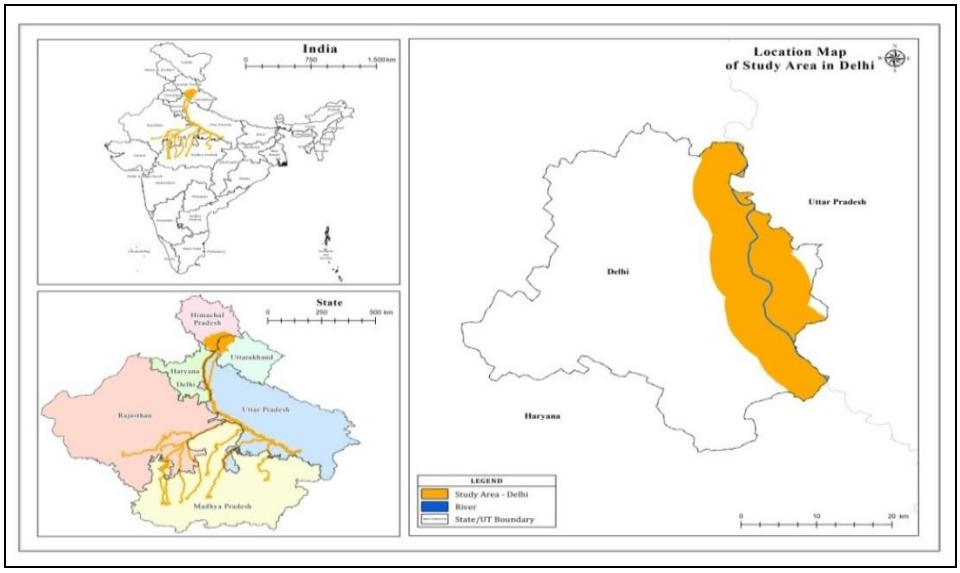


Fig. 4.8. Location map of study area in Delhi

4.11.6. LAND USE AND LAND COVER

A total of 12 major land use and land cover types i.e., agriculture, barren, canal, industrial area, mining/mining dump, open forest, plantation, river(dry)/ river sand, river (perennial), scrub, settlement, waterbody have been mapped in the riverscape. The

distribution of area under different land cover and land use classes is given in Table 4.7. and Fig 4.9).

Land use and land cover data indicate that settlement is the most widespread land use covering 211.85 $km^2$of the area in the riverscape under DPR. Agriculture comprises 79.67 km^2 of the riverscape. River, dry river/river sand, waterbody and canal covers 14.32 km^2 area.

Table 4.7. Distribution of area under different land use and land cover categories in the Riverscape

S.no.	Land use and land cover	Area (km^2)
1	Agriculture	79.67
2	Barren	0.51
3	Canal	2.05
4	Industrial area	0.5
5	Mining/Mining dump	0.57
6	Open forest	4.58
7	Plantation	1.61
8	River (dry)/River sand	0.86
9	River (perennial)	9.59
10	Scrub	29.18
11	Settlement	211.85
12	Waterbody	1.82
	Total	**342.79**

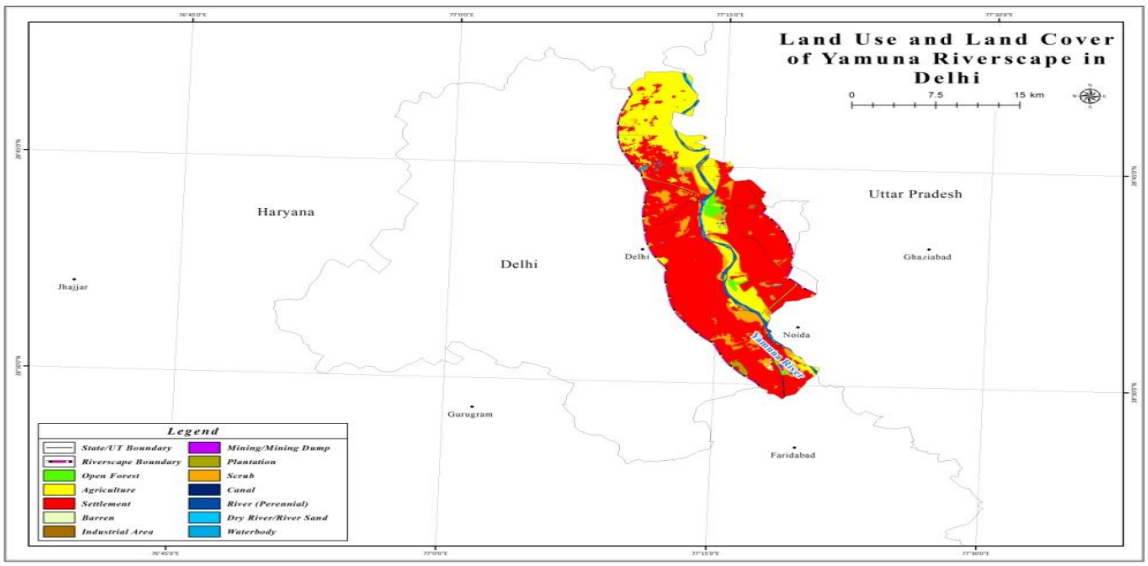


Fig. 4.9. Land Use and Land cover map of project area in Yamuna Riverscape (Based on information from NBSSLUP, Nagpur)

4.11.7. Slope

Slope of land is an important locality factor influencing the soil and water runoff and suitability of the area for forestry interventions. Lands with steep slopes are prone to soil erosion and hence do not support growth of most of the plant species unless suitable stabilization measures are adopted. The land in Delhi has been grouped into 10 classes of slope from less than 2.5 to more than 40 degrees. The distribution of areas under different slope classes is given in Table 4.8. and Fig. 4.10. The maximum area of Delhi falls in slope class 3 i.e.>5 to <10^0.

Table 4.8. Distribution of area under different slope categories

S.no.	Slope class (^{0})	Area (km^2)
1	Less than 2.5	34.42
2	>2.5 to <5	69.97
3	>5 to <10	152.36
4	>10 to <15	68.40
5	>15 to <20	14.64
6	>20 to <25	2.14
7	>25 to <30	0.53
8	>30 to <35	0.19
9	>35 to <40	0.09
10	>40	0.05
	Total	**342.79**

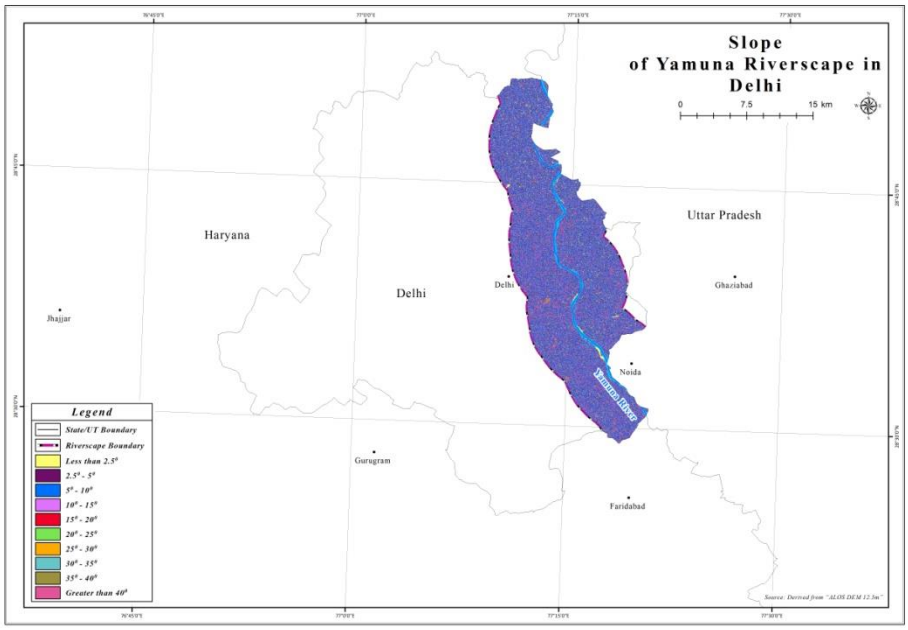


Fig.4.10. Slope of Yamuna Riverscape
(Based on information from NBSSLUP, Nagpur)

4.11.8. Soil Erosion

A total six categories of the erosion classes have been mapped in Delhi, *viz*., less than 5, 5 to 10, 10 to 20, 20-40 and more than 40 t $km^{-2}yr^{-1}$. An area of 223.58 km^2 falls in the non-soil category. These areas may not be suitable for forest plantations. The distribution of areas under different erosion classes and their area is given in Table 4.9. and Fig. 4.11.

Table 4.9. Distribution of area under different soil erosion categories

S.no.	Soil erosion class ($tkm^{-2}\,yr^{-1}$)	Area (km^2)
1	<5	23.19
2	5-10	60.28
3	10-20	35.13
4	20-40	0.34
5	>40	0.27
6	Non Soil	223.58
	Total	**342.79**

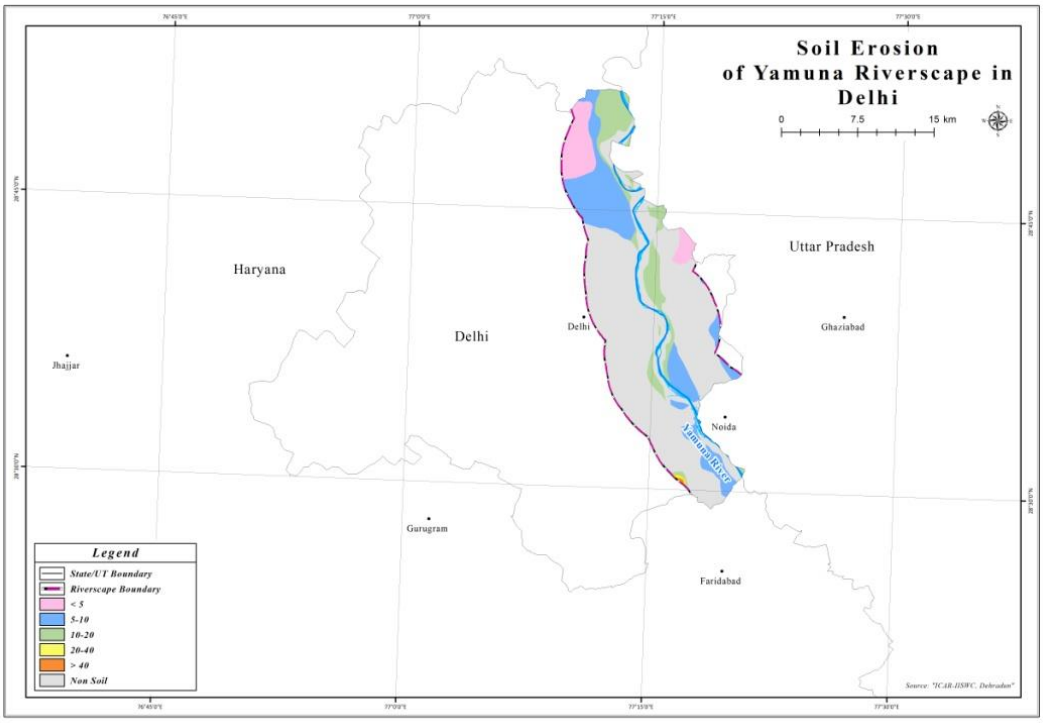


Fig.4.11.Soil erosion classes in Yamuna Riverscape
(Based on information from ICAR-IISWC, Dehradun)

4.11.9. Forest Cover and Forest Type

Delhi state forest cover is divided into three types namely non-forest, open forest and scrub. The maximum area 309.03 km^2 is non-forest. Also, Delhi state has four types of forest, *viz*., non forest, scrub, tropical dry deciduous and tropical thorn forests. Area wise distribution of forest cover and forest type is given in Table 4.10. and Fig. 4.12. , Table 4.11. and Fig. 4.13., respectively.

Table 4.10. State Area wise distribution of forest cover

S.no.	Forest cover	Area (km^2)
1	Non-forest	309.03
2	Open forest	4.58
3	Scrub	29.18

Table 4.11. State Area wise distribution of forest type

S.no.	Forest type	Area (km^2)
1	Non-forest	309.03
2	Scrub	29.18
3	Tropical dry deciduous forest	0.52

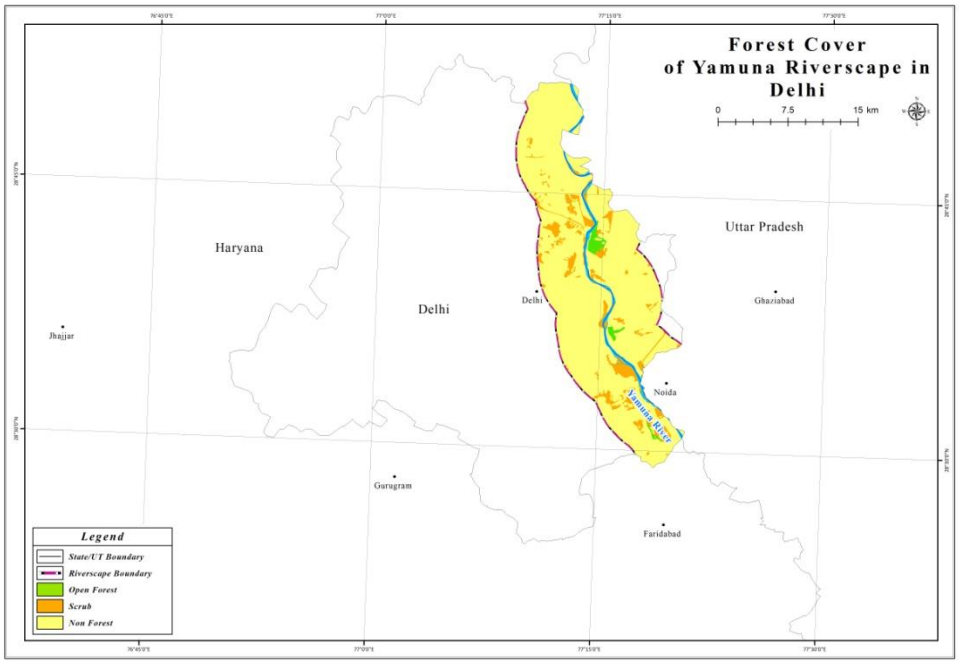


Fig. 4.12. Forest cover in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

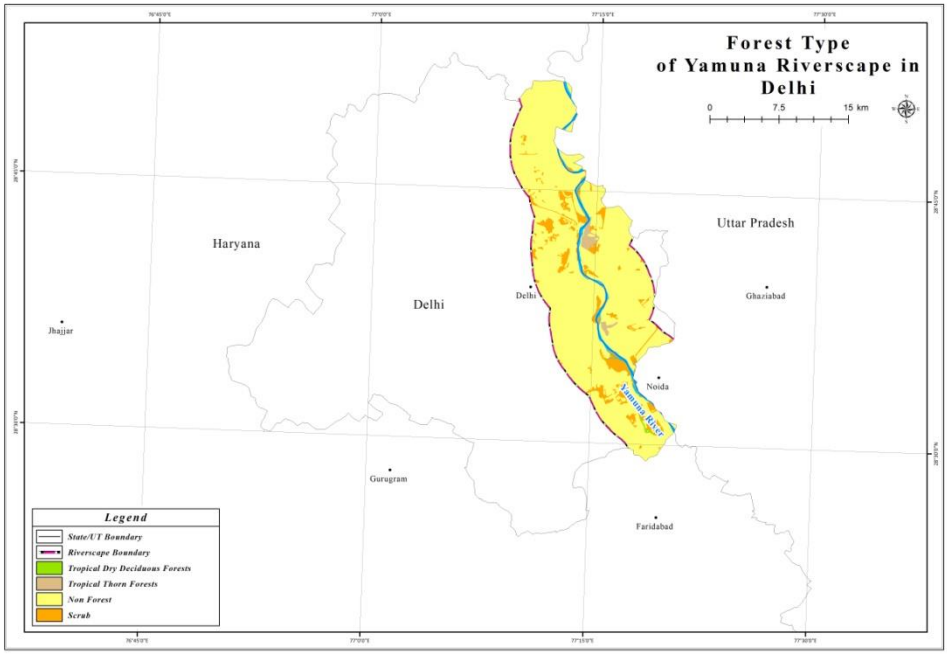


Fig.4.13. Forest types in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

4.11.10. Prioritisation of sites for Forestry Interventions

A multi-stakeholder approach was followed for preparing the DPR on rejuvenation of Yamuna through Forestry Interventions. It included extensive consultation and review of literature, reports, primary and secondary data collection, its analysis, expert consultations with institutes, individuals and various stakeholders (Central and state government departments, State Forest Departments of seven states, research institutions/scientific departments dealing with forestry, environment, river conservation, environment; civil society, non-governmental organisations in this field, defence and paramilitary forces, other interest groups).

Priority criteria: For the purpose of preparation of DPR and for identification of priority areas for the proposed treatment/forestry interventions in the Yamuna riverscape, GIS-assisted decision making process by way of geospatial analysis and modelling was used. GIS was used to generate different layers within the riverscape like land use, soil erosion rates, and slope of the topography (Refer Table 1.15a. Chapter 1: Uttarakhand).

4.11.11. Priority Class

Statistical analysis of the area estimates show that 2.39 km^2 area is in high , 84.31 km^2 area in medium and 256.09 km^2 area is in low priority region for Delhi State as given in Table 4.12.

Table 4.12. Priority treatment areas

S.no.	Priority class	Area (km^2)
1	High	2.39
2	Medium	84.31
3	Low	256.09

4.12. PROPOSED FORESTRY INTERVENTIONS

Table 4.13. Models for Yamuna and tributaries in Delhi state (tentative)

Model	Natural landscape
Nil	Proposals for Delhi NCT not received from SFD
	Agricultural landscape
Nil	Proposals for Delhi NCT not received from SFD
	Urban/peri-urban landscape
Nil	Proposals for Delhi NCT not received from SFD
	Conservation interventions
YM/DL/CI/01	Rehabilitation of soil and moisture conservation structures

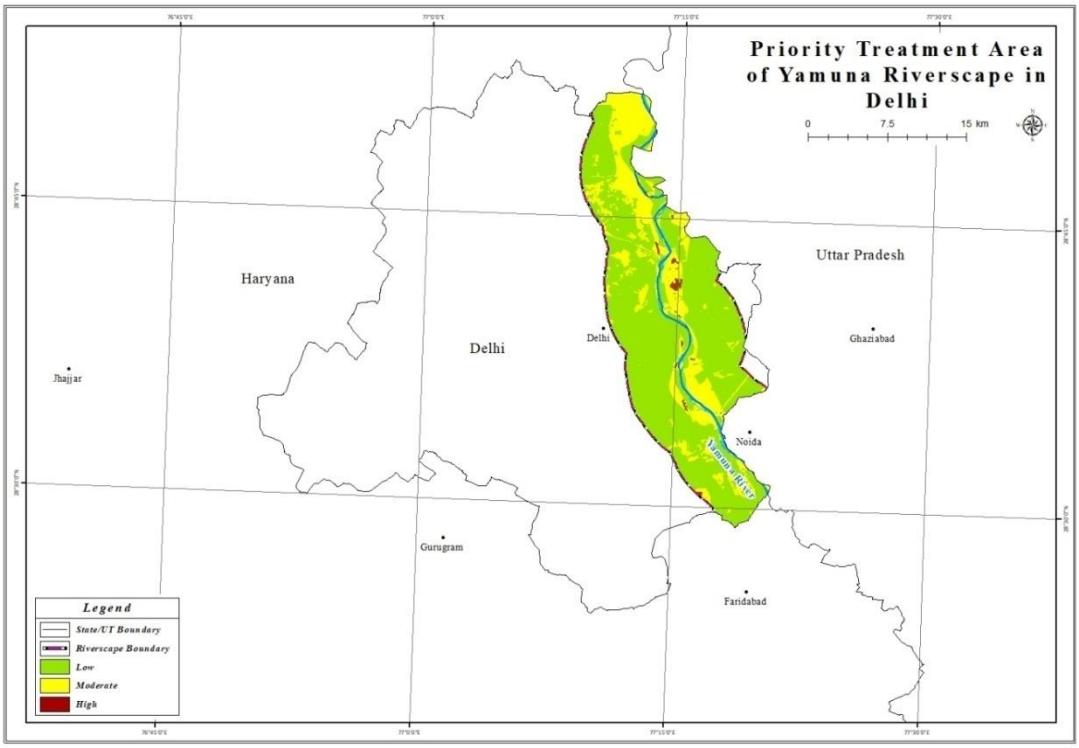


Fig. 4.14. Priority of treatment areas in Yamuna Riverscape

The forest cover in Delhi is 195.44 km^2, and an additional 0.30 km^2area is under scrub (FSI, 2019b). However, the total recorded forest area in Delhi is 85 km^2 i.e. 5.73% of the geographic area of which the reserved and protected forests constitute 91.76% and 8.24% of the forest area respectively. The extent of forest in the riverscape, i.e. within 5 km on each side of Yamuna, is quite small (approx. 458 ha open forest while 2918 ha is scrub);the larger part of this area is not under the control of SFD as it is under the control of Delhi Development Authority or under illegal occupation by encroachers. A separate, independent body exists in Delhi to plan and execute the entire restoration programme for the River Zone in the state. Delhi government plans to make 'Zone 0' (river zone) a place

of attraction and active indulgence by the city dwellers without compromising the river's ecological and social functions. Several works are being executed in Delhi under the directions of NGT for restoration of River Yamuna (Item No. 01, Court No. 1, National Green Tribunal Principal Bench, New Delhi, document dated March 5, 2020). The following activities relevant to this DPR are being carried out or are under consideration of NGT in the floodplain and nearby areas in the riverscape:

- Creation of wetlands at various locations.
- Demolition plans and action taken to retrieve flood plain land and free it of encroachments.
- Enforcement against vehicles dumping debris in and around the flood plain.
- Floodplain rejuvenation on the Eastern bank of the river.
- Tree plantation drives in forest and outside forest.
- Ameliorative measures for cleaning drains and in-situ bioremediation measures.
- Controlled dredging in River Yamuna.

In view of the above, sites for Delhi NCT have not been proposed by SFD Delhi for treatment under DPR for rejuvenation of Yamuna River. In this background, the following treatment model is being proposed under the DPR for Delhi state:

4.12.1. Conservation Intervention

YM/DL/CI/01: Rehabilitation of soil and moisture conservation structures

This model will be deployed at all sites in forest areas in the riverscape of Yamuna in the state of Delhi because sites for any other model have not been proposed by SFD for reasons stated above. Soil and moisture conservation is crucial to river rejuvenation as these measures increase percolation of water in the soil, reduce surface runoff and check soil erosion thereby prolonging retention of water in the catchment area, improvement of environmental flow and improvement of quality of water. These measures indirectly ameliorate site quality which, in turn, result in improvement of natural regeneration, plant survival and growth, and enhancement of forest productivity and biodiversity conservation. Soil and moisture conservation structures have direct, definite and immediate effect on water quality and quantity.

The soil and moisture structures in several areas in the riverscape are quite old or inadequate and need repair /strengthening. This model aims to strengthen the soil and water conservation measures in different forest areas in the riverscape and catchment area of Yamuna at a modest scale through need-based repair/ development of low-cost structures such as conservation ditches, contour trenches, contour bunds, earthen check dams, brushwood check dams, loose boulder check dams, ponds, gully plugs, etc.

Unlike plantation models, this model would not change the land use or interfere with existing land use of the forest area, hence it has been proposed as a treatment model for Delhi.

The DFOs at time of implementation of the project will have the power to make site-specific modifications in prescriptions to suit the site conditions within the total budget proposed in the DPR for the Division. The flexibility applies to choice of species, site, model, quantity of work and timing of activities.

Table 4.14. Cost norm for YM/DL/CI/01

Model	Year 1 (Rs. ha^{-1})	Year 2 to 6 (Rs. ha^{-1})	Total cost (Rs. ha^{-1})
YM/DL/CI/01: Rehabilitation of soil and water conservation structures	8,000 ha^{-1}	10,000 (2,000 yr^{-1} for 5 yrs)	18,000 ha^{-1}

Table 4.15. Year-wise cost summary for YM/DL/CI/01 (Rs.ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
8,000	2,000	2,000	2,000	2,000	2,000	18,000

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

The amount mentioned for year 2 to 6 may be used for construction or maintenance of structure(s).

The typical sizes of various soil and moisture conservation structures are as under:
Conservation ditch:3 m x 1.5 m x 0.60 m size per structure.
Contour trench: 3 m x 0.45 m x 0.45 m size per structure.
Contour bund: (40 cm base +20 cm top)/2 x 25 cm x 1 m size per structure.
Loose boulder check dam: 3m x 0.60 m x 0.45 m size per structure.
Brushwood check dam: Site-specific size.
Pond: Site-specific size, depth not more than 1.50 m.
Earthen check dam: Site-specific size.
Gully plug: Site-specific size.

The number of these structures per ha will be such that the total cost will be equal to the model cost stated above.
A total of4500 ha forest area in the riverscape/catchment area is proposed to be treated with this model.

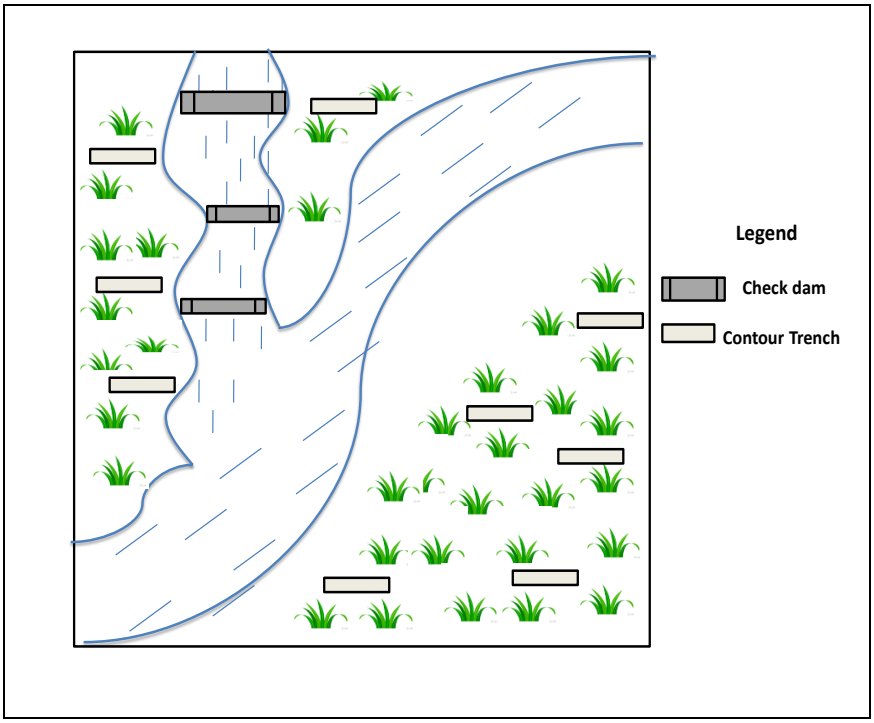


Fig. 4.15. Illustration of model on SMC works

4.13. SUPPORTING ACTIVITIES

Other activities such as awareness generation, capacity building, monitoring, research, protection against fire, etc. are essential to facilitate the forestry interventions and are considered vital for successful and effective execution of proposed forestry interventions.

A multi-tiered mechanism has been suggested for monitoring of the project (Fig. 4.16).

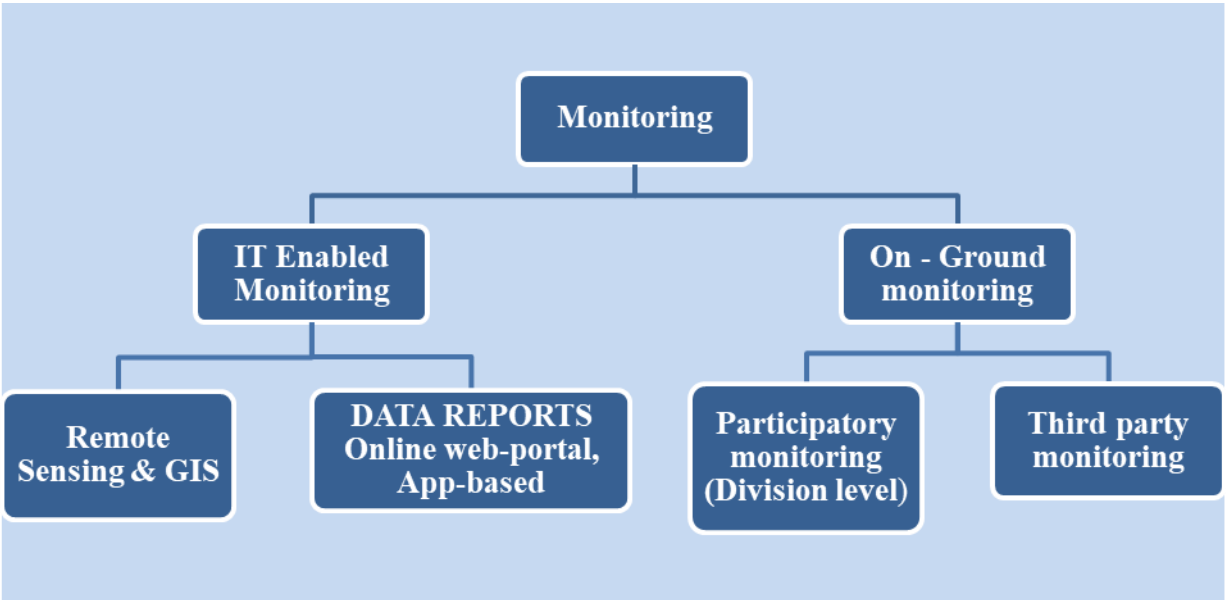


Fig. 4.16. A multi -tiered monitoring mechanism for forestry interventions for Rejuvenation of Yamuna River



Fig. 4.17. Sparking water in Yamuna in Delhi during the country-wide lockdown due to COVID 19 pandemic
(***Source:*** https://timesofindia.indiatimes.com/)

4.14. BUDGET ESTIMATE

The physical and financial projections for all the interventions, supporting activities to be undertaken for the cost, area and duration, in Delhi are given in Table 4.16. to Table 4.27.

The total budget for Implementing Agency proposed for Delhi is Rs. 1,072.66 crore. An amount of Rs. 904.23 lakh has been allocated for Conservation Interventions in the forests in catchment area of Yamuna in Delhi. For carrying out supporting activities like awareness generation, research activities, capacity building, monitoring and evaluation, etc. for the duration of project, an allocation of Rs. 168.43 lakh has been made (Table 4.17) which includes Rs. 103 lakh for awareness generation, research activities, capacity building, monitoring and evaluation, etc., Rs. 42.82 lakh for field activities and miscellaneous costs, and Rs. 22.61 lakh for Project Monitoring Unit in the state.

Table 4.16. Component/activity-wise budget allocation for Delhi

S. no.	Component and /or activity	Amount (Rs. in lakh)	Allocation (%)
Implementation of forestry interventions in riverscape area in Delhi		**1,072.66**	**100.00**
A.	**Plantations and treatment models in three categories of landscape**	**0.00**	
A.1	Natural landscapes	0.00	
A.2	Agriculture landscapes	0.00	
A.3	Urban and peri-urban landscapes	0.00	
B.	**Conservation interventions**	**904.23**	**84.30**
C.	**Supporting activities**	**168.43**	**15.70**

C.1	Awareness generation, research activities, capacity building, nursery establishment/ improvement, fire protection, monitoring and evaluation, etc.	103.00	
C.2	Field activities, contingency and miscellaneous expenses	42.82	
C.3	Cost of PMU in Delhi	22.61	

Table 4.17. Year-wise cost summary for supporting activities (cost Rs.in lakh)

S. no.	**Particular**	**1st yr**	**2nd yr**	**3rd yr**	**4th yr**	**5th yr**	**Total**
1	Awareness generation, research activities, capacity building, nursery establishment/improvement , Fire protection, monitoring and evaluation, etc.	**28.00**	**21.00**	**21.00**	**17.00**	**16.00**	**103.00**
2	Field activities, contingency and miscellaneous expenses	11.00	7.83	7.83	8.08	8.08	42.82
3	Cost of PMU in Delhi	4.97	4.97	4.97	3.85	3.85	22.61
	Total	**43.97**	**33.80**	**33.80**	**28.93**	**27.93**	**168.43**

Indexing of cost

The budget for the project has been prepared on the basis of rates applicable during April 2020. The cost of the project may be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI).

Table 4.18. Plantation/treatment area summary for Forestry Interventions (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**
Natural	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban/peri-urban	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Conservation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Soil moisture conservation activities will be undertaken in forest areas in Yamuna catchment in Delhi (Table 4.18) for which a budgetary provision of Rs. 904.23 lakh has been made, out of it Rs. 729.05 lakh is provided for five-year Phase I (Table 4.19).

Table 4.19. Cost summary for Forestry Interventions (Rs. in lakh)

	Year1	Year 2		Year 3		Year 4	Year 5	Phase I			Phase II	Grand total
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**Total**		
Natural	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban/peri-urban	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Conservation	180.00	189.00	47.25	0.00	99.23	104.18	109.40	369.00	360.05	729.05	175.17	904.23
Total	**180.00**	**189.00**	**47.25**	**0.00**	**99.23**	**104.18**	**109.40**	**369.00**	**360.05**	**729.05**	**175.17**	**904.23**

Table 4.20. Year-wise cost summary for supporting activities (Cost Rs.in Lakhs)

S. no.	Supporting Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Awareness generation	3.00	3.50	3.50	2.00	2.00	14.00
2	Capacity building and value-chain development	2.00	2.50	2.50	2.00	2.00	11.00
3	Entry point activities	0.00	0.00	0.00	0.00	0.00	0.00
4	Nursery improvement and fire protection	0.00	0.00	0.00	0.00	0.00	0.00
5	Research	20.00	10.00	10.00	10.00	10.00	60.00
6	Monitoring and evaluation	3.00	5.00	5.00	3.00	2.00	18.00
	Total	**28.00**	**21.00**	**21.00**	**17.00**	**16.00**	**103.00**

Table 4.21. Year-wise details of PMU (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Recurring	2.00	2.97	3.47	2.85	3.00	14.29
2	Non-recurring	2.97	2.00	1.50	1.00	0.85	8.32
	Total	**4.97**	**4.97**	**4.97**	**3.85**	**3.85**	**22.61**

Table 4.22. Field activities, contingency and miscellaneous expenses (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Field activities, contingency and miscellaneous costs	11.00	7.83	7.83	8.08	8.08	42.82

Table 4.23. Area in Conservation Intervention (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Delhi forest areas			0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Table 4.24. Cost for Conservation intervention (Rs. in lakh)

	Year 1	**Year 2**		**Year 3**		**Year 4**	**Year 5**	**Phase I**		**Phase II**	**Grand total**
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	totalMaint.	Maint.	
Delhi forest areas	**180.00**	**189.00**	**47.25**	**0.00**	**99.23**	**104.18**	**109.40**	**369.00**	**360.05**	**175.17**	**904.23**
Total	180.00	189.00	47.25	0.00	99.23	104.18	109.40	369.00	360.05	175.17	904.23

Table 4.25. Division-wise area and cost summary for different landscapes (Area in ha and cost in lakh rupees)

	Natural			**Agriculture**			**Urban/peri-urban**			**Conservation**			**Total**		
Division	**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**	
	Est.	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**
Delhi Forest Department										0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**369.00**	**360.05**	**0.00**	**369.00**	**360.05**

Table 4.26. Division-wise area and cost summary for different landscapes (Area in ha and cost in lakh rupees)

	Phase I			**Phase II**	**Grand total**
Division	**Area**	**Cost**		**cost**	
	Est.	**Est.**	**Maint.**	**Maint**	**cost**
Delhi forest	0.00	369.00	360.05	175.17	904.23
Total	**0.00**	**369.00**	**360.05**	**175.17**	**904.23**

Table 4.27. Model- wise area and cost summary (Area in ha and cost in lakh rupees)

	Phase I		Phase II	Grand total
Landscape	**Area**	**Cost**	**Cost**	**Cost**
Natural	0.00	0.00	0.00	0.00
Agriculture	0.00	0.00	0.00	0.00
Urban/peri-urban	0.00	0.00	0.00	0.00
Conservation	0.00	0.00	0.00	0.00
YM/DL/CI/01	0.00	729.05	175.17	904.23
Total	**0.00**	**729.05**	**175.17**	**904.23**

Chapter 5

UTTAR PRADESH

5.1. INTRODUCTION

Situated in the northern part of the country, Uttar Pradesh covers an area of 2,40,928 km^2, which is 7.33% of the geographical area of the country. It is the fourth largest state of the country in respect of geographical area and the largest state from standpoint of population. It is surrounded by Bihar in the east, Madhya Pradesh in the south, Rajasthan, Delhi and Haryana in the west, and Uttarakhand in the north. It touches small areas of Jharkhand and Chhattisgarh in the south eastern corner and Himachal Pradesh in the north-west corner. Nepal flanks the international border of Uttar Pradesh on the north (Fig. 5.1). There are 75 districts and 18 divisions in the state, of which one is a tribal district and there are no hill districts. Owing to the presence of many perennial rivers, the land in a large part of Uttar Pradesh is very fertile and extensively exploited for cultivation. Dotted with various pilgrimage places, the state plays an important role in the politics, education, culture, industry, agriculture and tourism of India.

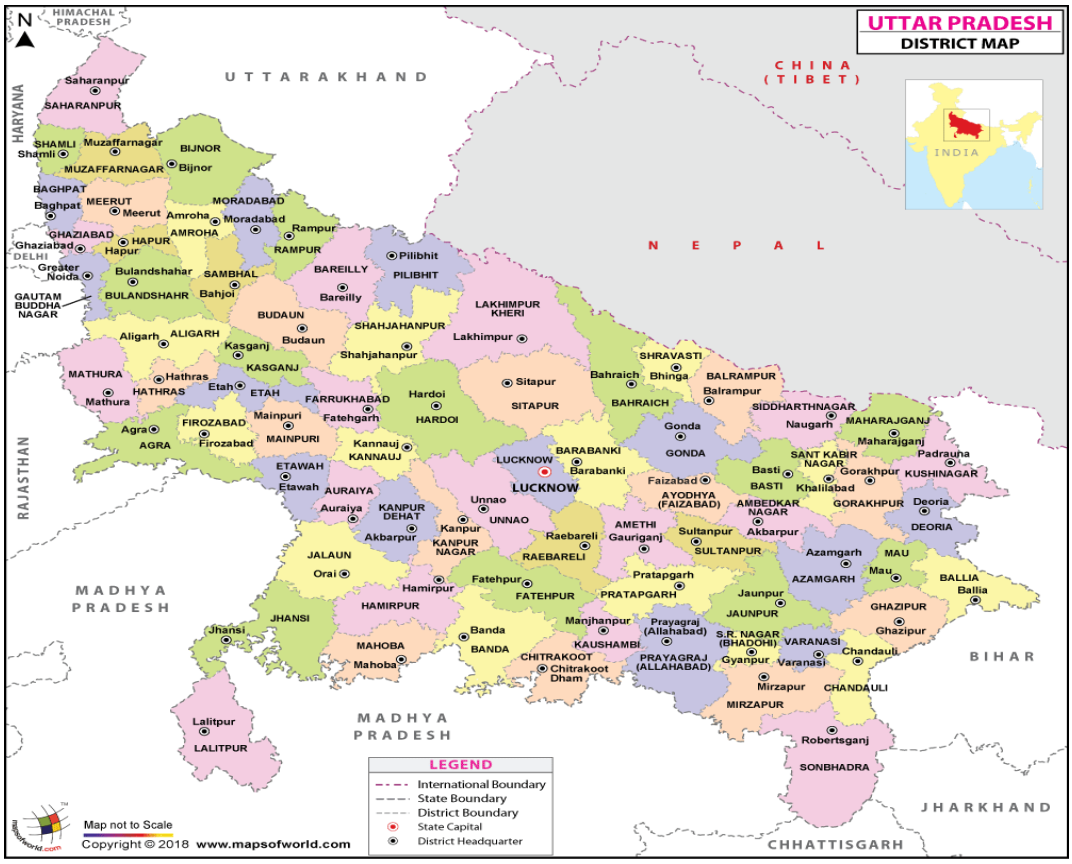


Fig. 5.1. Districts of Uttar Pradesh
(***Source:*** mapsofworld.com)

5.2. GEOGRAPHICAL EXTENT

The state lies between 23°52'N to 31°28'N latitude and 77°30'E to 84°39' E longitude, and has three distinct regions namely, the Shiwalik region in the north, Gangetic plains in the central region and Vindhyan hills in the south. The Gangetic Plains occupy three quarters of the state and include the Ganga-Yamuna Doab, the Ghaghra plains, the Ganga plains and the Terai. The smaller Vindhya Range and plateau region are in the south (Fig.5.2). The state has more than 32 large and small rivers; of them, the Ganga, Yamuna, Sarayu, Betwa, and Ghaghra are larger and of religious importance.

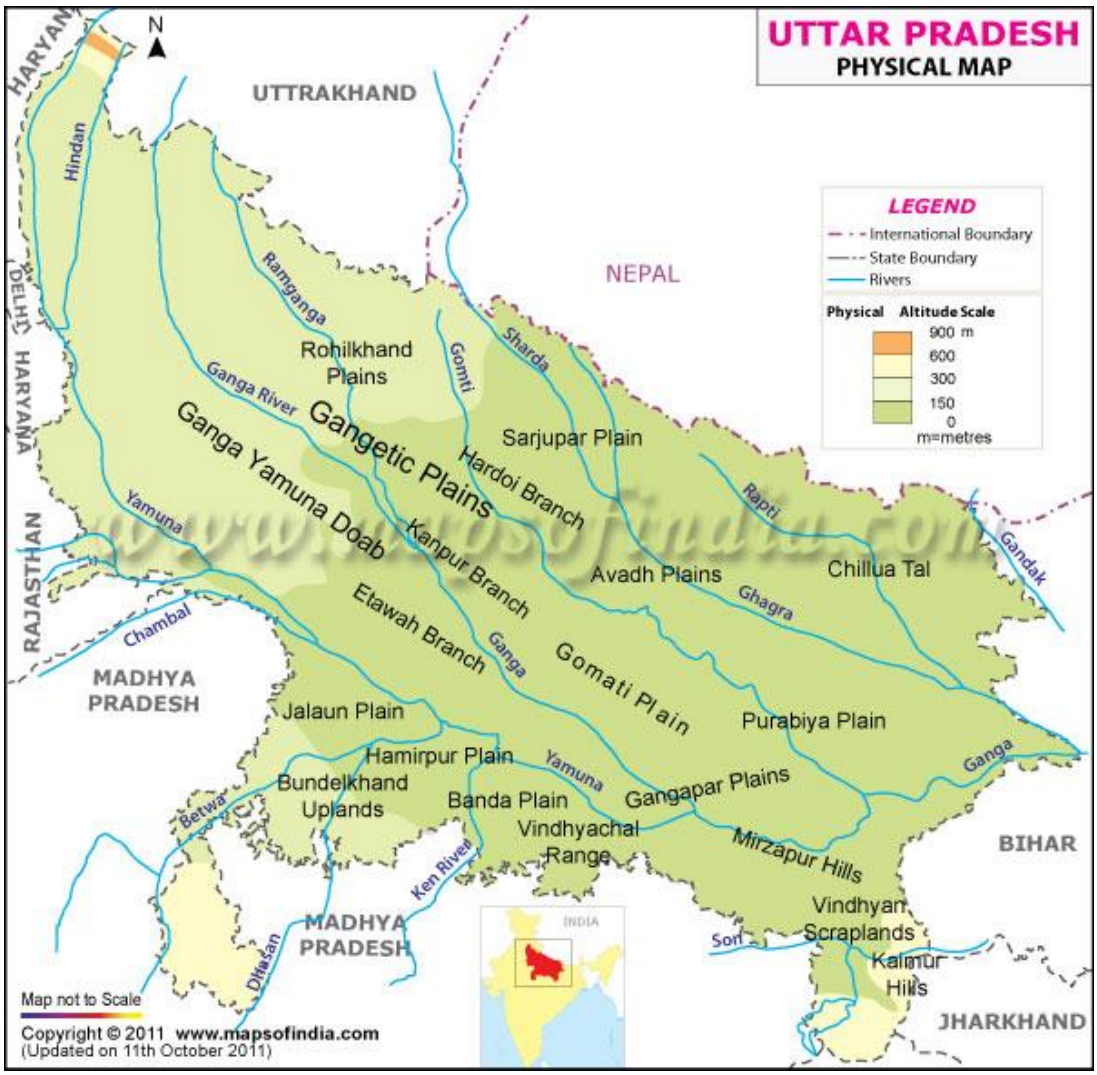


Fig. 5.2. Physical map of Uttar Pradesh
(*Source:* www.mapofindia.com)

5.3. GEOLOGY

The Gangetic Plain lies between the rocky Himalayan belt in the north and the southern hilly tract comprising mainly Pre-Cambrian rocks. Gangetic Plain is filled with recent alluvial sediments which are at places more than 1,000 m. thick and an amalgam of sand, silt, clay in varying proportions. The southern hilly tract is roughly parallel to the Ganga-Yamuna lineament. The tract is underlain by granitic complex in Bundelkhand region and in Sonbhadra. It is overlain by rocks Mahakoshal (Bijawar) and Vindhyan Super group. The younger rocks consist of coal bearing Gondwana in south Sonbhadra and basaltic rocks in southern part of Lalitpur (GoUP, 2019).

5.4. TOPOGRAPHY AND SOILS

5.4.1. Topography

Uttar Pradesh has four distinct topographical regions:

a. The Terai Region

The northern part of the upper Gangetic Plains adjacent to Nepal is known as terai region. This area has rich plant diversity, many wetlands, lakes and ponds. The terai area which is covered with tall elephant grass and thick forests interspersed with marshes and swamps. The sluggish rivers of the bhabhar deepen in this area, their course running through a tangled mass of thick undergrowth. The terai runs parallel to the bhabhar in a thin strip.

b. The Gangetic Plain

The Gangetic plains fall between the Himalayas in the north and Vindhyas to the south. This region is characterized by warm wet summers and dry cold winters. Due to extensive agricultural practices, population pressure, excessive felling of trees, overgrazing, fire and human interference, forests have been degraded to open scrub vegetation with scattered small trees. Its flat topography is broken by numerous lakes, ponds and rivers.

c. The Bundelkhand Region

It is a large rugged territory mainly consisting of low rising hills, valleys and plateaus in between the Gangetic Plain in the north and Deccan Peninsula in the south. It has limited water availability.

d. The Vindhya Range and Plateau Region

This region is in the south and is characterized by hard rock strata and a varied topography of hills, plains, valleys and plateaus.

5.4.2. Soils

Six well defined and distinct soil groups differing from one another in their geological formation and pedogenic characters have been recognized. These are bhabhar soils, terai soils, Vindhyan soils, Bundelkhand soils, Aravalli soils and alluvial soils. Each of these soil groups have developed under the combined influence of a wide range of soil forming factors including climate, vegetation and parent materials. The major coverage of alluvial soil is further grouped as saline/alkaline soils, *Karail* soils and *Bhatt* soils. The major part of the state has highly fertile alluvial soil. The rivers originating in the Himalayas bring the products of weathering of rocks in various degree of fineness and deposit them in the plains. The soil in Terai region is rich in

humus and has high water retaining capacity. The soil of the Bundelkhand is less fertile (Singh *et al*., 2013).

5.5. CLIMATE

Uttar Pradesh has a humid sub-tropical climate with dry winters. The annual rainfall ranges between 1,000 to 1,200 mm and the annual temperature varies from 5° to 46°C. It experiences four seasons. The winter in January and February is followed by summer between March and May and the monsoon season between June and September. Summers are extreme with temperatures fluctuating anywhere between 40° and 50°C in parts of the state for many weeks. Low relative humidity of around 20% prevails during summer and hot dust-laden winds called *loo* blow throughout the season. The mean annual rainfall ranges from 650 mm in the southwest corner of the state to 1,000 mm in the eastern and south-eastern parts, and 1,700 mm in hilly areas to 840 mm in western Uttar Pradesh. The Vindhya Range and plateau receive 1,000 and 1,200 mm rainfall. The Bay of Bengal branch of monsoon is the major bearer of rain in most parts of state. Rain due to the western disturbances and north-east monsoon also contribute small quantities towards the overall precipitation of the state.

5.6. RIVER SYSTEM AND HYDROLOGY

5.6.1. River System

Uttar Pradesh has more than 32 large and small rivers which include Ganga, Yamuna, Gomti, Ghaghra, Betwa, Chambal and Gandak. The river Ganga flows over the fertile plains and receives the Ramganga before reaching Prayagraj, where it is joined by the Yamuna on its right bank. The Chambal, the Betwa and the Ken are the principal streams flowing into the Yamuna and they drain considerable areas of Madhya Pradesh. After Prayagraj, the river sweeps for another 245 km to Varanasi and receives the Tons from the south. The Gomti joins it immediately downstream Varanasi. The Ganga flows approximately in the direction of north-west to southeast. The Ganga basin is roughly rectangular in shape, the width in the western end where the Yamuna and the Chambal originate from the north and the south, respectively (Fig. 5.3).

The Yamuna exits Uttarakhand, onto the Indo-Gangetic Plain, along the border between Uttar Pradesh and Haryana state to the west. The Eastern and Western Yamuna canals are fed from the river at that point. The Yamuna then passes Delhi, where it feeds the Agra Canal. South of Delhi, and now wholly within Uttar Pradesh, it turns south-eastwards near Mathura and passes Agra, Firozabad and Etawah. Downstream Etawah it receives a number of southern tributaries, the largest of which are the Chambal, the Sindh, the Betwa, and the Ken. Near Prayagraj, after a course of about 1,376 km, the Yamuna joins the Ganga. The confluence of the two rivers is an especially sacred place to Hindus and is the site of annual festivals, as well as the famous *Kumbh Mela*, which is held every 12 years and is attended by millions of devotees.

The *Ganga-Yamuna Doab* is the segment of the Indo-Gangetic Plain in western and south-western Uttar Pradesh state between the Ganga and Yamuna rivers, west of the Upper Ganga Plain. It has an area of about 60,500 km^2. The *doab* (river basin) is about 800 km in length and 100 km in width and consists of a wide trough between the Great Himalayas to the north and the Deccan plateau to the south. It was formed by sediment deposited by rivers flowing southward from the Himalayas.

The *doab* region can be categorised into three sections: upper, middle, and lower. The Upper Doab extending from Haridwar on the north to Aligarh on the south has gentle slope

and is criss-crossed by a number of streams. Secondary transverse slopes on older floodplains have developed in the Middle Doab. Lower Doab have flat topography, where the Sindh, Betwa, and Ken run parallel to each other. Geologically, the whole region forms part of the alluvial Indo-Gangetic trough. Forests, occurring in patches, are composed of acacia and teak. The economy of this region is dominated by agriculture based on intensive cultivation and crop rotation; crops include cereals, pulse (legumes), sugarcane, fruits, and vegetables. Livestock raising and dairy farming are also important. The region is also highly industrialized and produces refined sugar, printed calico, fans, automobile radiators, insulated wire, textile machinery, textiles, brass and copper utensils, and railroad equipment. Roads and railways link the regional centres, and there is an airport in Prayagraj. Meerut, Aligarh, Agra (Fig. 5.4), Saharanpur and Ghaziabad are other important cities. The doab is one of the most fertile and densely populated regions in India (Britannica, 2016).

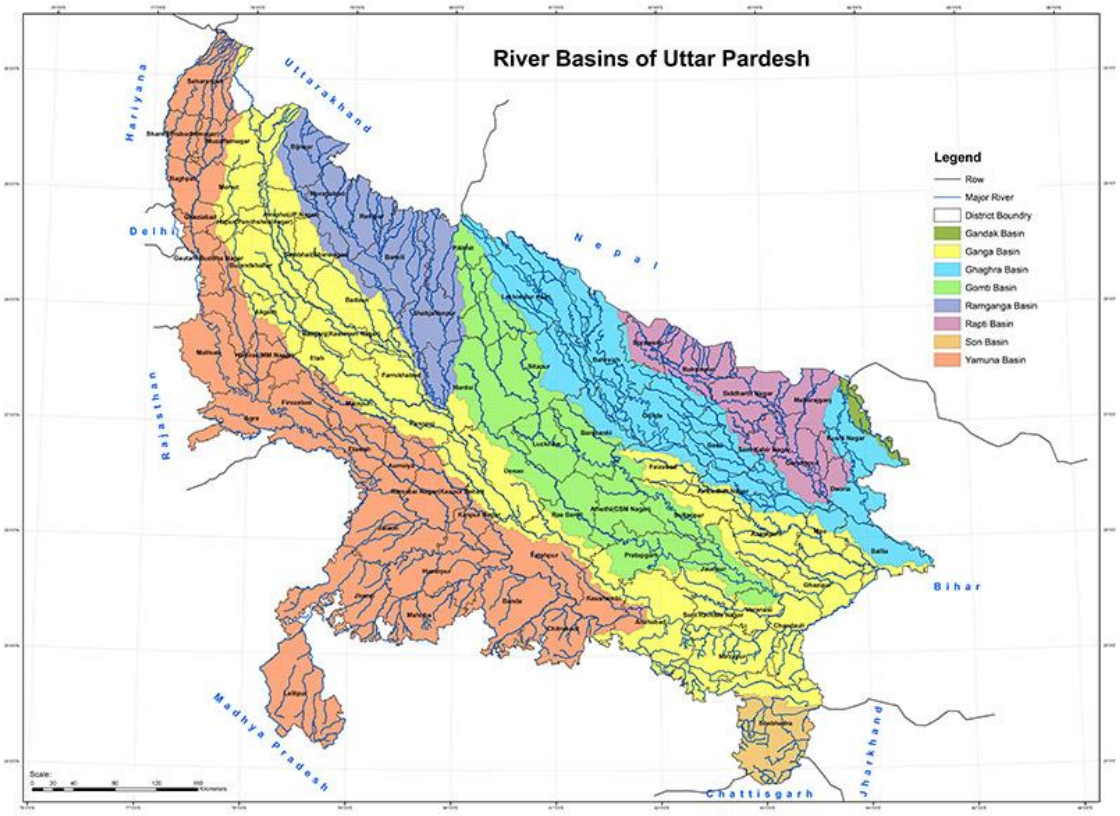


Fig. 5.3. River basins of various rivers/ tributaries in Uttar Pradesh
(***Source:*** www.idup.gov.in)

5.6.2. Yamuna River Tributaries

Important tributaries of Yamuna in Uttar Pradesh are as follows:

Hindon

Hindon River originates in Saharanpur District, from the Shiwalik range. The river is entirely rainfed and has an approximate catchment area of 7,083 km^2. It flows between the Ganga and Yamuna rivers for 400 km through Muzaffarnagar, Meerut, Baghpat, Ghaziabad, Noida, Greater Noida before it joins the Yamuna just outside Delhi. Its tributary, Kali river, which originates in upper Shiwalik range in Uttarakhand, travels about 150 km through Saharanpur, Muzaffarnagar,

Meerut and Baghpat districts, and merges with Hindon River. The Kali river is also highly polluted and adds to the pollution of the Hindon, as it passes through populated and industrial belt of Uttar Pradesh.



Fig. 5.4. UNESCO heritage site Taj Mahal on the bank of Yamuna River in Agra
(***Source:*** https://www.flickr.com/photos/twiga_swala)

Betwa

Betwa or Betravati is a river in Northern India, and a tributary of the Yamuna (Fig. 5.5). It rises in the Vindhya Range (Raisen) just north of Hoshangabad in Madhya Pradesh and flows north-east through Madhya Pradesh and Orchha to Uttar Pradesh. Nearly half of its course, which is not navigable, runs over the Malwa Plateau. The confluence of the Betwa and the Yamuna rivers is Hamirpur town in Uttar Pradesh, in the vicinity of Orchha. The length of the river from its origin to its confluence with Yamuna is 590 km, out of which 232 km lies in Madhya Pradesh and remaining 358 km in Uttar Pradesh. The Betwa River is being linked with the Ken River as a part of the river interlinking project in Madhya Pradesh.



Fig. 5.5. A scenic view of Betwa River
(***Source:*** Project Team**)**

Chambal

It is a legendary river and finds mention in the ancient scriptures. The perennial Chambal originates at Janapav, south of Mhow town, near Manpur, Indore, on the south slope of the Vindhya Range in Madhya Pradesh. The Chambal and its tributaries drain the Malwa region of north-western Madhya Pradesh, while its tributary, the Banas which rises in the Aravalli Range, drains south-eastern Rajasthan. It ends a confluence of five rivers, including the Chambal, Kwari, Yamuna, Sind, Pahuj, at Pachnada near Bhareh in Uttar Pradesh state, at the border of Bhind and Etawah districts.

Ken

The Ken River is one of the major rivers of the Bundelkhand region of central India and flows through two states, Madhya Pradesh and Uttar Pradesh (Fig. 5.6). The Ken originates near village Ahirgawan on the north-west slopes of Barner Range in Katni district and travels a distance of 427 km, before merging with the Yamuna at Chilla village, district Banda in Uttar Pradesh. Ken has an overall drainage basin of 28,058 km^2. Out of its total length of 427 km, it flows for 292 km in Madhya Pradesh, 84 km in Uttar Pradesh and 51 km forms the boundary between the two states.



Fig. 5.6. Ken River
(***Source:*** Project Team**)**

Sind/ Sindh

The Sindh originates on the Malwa Plateau in Vidisha district, Madhya Pradesh and flows north-northeast through the districts of Guna, Ashoknagar, Shivpuri, Datia, Gwalior and Bhind in Madhya Pradesh to join the Yamuna River in Jalaun district, Uttar Pradesh, just after the confluence of the Chambal River with the Yamuna River. It has a total length of 470 km, out of which 461 km are in Madhya Pradesh and 9 km are in Uttar Pradesh.

5.6.3. Other Water Sources and Aquifers

There are 2,351 natural and men-made inland wetlands in Uttar Pradesh that includes 310 rivers/streams, 504 reservoirs/barrages and 899 small wetlands (<2.25 ha). Area under wetlands inside Recorded Forest (or Green Wash) is 3.14% (Table 5.1; FSI 2019).

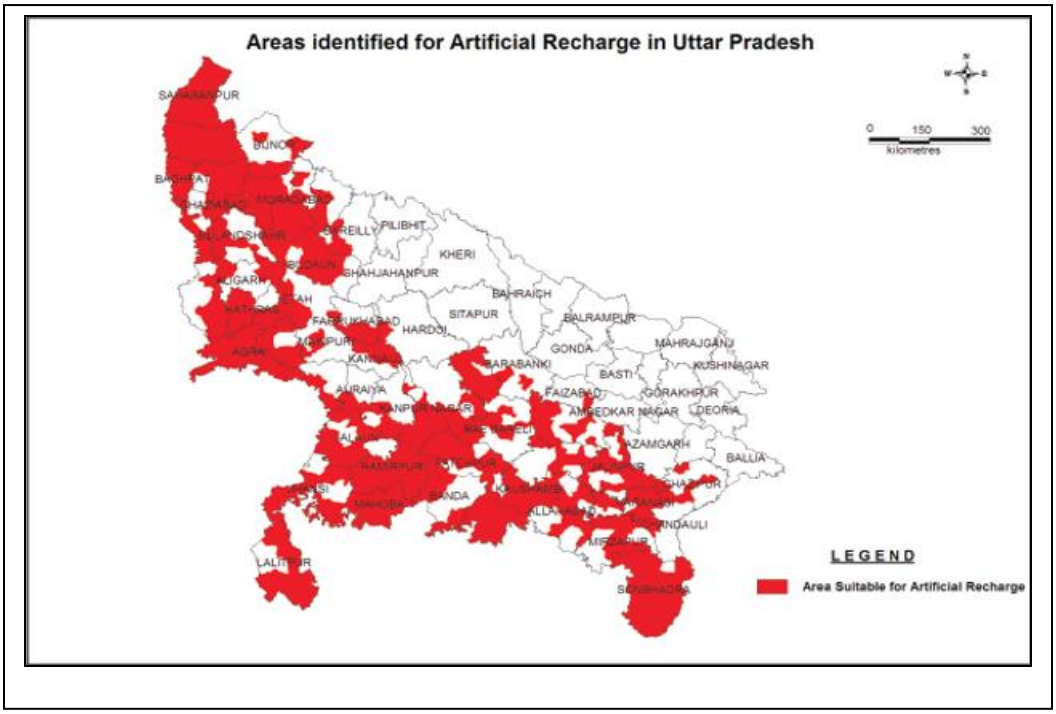
Table 5.1. Wetlands inside the recorded forest area (or green wash) in Uttar Pradesh

Wetland category	No. of wetlands	Total wetlands area (ha)
Inland wetlands-natural		
Lake/Pond	92	924
Ox-bow lake/Cut-off meander	47	742
Riverine wetland	103	1,079
Waterlogged	240	3,035
River/Stream	310	26,048
Sub-Total	**792**	**31,826**
Inland wetlands-man-made		
Reservoir/Barrage	504	8,754
Tank/Pond	106	353
Waterlogged	50	390
Sub-Total	**660**	**9,497**
Wetlands (<2.25 ha)	899	899
Total	**2,351**	**42,224**
Total recorded forest (or green wash) area (ha)		**13,43,375**
Per cent of wetland area inside recorded forest (or green wash) area		**3.14%**

The state of Uttar Pradesh forms part of the vast Gangetic Alluvial Plain covering an area of 2,40,928 km^2. The state is a part of the Ganga basin comprising the Yamuna, Ram Ganga, Gomti, Ghaghra and Sone sub basins. The alluvial plains and southern rocky terrain are the main water bearing formations for ground water availability. To adopt sound and scientific management of groundwater resources, artificial recharge plan has been prepared using the hydro geological and hydrological data base. Identification of suitable areas for recharge has been done by considering the feasibility of different ground water assessment units. A total of 335 blocks falling in 52 districts covering 1,10,783.14 km^2 area (1,03,621.93 km^2 for alluvial are and 7,161.21 km^2 for hard rock area) have been identified as feasible for artificial recharge (Fig.5.7). From this, the rechargeable areas for aquifers in the Yamuna Basin fall in the districts of Jhansi, Lalitpur, Jaunpur, Agra, Prayagraj, Kanpur, Saharanpur, Meerut, etc. (CGWB, 2013).

5.6.4. Hydrology

The total replenishable ground water potential of the country has been estimated as 431.2 BCM yr^{-1}. The replenishable ground water potential of Uttar Pradesh is 75.25 BCM yr^{-1} which is 17.5% of the national potential (CWC, 2013). The river and canal length in the state is 28,500 km, the highest in India.



(***Source:*** CGWB, 2013)

5.6.5. Issues about Water Resources

There are 64 monitoring locations on 16 rivers in Uttar Pradesh out of which 42 locations are exceeding the water quality criteria limit with respect to BOD (CPCB, 2015). These 42 non-compliant locations are situated on 13 rivers: Gomti, Hindon, Kalinadi, Ramganga, Rapti, Rihand, Sai, Saryu, Ganga, Yamuna and Kosi. These rivers are classified in four priority classes (Class – I, III, IV and V). The details of polluted river stretches are provided in Table 5.2.

Table 5.2. Polluted river stretches in Uttar Pradesh

S. no.	River name	Stretch identified	Town identified	Approx. length of the stretch (km)
1	Betwa	Hamirpur to Wagpura	Hamirpur, Jhansi	60
2	Hindon	Saharanpur to Ghaz iabad	Saharanpur, Muzaffarnagar, Meerut, Ghaziabad	200
3	Yamuna	Asgarpur (Noida) to Etawah, and Shahpur to Prayagraj (Balua Ghat)	Gautam Buddha Nagar (Noida and Greater Noida), Vrindavan, Mathura, Agra, Shahpur	600

The Hindon is highly polluted. Industries in western Uttar Pradesh discharge their effluents, often with no treatment, directly into the Hindon River. Official records state that 151 of the 400 villages on the banks of the river have reported ailments like cancer, neurological and digestive disorders and skin and respiratory infection due to the contaminated water (Jeelani, 2016). As per water quality data of CPCB, 2014 the coliform count of many tributaries of Yamuna (Hindon, Betwa, etc.) in Uttar Pradesh is many times than the safe limit of 5,000 MPN 100 ml^{-1} (MPN stands for most probable number) for bathing (Fig. 5.8).

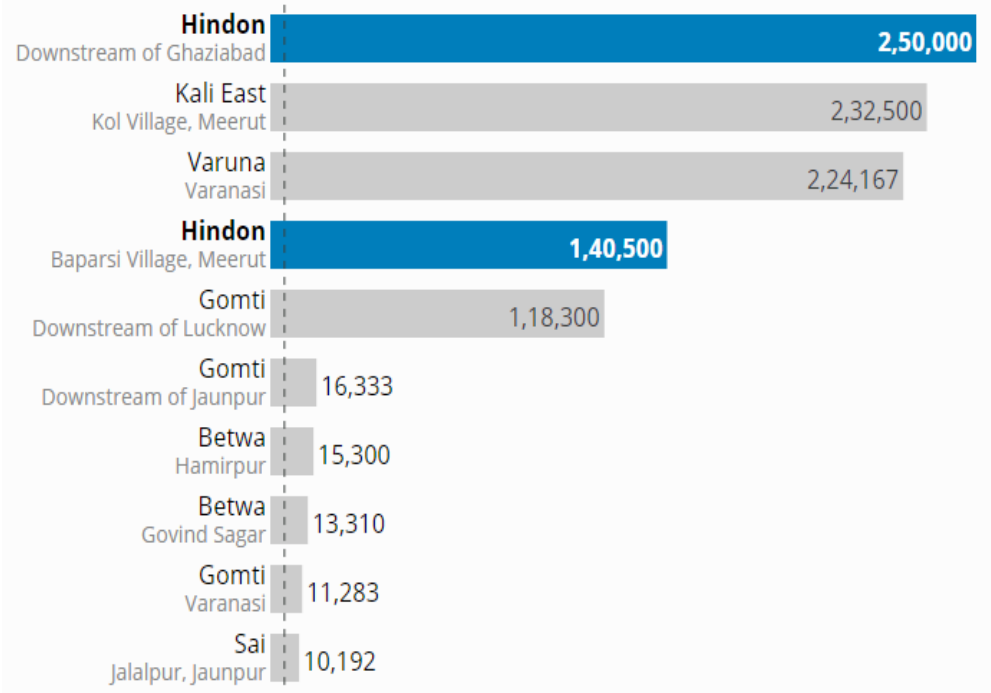


Fig. 5.8. Water quality of Yamuna tributaries in Uttar Pradesh

(***Source:*** CPCB, 2014)

Weathering of the rock material found along the river makes Ken rich in sand, which is of light orange colour quartz. It is coarser with particles bigger than usual grey colour sand. This sand is locally known as *morang*. The general perception is that the *morang* makes stronger bond with cement. Hence, it is mined indiscriminately and used widely in construction. This virtue of *morang* has made Ken River a preferred destination for organized sand mafias in the region. The stretch of river particularly in Panna and Banda districts are hotspots for large illegal sand mining. The river also forms the boundary between MP and UP for about 53 km. This stretch is routinely ravaged by mechanized excavation of riverbed (Rawat, 2019). The farmers whose crops are damaged during sand transportation process through their fields, and also the villagers, suffer in multiple ways including lack of water in the river and falling groundwater due to illegal mining operation. These impacts remain unaddressed. Moreover, the adverse impact of mindless mining on river aquatic biodiversity and riparian flora and fauna is not even assessed. The turtles, fish, crabs, gharials, water birds, etc. are at receiving end of illegal mining activities.

5.7. FORESTS AND VEGETATION

As per the Champion and Seth Classification of Forest Types (1968), the forests in Uttar Pradesh belong to five Forest Type Groups which are further divided into 28 Forest Types. Major part of the state is agrarian. In recent years, massive plantation programmes have been taken up in the state to increase the forest and tree cover. Through the Nursery Management Scheme, tall saplings of 8' to 12' height are also being raised for planting. During the plantation season of 2019, more than 225 M saplings were planted across the state under the *Vriksha Mahakhumbh* Programme. To promote tree plantations outside forest areas, improve livelihoods and enhance income of the farmers, the state Government has exempted most of the trees species from felling and transit rules. Recorded Forest Area (RFA) in the State is 16,582 km^2 of which 12,070 km^2 is Reserved Forest, 1,157 km^2 is Protected Forest and 3,355 km^2 is Unclassed Forests (Fig. 5.9; FSI, 2019).

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period October 2017 to January 2018, the forest cover in the state is 14,805.65 km^2 which is 6.15% of the state's geographical area (Table 5.3). In terms of forest canopy density classes, the State has 2,616.43 km^2 under Very Dense Forest (VDF), 4,080.04 km^2 under Moderately Dense Forest (MDF) and 8,109. km^2 under Open Forest (OF). Forest Cover in the State has increased by 126.65 km^2 as compared to the previous assessment reported in ISFR 2017 (FSI, 2019).

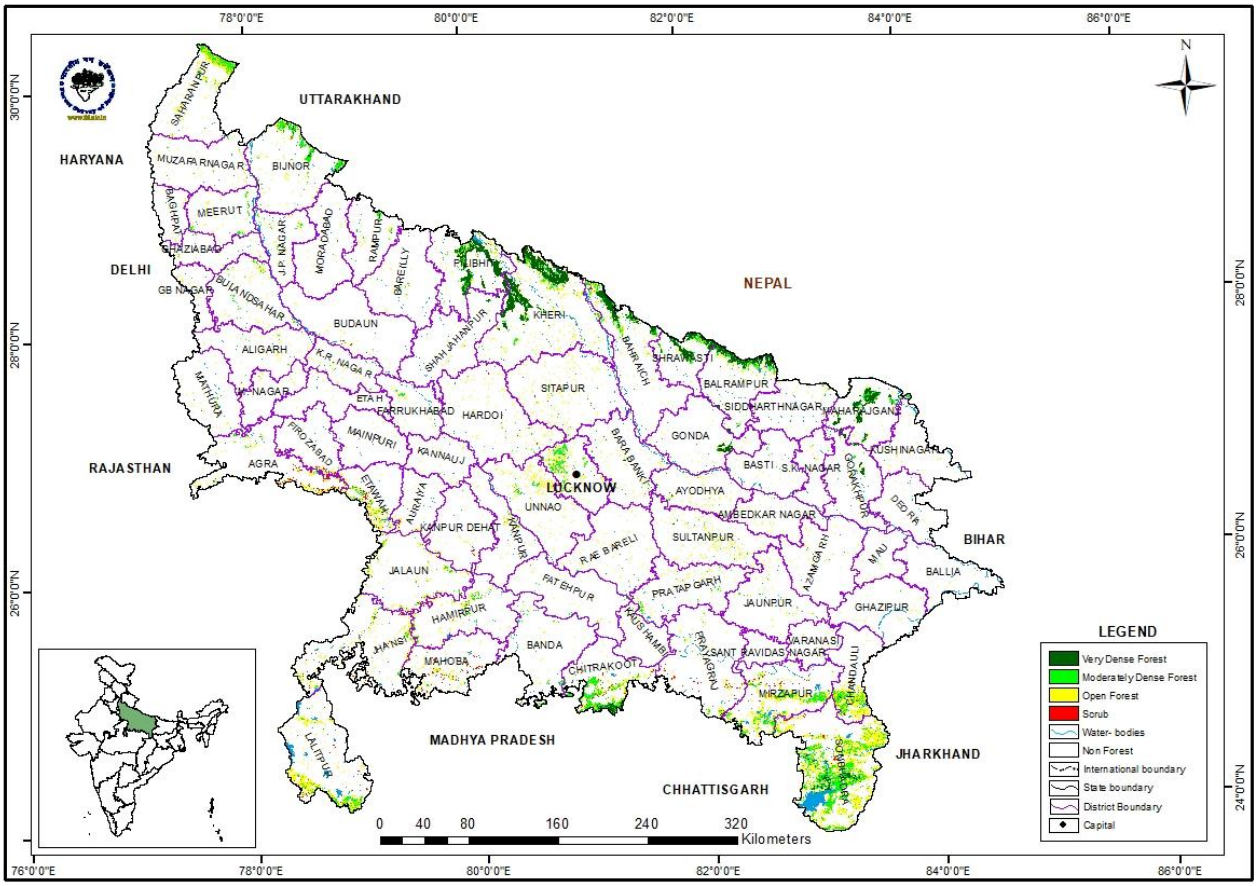


Fig. 5.9. Forest cover map of Uttar Pradesh

(***Source:*** FSI, 2019)

Table 5.3. Forest cover of Uttar Pradesh

Class	Area (km^2)	Per cent of geographical area
Very dense forest	2,616.43	1.09
Moderately dense forest	4,080.04	1.69
Open forest	8,109.18	3.37
Total	**14,805.65**	**6.15**
Scrub	586.52	0.24

(***Source:*** FSI, 2019)

Forests in Uttar Pradesh primarily lie (97.25%) in the altitude zone of 0-500m and same is valid for scrubs. More than 50% of it is of poor quality of OP (Table 5.4; FSI, 2019).

Table 5.4. Altitude-wise forest cover (km^2) in Uttar Pradesh

Altitude zone(m)	Geographical area (km^2)	Very dense	Moderately dense	Open	Total	Scrub
0-500	2,40,458	2,617	3,894	7,888	14,399 (97.25%)	585
500-1,000	470	0	186	221	407 (2.75%)	2
Total	**2,40,928**	**2,617**	**4,080**	**8,109**	**14,806**	**587**

(***Source:*** FSI, 2019)

The plains of Uttar Pradesh were very rich in natural vegetation which has, however, diminished due to exploitation for agricultural expansion. Tropical dry deciduous forests are found in all parts of the plains, and usually in central eastern and western regions. Important trees are sal, palas, amaltas, bel, fig, etc. Neem, peepal, sheesham, mango, jamun, babool, imli (Tamarind), etc. grow along riverbanks and in other moist regions. Tropical thorny forests are mostly found in south-western parts of the state. Such forests are confined to the areas which have low annual rainfall (500-700 mm), mean annual temperature between 25^o degree to 27^{o}C and low humidity (less than 47%). Widely scattered thorny trees, mainly, babool, thorny, legumes and Euphorbias are extensively found here (up.gov.in › upwealth).

5.8. WILDLIFE

One national park and 26 wildlife sanctuaries constitute the Protected Area Network of the state covering 11.82% of its geographical area. Dudhwa National Park located in the state is known for successful translocation of one-horned rhinoceros (FSI, 2019). Several species of large and small mammals, reptiles, and insects are found in the forests. The Ganga and its tributaries are the habitat of large and small reptiles, amphibians, fresh-water fish and crabs. Animals such as the chinkara are found in the arid Vindhyas. Other animals in the state include reptiles such as lizards, cobras, kraits, and gharials. Among the wide variety of fishes, the most common ones are mahaseer and trout. Some animal species in Uttar Pradesh have gone extinct in recent years, while others, like the lion from the Gangetic Plain and the rhinoceros from the Terai region, have become endangered. Many species are vulnerable to poaching.

Uttar Pradesh is known for its extensive avifauna (Fig. 5.10). Bird sanctuaries in the state include Bakhira, National Chambal, Chandra Prabha, Hastinapur, Kaimoor and Okhla Sanctuary. The most common birds which are found in the state are doves, peafowl, jungle fowl, black partridges, house sparrows, songbirds, blue jays, parakeets, quails, bulbuls, comb ducks, kingfishers, woodpeckers, Snipes, and parrots.



Fig. 5.10. Rich avifaunal diversity in Yamuna River at Prayagraj
(***Source:*** Project Team**)**

The Chambal River is considered pollution free,[and hosts an amazing riverine faunal assemblage including two species of crocodilians – the mugger and gharial, eight species of freshwater turtles, smooth-coated otters, Gangetic river dolphins, skimmers, black-bellied terns, sarus cranes and black-necked storks, amongst others.

The Ken and Betwa rivers traversing through Central India are major tributaries of the river Yamuna. Both rivers originate above 550 m above sea level in the Vindhya region. An interlinking project proposed for the rivers envisages diversion of water from Ken basin to the Betwa. The river sediment is alkaline and dominated by sand (78-89 %) in both rivers. Oxygen-rich alkaline water and moderate values of chemical parameters show the pollution free and productive nature of both the rivers. There was no statistically significant difference in water quality between the Ken and Betwa rivers, except for total alkalinity. The biotic parameters were observed in similar ranges and moderate condition. A total of 61 planktonic forms were recorded from the rivers out of which 55 were phytoplankton. For the first time, 89 fish species belonging to 10 orders, 26 families, and 62 genera have been recorded in the river Ken, while 81 species classified under 10 orders, 24 families, and 55 genera were found in the Betwa. Exotic fish species were also observed in the downstream stretches of both rivers. Out of the total fish species, 77 were common to both rivers, 12 were found only in the Ken River, and 4 species

were restricted to the Betwa. Analysis of relative abundance showed dominance of *Labeo boggut* in the Ken and *Osteobrama cotio* in the Betwa River. On comparison of the Shannon-Wiener Diversity and Evenness Indices of fish diversity, these indicated slightly higher values in the Ken (3.76 and 0.842) than the Betwa (3.66 and 0.835). A total of nine near-threatened fish species was recorded in the rivers. Both rivers have already been obstructed by many developmental projects; the proposed interlinking would further negatively impact the ecology and fisheries (Joshi *et al.*, 2017).

5.9. AGROECOSYSTEM

The economy of Uttar Pradesh is based mainly on agriculture and round 65% of the total population is dependent on it. Contribution of agriculture sector is significant in economic development of the state. According to the survey of 2014-15, approximately 16.59 M ha (68.7%) land is used for cultivation (Table 5.5). According to Agriculture Survey 2011-12, there are 23.32 M farmers in the state (upagripardarshi.gov.in › staticpages › Uttar Pradesh). Agriculture is the main occupation of 66% of the population of the state. Uttar Pradesh agriculture is highly diversified. It produces numerous crops and is one of the major food-grain producing states in the country. The soils are fertile and there is good rainfall over nearly all the region. Irrigation facilities supply water to about one-third of the cropped area. Wheat, rice, maize, millet, and pulses, such as beans, peas and lentils, are the major food crops. Uttar Pradesh is the country's major producer of sugar cane. Cotton, oilseeds, jute, potatoes, and tobacco are other important cash crops. As part of national and state projects for sericulture (the production of silk fibre), large-scale planting of mulberry trees is under way across the state. Mulberry trees serve as host for the caterpillars of the silkworm moth. The 19th Livestock Census of 2012 has reported a total livestock population of 68.71 M.

Table 5.5. Land use pattern of Uttar Pradesh

Land use type	**Area ('000 ha)**	**Percentage**
Geographical area	24,093	
Reporting area for land utilization	24,170	100.00
Forests	1,659	6.86
Not available for land cultivation	3,507	14.51
Permanent pastures and other grazing lands	65	0.27
Land under misc. tree crops and groves	305	1.26
Culturable wasteland	405	1.68
Fallow land other than current fallows	509	2.11
Current fallows	1,122	4.64
Net area sown	**16,598**	**68.67**

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2014-15.

5.10. DEMOGRAPHY

As per Census 2011, Uttar Pradesh has a population of 199.81 M, which is 16.50% of the country's population. The urban and rural population constitute 22.27 and 77.73%, respectively. The Tribal population is 0.57%. The average population density of the state is 829 km^{-2}, which is more than twice the national average (Census India 2011). Out of the total population of Uttar Pradesh, 10,45,96,415 are males and 9,49,85,062 females; 22.28% per cent people live in urban and 77.72% live in rural area. Kanpur, Lucknow, Ghaziabad and Agra are the largest urban agglomerations. The numbers of urban centres with more than one lakh population have grown

slowly over last thirty years. The growth of urban centres with population less than five thousand have, on the other hand, have grown more significantly and these centres have grown in larger numbers in the western part of the state. The western Uttar Pradesh is agriculturally prosperous; more industrialised and has seen greater degree of urbanisation.

5.11. INDUSTRIES

The state falls under the influence area of key industrial corridors such as North-South and East-West (NS-EW) Corridor and several expressways and highways, conveniently connecting it with the rest of the country. The key industries in the state include food processing, information technology, tourism, mineral-based industries, automobile components, textiles, handlooms and handicrafts, biotechnology, leather-based and sports goods industries. There is an oil refinery at Mathura.

Uttar Pradesh is India's largest milk-producer, second largest producer of hydel power and third largest producer of thermal power. The state is also a leader in the production of agricultural and horticultural crops such as wheat, sugarcane, potato, vegetables, mango, etc. The state has the highest number of cities identified under the Smart Cities Mission of the Central government. Tourism is an important sector. Agra, Mathura, Varanasi, Prayagraj, etc. are prominent places of tourist importance.

5.12. RIVERSCAPE ANALYSIS

5.12.1. Remote Sensing and GIS Methodology

Image processing and GIS tools used in the present assessment were ERDAS Imagine, Geomedia Professional, ArcGIS along with other software packages. The GIS softwares provide the tool needed to store, analyze and display geographic information.

5.12.2. Satellite Data Used

Landsat-8 satellite data for the month of Feb to April 2019 has been used for preparation of Land use/Land cover map of the riverscape. The Row, Path along with Date of Pass of the satellite data used in the current study for the parts of states of and covering the riverscape is given in Table 5.6a.

Table 5.6a. List of data downloaded for the study

State	Path	Row	Date of pass	Satellite
Uttar Pradesh	143	042	06-03-2019	Landsat-8
Uttar Pradesh	143	043	22-03-2019	Landsat-8
Uttar Pradesh	144	042	13-03-2019	Landsat-8
Uttar Pradesh	144	043	29-03-2019	Landsat-8
Uttar Pradesh	145	041	05-04-2019	Landsat-8
Uttar Pradesh	145	042	05-04-2019	Landsat-8
Uttar Pradesh	145	043	05-04-2019	Landsat-8

5.12.3. Ancillary Data

Almost all of the ancillary information has been taken from various Government of India sources. Information about the state and district boundaries for the riverscape taken up for analysis were obtained from the Survey of India. Basin boundary, Catchment boundary, Sub-Catchment boundary, Watershed boundary and Micro-watershed boundaries where obtained from Soil and Land Use Survey of India, New Delhi. Village and Tehsil

boundaries were obtained from the published document 'Administrative Atlas of Uttar Pradesh' by Census of India (2011). Forest Type and Forest Density data were obtained in digital format from Forest Survey of India. Soil map and soil depth information was obtained from published maps of National Bureau of Soil Survey & Land Use Planning, Nagpur. Soil erosion data which is the backbone of multi-criterion analysis was obtained in GIS format from the Indian Institute of Soil & Water Conservation, Dehradun. Topographical sheets on 1:50,000 scale obtained from Survey of India have been used for Geo-reference only. Bhuvan data was also referred, wherever required for the preparation of land use map.

5.12.4. Bank-Line and Highest Flood Level

For the identification of the riverscape the year 2013 was denoted as the highest flood level year based on literature review and stakeholder's consultation on various levels. Then, a post-monsoon satellite image of the year 2013 was used to create the bank-line of the main stem and Hindon, Chambal, Ken, Betwa and Sind tributaries of Yamuna.

5.12.5. Spatial Extent

The riverscape zone for Uttar Pradesh state lies between latitudes 24° 24' 33.437" N to 30° 27' 57.912" N , longitudes 77° 16' 54.255" E to 81° 52' 56.391" E and has an area of 12640.77 km^2. Details of the influence zone under consideration from the viewpoint of DPR are shown in Fig.5.11. and spatial extent presented in Table 5.6b. The area in the riverscape comprises 5.19 % of the geographical area of the state and 28.68% of the entire riverscape.

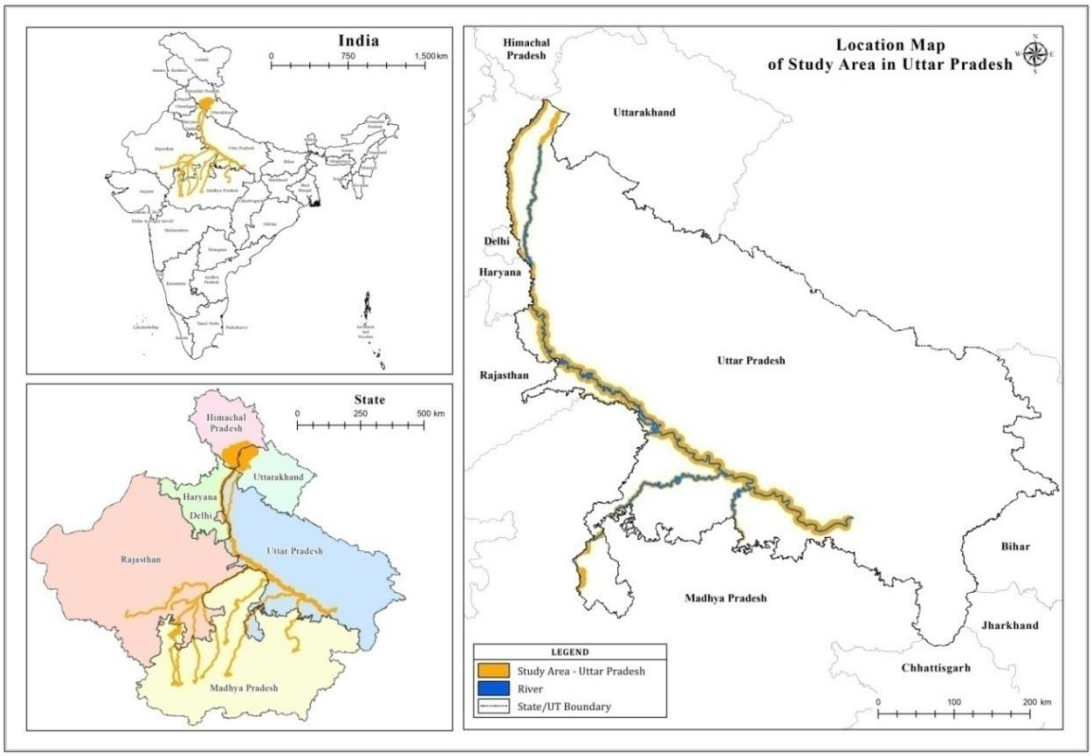


Fig. 5.11. Location map of study area in the state

Table 5.6b. State wise spatial extent of the project area in Uttar Pradesh

Geographical area of state (km^2)	Geographical coordinate (from-to)		Area in riverscape (in km^2)	Percent area of total riverscape
	Lat N	Long E		
2,43,290	24° 24' 33.437" to 30° 27' 57.912"	77° 16' 54.255" to 81° 52' 56.391"	12,640.77	28.68

Six major rivers of the Yamuna Basin, *viz*., Betwa, Chambal, Hindon, Ken, Sindh and Yamuna flow through the state. The river length and area of each river is shown in Table 5.7.

Table 5.7. Major rivers length and area of Uttar Pradesh state

S. no.	Name	River length (km)	Area (km^2)
1	Betwa River	381.75	1,517.18
2	Chambal River	153.80	245.78
3	Hindon River	286.69	1,078.37
4	Ken River	141.74	413.1
5	Sindh River	14.20	28.33
6	Yamuna River	1,253.04	9,358.01
	Total	**2,231.22**	**12,640.77**

5.12.6. Land Use and Land Cover

A total of 15 major land use and land cover types, i.e., agriculture, barren, canal, gullied/ravinous land, industrial area, mining/mining dump, moderately dense forest, open forest, plantation, river (dry)/ river sand, river (perennial), scrub, settlement, waterbody and cloud have been mapped in the riverscape. Agriculture covers maximum area 8,415.03 km^2 of the riverscape, followed by gullied/ravinous land 1,214.68 km^2. The distribution of area under different land cover and land use classes of each river is given in Table 5.8 and Fig. 5.12.

Table 5.8. Distribution of area of different land use and land cover categories of each river in the riverscape

Land use and Land Cover	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area (km^2)
Agriculture	783.69	60.86	823.17	259.16	14.74	6,473.41	8,415.03
Barren	41.75	-	9.07	7.1	-	40.89	98.81
Canal	0.83	-	0.63	0.61	-	12.88	14.95
Gullied/Ravinous land	155.77	76.38	-	56.31	11.65	914.57	1,214.68
Industrial Area	3.07	-	1.64	0.19	-	7.32	12.22
Mining/Mining dump	2.85	-	-	-	0.49	7.01	10.35
Mod. dense forest	26.3	13.07	21.27	5.37	-	105.72	171.73
Open forest	74.58	56.96	16.96	3.56	-	224.9	376.96
River (dry)/River sand	52.37	13.75	15.26	23.07	-	188.74	293.19
River (perennial)	139.34	13.64	6.05	15.7	0.77	301.94	477.44
Scrub	207.92	9.53	12.51	27.35	0.82	397.8	655.93
Settlement	26.79	1.59	135.25	14.44	0.35	659.97	838.39
Waterbody	1.92	-	0.49	0.24	-	11.25	13.90
plantation	-	-	29.59	-	-	9.82	39.41
Cloud	-	-	6.48	-	-	1.64	8.12
Total							**12,640.77**

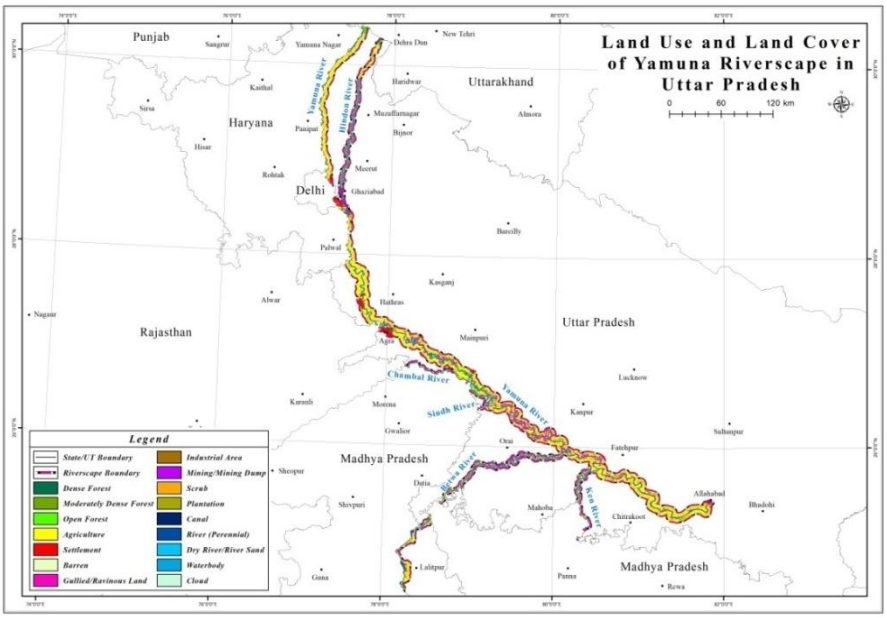


Fig. 5.12. Land use and land cover in Yamuna Riverscape
(Based on information from SLUSI, New Delhi)

5.12.7. Altitude

The area in the riverscape has been grouped into 4 elevation classes. The area under different elevation class of each river is given in Table 5.9.

Table 5.9. Area (km^2) under elevation classes

S. no.	Elevation class (m)	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area (km^2)
1	Less than 250	1,146.52	245.78	933.37	413.1	28.33	9,221.35	11,926.27
2	>250 to <500	370.66	0.00	123.75	0.00	62.18	121.5	678.09
3	>500 to <750	0.00	0.00	20.66	0.00	0.00	15.03	35.69
4	>750 to <1000	0.00	0.00	0.59	0.00	0.00	0.13	0.72
	Total	0.00	0.00		0.00	0.00	0.00	**12,640.77**

5.12.8. Slope

Slope of land is an important locality factor influencing the soil and water runoff and suitability of the area for forestry interventions. Lands with steep slopes are prone to soil erosion and hence do not support growth of most of the plant species unless suitable stabilization measures are adopted. The land in Uttar Pradesh has been grouped into 10 classes of slope from less than 0.25 to more than 40 degrees. The distribution of areas under different slope classes of each is given in Table 5.10 and Fig. 5.13. The maximum area of Uttar Pradesh falls in slope class 3, i.e., >5 to <10^o slope.

Table 5.10. Distribution of area under different slope categories of each river

S. no.	Slope classes (°)	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area (km^2)
1	Less than 2.5	203.55	26	132.09	54.84	1.86	1,211.31	1,629.65
2	>2.5 to <5	296.06	45.21	231.79	90.3	4.93	1,940.69	2,608.98
3	>5 to <10	643.31	102.39	475.42	182.5	12.04	4,074.18	5,489.84
4	>10 to <15	292.34	52.73	191.16	71.65	6.83	1,744.58	2,359.29
5	>15 to <20	66.91	15.17	30.8	11.18	2.11	316.99	443.16
6	>20 to <25	11.08	3.17	7.48	1.77	0.41	45.93	69.84
7	>25 to <30	2.87	0.8	4.63	0.63	0.1	14.15	23.18
8	>30 to <35	0.76	0.22	2.62	0.18	0.03	5.92	9.73
9	>35 to <40	0.21	0.06	1.3	0.04	0.01	2.55	4.17
10	Greater than 40	0.09	0.03	1.08	0.01	0.01	1.71	2.93
	Total							**12,640.77**

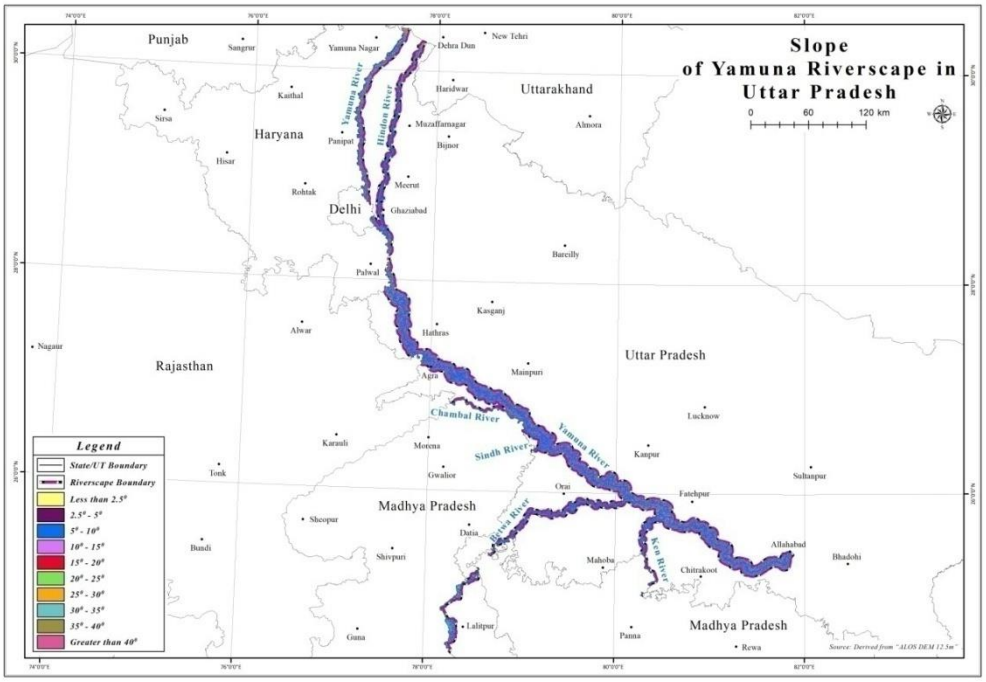


Fig. 5.13. Slope categories in the Yamuna Riverscape
(Based on information from SLUSI, New Delhi)

5.12.9. Soil Erosion

A total six categories of the erosion classes have been mapped in Uttar Pradesh, *viz*., less than 5, 5-10, 10-20, 20-40 and more than 40 t $km^{-2}yr^{-1}$. An area of 1,569.09 km^2 falls in the sixth class of non-soil category. These areas may not be suitable for forest plantations. The distribution of areas under different erosion classes and their area is given in Table 5.11 and Fig. 5.14.

Table 5.11. Distribution of area under different soil erosion categories (km^2)

S. no.	Soil erosion class ($t\ km^{-2}\ yr^{-1}$)	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area
1	**<5**						4.21	4.21
2	**5-10**	18.04					54.63	72.67
3	**10-20**	194.63	131.65	927.33	36.39	26.08	4,541.02	5,857.1
4	**20-40**	91.64	13.86	68.13	54.78		1,295.13	1,523.54
5	**>40**	847.16	48.69	18.76	245.87		2,453.68	3,614.16
6	**Non-soil**	365.71	51.58	64.15	76.06	2.25	1,009.34	1,569.09
		1,517.18	**245.78**	**1,078.37**	**413.10**	**28.82**	**9,357.86**	**12,640.77**

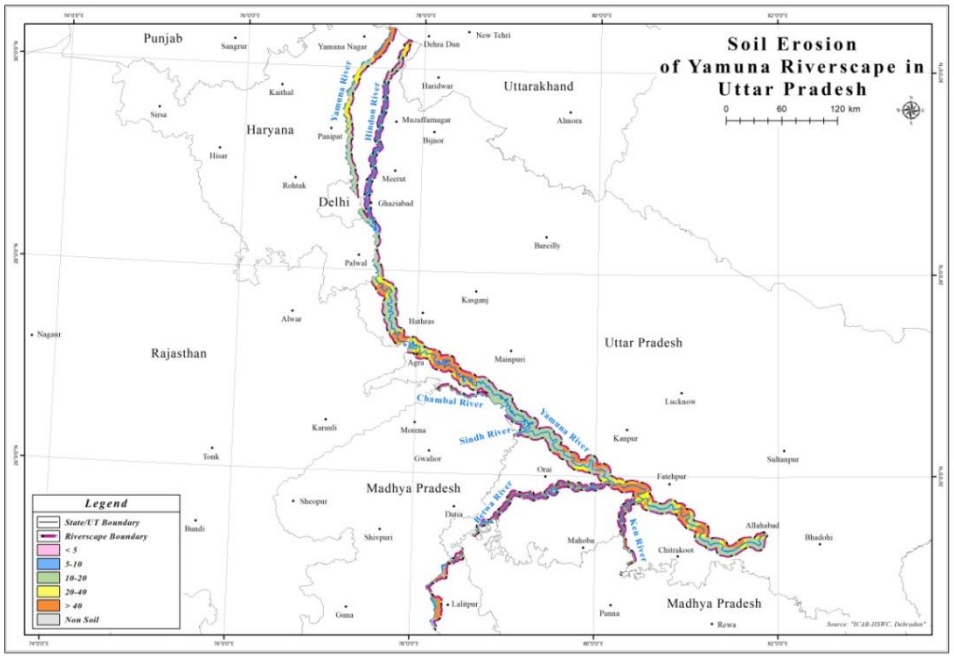


Fig. 5.14. Soil erosion classes in Yamuna Riverscape
(Based on information from ICAR-IISWC, Dehradun)

5.12.10. Soil Depth

Soil depth is one of the most important factors governing the selection of species for plantation. The depth of soil is very important for the penetration of the roots of tree species. Four depth classes, *viz*., deep, moderately deep, moderately shallow and non-soil have been mapped in Uttar Pradesh. These areas could be suggested as suitable for plantations based on other ground parameters. The distribution of area under different soil depth classes is given in Table 5.12.

Table 5.12. Distribution of area under different soil depth categories of each river

S. no.	Soil depth	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area (km^2)
1	Deep	967.55	192.83	984.14	336.7	26.12	8,188.85	10,696.19
2	Moderately deep	133.13						133.13
3	Moderately shallow	50.44		30.08			121.67	202.19
4	Non-soil	366.06	52.95	64.15	76.4	2.21	1,047.49	1,609.26
	Total	1,517.18	245.78	1,078.37	413.10	28.33	9,358.01	**12,640.77**

5.12.11. Forest Cover and Forest Type

Uttar Pradesh state's forest cover is divided into five types namely dense forest, moderately dense forest, non forest, open forest, scrub. The maximum area 11,436 km^2 is non-forest. Also, Uttar Pradesh state has four types of forest *viz* non forest, scrub, tropical dry deciduous and tropical thorn forest. Area wise distribution of forest cover and forest type is given in Tables 5.13 and 5.14, and Figs. 5.15 and 5.16, respectively.

Table 5.13. Area wise (km^2) distribution of forest cover of Uttar Pradesh

S. no.	Forest cover	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area (km^2)
1	Mod. dense forest	26.3	13.07	21.27	5.37	0.00	105.72	171.73
2	Non-forest	1,208.38	166.22	1,027.63	376.82	27.51	8,629.44	11,436
3	Open forest	74.58	56.96	16.96	3.56		224.9	376.96
4	Scrub	207.92	9.53	12.51	27.35	0.82	397.8	655.93
5	Dense forest	0.00	0.00	0.00	0.00	0.00	0.15	0.15
	Total	0.00	0.00	0.00	0.00	0.00	0.00	**12,640.77**

Table 5.14. Area wise (km^2) distribution of forest type of the state

S. no.	Forest type	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area (km^2)
1	Non-forest	1,208.38	166.22	1,027.63	376.82	27.51	8,629.44	11,436
2	Scrub	207.92	9.53	12.51	27.35	0.82	397.8	655.93
3	Tropical dry deciduous forests	67.46	36.12	38.23	8.93	0.00	175.3	326.04
4	Tropical thorn forests	33.42	33.91	0.00	0.00	0.00	155.47	222.8
	Total	0.00	0.00	0.00	0.00	0.00	0.00	**12,640.77**

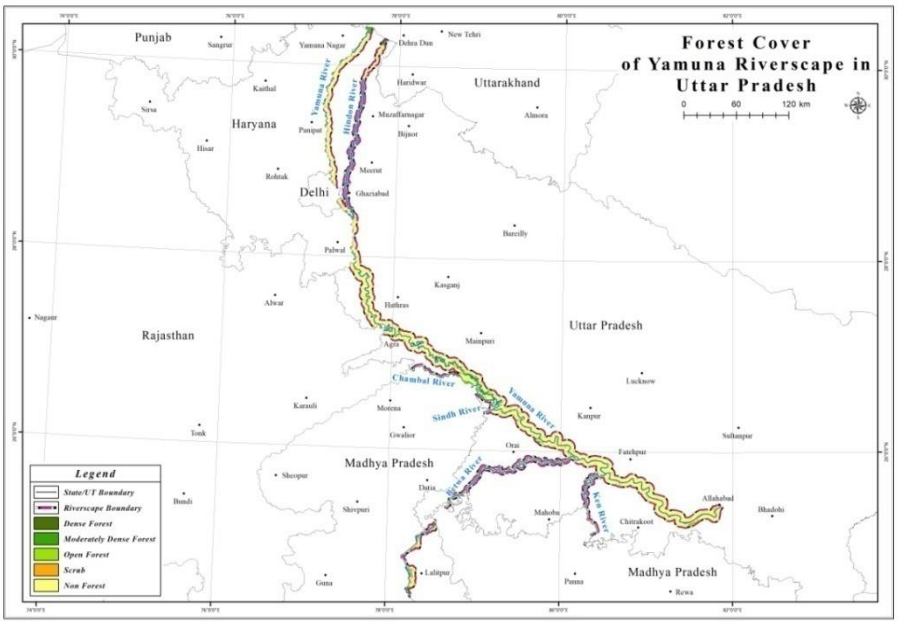


Fig. 5.15. Forest cover in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

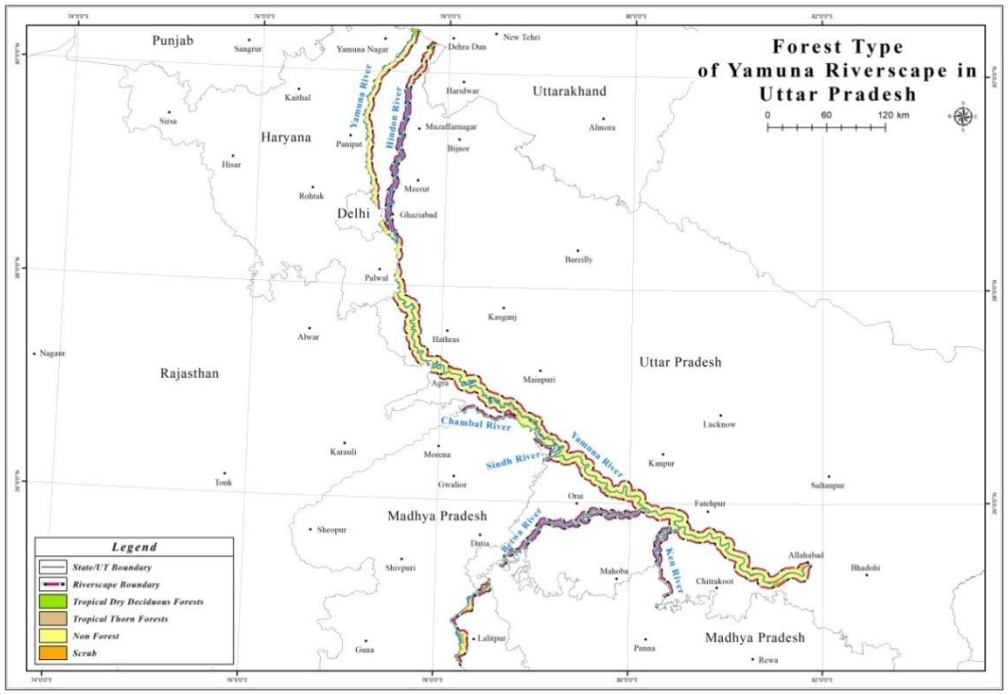


Fig. 5.16. Forest types in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

5.12.12. Prioritisation of sites for Forestry Interventions

A multi-stakeholder approach was followed for preparing the DPR on rejuvenation of Yamuna through Forestry Interventions. It included extensive consultation and review of literature, reports, primary and secondary data collection, its analysis, expert consultations with institutes, individuals and various stakeholders (Central and state government departments, state forest departments of seven states, research institutions/scientific departments dealing with forestry, environment, river conservation, environment; civil society, non-governmental organisations in this field, defence and paramilitary forces, other interest groups).

Priority criteria: For the purpose of preparation of DPR and for identification of priority areas for the proposed treatment/forestry interventions in the Yamuna riverscape, GIS-assisted decision making process by way of geospatial analysis and modelling was used. GIS was used to generate different layers within the riverscape like land use, soil erosion rates, and slope of the topography (Refer Table 1.15a. of Uttarakhand Chapter).

5.12.13. Priority Classes

Statistical analysis of the area estimates show that 5,822.31 km^2 area is in medium priority region, 5,497.2 km^2 area is in high priority and 1,321.26 km^2 area is in low priority region for Uttar Pradesh State as given in Table 5.15. and Fig. 5.17.

Table 5.15. Area (km^2) of priority treatment areas of each river of the state

S. no.	Priority class	Betwa	Chambal	Hindon	Ken	Sindh	Yamuna	Total area (km^2)
1	High	905.14	107.25	87.3	289.22	11.92	4,096.37	**5,497.2**
2	Low	249.5	40.35	77.61	59.56	2.18	892.06	**1,321.26**
3	Medium	362.54	98.18	913.46	64.32	14.23	4,369.58	**5,822.31**
								12,640.77

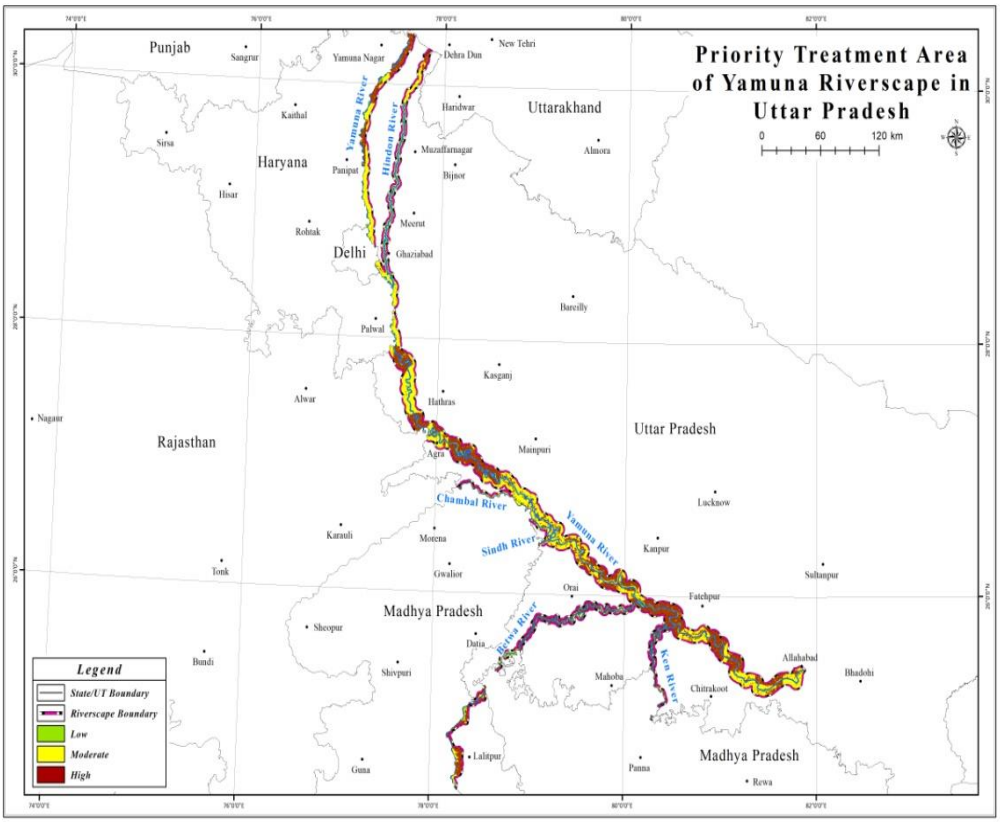


Fig. 5.17. Prioritised treatment area in the Yamuna Riverscape

5.13. PROPOSED FORESTRY INTERVENTIONS

For addressing the challenges and problems highlighted above, various forestry interventions have been proposed in this DPR. Three landscapes in the delineated riverscape have been identified for proposing the forestry interventions:

(i) Natural landscape
(ii) Agricultural landscape
(iii)Urban/Peri-urban landscape

In the state of Uttar Pradesh, 5 km buffer zone along both the sides of Yamuna River and 2 km zone along both banks of its tributaries are part of the riverscape in the state. Models have been developed with landscape-specific approach in the DPR with the general principles to be followed for models in all landscapes:

The following general prescriptions are made for all models:

a) Native species of tree, shrub and herbs will be planted. Traditional horticultural crops which have long been in cultivation in the region are also included in agricultural and urban landscapes. Mixed crops that would promote biodiversity will be raised as far as possible in preference to pure plantation. Species that provide economically useful non-wood forest produce (NWFP) will be planted to the extent of 70% or more by number. Effort would be made to produce industrial surpluses of select raw material in consultation with local nutraceutical, food processing and other NWFP-based industries.

b) Digging of pits, contour trenches, protection trenches, fencing etc will be carried out sufficiently before planting operation according to the standard practice in the plantation area.

c) Site-specific modifications in the models are permitted provided they capture the essence of the respective models. The rates prevailing in SFD at the site and time of operation would be applicable. The DFOs at time of implementation of the project will have the power to make site-specific modifications in prescriptions to suit the site conditions within the total budget proposed in the DPR for the Division. The flexibility applies to choice of species, site, model, quantity of work and timing of activities.

d) Species will be selected in consultation with industries /market experts to plant species that would create industry-level surpluses.

e) Seed or other propagules of forest tree species will be sourced from natural forests and plantations, especially seed orchards, plus trees or seed production areas, wherever available in sufficient quantity, aiming at quality seed. Seed would not be purchased from market for plantation in natural landscape.

f) Survival of plants will be ensured by providing life-saving irrigation; the frequency of irrigation would vary with weather conditions. Casualty replacement will be done according to the existing norms of the state. If such norms are not existing, prescriptions in the respective models will be referred to.

g) During site preparation prior to plantation work, seedlings already growing in the site would be retained, nurtured (through soil working, manure, irrigation operations) and protected.

h) Complete removal of ground vegetation would not be done during rehabilitation of weed-infested areas, Partial removal of invasive weeds would be done followed by artificial regeneration to facilitate gradual replacement of the weeds with economically and ecologically useful species.

i) Biofertilizerssuch as arbuscular mycorrhiza (AM), organic manures will be applied in nurseries and plantations to boost plant growth. Eco-friendly plant protection measures (e.g. physical or mechanical methods, use of natural products, etc.) will be adopted to manage weed and pest without resorting to use of synthetic products. Tall seedlings may be planted to achieve greater survival in areas with high biotic disturbances.

j) Effective protection will be provided to the planted seedlings against biotic and abiotic stresses through watch & ward, public awareness besides fence, cattle-proof trenches, etc. according to the site.

Table 5.16. List of proposed models for Yamuna in Uttar Pradesh

	Natural landscape
YM/UP/NL/01	Afforestation of erosion-prone ravinous slopes
YM/UP/NL/02	Afforestation of slopes with shallow soil
YM/UP/NL/03	Plantation in open forest areas
YM/UP/NL/04	Plantation in open forest ravinous areas
YM/UP/NL/05	Rehabilitation of weed-infested forest areas
YM/UP/NL/06	Treatment of gullies and steep slopes through vegetative measures with soil conservation
YM/UP/NL/06/A	Earthen check dam
YM/UP/NL/06/B	Contour bunding
YM/UP/NL/06/C	Gully plug
YM/UP/NL/07	Ecorestoration by Eco Task Force
YM/UP/NL/08	Plantation in heterogenous areas in uneven terrain
YM/UP/NL/09	Plantation in *usar* flat terrain
	Agricultural landscape
YM/UP/AL/01	Planting of saplings by farmers
YM/UP/AL/02	Silvipasture on community land
YM/UP/AL/03	Community land afforestation in erosion-prone slope areas
	Urban/Peri-urban landscape
YM/UP/UL/01	Roadside linear plantation
YM/UP/UL/02	Roadside strip plantation
YM/UP/UL/03	Institutional plantation
YM/UP/UL/04	Block plantation in landbank and revenue land
YM/UP/UL/05	Landbank treatment in erosion prone slope areas
YM/UP/UL/06	Treatment of floodplain and land of irrigation department
YM/UP/UL/07	Eco-park development
YM/UP/UL/08	Riverfront development
YM/UP/UL/09	Bioremediation with strip plantation
	Conservation interventions
YM/UP/CI/01	Water storage bodies/structures
YM/UP/CI/02	Managing water flow, soil moisture and sedimentation
YM/UP/CI/02/A	SMC - sidewall
YM/UP/CI/02/B	SMC - spur
YM/UP/CI/02/C	SMC - *pucca* check dam
YM/UP/CI/02/D	SMC - dry gully plug
YM/UP/CI/02/E	SMC - brushwood check dam
YM/UP/CI/02/F	SMC - spillway
YM/UP/CI/02/G	Mixed SMC
YM/UP/CI/03	Riparian wildlife management
YM/UP/CI/04	Wetland management in uniform site conditions
YM/UP/CI/05	Wetland management in heterogenous areas
YM/UP/CI/06	Rehabilitation of soil and moisture conservation structures

The list of proposed sites is provided in Annexure 4 of this Volume of DPR (i.e., Volume II).

5.14. NATURAL LANDSCAPE

YM/UP/NL/01: Afforestation of erosion-prone ravinous slopes

This model will be applied in degraded forest areas in ravine formation having loose, sandy or kankar soil, rugged topography with steep slopes and high incidence of gully erosion. The area is full of *Prosopis juliflora* introduced through earlier afforestation programmes or invasion by this species. Native forest species need to be brought back in a phased manner by creating several gaps in the form of strips in Prosopis in places less prone to gully formation or soil erosion. The gaps will be created to the extent of 50 percent of the entire area by cutting off *P. juliflora* stems and their branches that project into the cleared strips. 200 contour trenches and 200 pits will be dug in the cleared strips uniformly distributed over an area of one hectare. 100 earthen check dams will be constructed per ha in areas prone to gully erosion. Plants of native tree, shrub and bamboo species will be planted in the pits. Sowing of native trees and grasses will be done on earthen check dams and contour trenches.

A protection trench will be dug all around the area and the soil will be heaped along the trench in the form of bund. Seeds of thorny and dense vegetation will be sown on this soil to create a bio-fence for protection of the area. Plants and fence will be maintained for five years. The treated patches will be kept free of invasive weeds or other interfering vegetation and shoots projecting from adjacent untreated area. The requirement of watch ward will reduce gradually.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree, shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species on earthen check dams

Tree and shrub: As indicated above

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apluda mutica, Vetiveria zizanioides,* etc.

Legume: *Alysicarpus rugosus, Rhynchosia minima, Indigofera glandulosa, Rhynchosia capitata, Alysicarpus longifolius, Stylosanthes hamata,* etc.

Species in pits

Tree and shrub: *Acacia nilotica, Azadirachta indica, Madhuca indica, Albizia lebbeck, Emblica officinalis, Bombax ceiba, Pithecellobium dulce, Ziziphus mauritiana, Cordia dichotoma Dalbergia sissoo, Holoptelea integrifolia, Sesbania sesban, Capparis zeylanica, Capparis decidua,* etc.

Bamboo: *Dendrocalamus strictus,* etc.

Important features (ha^{-1})

i. Clearing of 50% area: Strips of 5 m width will be cleared, alternating with 5 m wide uncleared strips, by cutting Prosopis at base and removal of shoots of Prosopis projecting from adjacent areas in the treated strips.
ii. Protection trench and bio-fence all around.
iii. Two hundred pits of 0.45 m x 0.45 m x 0.45 m and 200 contour trenches of size 3 m x 0.60 m x 0.45 m each.
iv. Hundred earthen check dams of size 3 m x 0.90 m x 0.45 m each (121.5 m^3 volume will be equivalent to one ha).
v. Tree and bamboo saplings will be planted in pits.
vi. Sowing of grasses and native tree species (*Prosopis* not to be planted) on earthen check dams and contour trenches.
vii. Maintenance upto 5 years after plantation year with decreasing intensity including weeding and hoeing, removal of shoots of *P. juliflora* projecting from adjacent areas in the treated strips, maintenance of fence.

Table 5.17. Cost norm for YM/UP/NL/01

Particular	Quantity ha^{-1}	Rate (Rs. 174 d^{-1})	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	45.59 ha^{-1}	45.59
Cutting of *Prosopis* from strips of 5 m width totalling 50% area	1 km	899.33 km^{-1}	899.33
Alignment			
a) Pits	200 no.	36.91/100	73.82
b) Contour trenches	200 no.	89.04/100	178.08
c) Earthen check dams	100 no.	89.04/100	89.04
Soil work			
a) Pits (45 cm x 45 cm x 45 cm)	200 no.	9.03 pit^{-1}	1,806
b) Contour trenches (3.00 m x 0.60 m x 0.45 m)	200 no.	79.93 trench^{-1}	15,986
c) Earthen check dams (3.00 m x 0.90 m x 0.45 m, 100 no. or other size/no. equivalent to 121.5 m^3	121.5 m^2	105 m^{-3}	12,757.50
Protective structures			
Protection trench			
a) Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep)	50 m	98.63 m^{-1}	4,931.50
b) Jhakarhbari work, including transportation (with protection trench)	50 m	8.68 m^{-1}	434
Stonewall fence			
a) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.20 m (stone available beyond 500 m)	50 m	423.75 m^{-1}	21,187.50
Making of inspection path 1 m wide inside plantation	50 m	2,085.33 km^{-1}	104.27
Cost of seed			
a) Quality seed for pits (200 plants + 20% for culling)	240 plants	Lump sum	2,400
b) Quality seed for contour trenches (at double of normal rate)	200 trenches	15.50 trench^{-1}	3,100
c) Seed for earthen check dams (other than *P. juliflora*) (at double of normal rate)	Equivalent to 100 earthen check dams	15.50 earthen check dam^{-1}	1,550
d) Seed for protection trenches (other than *P. juliflora*) (at double of normal rate)	50 m	2.40 m^{-1}	120
Cost of plant (incl. 20% culling for obtaining quality stock) for pits	240	7 plant^{-1}	1,680

Plantation sign board (per 25 ha)	1	3,500/25 ha	140
Miscellaneous			1,000
Total			68,482.63 **or 68,483**
Planting year			
Refilling/dressing pits, trenches and earthen check dams			
a) Refilling pits (45 cm x 45 cm x 45 cm)	200 no.	0.90 pit^{-1}	180
b) Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	200 no.	2.22 $trench^{-1}$	444
c) Dressing contour trenches	200 no.	1.74 $trench^{-1}$	348
d) Dressing earthen check dams	100 no.	1.74 earthen check dam^{-1}	174
e) Protection trenches	50 m	1.45 m^{-1}	72.50
Transportation of plants upto 25 km	200 no.	1.94 $plant^{-1}$	388
Local transport of plants	200 no.	1.52 $plant^{-1}$	304
Sowing of seed			
a) Sowing of seeds on contour trenches	200 trenches	1.45 $trench^{-1}$	290
b) Sowing of seeds on earthen check dams	100 earthen check dams	1.45 earthen check dam^{-1}	145
c) Sowing of seeds on protection trenches in two lines	50 m	1.11 m^{-1}	55.50
d) Re-sowing of seeds of a, b and c			490.50
Planting in pits	200 plants	3.47 $plant^{-1}$	694
Application of manure, AM, micronutrients	1,100 plants	5.80 $plant^{-1}$	6,380
Weeding and hoeing			
a) Around pits (three times)	200 pits x 3	89.90/100	539.00
b) On contour trenches (three times)	200 trenches x 3	298.89/100 trench	1,793.34
c) On earthen check dams (three times)	100 earthen check dams	298.89/100 earthen check dam^{-1}	298.89
d) On protection trenches (three times)	40 m x 3	1.11 m^{-1}	133.20
Irrigation of plants (6 times)	1,100 plants x 6	1.70 $plant^{-1}$	11220
Removal of shoots of *Prosopis* projecting from adjacent areas in the treated strips and miscellaneous silvicultural works	0.5 ha	508.33	254.17
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		4,550/26 days of 8 hrs	9450
Contingency	Lump sum		2000
Total			35,654.10 **or 35,654**

Maintenance cost			
Year 3			
20% beating up of planted seedlings	40 plants	30 $plant^{-1}$	1,200
Weeding and hoeing			
a) Around pits (three times)	200 pits x 3	89.90/100	539.40
b) On contour trenches (three times)	200 trenches x 3	298.89/100 trench	1,793.34
c) On earthen check dams (three times)	100 earthen check dams x 3	298.89/100 earthen check dams	896.67
d) On protection trenches (three times)	50 m x 3	1.11 m^{-1}	188.50
Irrigation of plants (12 times)	1,100 plants x 12	1.70 $plant^{-1}$	22,440
Application of manure, AM, micronutrients	1,100 plants	5.80 $plant^{-1}$	6380
Removal of shoots of *Prosopis* projecting from adjacent areas in the treated strips and miscellaneous silvicultural works	0.5 ha	508.33	254.17

Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			43,642.08 **or 43,643**
Year 4			
15% beating up of planted seedlings	30 plants	30 plant^{-1}	900
Weeding, and hoeing (1 time yr^{-1})			
a) Around pits	200 pits x 1	89.90/100	179.80
b) On contour trenches	200 trenches x 1	298.89/100 trench	597.78
c) On earthen check dams	100 earthen check dams x 1	298.89/100 earthen check dams	298.89
Irrigation of plants (6 times)	1,100 plants x 6	1.70 plant^{-1}	11,220
Application of manure, AM, micronutrients	1,100 plants	5.80 plant^{-1}	6,380
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			29,526.47 **or 29,527**
Year 5			
5% beating up of planted seedlings	10 plants	30 plant^{-1}	300
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	200 pits x 1	89.90/100	179.80
b) On contour trenches	300 trenches x 1	298.89/100 trench	896.67
c) On earthen check dams	100 earthen check dams x 1	298.89/100 earthen check dams	298.89
Irrigation of plants (3 times)	1,100 plants x 3	1.70 plant^{-1}	5,610
Application of manure, AM, micronutrients	1,100 plants	5.80 plant^{-1}	6,380
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			23,615.36 **or 23,615**
Year 6			
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			**9,950**
Year 7			**9,950**

Table 5.18. Year-wise cost summary for YM/UP/NL/01

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	68,483
Year 2 (Planting and establishment)	35,654
Year 3 (1st maintenance)	43,643
Year 4 (2nd maintenance)	29,527
Year 5 (3rd maintenance)	23,615
Year 6 (4th maintenance)	9,950
Year 7 (5th maintenance)	9,950
Total	**2,20,822**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

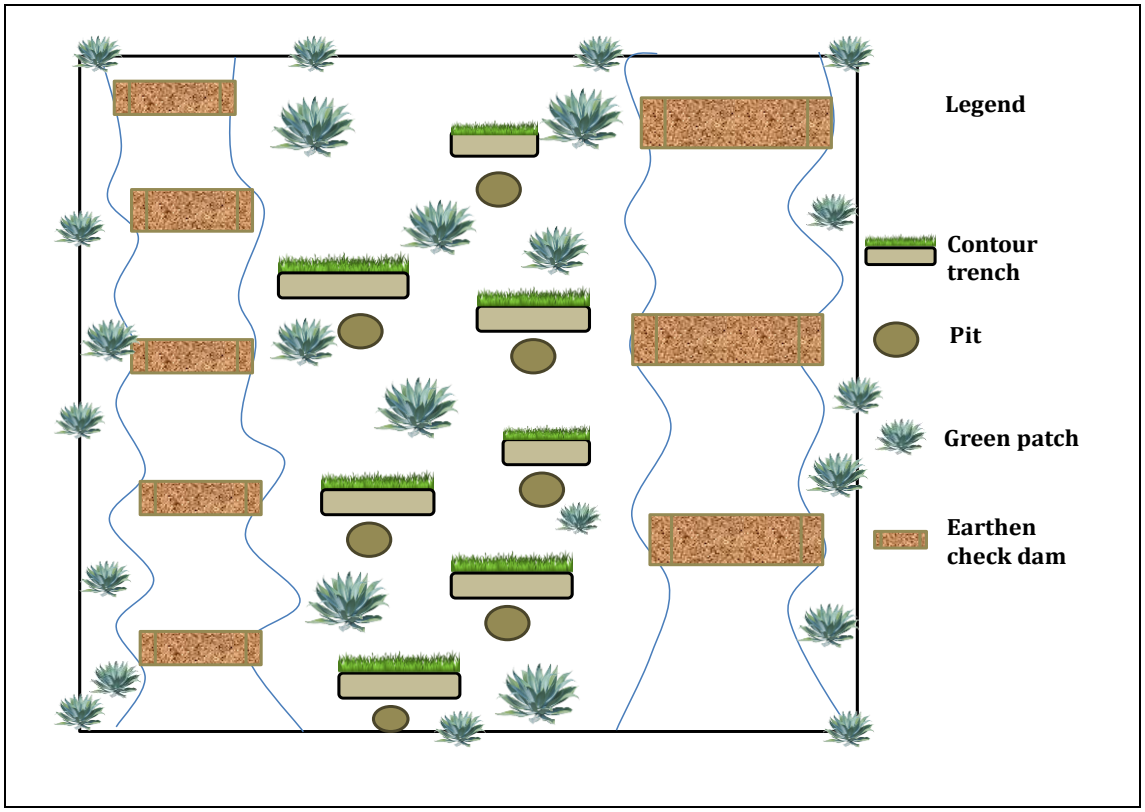


Fig. 5.18. Illustration of afforestation in erosion prone ravinous areas

YM/UP/NL/02: Afforestation of slopes with shallow soil

This model will be applied in areas where terrain is undulating with shallow soil. Slopes are gentle or moderate and have poor moisture retention ability. The soil is poor in nutritional content. Contour trenches are required to collect rainwater for supporting moisture and soil conservation. Contour trenches will be made and seeds of grasses, legumes and local vegetation will be sown on contour trenches. Some trees are already existing in such sites, but their density is quite low. Such trees will be retained and supported through soil working and tending activities. In the model, it is envisaged to make 300 contour trenches/ha. Additionally, 200 pits will also be dug. Sowing of native grasses, legumes shrubs and trees will be done on trenches. Seedlings will be planted in pits.

The areas where this model is proposed to be implemented have high incidence of grazing. Barbed wire fence alone is not effective. Biofence takes longer time to establish. A combination of both will be used.

Important features (ha^{-1})

i. Bio-fence of thorny fast-growing plants and barbed wire fence all around.
ii. Three hundred trenches of 3 m x 0.6 m x 0.45 m.
iii. Two hundred pits of 0.45 m x 0.45 m x 0.45 m.
iv. Seedlings in pits.
v. Sowing of grasses and native tree species (Prosopis not to be sown) along trenches.
vi. Maintenance upto 5 years after plantation year.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species on contour trenches

Tree and shrub: As indicated above

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apluda mutica, Vetiveria zizanioides,* etc.

Legume: *Alysicarpus rugosus, Rhynchosia minima, Indigofera glandulosa, Rhynchosia capitata, Alysicarpus longifolius, Stylosanthes hamata,* etc.

Species in pits

Tree and shrub: *Acacia nilotica, Azadirachta indica, Madhuca indica, Butea monosperma, Albizia lebbeck, Emblica officinalis, Bombax ceiba, Pithecellobium dulce, Ziziphus mauritiana, Cordia dichotoma, Dalbergia sissoo, Acacia nilotica, Holoptelea integrifolia, Sesbania sesban, Capparis zeylanica, Capparis decidua,* etc.

Bamboo in pits: *Dendrocalamus strictus,* etc.

Table 5.19. Cost norm for YM/UP/NL/02

Particular	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	45.59 ha^{-1}	45.59
Cleaning of area	1 ha	299.73 ha^{-1}	299.73
Alignment			
a) Pits	200 no.	36.91/100	73.82
b) Contour trenches	300	89.04/100	267.12
Soil work			
a) Pits (45 cm x 45 cm x 45 cm)	200 no.	9.03 pit^{-1}	1,806
b) Contour trenches (3.00 m x 0.60 m x 0.45 m)	300 no.	79.93 trench^{-1}	23,979
Protective structure			
Protection trench			
a) Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep)	40 m	98.63 m^{-1}	3,945.20
b) Jhakarhbari work, including transportation (with protection trench)	40 m	8.68 m^{-1}	347.20
Stonewall fence			
a) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.00 m (stone available within 500 m)	45 m	145.47 m^{-1}	6,546.15
b) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.00 m (stone available beyond 500 m)	15 m	265.95 m^{-1}	3,989.25
Miscellaneous advance silvicultural works	1 ha	508.33 ha^{-1}	508.33
Making of inspection path			
a) 3 m wide path inside plantation for jeep	25 m	8,984.30 km^{-1}	224.61
b) 1 m wide path inside plantation	50 m	2,085.33 km^{-1}	104.27
Cost of seed			
a) Quality seed for pits (200 plants + 20% for culling)	240 plants	Lump sum	2,400

b) Quality seed for contour trenches (at double of normal rate)	300 trenches	15.50 trench^{-1}	4,650
c) Seed for protection trenches (other than *P. juliflora*) (at double of normal rate)	40 m	2.40 m^{-1}	96
Cost of plant (incl. 20% culling for obtaining quality stock) for pits	240	7 plant^{-1}	1,680
Plantation sign board (per 25 ha)	1	3,500/25 ha	140
Miscellaneous			1,000
Total			52,102.27 **or 52,102**
Planting year			
Refilling/dressing pits and trenches			
a) Refilling pits (45 cm x 45 cm x 45 cm)	200 no.	0.90 pit^{-1}	180
b) Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	300 no.	2.22 trench^{-1}	666
c) Dressing contour trenches	300 no.	1.74 trench^{-1}	522
d) Protection trenches	40 m	1.45 m^{-1}	58
Transportation of plants upto 25 km	200 no.	1.94 plant^{-1}	388
Local transport of plants	200 no.	1.52 plant^{-1}	304
Planting in pits	200 plants	3.47 plant^{-1}	694
Sowing of seed			
a) Sowing of seeds on contour trenches	300 trenches	1.45 trench^{-1}	435
b) Sowing of seeds on protection trenches in two lines	40 m	1.11 m^{-1}	44.40
c) Re-sowing of seeds of a and b			479.40
Application of manure, AM, micronutrients	1,100 plants	5.80 plant^{-1}	6,380
Weeding and hoeing			
a) Around pits (three times)	200 pits x 3	89.90/100	539.00
b) On contour trenches (three times)	300 trenches x 3	298.89/100 trench	2,690.01
c) On protection trenches	40 m x 3	1.11 m^{-1}	133.20
Irrigation of plants (6 times)	1,100 plants x 6	1.70 plant^{-1}	11,220
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		4,550/26 d of 8 hrs	9,450
Contingency	Lump sum		2,000
Total			36,183.01 **or 36,183**
Maintenance cost			
Year 3			
20% beating up of planted seedlings	40 plants	30 plant^{-1}	1,200
Weeding and hoeing (3 times yr^{-1})			
a) Around pits (three times)	200 pits x 3	89.90/100	539.40
b) On contour trenches	300 trenches x 3	298.89/100 trench	2,690.01
c) On protection trenches	40 m x 3	1.11 m^{-1}	133.20
Irrigation of plants (12 times)	1,100 plants x 12	1.70 plant^{-1}	22,440
Application of manure, AM, micronutrients	1,100 plants	5.80 plant^{-1}	6,380
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			43,332.61 or **43,333**
Year 4			
15% beating up of planted seedlings	30 plants	30 plant^{-1}	900
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	200 pits x 1	89.90/100	179.80
b) On contour trenches	300 trenches x 1	298.89/100 trench	896.67
Irrigation of plants (6 times)	1,100 plants x 6	1.70 plant^{-1}	11,220
Application of manure, AM, micronutrients	1,100 plants	5.80 plant^{-1}	6,380

Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			29,526.47 or **29,527**
Year 5			
5% beating up of planted seedlings	10 plants	30 plant^{-1}	300
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	200 pits x 1	89.90/100	179.80
b) On contour trenches	300 trenches x 1	298.89/100 trench	896.67
Irrigation of plants (3 times)	1,100 plants x 3	1.70 plant^{-1}	5,610
Application of manure, AM, micronutrients	1,100 plants	5.80 plant^{-1}	6,380
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			23,316.47 or **23,316**
Year 6			
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			**9,950**
Year 7			**9,950**

Table 5.20. Year-wise cost summary for YM/UP/NL/02

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	52,102
Year 2 (Planting and establishment)	36,183
Year 3 (1st maintenance)	43,333
Year 4 (2nd maintenance)	29,527
Year 5 (3rd maintenance)	23,316
Year 6 (4th maintenance)	9,950
Year 7 (5th maintenance)	9,950
Total	**2,04,361**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

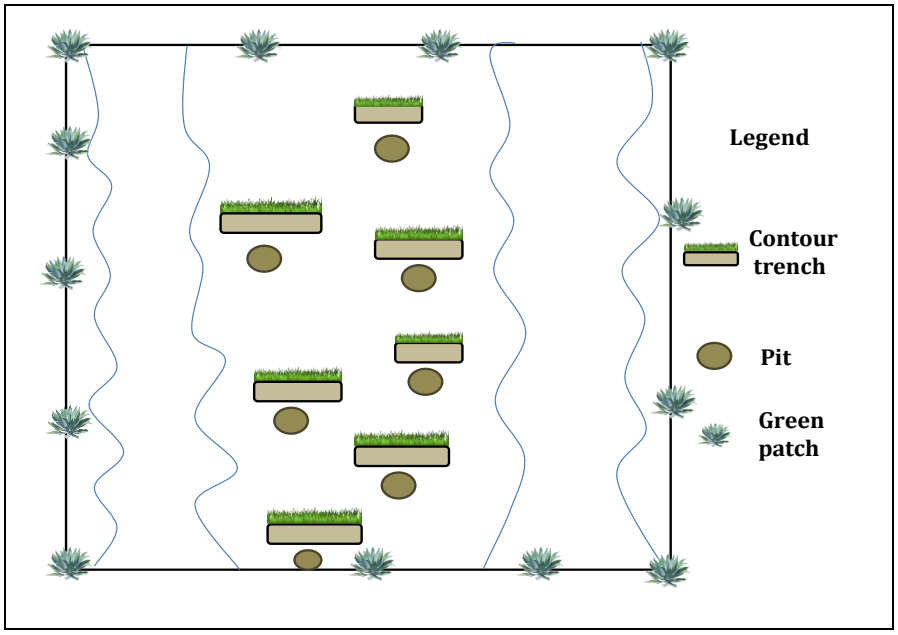


Fig.5.19. Illustration of model on afforestation of slopes with shallow soil

YM/UP/NL/03: Plantation in open forest

This model will be applied in forest areas with have poor crown cover. The terrain of the proposed sites is mostly flat and the soil is poor in nutritional status. Some seedlings and trees are already existing in such sites, but their density is quite low. Such saplings and trees will be retained and supported through soil working activities. Planting will be done in pits of 0.45 m x 0.45 m x 0.45 m size at density of 1,000 plants ha^{-1} and maintained for five years after the planting year. *Kachcha* water pond(s) of total 50,000 L storage capacity will be created as a part of this model outside the plantation area for free access of grazing animals. 700 m^2 strip of grass will be planted around this pond which will be protected with brushwood fence during first year. *Kachcha* water pond(s), with base of stone or some impermeable or semi-permeable material, of total 25,000 L will be created inside the plantation to store water for a longer period of time for irrigation of plants; after two years the stone at the base will be removed to facilitate ground water recharge.

The areas where this model is proposed to be implemented have high incidence of grazing. Barbed wire fence alone is not effective. Bio-fence takes longer time to establish. A combination of both will be used.

Important features (ha^{-1}):

i. Fencing and protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep) all around (Cost of barbed wire fence and cost of protection trench may be given separately).
ii. Biofence of fast-growing thorny plants all around.
iii. One thousand fifty pits of 0.45 m x 0.45 m x 0.45 m size.
iv. Planting of seedlings in pits.
v. Application of manure / vermicompost to plants in the pits.
vi. Beating up of plants 20% in first year, 15% in second year and 5% in third year.
vii. Maintenance for 1+5 years (planting year plus five additional years) including weeding and hoeing, maintenance of fence, watch and ward.
viii. *Kachcha* pond 50,000 L outside the plantation area in nearby place along with 700 m^2 strip of grass.

ix. *Kachcha* water pond of 25,000 L having base of stone pitching or some impermeable or semi-permeable material.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species in pits

Tree and shrub: *Azadirachta indica, Madhuca indica, Albizia lebbeck, Emblica officinalis, Bombax ceiba, Pithecellobium dulce, Ziziphus mauritiana, Cordia dichotoma, Dalbergia sissoo, Acacia nilotica, Holoptelea integrifolia, Sesbania sesban, Capparis zeylanica, Capparis decidua,* etc.

Bamboo: *Dendrocalamus strictus,* etc.

Grass around pond: *Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apluda mutica*, etc.

Table 5.21. Cost norm for YM/UP/NL/03

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			
Survey and demarcation of area	1 ha	45.59 ha^{-1}	45.59
Cleaning of plantation area	1 ha	299.73 ha^{-1}	299.73
Cleaning of area outside plantation area for planting of grass	250 m^2	299.73 ha^{-1}	7.49
Alignment of pits	1,050 no.	36.91/100	387.56
Digging of pits (45 cm x 45 cm x 45 cm)	1,050 no.	9.03 pit^{-1}	9,481.50
Protective structure			
Protection trench			
a) Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep)	50 m	98.63 m^{-1}	4,931.50
b) Jhakarhbari work, including transportation (along protection trench)	50 m	8.68 m^{-1}	434
Ploughing of area for pasture grass around pond, loosening and levelling of soil	250 m^2	Lumpsum	25
Stonewall fence			
a) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.20 m (stone available beyond 500 m)	50 m	423.75 m^{-1}	21,187.50

Kachcha pond inside plantation area with stone pitching at base			
a) Digging of *Kachcha* pond inside plantation in area of hard rock	25 m^3	128 m^{-3}	3,200
b) Providing stone pitching at base (incl. cost of material)	Lump sum		800
Digging of *Kachcha* water pond outside plantation with *Kachcha* base	50 m^3	128 m^{-3}	6,400
Making of inspection path			
a) 3 m wide path inside plantation for jeep	25 m	8,984.30 km^{-1}	224.61
b) 1 m wide path inside plantation	50 m	2,085.33 km^{-1}	104.27
Cost of seed			
a) Quality seed for pits (1,050 plants + 20% for culling)	1,260 plants	Lump sum	1,260
b) Seed for protection trenches (other than *P. juliflora*) (at double of normal rate)	50 m	2.40 m^{-1}	120
Cost of plants (incl. 20% culling for obtaining quality stock) for pits	1,260	7 $plant^{-1}$	8,820
Plantation sign board (per 25 ha)	1	3,500/25 ha	140
Miscellaneous			1,000
Total			58,868.57 **or 58,869**
Planting year			
Refilling/dressing pits and trenches			
a) Refilling pits (45 cm x 45 cm x 45 cm)	1,050 no.	0.90 pit^{-1}	945
b) Dressing protection trenches	50 m	1.45 m^{-1}	72.50
Transportation of plants upto 25 km	1,050 no.	1.94 $plant^{-1}$	2,037
Local transport of plants	1,050 no.	1.52 $plant^{-1}$	1,596
Planting of plants in pits	1,050 plants	3.47 $plant^{-1}$	3,643.50
Sowing of seed			
a) Sowing of seeds on protection trenches in two lines	50 m	1.11 m^{-1}	55.50
b) Sowing of pasture grass around outer pond (incl. cost of seed)	250 m^2	524.80 ha^{-1}	13.12
c) Re-sowing of seeds of a and b			68.62

Creation of brushwood fence around pasture grass area	120 m	8.68 m^{-1}	1,041.60
Application of manure, AM, micronutrients in pits	1,050 plants	5.80 $plant^{-1}$	6,090
Application of manure to pasture grass	250 m^2	Lump sum	50
Weeding and hoeing			
a) Around pits (three times)	1,050 pits x 3	89.90/100	2,831.85
b) On protection trenches (three times)	50 m x 3	1.11 m^{-1}	166.50
c) In pasture grass area (two times)	250 m^2 x 2	Lumpsum	150
Irrigation			
a) Plants in pits (6 times)	1,050 plants x 6	1.70 $plant^{-1}$	10,710
b) Pasture grass area (two times)	250 m^2 x 2	Lumpsum	100
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		4,550/26 days of 8 hrs	9,450
Contingency	Lump sum		2,000
Total			41,021.19 **or 41,021**

Maintenance cost			
Year 3			
20% beating up of planted seedlings	210 plants	30 $plant^{-1}$	6,300
Weeding and hoeing			
a) Around pits (three times)	1,050 pits x 3	89.90/100	2,831.85
b) On protection trenches (three times)	50 m x 3	1.11 m^{-1}	166.50
Irrigation			
a) Plants in pits (12 times)	1,050 plants x 12	1.70 $plant^{-1}$	21,420
b) Pasture grass area (two times)	250 m^2 x 2	Lumpsum	200
Application of manure, AM, micronutrients in pits	1,050 plants	5.80 $plant^{-1}$	6,090
Application of manure to pasture grass	250 m^2	Lump sum	50
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			47,008.35 or **47,008**
Year 4			
15% beating up of planted seedlings	158 plants	30 $plant^{-1}$	4,740
Weeding and hoeing			
a) Around pits (1 time yr^{-1})	1,050 pits x 1	89.90/100	943.95
Irrigation			
a) Plants in pits (6 times)	1,050 plants x 6	1.70 $plant^{-1}$	10,710
Application of manure, AM, micronutrients in pits	1,050 plants	5.80 $plant^{-1}$	6,090
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			32,433.95 **or**

			32,434
Year 5			
5% beating up of planted seedlings	53 plants	30 plant^{-1}	1,590
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	1,050 pits x 1	89.90/100	943.95
Irrigation of plants (3 times)	1,050 plants x 3	1.70 plant^{-1}	1,785
Application of manure, AM, micronutrients	1,050 plants	5.80 plant^{-1}	6,090
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			20,358.95 or **20,359**
Year 6			
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			**9,950**
Year 7			**9,950**

Table 5.22. Year-wise cost summary for YM/UP/NL/03

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	58,869
Year 2 (Planting and establishment)	41,021
Year 3 (1st maintenance)	47,008
Year 4 (2nd maintenance)	32,434
Year 5 (3rd maintenance)	20,359
Year 6 (4th maintenance)	9,950
Year 7 (5th maintenance)	9,950
Total	**2,19,591**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

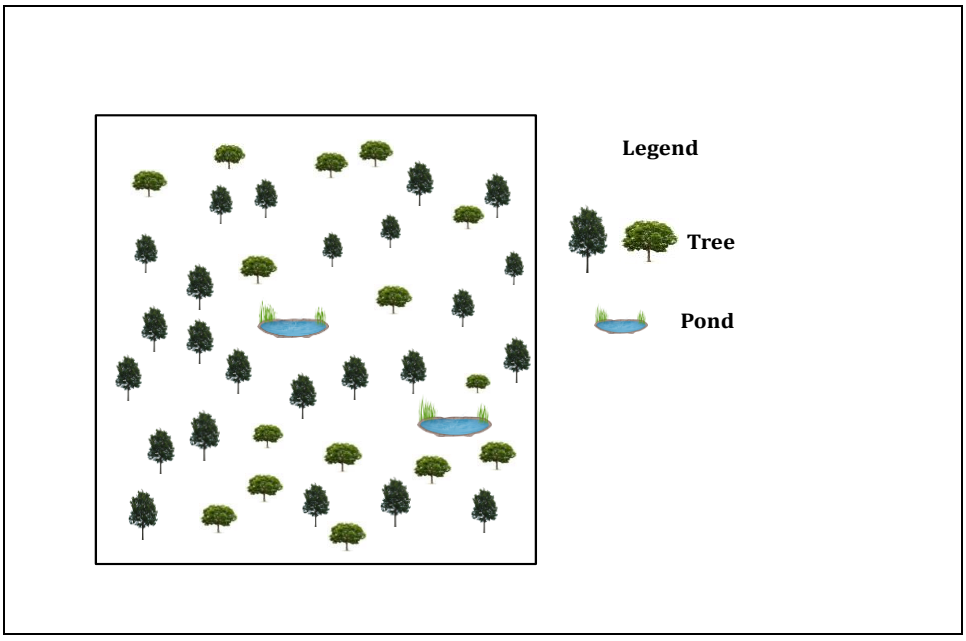


Fig.5.20. Illustration of plantation in open forest

YM/UP/NL/04: Plantation in open forest ravinous areas

This model we be applied in ravine areas with less steep slopes (less than 15 degrees) having open forest cover. The afforestation model developed by State Forest Research Institute, Kanpur will be used that prescribes planting in V-ditches (contour ridges) spaced at 4 m intervals in a multi-storey arrangement. Contour furrows of 0.15 m x 0.15 m will be made between V-ditches. Trees, fodder grasses and legumes will be raised.

Cost norm for YM/UP/NL/04 (Rs. ha^{-1})

Cost norms and details are to be provided by SFD. Tentative cost per ha is **Rs. 2,50,000.**

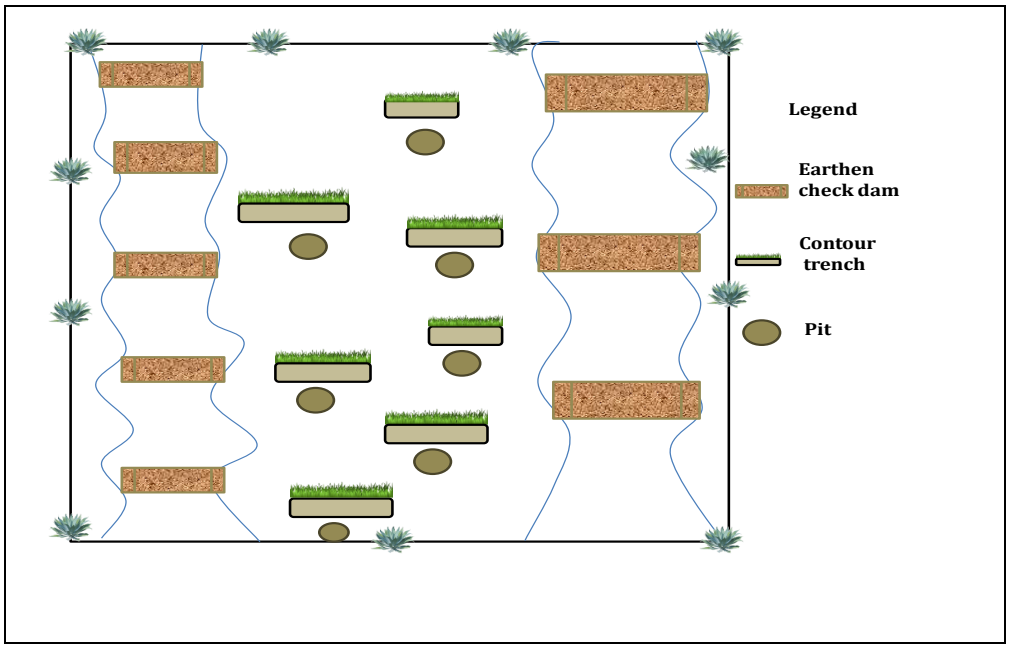


Fig. 5.21. Illustration of plantation in open forest ravinous areas

YM/UP/NL/05: Rehabilitation of weed-infested forest areas

This model will be applied in moist forest areas in Shiwalik hills in northern part of Uttar Pradesh and other areas where natural regeneration is not able to establish due to presence of weeds and damage by grazing animals. The sites are infested with moderate to dense growth of various shrub species, including *Lantana,* having invasive nature and low ecological and economic utility. The roots of the bushes hold soil, and *en masse* uprooting of bushes for planting of economic trees would be undesirable as it would promote soil erosion. In such areas, native forest species would be regenerated in a phased manner by enrichment planting. Moisture conservation activities are also proposed to be carried out to create more favourable environment for artificial and natural regeneration of indigenous species.

In this model, the area will be fenced and small pockets, 150 in number per hectare, of about 20 m^2 area would be cleared of invasive shrub species by uprooting them. Seedlings of species having ecological or economic utility, wherever present, will be retained while creating these gaps, and soil will be worked to make *thala* around them. Passages connecting such gaps will also be cleared to allow movement of workers between the gaps. One trench of size 3 m

length, 45 cm width and 45 cm depth will be dug in each gap. A pit of 45 cm x 45 cm x 45 cm would be dug about one m downhill the trench at the middle of the length of the trench. Enrichment planting of seedlings of indigenous species will be done in the pits. Direct sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Grass slips will be planted at six points along the trench. The treated patches will be kept free of weeds and of shoots projecting from adjacent untreated area. Plants and fence will be maintained for five years.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species in pits

Tree and shrub: *Terminalia alata, Terminalia bellirica, Anogeissus latifolia, Lagerstroemia parviflora, Haldina cordifolia, Albizia lebbeck, Syzygium cumini, Bombax ceiba, Pithecellobium dulce, Cordia dichotoma, Dalbergia sissoo, Acacia nilotica, Holoptelea integrifolia, Ficus religiosa, Ficus benghalensis, Madhuca indica,* etc.

Important features (ha^{-1})

i. Fencing of site with stone wall or barbed wire with bio-fence.
ii. Clearing of 30% area: 3000 sq m total area (150 patches of about 20 m^2 area each, inspection paths connecting the patches) will be cleared by uprooting shrubs.
iii. One hundred fifty contour trenches of size 3 m x 0.45 m x 0.45 m.
iv. One hundred fifty pits of 0.45 m x 0.45 m x 0.45 m.
v. Planting of seedlings in pits.
vi. Sowing of tree seeds at 3 places per trench and planting of 6 grass slips per trench. More than one seed may be sown per spot to ensure seedling establishment at each spot.
vii. Application of manure / vermicompost to plants in the pits.
viii. Maintenance for 5 years after planting year including weeding and hoeing, removal of shoots of plants projecting from adjacent areas in the treated patches.

Table 5.23. Cost norm for YM/UP/NL/05

Particulars	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	45.59 ha^{-1}	45.59
Cleaning of area by uprooting shrubs including *Lantana*	0.30 ha	2997.66 ha^{-1}	899.30
Alignment			
a) Pits	150 no.	36.91/100	55.37
b) Contour trenches	150 no.	89.04/100	133.56
Soil work			
a) Pits (45 cm x 45 cm x 45 cm)	150 no.	9.03 pit^{-1}	1,354.50
b) Contour trenches (3.00 m x 0.60 m x 0.45 m)	150 no.	79.93 trench^{-1}	11,989.50
Protective structure			
Protection trench			
a) Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep)	40 m	98.63 m^{-1}	3,945.20
b) Jhakarhbari work, including transportation (with protection trench)	40 m	8.68 m^{-1}	347.20
Stonewall fence			
a) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.00 m (stone available within 500 m)	45 m	145.47 m^{-1}	6,546.15
b) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.00 m (stone available beyond 500 m)	15 m	265.95 m^{-1}	3,989.25
Making of thawla around pre-existing seedlings, saplings	500 no.	1.94 plant^{-1}	970
Miscellaneous advance silvicultural works	1 ha	508.33 ha^{-1}	508.33
Making of inspection path			
a) 3 m wide path inside treatment area for jeep	25 m	8,984.30 km^{-1}	224.61
b) 1 m wide path inside treatment area	50 m	2,085.33 km^{-1}	104.27
Cost of seed			
a) Quality seed for pits (150 plants + 20% for culling)	180 plants	Lump sum	1,800
b) Quality seed for contour trenches (at double of normal rate)	150 trenches	15.50 trench^{-1}	2,325
c) Seed for protection trenches (other than *P. juliflora*) (at double of normal rate)	40 m	2.40 m^{-1}	96
Cost of plant (incl. 20% culling for obtaining quality stock) for pits	180	7 plant^{-1}	1,260
Plantation sign board (per 25 ha)	1	3,500/25 ha	140
Miscellaneous			1,000
Total			37,733.83 **or 37,734**
Planting year			
Refilling/dressing pits and trenches			
a) Refilling pits (45 cm x 45 cm x 45 cm)	150 no.	0.90 pit^{-1}	135
b) Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	150 no.	2.22 trench^{-1}	333
c) Dressing contour trenches	150 no.	1.74 trench^{-1}	261
d) Protection trenches	40 m	1.45 m^{-1}	58
Transportation of plants upto 25 km	150 no.	1.94 plant^{-1}	291
Local transport of plants	150 no.	1.52 plant^{-1}	228
Planting in pits	150 plants	3.47 plant^{-1}	520.50
a) Sowing of seeds on contour trenches	150 trenches	1.45 trench^{-1}	217.50
b) Sowing of seeds on protection trenches in two lines	40 m	1.11 m^{-1}	44.40
c) Re-sowing of seeds of a and b			261.90
Application of manure, AM, micronutrients	600 plants	5.80 plant^{-1}	3,480
Weeding and hoeing			
a) Around pits (three times)	150 pits x 3	89.90/100	404.55

b) On contour trenches (three times)	150 trenches x 3	298.89/100 trench	1,345.01
c) On protection trenches	40 m x 3	1.11 m^{-1}	133.20
Irrigation of plants (6 times)	600 plants x 6	1.70 $plant^{-1}$	6,120
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		4550/26 days of 8 hrs	9,450
Contingency	Lump sum		2,000
Total			25,282.90 **or 25,283**

Maintenance cost			
Year 3			
20% beating up of planted seedlings	30 plants	30 $plant^{-1}$	900
Weeding, and hoeing (3 times yr^{-1})			
a) Around pits (three times)	150 pits x 3	89.90/100	404.55
b) On contour trenches	150 trenches x 3	298.89/100 trench	1,345.01
c) On protection trenches	40 m x 3	1.11 m^{-1}	133.20
Irrigation of plants (12 times)	600 plants x 12	1.70 $plant^{-1}$	12240
Application of manure, AM, micronutrients	600 plants	5.80 $plant^{-1}$	3,480
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			28,452.76 **or 28,453**
Year 4			
15% beating up of planted seedlings	23 plants	30 $plant^{-1}$	690
Weeding, hoeing (1 time yr^{-1})			
a) Around pits	150 pits x 1	89.90/100	134.85
b) On contour trenches	150 trenches x 1	298.89/100 trench	448.34
Irrigation of plants (6 times)	600 plants x 6	1.70 $plant^{-1}$	6,120
Application of manure, AM, micronutrients	600 plants	5.80 $plant^{-1}$	3,480
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			20,823.19 or **20,823**
Year 5			
5% beating up of planted seedlings	8 plants	30 $plant^{-1}$	240
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	150 pits x 1	89.90/100	134.85
b) On contour trenches	150 trenches x 1	298.89/100 trench	400.51
Irrigation of plants (3 times)	600 plants x 3	1.70 $plant^{-1}$	3,060
Application of manure, AM, micronutrients	600 plants	5.80 $plant^{-1}$	3,480
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			17,265.36 **or 17,265**
Year 6			
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			**9,950**

Year 7			**9,950**

Table 5.24. Year-wise cost summary for YM/UP/NL/05

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	37,734
Year 2 (Planting and establishment)	25,283
Year 3 (1st maintenance)	28,453
Year 4 (2nd maintenance)	20,823
Year 5 (3rd maintenance)	17,265
Year 6 (4th maintenance)	9,950
Year 7 (5th maintenance)	9,950
Total	**1,49,458**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/NL/06: Treatment of gullies and steep slopes through vegetative measures with soil conservation

There are many forest areas which are already well vegetated, but are suffering from problem of gully erosion in some spots. Gully plugs and earthen check dams will be prepared in places of problem. Steep slopes are also cause of erosion in some spots; slopes will be broken through contour bund or contour trench. The quantity of these need-based works will vary with site. Sowing of seeds of trees and shrubs and planting of slips of grasses will be done on the treated gullies, earthen check dam, contour bunds and trenches.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apluda mutica, Vetiveria zizanioides,* etc.

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Table 5.25. Cost norms for YM/UP/NL/06/A to YM/UP/NL/06/C (Rs. ha^{-1})

Sub-model	Cost of soil work (Rs.)	Cost of seed and sowing	Estt. cost	Maint. cost (yr^{-1})	Total cost (Rs. m^{-3} or ha)
YM/UP/NL/06/A Earthen check dam 3m x 0.60 m x 0.45 m size; quantity as per requirement of particular site (200 no. or 162 m^3 earthen check dams will be equivalent to 1 ha)	Rs. 105 m^{-3} (or Rs. 21,000 ha^{-1})	Rs. 15 m^{-3} (or Rs. 3,000 ha^{-1})	Rs. 120 m^{-3} (or Rs. 24,000 ha^{-1})	Rs. 12 m^{-3} (or Rs. 2,400 ha^{-1}) x 5 years = 60 m^{-3} or 12,000 ha^{-1}	Rs. 180 m^{-3} (or Rs. 36,000 ha^{-1})
YM/UP/NL/06/B Contour bunding (40 cm +20 cm)/2 x 25 cm x 1m; quantity as per requirement of particular site (1000 m or 75 m^3 bunds will be equivalent to 1 ha)	Rs. 11.19 m^{-1} (or Rs. 11,190 ha^{-1})	Rs. 3.47 m^{-1} (or Rs. 3,470 ha^{-1})	Rs. 14.66 m^{-1} (or Rs. 14,660 ha^{-1})	Rs. 1.466 m^{-1} (or Rs. 146.60 ha^{-1}) x 5 years = 7.33 m^{-1} or 7,330 ha^{-1}	Rs. 21.99 m^{-1} (or Rs. 21,990 ha^{-1})
YM/UP/NL/06/C Gully plug; quantity as per requirement of particular site (150 m^3 will be equivalent to 1 ha)	Rs. 100 m^{-3} (or Rs. 15,000 ha^{-1})	Rs. 25 m^{-3} (or Rs. 3,750 ha^{-1})	Rs. 125 m^{-3} (or Rs. 18,750 ha^{-1})	Rs. 12.50 m^{-3} (or Rs. 1875 ha^{-1}) x 5 years = 62.50 m^{-3} or 9,375 ha^{-1}	Rs. 187.50 m^{-3} (or Rs. 28,125 ha^{-1})

Table 5.26. Year-wise cost summary for YM/UP/NL/06/A to YM/UP/NL/06/C (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/UP/NL/06/A Earthen check dam						
24,000	2,400	2,400	2,400	2,400	2,400	**36,000**
YM/UP/NL/06/B Contour bunding						
14,660	146.60	146.60	146.60	146.60	146.60	**21,990**
YM/UP/NL/06/C Gully plug						
18,750	1,875	1,875	1,875	1,875	1,875	**28,125**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

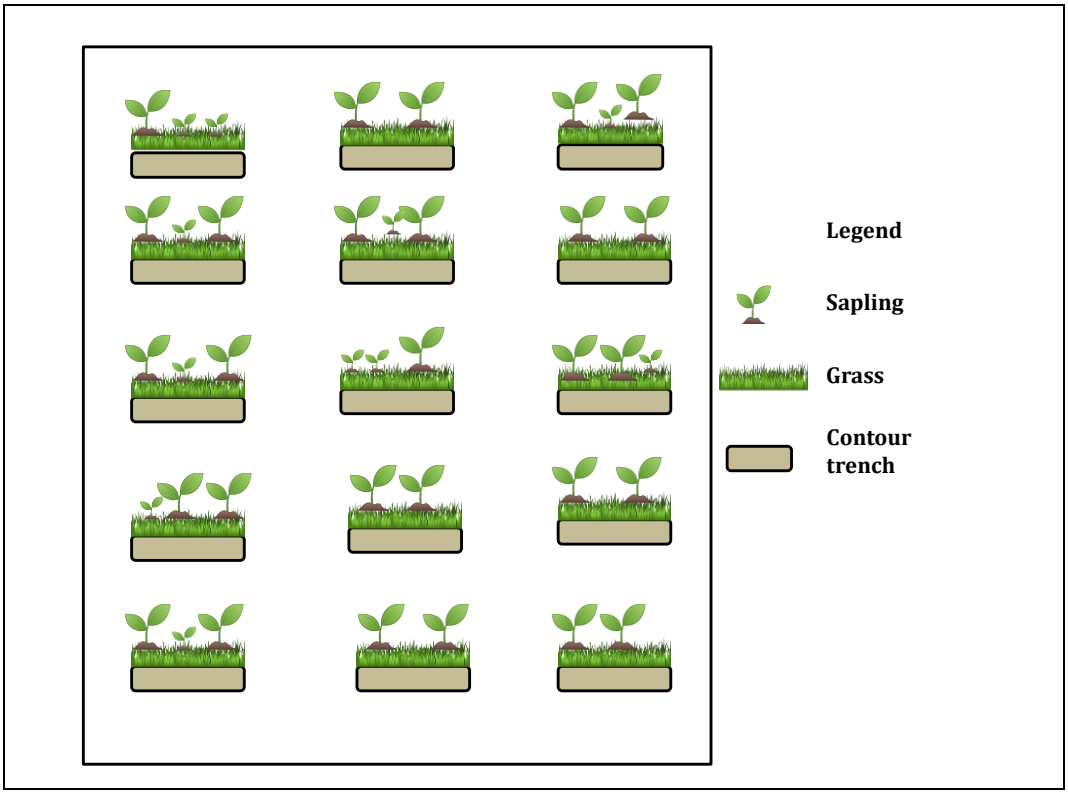


Fig. 5.22. Illustration of vegetative measures

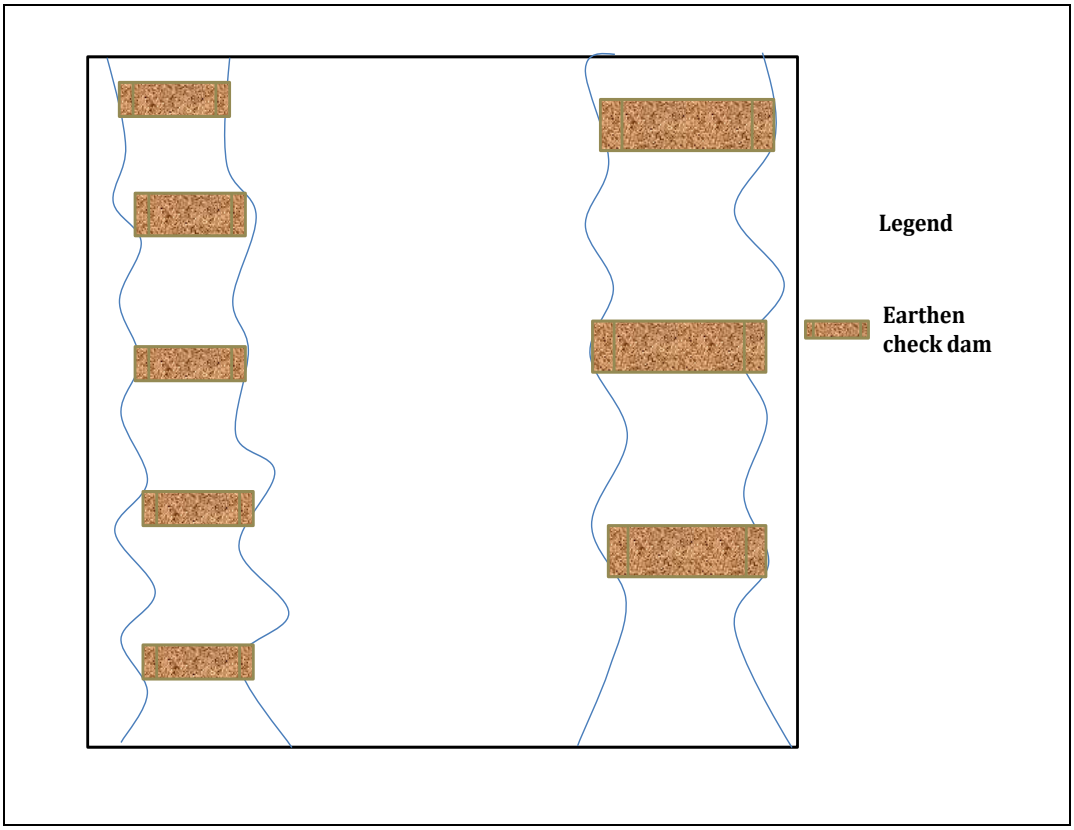


Fig. 5.23. Illustration of earthen check dams



Fig. 5.24. Illustration of contour bunds

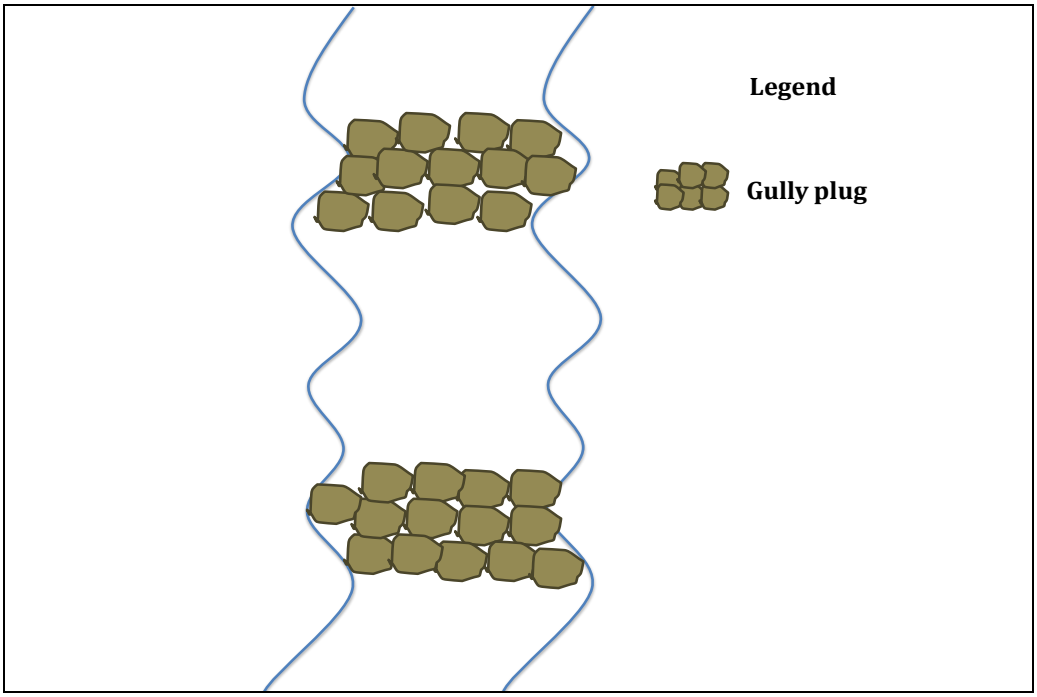


Fig. 5.25. Illustration of gully plugs

YM/UP/NL/07: Afforestation by Eco-Task Force

Ecological units of the Territorial Army, called Eco Task Force (ETF), have been carrying out afforestation works in difficult and inaccessible areas for over last three decades. These are manned by a mixture of regular army personnel and young ex-service men. ETFs are funded by state governments and the Ministry of Environment, Forest and Climate Change, GoI. The ETFs, through tree plantation, have performed admirably in restoration of sites affected by mining in the Mussoorie hills of Uttarakhand, sand dune stabilisation in the Thar Desert of Rajasthan and afforestation in harsh sites in other states such as Himachal Pradesh, Assam, etc. ETFs are effectively carrying out plantation works at sites allotted by Uttar Pradesh SFD along the Ganga River near Prayagraj.

It is proposed that inhospitable sites in difficult terrain measuring 600 ha will be assigned by SFD to Eco-Tack Force for carrying out afforestation activities. Models under natural landscape or their combinations suitable to the area, will be implemented.

Cost: Rs. 2,30,000 ha^{-1} is proposed tentatively. 600 ha is proposed to be treated in the state.

Table 5.27. Year-wise cost summary for YM/UP/NL/07 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,30,000	0	0	0	0	0	**2,30,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/NL/08: Plantation in heterogenous areas in uneven terrain

This model is proposed to be applied in sites in Etawah district of Uttar Pradesh which is the confluence of Yamuna and Chambal. The region falling all along Yamuna River has uneven topography characterised by ravines. Southern and southwestern parts of the district have ravinous land with small narrow deep depression usually carved by the running water. The forest terrain proposed for forestry interventions under the project is highly variable which defies uniform treatment over the proposed area. Site-specific activities will be carried out at different places in harmony with the site conditions. Planting of native species will be undertaken.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree, shrub: *Acacia catechu, Acacia nilotica, Vitex negundo, Dalbergia sissoo, Syzygium cumini, Terminalia arjuna, Terminalia alata, Terminalia bellirica, Lagerstroemia parviflora, Acacia nilotica, Albizia lebbeck, Azadirachta indica, Haldina cordifolia, Pongamia pinnata, Holoptelea integrifolia, Ougeinia oojeinensis,* etc.

Grass: *Saccharum bengalense, Saccharum spontaneum, Scirpus affinis, Cyperus eleusinoides, Cyperus exaltatus, Arundo donax, Phragmites karka, Themeda arundinacea, Vetiveria zizanioides, Cymbopogon flexuosus, Desmostachya bipinnata, Dichanthium annulatum, Pseudosorghum fasciculare, Cymbopogon jwarancusa, Hygroryza aristata, Panicum paludosum,* etc.

Table 5.28. Year-wise cost summary for YM/UP/NL/08 (Rs. ha^{-1})

Sub-model	Establishment cost	Maintenance cost	Total cost
YM/UP/NL/08	Site-specific requirement	Site-specific requirement	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/NL/09: Plantation in *usar* flat terrain

This model is proposed to be applied in *usar* land of Uttar Pradesh characterized by high pH and presence of hard *kankar* pan in the tree root zone with othersie normal looking area. The soil may be saline or alkaline. The low amount of sulphate and phosphate in usar soil can't support normal growth of plant species. These soils also have very low total nitrogen content. Hard *kankar* pan will be broken by digging deep pits with the help of an augur. The pH needs to neutralized by addition of acidic soil amendments such as gypsum. Planting of tolerant species will be undertaken.

Kachcha water pond(s) of total 50,000 L storage capacity will be created as a part of this model outside the plantation area for free access of grazing animals. 700 m^2 strip of grass will be planted around this pond which will be protected with brushwood fence during first year. *Kachcha* water pond(s), with base of stone or some impermeable or semi-permeable material, of total 25,000 L will be created inside the plantation to store water for a longer period of time for irrigation of plants; after two years the stone at the base will be removed to facilitate ground water recharge.

The areas where this model is proposed to be implemented have high incidence of grazing. Barbed wire fence alone is not effective. Biofence takes longer time to establish. A combination of both will be used.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species in pits

Tree and shrub: *Azadirachta indica, Pongamia pinnata, Terminalia arjuna, Albizia lebbeck, Emblica officinalis, Acacia nilotica,*etc.

Grass around pond:*Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apluda mutica,* etc.

Important elements (ha^{-1}):

i. Fencing and protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep) all around (Cost of barbed wire fence and cost of protection trench may be given separately)
ii. Biofence of fast-growing thorny plants all around.
iii. One thousand fifty pits of one metre depth and diameter around 20 cm with augur.
iv. Planting of seedlings in pits.
v. Application of manure / vermicompost to plants in the pits.
vi. Beating up of plants 20% in first year, 15% in second year and 5% in third year.

vii. Maintenance for 1+5 years (planting year plus five additional years) including weeding and hoeing, maintenance of fence, watch and ward.
viii. *Kachcha water pond* 50,000 L outside the plantation area in nearby place along with 700 m^2 strips of grass.
ix. *Kachcha* water pond of 25,000 L having base of stone pitching or some impermeable or semi-permeable material.

Table 5.29. Cost norm for YM/UP/NL/09

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			
Survey and demarcation of area	1 ha	45.59 ha^{-1}	45.59
Cleaning of plantation area	1 ha	299.73 ha^{-1}	299.73
Cleaning of area outside plantation area for planting of grass	250 m^2	299.73 ha^{-1}	7.49
Alignment of pits	1,050 no.	36.91/100	387.56
Digging of pits	1,050 no.	15 pit^{-1}	15,750.00
Protective structure			
Protection trench			
a) Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep)	50 m	98.63 m^{-1}	4,931.50
b) Jhakarhbari work, including transportation (along protection trench)	50 m	8.68 m^{-1}	434
Ploughing of area for pasture grass around pond, loosening and levelling of soil	250 m^2	Lumpsum	25
Stonewall fence			
a) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.20 m (stone available beyond 500 m)	50 m	423.75 m^{-1}	21,187.50
Kachcha pond inside plantation area with stone pitching at base			
a) Digging of *Kachcha* pond inside plantation in area of hard rock	25 m^3	128 m^{-3}	3,200
b) Providing stone pitching at base (incl. cost of material)	Lump sum		800
Digging of *Kachcha* water pond outside plantation with *Kachcha* base	50 m^3	128 m^{-3}	6,400
Making of inspection path			
a) 3 m wide path inside plantation for jeep	25 m	8,984.30 km^{-1}	224.61
b) 1 m wide path inside plantation	50 m	2,085.33 km^{-1}	104.27
Cost of seed			
a) Quality seed for pits (1,050 plants + 20% for culling)	1,260 plants	Lump sum	1,260
b) Seed for protection trenches (other than *P. juliflora*) (at double of normal rate)	50 m	2.40 m^{-1}	120
Cost of plants (incl. 20% culling for obtaining quality stock) for pits	1,260	7 $plant^{-1}$	8,820
Plantation sign board (per 25 ha)	1	3,500/25 ha	140
Miscellaneous			1,000
Total			65,137.50**or 65,138**
Planting year			
Refilling/dressing pits and trenches			
a) Refilling pits (45 cm x 45 cm x 45 cm)	1,050 no.	1.90 pit^{-1}	1,995.00
b) Dressing protection trenches	50 m	1.45 m^{-1}	72.50
Transportation of plants upto 25 km	1,050 no.	1.94 $plant^{-1}$	2,037
Local transport of plants	1,050 no.	1.52 $plant^{-1}$	1,596

Planting of plants in pits	1,050 plants	4.00 plant^{-1}	4,200.00
Sowing of seed			
a) Sowing of seeds on protection trenches in two lines	50 m	1.11 m^{-1}	55.50
b) Sowing of pasture grass around outer pond (incl. cost of seed)	250 m^2	524.80 ha^{-1}	13.12
c) Re-sowing of seeds of a and b			68.62
Creation of brushwood fence around pasture grass area	120 m	8.68 m^{-1}	1,041.60
Application of soil amendments, manure, cyanobacteria, micronutrients in pits	1,050 plants	10 plant^{-1}	10,500
Application of manure to pasture grass	250 m^2	Lump sum	50
Weeding and hoeing			
a) Around pits (three times)	1,050 pits x 3	89.90/100	2,831.85
b) On protection trenches (three times)	50 m x 3	1.11 m^{-1}	166.50
c) In pasture grass area (two times)	250 m^2 x 2	Lumpsum	150
Irrigation			
a) Plants in pits (6 times)	1,050 plants x 6	1.70 plant^{-1}	10,710
b) Pasture grass area (two times)	250 m^2 x 2	Lumpsum	100
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		4,550/26 days of 8 hrs	9,450
Contingency	Lump sum		2,000
Total			47,037.70**or 47,038**

Maintenance cost			
Year 3			
20% beating up of planted seedlings	210 plants	30 plant^{-1}	6,300
Weeding and hoeing			
a) Around pits (three times)	1,050 pits x 3	89.90/100	2,831.85
b) On protection trenches (three times)	50 m x 3	1.11 m^{-1}	166.50
Irrigation			
a) Plants in pits (12 times)	1,050 plants x 12	1.70 plant^{-1}	21,420
b) Pasture grass area (two times)	250 m^2 x 2	Lumpsum	200
Application of soil amendments, manure, cyanobacteria, micronutrients in pits	1,050 plants	10 plant^{-1}	10,500
Application of manure to pasture grass	250 m^2	Lump sum	50
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			51,418.35 or **51,418**
Year 4			
15% beating up of planted seedlings	158 plants	30 plant^{-1}	4,740
Weeding and hoeing			
a) Around pits (1 time yr^{-1})	1,050 pits x 1	89.90/100	943.95
Irrigation			
a) Plants in pits (6 times)	1,050 plants x 6	1.70 plant^{-1}	10,710
Application of soil amendments, manure, cyanobacteria, micronutrients in pits	1,050 plants	10 plant^{-1}	10,500
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			36,843.95**or 36,844**
Year 5			

5% beating up of planted seedlings	53 plants	30 plant^{-1}	1,590
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	1,050 pits x 1	89.90/100	943.95
Irrigation of plants (3 times)	1,050 plants x 3	1.70 plant^{-1}	1,785
Application of soil amendments, manure, cyanobacteria, micronutrients in pits	1,050 plants	10 plant^{-1}	10,500
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			24,768.95 or **24,769**
Year 6			
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			**9,950**
Year 7			**9,950**

Table 5.30. Year-wise cost summary for YM/UP/NL/03

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	65,138
Year 2 (Planting and establishment)	47,038
Year 3 (1st maintenance)	51,418
Year 4 (2nd maintenance)	36,844
Year 5 (3rd maintenance)	24,769
Year 6 (4th maintenance)	9,950
Year 7 (5th maintenance)	9,950
Total	**2,45,107**

5.15. AGRICULTURAL LANDSCAPE

YM/UP/AL/01: Planting of saplings by farmers

Tree planting is expected to benefit the river and general environment of the area in many ways in the long run. Saplings of plants are proposed to be distributed to farmers for planting in their private agricultural land in the riverscape. The aftercare of plants will be done by the farmers.

Trees in private land are grown by farmers in the form of block plantation (either in association with agricultural crop or, alternatively, without agricultural crop i.e. as solo crop) or in form of bund plantation (always in association with agricultural crops).

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Acacia nilotica, Albizia lebbeck, Tectona grandis, Azadirachta indica, Madhuca indica, Tamarindus indica, Morus australis, Bombax ceiba, Bauhinia purpurea, Bauhinia variegata, Syzygium cumini, Terminalia arjuna, Moringa oleifera, Aegle marmelos, Emblica officinalis, Melia azedarach, Mangifera indica, Psidium guajava, Ficus* sp., *Buchanania lanzan,* etc.

Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.

Cost norm for YM/UP/AL/01 (Rs. ha^{-1})

For distribution of plants up to 150 plants/farmer:
Cost of tree sapling, including carriage to village: Rs. 50 plant^{-1}.
Planting and maintenance cost during planting year: Rs. 50 plant^{-1}.
Maintenance cost in 1st year: Rs. 25 plant^{-1}.
Maintenance cost in 2nd year: Rs. 25 plant^{-1}.
Maintenance cost in 3rd year: Rs. 25 plant^{-1}.
Maintenance cost in 4th year: Rs. 25 plant^{-1}
Establishment cost ha^{-1}: Rs. 50,000 ha^{-1}
Maintenance cost ha^{-1}: Rs. 50,000 ha^{-1}
Total cost ha^{-1}: Rs. 1,00,000 ha^{-1}

Table 5.31. Year-wise cost (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
50,000	12,500	12,500	12,500	12,500	**1,00,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/AL/02: Silvipasture on community land

Tree planting on community land is very important for utilizing this land resource and providing economic and environmental benefits to the rural society. While planting trees, planting of grasses is of immense importance to arrest soil erosion. Grasses establish and grow fast, cover the ground rapidly and start providing environmental goods and services earlier than trees do. Grasses, in comparison with trees, need less aftercare and show greater survival on marginal lands. Silvi-pasture model will be applied with necessary local modification. Tree saplings and grass slips will be planted on community land. Site will be prepared before monsoon season. 400 pits of 45 cm x 45 cm x 45 cm size will be dug per ha at 8 m x 3 m spacing. Seedlings of trees will be planted during the monsoon season. Area between tree rows will be sown with high-yielding fodder grasses. Weeding will be done and organic manures will be applied. Harvesting of pasture grasses will be done 2-3 times (from September to December) depending on growth of pasture up to initial 5 years using the cut and carry system. After that period considering the growth of trees, grazing may be allowed for small ruminants. 20-40 % lopping of trees may be done after three years of tree age.

Kachcha water pond(s) of total 50,000 L storage capacity will be created as a part of this model outside the plantation area for free access of grazing animals. This pond will be surrounded by a strip of grass covering 150 m^2 area, fenced with brushwood. *Kachcha* water pond(s), with base of stone or some impermeable or semi-permeable material, of total 25,000 L will be created inside the plantation to store water for a longer period of time for irrigation of plants; after two years the stone at the base will be removed to facilitate ground water recharge.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Azadirachta indica, Dalbergia sissoo, Moringa oleifera, Morus alba, Salvadora persica, Pongamia pinnata, Melia azedarach, Holoptelea integrifolia, Mangifera indica, Ficus* sp., *Buchanania lanzan, Ougeinia oojeinensis,* etc.

Biofence: *Ziziphus nummularia, Carissa opaca, Acacia catechu, Acacia nilotica, Agave sisalana* etc.

Grass: *Pennisetum purpureum* (Napier grass), *Pennisetum pedicellatum* (dinanath grass), *Chrysopogon fulvus* (dhawalu grass), *Cenchrus ciliaris* (anjan grass), *Dichanthium annulatum* (Kel grass), *Bothriochloa pertusa* (phulwa grass), *Setaria sphacelata* (nandi grass), *Sehima nervosum* (sen grass), *Cynodon dactylon* (doob), *Heteropogon contortus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya,* etc.

Important features (ha^{-1})

Fencing: Barbed wire fence with bio-fence for plantation area, and brushwood fence around pasture area near outer pond

Pit size: 45 cm x 45 cm x 45 cm

400 trees ha^{-1}

Interspaces will be intercropped with pasture grasses

Kachcha pond 50,000 L outside the plantation area in nearby place along with 700 m^2 strip of grass

Kachcha water pond of 25,000 L having base of stone pitching or some impermeable or semi-permeable material

Chowkidar will protect the plantation

Table 5.32. Cost norm for YM/UP/AL/02

Particular	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	45.59 ha^{-1}	45.59
Cleaning of area by uprooting shrubs including *Lantana*	1 ha	2,997.66 ha^{-1}	2,997.66
Cleaning of area outside plantation area (near outer pond) for planting of grass	250 m^2	299.73 ha^{-1}	7.49
Alignment of pits	400 no.	36.91/100	147.64
Digging of pits (45 cm x 45 cm x 45 cm)	400 no.	9.03 pit^{-1}	3,612
Protective structure			
Protection trench			
a) Protection trench (1.20 m wide at top, 0.90 m at base and 1.00 m deep)	50 m	98.63 m^{-1}	4,931.50
b) Jhakarhbari work, including transportation (along protection trench)	50 m	8.68 m^{-1}	434
Ploughing of area for pasture grass around pond, loosening and levelling of soil	250 m^2	Lumpsum	70
Stonewall fence			
a) Stone wall fence with 10 cm earthing up (1.20+0.80/2) x 1.20 m (stone available beyond 500 m)	50 m	423.75 m^{-1}	21,187.50
Kachcha pond inside plantation area with stone pitching at base			
a) Digging of *Kachcha* pond inside plantation in area of hard rock	25 m^3	128 m^{-3}	3,200
b) Providing stone pitching at base (incl. cost of material)	Lump sum		800

Digging of *Kachcha* pond outside plantation with *Kachcha* base	50 m^3	128 m^{-3}	6,400
Making of inspection path			
a) 3 m wide path inside plantation for jeep	25 m	8,984.30 km^{-1}	224.61
b) 1 m wide path inside plantation	50 m	2,085.33 km^{-1}	104.27
Cost of seed			
a) Quality seed for pits (400 plants + 20% for culling)	480 plants	Lump sum	480
b) Seed for protection trenches (other than *P. juliflora*) (at double of normal rate)	50 m	2.40 m^{-1}	120
Cost of plants (incl. 20% culling for obtaining quality stock) for pits	480	7 $plant^{-1}$	3,360
Plantation sign board (per 25 ha)	1	3,500/25 ha	140
Miscellaneous			1,500
Total			49,762.26 **or 49,762**
Planting year			
Cleaning of plantation area (to facilitate ploughing by tractor)	1 ha	299.73 ha^{-1}	299.73
Refilling/dressing pits and trenches			
a) Refilling pits (45 cm x 45 cm x 45 cm)	400 no.	0.90 pit^{-1}	360
b) Dressing protection trenches	50 m	1.45 m^{-1}	72.50
c) Ploughing of area, loosening and levelling of soil for pasture grass in plantation area	9,500 m^2	Lumpsum	800
d) Ploughing of area, loosening and levelling of soil for pasture grass around outer pond	250 m^2	Lumpsum	25
e) Ploughing of area, loosening and levelling of soil for pasture grass around outer pond	250 m^2	Lumpsum	800
Transportation of plants upto 25 km	400 no.	1.94 $plant^{-1}$	776
Local transport of plants	400 no.	1.52 $plant^{-1}$	608
Sowing of seeds on protection trenches in two lines	50 m	1.11 m^{-1}	55.50
Planting of plants in pits	400 plants	3.47 $plant^{-1}$	1,388
Sowing of seed			
a) Sowing of seed inside plantation area	9,500 m^2	524.80 ha^{-1}	498.56
b) Sowing of pasture grass around outer pond (incl. cost of seed)	250 m^2	524.80 ha^{-1}	13.12
c) Re-sowing of seeds of a and b			511.68
Creation of brushwood fence around pasture grass area near outer pond	120 m	8.68 m^{-1}	1,041.60
Application of manure, AM, micronutrients in pits	400 plants	5.80 $plant^{-1}$	2,320
Application of manure, AM, micronutrients to grass in plantation area	9,500 m^2	Lump sum	1,900
Application of manure to pasture grass	250 m^2	Lump sum	50
Weeding and hoeing			
a) Around pits (three times)	400 pits x 3	89.90/100	359.60
b) On protection trenches (three times)	50 m x 3	1.11 m^{-1}	166.50
c) In pasture grass in plantation area (two times)	9,500 m^2 x 2	Lumpsum	570
d) In pasture grass area near outer pond (two times)	250 m^2 x 2	Lumpsum	15
Irrigation			
a) Plants in pits (6 times)	400 plants x 6	1.70 $plant^{-1}$	6,800
b) Pasture grass in plantation area near outer pond (two times)	9,500 m^2 x 2	Lumpsum	1,900
c) Pasture grass area (two times)	250 m^2 x 2	Lumpsum	50
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		4,550/26 days of 8 hrs	9,450
Contingency	Lump sum		2,000
Total			32,830.79 **or 32,831**

Maintenance cost			
Year 3			
20% beating up of planted seedlings	80 plants	30 plant^{-1}	2,400
Weeding, hoeing			
a) Around pits (three times)	400 pits x 3	89.90/100	1,078.80
b) On protection trenches (three times)	50 m x 3	1.11 m^{-1}	166.50
c) In pasture grass in plantation area (two times)	9,500 m^2 x 2	Lumpsum	570
d) In pasture grass area near outer pond (two times)	250 m^2 x 2	Lumpsum	15
Irrigation			
a) Plants in pits 12 times	400 plants x 12	1.70 plant^{-1}	8,160
b) Pasture grass in plantation area near outer pond (two times)	9,500 m^2 x 2	Lumpsum	1,900
c) Pasture grass area (two times)	250 m^2 x 2	Lumpsum	50
Application of manure, AM, micronutrients in pits	400 plants	5.80 plant^{-1}	2,320
Application of manure to pasture grass in plantation area	9,500 m^2	Lump sum	1,900
Application of manure to pasture grass	250 m^2	Lump sum	50
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			28,560.30 **or 28,560**
Year 4			
15% beating up of planted seedlings	60 plants	30 plant^{-1}	1,800
Weeding and hoeing			
a) Around pits (one time yr^{-1})	400 pits x 1	89.90/100	359.60
Irrigation			
a) Plants in pits 6 times	400 plants x	1.70 plant^{-1}	4,080
Application of manure, AM, micronutrients in pits	1,050 plants	5.80 plant^{-1}	2,320
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			18,509.60 **or 18,510**
Year 5			
5% beating up of planted seedlings	20 plants	30 plant^{-1}	600
Weeding and hoeing (one time yr^{-1})			
a) Around pits	400 pits x 1	89.90/100	359.60
Irrigation of plants (3 times)	400 plants x 3	1.70 plant^{-1}	680
Application of manure, AM, micronutrients, etc.	400 plants	5.80 plant^{-1}	2,320
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			13,909.60 **or 13,910**
Year 6			
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			**9,950**
Year 7			**9,950**

Table 5.33. Year-wise cost summary for YM/UP/AL/02

Year	Rs. ha^{-1}
Year 1 (Advance work)	49,762
Year 2 (Planting and establishment)	32,831
Year 3 (1st maintenance)	28,560
Year 4 (2nd maintenance)	18,510
Year 5 (3rd maintenance)	13,910
Year 6 (4th maintenance)	9,950
Year 7 (5th maintenance)	9,950
Total	**1,63,473**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/AL/03: Community land afforestation in erosion-prone slope areas

This model will be applied in agricultural landscape having site conditions similar to ravine land of natural landscape. The loose, fragile slopes of sand or *kankar* will be treated like model YM/UP/NL/01 (Afforestation of erosion-prone ravinous slopes). The cost norms of the said model will be followed.

Species and cost norms:

Similar to YM/UP/NL/01 (Afforestation of erosion-prone ravinous slopes).

5.16. URBAN/PERI-URBAN LANDSCAPE

YM/UP/UL/01: Roadside linear plantation

Under this model, plantations will be raised along road. Linear rows of trees will be created along the road on both sides. The plants will be protected with tree guards made of bricks. In flat areas free from problem of water logging, a wide variety of local tree species is available for planting. Trees with tall and spreading crown will be avoided in row adjacent to the road. In depressions along roads where rainwater accumulates during rainy season for more than two weeks, mounds will be prepared and seedlings will be planted on mounds. Water-logging tolerant tree species will be planted in depressions. 200 plants will be planted per kilometre: 100 plants on each side and will notionally constitute a hectare.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Syzygium cumini, Haldina cordifolia, Pongamia pinnata, Saraca asoca, Terminalia arjuna, Terminalia alata, Terminalia bellirica, Lagerstroemia parviflora, Albizia lebbeck, Azadirachta indica, Holoptelea integrifolia, Bauhinia purpurea, Ougeinia oojeinensis,* etc.

Important elements (km^{-1}) (1 km = 1 ha)

Plants per km: 100 plants x 2 sides of road (200 plants/ km length of road).

Size of plants: Tall seedlings.

Watch and ward: Provided upto four years after planting year.

Table 5.34. Cost norm for YM/UP/UL/01

Particular	Quantity ha^{-1}	Rs. km^{-1}
Advance work		
60% of cost of making brickguard, pit digging, planting, weeding and hoeing 60% of Rs. 3,269 per brickguard	400 plants	3,92,280
Total		**3,92,280**
Planting activity		
40% of cost of making brickguard, pit digging, planting, weeding and hoeing 60% of Rs. 3,269 per brickguard	400 plants	1,56,912
Total		**2,61,520**
Total establishment cost		**6,53,800**

Maintenance cost			
Year 1	Beating up, weeding, hoeing, protection (Rs. 362/brickguard)	400 plants	72,400
	Total		**72,400**
Year 2	Beating up, weeding, hoeing, protection (Rs. 289/brickguard)	400 plants	57,800
	Total		**57,800**
Year 3			**9,950**
Year 4			**9,950**
Year 5			**9,950**

Table 5.35. Year-wise cost summary for YM/UP/UL/01

Year		Rs. ha^{-1}
Planting year	Advance soil work	3,92,280
	Planting and establishment	2,61,520
1st year		72,400
2nd year		57,800
3rd year		9,950
4th year		9,950
5th year		9,950
Total		**8,13,850**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/UL/02 Roadside strip plantation

Under this model, plantations will be raised along roads. In most of the sites multi-row strips will be created along the road. The area will be fenced and tall seedlings will be planted. In flat areas free from problem of water logging, a wide variety of local tree species is available for planting. Trees with tall and spreading crown will be avoided in row adjacent to the road. In depressions along roads where rainwater accumulates during rainy season for more than two weeks, mounds will be prepared and seedlings will be planted on mounds. Water-logging tolerant tree species will be planted in depressions. 1,000 plants will be planted per ha.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Dalbergia sissoo, Syzygium cumini, Terminalia arjuna, Terminalia alata, Terminalia bellirica, Lagerstroemia parviflora, Acacia nilotica, Albizia lebbeck, Azadirachta indica, Haldina cordifolia, Pongamia pinnata, Holoptelea integrifolia, Ougeinia oojeinensis,* etc.

Important elements (ha^{-1}):
Fencing: Barbed wire fence.
Plants per ha: 400 plants in pits, 100 plants on mounds (total 500 plants) x 2 sides of road (1,000 plants km^{-1} length of road).
Size of plants: Tall seedlings.
Watch and ward: Provided upto four years after planting year.

Table 5.36. Cost norm for YM/UP/UL/02

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Advance work		
Survey and alignment		500
Cleaning of site and making inspection path	1 ha	740
Fencing of site (barbed wire)		58,000
Cost of tall seedlings (including 10% extra for culling)	500 +50 plants	66,000
Digging of pits 0.45 m x 0.45 m x 0.45 m size	400 pits	3,530
Making of mounds (2.10 m lower dia, 0.90 m upper dia, 0.70 m height)	100 mounds	3,600
Total		**1,32,370**
Planting activity		
Planting	500 plants	2,500
Manure/ vermicompost	Lumpsum	2,000
Weeding, hoeing, maintenance of mounds (2 rounds)		635
Watch and ward (for 9 months)		2,500
Contingency	Lumpsum	2,000
Total		**9,635**
Total establishment cost		**1,42,005**

Maintenance cost			
Year 1	20% beating up	100 plants	13,500
	Weeding, hoeing and maintenance of mounds (4 times yr^{-1})	Lumpsum	1,250
	Watch and ward	One year	3,300
	Contingency	Lumpsum	500
	Total		**18,550**
Year 2	15% beating up	75 plants	10,125
	Weeding, hoeing and maintenance of mounds (3 times yr^{-1})	Lumpsum	940
	Watch and ward	One year	3,300
	Contingency	Lumpsum	500
	Total		**14,865**
Year 3	5% beating up	25 plants	3,375
	Weeding, hoeing and maintenance of mounds (2 times yr^{-1})	Lumpsum	625
	Watch and ward	One year	9,950
	Contingency	Lumpsum	500
	Total		**14,450**
Year 4			**9,950**
Year 5			**9,950**

Table 5.37. Year-wise cost summary for YM/UP/UL/02

Year		**Rs. ha^{-1}**
Planting year	Advance soil work	1,32,370
	Planting and establishment	9,635
1st year		18,550
2nd year		14,865
3rd year		14,450
4th year		9,950
5th year		9,950
Total		**2,09,770**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/UL/03: Institutional plantation

Several government, private, social and religious organisations are located in the treatment zone of the DPR. Space is available in some of these for planting trees. Trees in their estates or surrounding may improve aesthetic appearance of the area, improve environment and reduce soil erosion. Ornamental, shade and fruit plants will be planted in such areas. Plants will be supplied to the institutions for planting and maintenance by themselves.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Mangifera indica, Dalbergia sissoo, Albizia lebbeck, Tectona grandis, Azadirachta indica, Madhuca indica, Tamarindus indicus, Morus australis, Bombax ceiba, Bauhinia purpurea, Bauhinia variegata, Syzygium cumini, Terminalia arjuna, Moringa oleifera, Aegle marmelos, Ficus religiosa, Haldina cordifiolia, Emblica officinalis, Neolamarckia cadamba, Melia azedarach, Psidium guajava, Ficus* sp., *Buchanania lanzan,* etc.

Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.

Cost norm for YM/UP/UL/03 (Rs. ha^{-1})

Cost of tree sapling, including carriage to the institution: Rs. 50 plant^{-1}.

Planting and maintenance cost during planting year: Rs. 50 plant^{-1}.Establishment cost: Rs. 100 plant^{-1}or Rs. 50,000 ha^{-1}

Maintenance cost: Nil

Total cost: Rs. 100 plant^{-1}or **Rs. 50,000 ha^{-1}**

Table 5.38. Year-wise cost summary for YM/UP/UL/03 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
50,000	0	0	0	0	**50,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/UL/04: Block plantation in landbank and revenue land

Some pieces of land are available near the river which were not under forestry activity in the recent years and are categorised as landbank and are suitable for tree plantation activity. Land of revenue department and other departments are also available where soil is suitable for growing of trees. Plantation will be raised in such sites under this model. The practices prescribed for model YM/UP/NL/03 (Plantation in open forest areas) will be followed.

Species and Cost norms: Same as YM/UP/NL/03 (Plantation in open forest areas)

YM/UP/UL/05: Landbank treatment in erosion prone slope areas

Some pieces of land available near the river, categorised as landbank, are not suitable for planting of trees. These have fragile, loose soil with moderate slopes and are prone to soil erosion. These sites will be treated like YM/UP/NL/01 (Afforestation of erosion-prone ravinous slopes).

Species: Same as YM/UP/NL/01 (Afforestation of erosion-prone ravinous slopes)

Cost norms: Same as YM/UP/NL/01 for planting of entire area (Afforestation of erosion-prone ravinous slopes). However, for development of check dam only with sowing of seeds of trees and grasses, 1,100 check dams/ha or 891 m^3/ha will be considered to cost Rs. 2,20,822 ha^{-1}.

YM/UP/UL/06: Treatment of floodplain and land of irrigation department

Floodplain sites and lands of irrigation department near the river are available where loose, sandy soil is found with gravel and boulder. The soil is very poor in fertility and is frequently inundated by water from the river. Grazing incidence is high. Raising of trees is quite difficult in such conditions. Under this model, water-tolerant or water-loving grasses such *Saccharum* and thorny shrubs/small trees such as *Acacia catechu*, will be established by planting slips of the grass species and dibbling of seeds on such sites. The area will not be fenced. The existing vegetation will not be removed. The seedlings already growing in the area will be protected from animals by surrounding them with pile of brushwood. 8,000 plants of grass will be planted per ha. Pits will be dug at time of planting (not in advance).

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Grass: *Saccharum bengalense, , Saccharum spontaneum, Scirpus affinis, Cyperus eleusinoides, Cyperus exaltatus, Arundo donax, Phragmites karka, Themeda arundinacea, Vetiveria zizanioides, Cymbopogon flexuosus, Desmostachya bipinnata, Dichanthium annulatum, Pseudosorghum fasciculare, Cymbopogon jwarancusa, Hygroryza aristata, Panicum paludosum,* etc.

Tree, shrub: *Acacia catechu, Acacia nilotica, Vitex negundo,* etc.

Important elements (ha^{-1}):

Plants per ha: 8,000 plants of grass; dibbling of seeds of shrubs/small thorny trees at 4,000 points.

Table 5.39. Cost norm for YM/UP/UL/06

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			
Survey and demarcation of area	1 ha	45.59 ha^{-1}	45.59
Cleaning of plantation area	1 ha	299.73 ha^{-1}	299.73
Making of inspection path			
a) 3 m wide path inside plantation for jeep	25 m	8,984.30 km^{-1}	224.61
b) 1 m wide path inside plantation	50 m	2,085.33 km^{-1}	104.27
Plantation sign board (per 25 ha)	1	3,500/25 ha	140
Miscellaneous			500
Total			1,314.20 **or 1,314**
Planting year			
Sowing of seed			
a) Sowing of seed of trees/shrubs	1,000 m	3.47 m^{-1}	3470
b) Sowing of seeds of grasses	9,500 m	524.80 ha^{-1}	498.56
c) Re-sowing of seeds of a and b			3,968.56
Making of thawla around existing plants	300 no.	1.94 $plant^{-1}$	582
Application of manure	1 ha	Lump sum	2,000
Weeding and hoeing in grass and seedlings area (two times)	1 ha x 2	Lumpsum	600
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)		4,550/26 days of 8 hrs	9,450
Contingency	Lump sum		500
Total			21,069.12 **or 21,069**

Maintenance cost			
Year 3			
Weeding, hoeing in grass and seedlings area (two times)	1 ha x 2	Lumpsum	600
Irrigation in grass and seedlings area (two times)	1 ha x 2	Lumpsum	2,000
Application of manure to pasture grass	250 m^2	Lump sum	50
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 10 ha)		5,460/26 days of 8 hrs	9,450
Contingency		Lumpsum	500
Total			12,600 **or 12,600**

Year 4			**9,950**
Year 5			**9,950**

Table 5.40. Year-wise cost summary for YM/UP/UL/06

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	1,314
Year 2 (Planting and establishment)	21,069
Year 3 (1st maintenance)	12,600
Year 4 (2nd maintenance)	9,950
Year 5 (3rd maintenance)	9,950
Total	**54,883**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/UL/07: Eco-park Development

Eco-park is a mini ecological park or an amusement park established without hampering the natural environment of the area. Generally a particular area of a forest is demarcated and brought under intensive management for purpose and the beauty offered by the nature is opened to the visitors. Sometimes forest areas having special natural features are selected for eco-park development. Landscaping and beautification is proposed to be done for urban and peri-urban landscapes of frequent public visitation to bring forth aesthetics and entertainment coupled with natural awareness. The natural layout of the land will be manoeuvred in such a way that the aesthetic beauty will be enhanced without much investment. Landscaped area will be designed to afford good soil, moisture and biodiversity conservation. *Nakshatra vatika, Rashi vatika, Nav-grah vatika, Panchvati vatika, Dhanvantari vatika,* etc. will be established within the park for awareness generation, yoga, meditation and spiritual fulfilment. Site-specific activities will be carried out at different places in harmony with the site conditions. An eco-park will have better facilities than riverfront development to facilitate the visitors.

The proportion of ornamental plants will be relatively more in eco-park than in the riverfront development model. An eco-park may have vegetative and non-vegetative components:

Vegetative part: Miscellaneous ornamental species.

Non-vegetative part: Fencing, stairs, pathways, walking trails, stone pitching, rain shelter, benches, public utilities, parking area, information centre, children playing area, pond beautification, landscaping etc. as per site-specific requirement.

List of illustrative plant types for plantation miscellaneous/ ornamental plants:

Lawn grasses, hedge plants, shrubs, creepers, hanging plants, grove of ornamental trees, fruit trees and ornamental bamboos, flowering herbs/shrubs, cacti, ferns, palms, aquatic plants, medicinal plants.

Table 5.41. Cost norm for YM/UP/UL/07

Model	**Estt. cost (Rs. in lakh ha^{-1})**	**Maint. cost (Rs. in lakh ha^{-1})**	**Total cost (Rs. in lakh ha^{-1})**
Eco-park development	25.00	7.20 (12,000 mo^{-1} for next 5 yrs)	32.20

Table 5.42. Year-wise cost summary for YM/UP/UL/07 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
25,00,000	1,44,000	1,44,000	1,44,000	1,44,000	1,44,000	**32,20,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/UL/08: Riverfront Development

Along the River, there are many opportunities for integrated regenerative design, storm water management, habitat restoration, public access, stewardship and redevelopment. River banks, riparian buffers and river habitats are important for Riverfront development to accommodate the routines of runners, strollers, anglers, boaters, working barges, etc. In addition this activity would attract residents and visitors and provide them a grand sight of the river along with fresh air, mental peace, solace and spiritual fulfilment that would connect them with the river. It includes integrated green infrastructure, improved trail access, improved habitat corridor with increased vegetative types such as meadows and transitional woodlands, as well as increased tree canopy, open space amenity and provision of ecosystem services.

Riverfront development envisages riverbank plantation to stabilize the riverbank by protecting it from soil erosion. This involves covering the entire ground by intercepting the sunlight at various heights of canopy through multiple layers of vegetation. At the ground surface, the grasses or surface growers are allowed to cover and to bind the surface soil and control the surface soil erosion like sheet erosion, splash erosion and rill erosion. It also promotes the rain water percolation. At the second layer of vegetation, small to medium sized herbs and shrubs are accommodated to intercept some amount of sunlight and slow down the speed and reduce the erosive force of rain drops falling directly from sky and/or upper layers of canopy thereby reducing soil erosion (splash erosion). At the third layer of canopy above the ground surface, small to medium sized trees or larger shrubs are accommodated to provide a dense crown cover. This comprises light loving plants having good timber value and multipurpose benefits. Scattered taller strong light demander trees may make one or two higher layers of canopy. Strong root binders are promoted on this type of site. Multi-tier planting methods are preferred. A basic support system may also be developed for the convenience of visitors.

The riverfront of the Yamuna and tributaries has different stakeholders: farmers, municipal corporations, panchayats, irrigation department, institutions, forests department, defence, etc. and substantial portion is under private ownership. Suitable steps will be taken to ensure smooth coordination of the activities among different agencies. One model for riverfront development has been proposed. Site-specific activities will be carried out at different places commensurate with the site conditions.

The proposed model of riverfront development would involve plantation along the riverbank to stabilize the soil and protect the bank from soil erosion. In addition to it, need-based activities will be undertaken to generate awareness and provide a pleasing and relaxing environment to the visitors. A typical landscaping area may have vegetative and non-vegetative components (Fig. 5.26.).

List of components to be created according to requirement:

Vegetative part: Grove consisting of shade trees, ornamental trees and bamboos, medicinal plant garden, climbers, hedges, grasses, lawn.

Non-vegetative part: Stairs, pathways, walking trails, stone pitching, rain shelter, benches, low-cost public utilities, parking area, information centre, etc. as per site specific requirement.

The vegetative and non-vegetative components will be arranged to enhance the aesthetic appeal. Various species will be planted according to their recommended spacing and resource use ability. Multi-tier planting methods will be used which will utilize the land more economically and efficiently. Water loving and soil-binder tree species are ideal choice species for riverbank planting. At the ground surface, grasses or surface growers will be allowed to cover and to bind the surface soil and to control the surface soil erosion like sheet erosion and splash erosion and rill erosion. It will also promote rain water percolation. At the second layer of vegetation, small to medium sized herbs and shrubs will be accommodated to intercept some amount of sunlight and stop the fast/forceful falling of rain drops directly from sky in turn which stop soil erosion (splash erosion). At the third layer of canopy, small to medium sized trees or larger shrubs, i.e. mainly light loving plants, will be accommodated to cover the crown area. This layer will give timber, fodder and multipurpose benefits. The top canopy will have strong light demanding species which are the dominant species on river-sides. Various species will be planted according to their recommended spacing and resource use ability. The species will be accommodated as per the use value. In urban and peri-urban areas, planting will be done keeping in view aesthetic improvement while planting in rural areas will be done for providing multiple benefits for meeting local needs.

List of illustrative species / plant types for riverfront development

Large tree: *Bauhinia variegata, Terminalia bellirica, Terminalia chebula, Terminalia arjuna, Azadirachta indica, Syzygium cumini, Pongamia pinnata, Albizia lebbeck, Moringa oleifera, Aegle marmelos, Emblica officinalis, Melia azedarach, Psidium guajava, Ficus* sp., *Buchanania lanzan, Morus australis, Bombax ceiba,* etc.

Dwarf tree/ Shrub/bamboo: *Cassia fistula, Vitex negundo, Thespesia populnea, Dendrocalamus strictus, Woodfordia fruticosa, Sesbania grandiflora, Bambusa bambos,* etc.

Herb: *Adhatoda vasica, Ocimum sativum, Wedelia trilobata, Ipomea sp., Carissa opaca,* etc.

Grass: *Stylosanthes sp., Arundo donax, Saccharum munja, Saccharum spontaneum, Saccharum bengalense, Scirpus affinis, Cyperus eleusinoides, Cyperus exaltatus, Phragmites karka, Themeda arundinacea, Vetiveria zizaniodes, Cymbopogon flexuosus, Desmostachya bipinnata, Dichanthium annulatum, Pseudosorghum fasciculare, Cymbopogon jwarancusa, Hygroryza aristata, Panicum paludosum,* etc.

Miscellaneous ornamental plant: Lawn grasses, hedge plants, shrubs, ornamental trees, ornamental bamboos, flowering herbs/shrubs, palms, aquatic plants.



Fig. 5.26. Riverfront development model
(***Source:*** Project Team**)**

Table 5.43. Cost norm for YM/UP/UL/08

Model	**Estt. cost (Rs. in lakh ha^{-1})**	**Maint. cost (Rs. in lakh ha^{-1})**	**Total cost (Rs. in lakh ha^{-1})**
River front development	35.00 lakh	7.20 lakh (12,000 mo^{-1} for next 5 yrs)	42.20 lakh

Table 5.44. Cost summary for YM/UP/UL/08 (Rs. ha^{-1})

Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Total**
35,00,000	1,44,000	1,44,000	1,44,000	1,44,000	1,44,000	**42,20,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/UL/09: Bioremediation with strip plantation

This model is proposed to be applied in sites in areas near the confluence of Yamuna and Chambal in Etawah district of Uttar Pradesh. Sites of strip plantations are often inundated or flooded by water and allow planting of species that would promote bioremediation besides providing other ecosystem good and services. The terrain proposed for forestry interventions under the project is highly variable and require site-specific activities to be carried out at different places according to the site conditions.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Grass: *Saccharum bengalense, Saccharum spontaneum, Arundo donax, Phragmites karka, Themeda arundinacea, Vetiveria zizanioides, Cymbopogon flexuosus, Desmostachya bipinnata, Dichanthium annulatum, Pseudosorghum fasciculare, Cymbopogon jwarancusa,* etc.

Tree and shrub: *Acacia catechu, Acacia nilotica, Terminalia arjuna, Terminalia alata, Terminalia bellirica, Vitex negundo, Dalbergia sissoo, Syzygium cumini, Lagerstroemia parviflora, Acacia nilotica, Albizia lebbeck, Azadirachta indica, Haldina cordifolia, Pongamia pinnata, Holoptelea integrifolia, Ougeinia oojeinensis,* etc.

Table 5.45. Cost norm for YM/UP/UL/09

Sub-model	Establishment cost	Maintenance cost	Total cost
YM/UP/UL/09	Site-specific requirement	Site-specific requirement	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

5.17. CONSERVATION INTERVENTIONS

YM/UP/CI/01: Water storage bodies/structures

Ponds and water percolation tanks will be created in forest areas where sites have been proposed by the forest department. The stored water will increase ground water recharge, reduce problem of soil erosion, provide drinking water for animals and improve the site quality. Planting work will not be done.

Table 5.46. Cost norm for YM/UP/CI/01

Sub-model*	Estt. cost (Rs. m^{-3})	Maint. cost (Rs. m^{-3})	Total cost (Rs. m^{-3})
YM/UP/CI/01/a Pond	100 (manual digging) (1 m^3=1,000 L)	25(5 yr^{-1} x 5 yrs)	**Rs. 125 m^{-3}**

Table 5.47. Year-wise cost summary for YM/UP/CI/01

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
100	5	5	5	5	5	**125**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/CI/02: Managing water flow, soil moisture and sedimentation

There are several sites where problem of soil erosion is present. The loose soils show incidence of erosion of the upper soil layer and/or gully formation. Dry check dam (boulder check dam), brushwood check dam and dry gully pugs will be created where they are expected to be effective. For brushwood check dam wooden or bamboo posts of suitable length, 8-12 cm diameter will be placed at 1 m interval with each pole driven around 50-75 cm inside soil for better strength. These posts will be held together with bamboo poles.

In some sites where the above structures are not likely to sustain the pressure of flowing water, spur, spillway and sidewall will be erected. Planting of trees will not be done on these structures. The remaining forest area will not be treated.

Table 5.48. Cost norm for YM/UP/CI/02/A to YM/UP/CI/02/G

Sub-model	Estt.cost (Rs. m^{-3})	Maint. cost (Rs. m^{-3})	Total cost (Rs. m^{-3})
YM/UP/CI/02/A Sidewall*	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/UP/CI/02/B Spur*	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/UP/CI/02/C Dry check dam*	200	100 (20 yr^{-1} for 5 yrs)	300
YM/UP/CI/02/D Dry gully plug*	190	95 (19 yr^{-1} for 5 yrs)	285
YM/UP/CI/02/E Brushwood check dam	8.68	8.68 (1.74 yr^{-1} for 5 yrs)	17.36
YM/UP/CI/02/F Spillway*	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/UP/CI/02/G Mixed SMC*	Site-specific requirement	Site-specific requirement	Site-specific cost

* Requirement is given in monetary terms as rates vary widely with site and specifications

Table 5.49. Year-wise cost summary for YM/UP/CI/02/A to YM/UP/CI/02/G

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/UP/CI/02/A to YM/UP/CI/02/B						
80% of amount demanded	-	-	10% of amount demanded	-	10% of amount demanded	Site-specific cost
YM/UP/CI/02/C (Rs. m^{-3})						
200	20	20	20	20	20	**300**
YM/UP/CI/02/D (Rs. m^{-3})						
190	19	19	19	19	19	**285**
YM/UP/CI/02/E (Rs. m^{-3})						
8.68	1.74	1.74	1.74	1.74	1.74	**17.36**
YM/UP/CI/02/F to YM/UP/CI/02/G						
80% of amount demanded	-	-	10% of amount demanded	-	10% of amount demanded	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/CI/03: Riparian wildlife management

For providing a good habitat for wildlife, various activities have been proposed as part of aforesaid models. Under this model on riparian wildlife management, water ponds will be created in wildlife-rich area for providing drinking water for the wild animals. Fodder grasses and wild fruit tree species will be planted in the surrounding area to provide a wholesome environment for the animals.

Table 5.50. Cost norm for YM/UP/CI/03

Model	Estt. cost (Rs. ha^{-1})	Maint. cost (Rs. ha^{-1})	Total cost (Rs. ha^{-1})
YM/UP/CI/03 Riparian wildlife management	2.00 lakh ha^{-1}	2.00 lakh (20% of estt. cost / year for 5 yrs)	4.00 lakh ha^{-1}

Table 5.51. Year-wise cost summary for YM/UP/CI/03 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,00,000	40,000	40,000	40,000	40,000	40,000	**4,00,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/CI/04: Wetland management in uniform site conditions

This model of wetland management will be undertaken in sites which have small area and are fairly uniform to allow similar treatment per hectare. Under this model, water ponds will be created or dug deeper for collecting water to prevent runoff or check inundation in surrounding areas. Removal of water hyacinth and other aquatic weeds will be carried out. Population of fishes of native species will be augmented. Water-logging tolerant plant species will be planted wherever possible.

Table 5.52. Cost norm for YM/UP/CI/04

Model	Estt. cost (Rs. ha^{-1})	Maint. cost (Rs. ha^{-1})	Total cost (Rs. ha^{-1})
YM/UP/CI/04: Wetland management	2.00 lakh ha^{-1}	1.00 lakh (10% of estt. cost yr^{-1} for 5 yrs)	3.00 lakh ha^{-1}

Table 5.53. Year-wise cost summary for YM/UP/CI/04 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,00,000	20,000	20,000	20,000	20,000	20,000	**3,00,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/CI/05: Wetland management in heterogenous areas

The region near the confluence of Chambal and Yamuna in Etawah district is dotted with wetlands of diverse sizes. These serve as habitat of aquatic animals and in particular, these are renowned as breeding places of Sarus crane (*Grus antigone*). Under the project it is proposed to carry out activities for conservation and scientific management of such wetlands.

Activities such as the following will be taken up depending upon site-specific requirement:

Removal of encroachments, afforestation and aided regeneration, small scale engineering, measures (gully plugging, check dams, gabion structures etc.), selective dredging and desilting to improve hydrological connectivity, interception, diversion and treatment of point sources of pollution, maintenance of breeding and spawning grounds for key species, management of invasive species, microenterprise development, sustainable fisheries development, etc.

Table 5.54. Cost norm for YM/UP/CI/05 (Rs. ha^{-1})

Model	Estt. Cost	Maint. cost	Total cost
YM/UP/CI/05	Site-specific requirement	Site-specific requirement	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/UP/CI/06: Rehabilitation of soil and water conservation structures

This model will be deployed in all such sites in forest areas in the catchment area of the Yamuna where no other model is proposed to be used. Soil and moisture conservation is crucial to river rejuvenation as it increases percolation of water in the soil and reduces surface runoff and soil erosion thereby prolonging retention of water in the catchment area, improvement of environmental flow and improvement of quality of water. This indirectly ameliorates site quality which in turn results in improvement of natural regeneration, plant survival and growth, and enhancement of forest productivity and biodiversity conservation. Soil and moisture conservation structures have direct, definite and immediate effect on water quality and quantity. The soil and moisture structures in several forest areas are quite old or inadequate and need repair /strengthening. This model aims to strengthen the soil and water conservation measures in different areas in the riverscape at a modest scale through need-based repair/ development of low-cost structures such as contour trenches, contour bunds, check dams, brushwood check dams, ponds, gully plug, etc. The length of the Yamuna in Uttar Pradesh is about 1,200 km while it shares about 320 km length with Haryana. In Uttar Pradesh, the length of Hindon is 400 km, Betwa 358 km, Sind 9 km, Chambal 33 km in Uttar Pradesh and 150 km border with other states, Ken 84 km in Uttar Pradesh and 51 km border with Madhya Pradesh. The forest area in the riverscape in the state, which is not proposed to be treated by any other treatment model, is 50,000 ha.

Table 5.55. Cost norm for YM/UP/CI/06

Model	Year 1 (Rs ha^{-1})	Year 2 to 5 (Rs. ha^{-1})	Total cost (Rs ha^{-1})
YM/UP/CI/06: Rehabilitation of soil and water conservation structures	4,600 ha^{-1}	2,000 (400 yr^{-1} for 5 yrs)	6,600 ha^{-1}

Table 5.56. Year-wise cost summary for YM/UP/CI/06 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
4,600	400	400	400	400	400	**6,600**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

5.18. SUPPORTING ACTIVITIES:

Other activities such as awareness generation, capacity building, monitoring, research, nursery development, development of value chain, protection against fire, etc. are essential to facilitate the forestry interventions and are considered vital for successful and effective execution of proposed forestry interventions.

The strategies and specific interventions for these important supporting activities are provided in Volume 1 of the DPR.

A multi-tiered mechanism has been suggested for monitoring of the project (Fig. 5.26.).

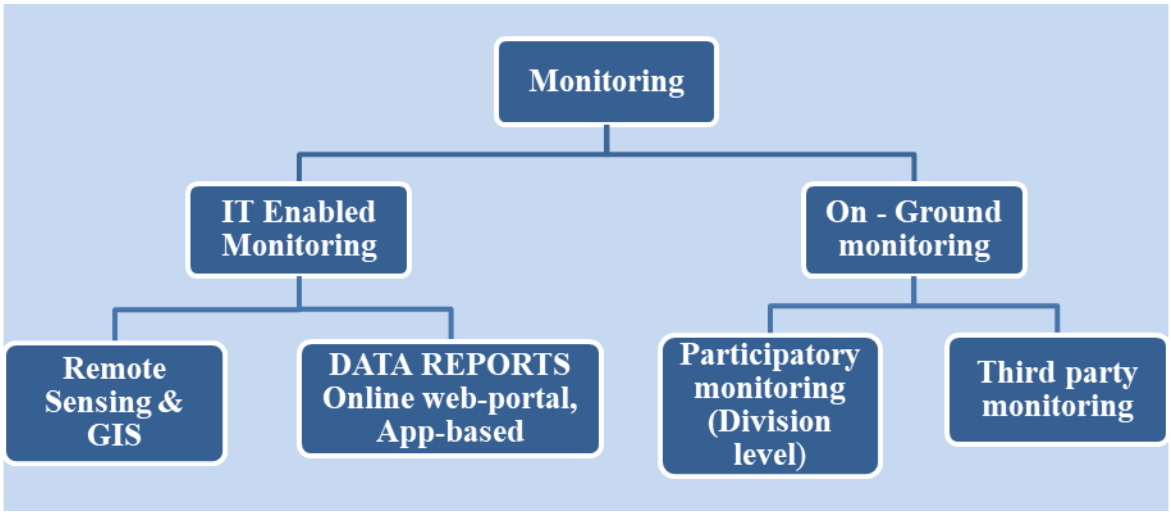


Fig. 5.27. A multi-tiered monitoring mechanism for forestry interventions for Rejuvenation of Yamuna River

5.19. BUDGET ESTIMATE

The physical and financial projections for all the interventions, supporting activities to be undertaken for the cost, area, duration as well as various divisions in Uttar Pradesh are given in Table 5.55 to 5.72.

The total budget proposed for Implementing Agency in the state is Rs. 45,178.33 lakh (Table 5.55.). About 68.42% (Rs. 30,913.11 lakh) of the budgetary provision has been made for plantations and treatment models in three landscapes while Rs. 10,623.22 lakh are provisioned for Conservation interventions. For supporting activities like awareness generation, research activities, capacity building, nursery establishment/improvement, fire protection, monitoring and evaluation, etc. an amount of Rs. 2,550 lakh is allocated while Rs. 500 lakh has been allocated for supportive field activities and miscellaneous costs and Rs. 592 lakh for Project Management Unit in the state.

Indexing of cost

The budget for the project has been prepared on the basis of rates applicable during April 2020. The cost of the project may be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI).

Table 5.55. Component/Activity-wise budget allocation for Uttar Pradesh

S. no.	Component and /or activity	Amount (Rs. in lakh)	Allocation (%)
Implementation of forestry interventions in riverscape area in Uttar Pradesh		**45,178.33**	**100.00**
A.	**Plantations and treatment models in three categories of landscape**	**30,913.11**	**68.42**
A.1	Natural landscapes	20,112.23	
A.2	Agriculture landscapes	3,578.89	
A.3	Urban and Peri-urban landscapes	7,221.99	
B.	**Conservation interventions**	**10,623.22**	**23.51**
	Total	**41,536.32**	
C.	**Supporting activities**	**3,642.00**	**8.06**
C.1	Awareness generation, research activities, capacity building, value-chain development, nursery establishment/Improvement, fire protection, monitoring and evaluation, etc.	2,550.00	
C.2	Field activities, contingency and miscellaneous expenses	500.00	
C.3	Cost of PMU in Uttar Pradesh	592.00	

Table 5.56. Year-wise cost summary for supporting activities (cost Rs. in lakh)

S. no.	Particular	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	Total
	Supporting activities						
1	Awareness generation, Research activities, capacity building, value-chain development, nursery establishment/Improvement, fire protection, monitoring and evaluation, etc.	585.00	600.00	540.00	460.00	365.00	2550.00
2	Field activities, contingency and miscellaneous expenses	110.00	110.00	110.00	95.00	75.00	500.00
3	Cost of PMU in Uttar Pradesh	110.00	150.00	124.00	104.00	104.00	592.00
	Total	**805.00**	**860.00**	**774.00**	**659.00**	**544.00**	**3,642.00**

Table 5.57. Plantation/treatment area summary for Forestry Interventions (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II	No. of sites
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	
Natural	**12,775.13**	**2,808.54**	**12,775.13**	**300.25**	**15,583.68**	**15,883.92**	**15,883.92**	**15,883.92**	**8,719.76**	**294**
Agriculture	**1,546.00**	**569.55**	**1,546.00**	**60.00**	**2,115.55**	**2,175.55**	**2,175.55**	**2,175.55**	**1,609.55**	**146**
Urban/ peri-urban	**928.30**	**228.08**	**918.00**	**0.00**	**1,138.00**	**1,138.00**	**1,138.00**	**1,156.38**	**534.00**	**88**
Conservation	**13,612.15**	**3,543.95**	**13,612.15**	**777.61**	**17,156.10**	**17,933.71**	**17,933.71**	**17,933.71**	**10,997.36**	**350**
Total	**28,861.59**	**7,150.12**	**28,851.29**	**1,137.85**	**35,993.33**	**37,131.18**	**37,131.18**	**37,149.56**	**21,860.67**	**878**

Plantation and treatment models interventions in the three landscapes will cover an area of 19,215.85 ha and Conservation interventions in 17,933.71 ha area in phase I of the project in Uttar Pradesh (Table 5.57.)

Table 5.58. Cost summary for Forestry Interventions (Rs. in lakh)

	Year1	Year 2		Year 3		Year 4	Year 5	Phase I			Phase II	Grand total
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**Total**		
Natural	4,587.08	2,018.73	2,058.59	539.45	3,279.09	2,904.46	2,400.69	7,145.26	10,642.83	17,788.09	2,324.14	**20,112.23**
Agriculture	860.34	315.25	426.32	33.08	589.70	494.02	429.03	1,208.67	1,939.06	3,147.73	431.16	**3,578.89**
Urban/ peri-urban	3,766.39	632.52	758.59	0.00	797.64	556.79	440.15	4,398.91	2,553.17	6,952.08	269.91	**7,221.99**
Conservation	5,273.88	1,716.02	373.28	226.93	548.79	752.62	665.34	7,216.83	2,340.04	9,556.87	1,066.34	**10,623.22**
Total	**14,487.68**	**4,682.52**	**3,616.78**	**799.46**	**5,215.22**	**4,707.89**	**3,935.21**	**19,969.67**	**17,475.10**	**37,444.76**	**4,091.56**	**41,536.32**

For interventions in Natural, Agriculture, Urban/Peri-urban landscape an expenditure of Rs. 17,788.09 lakh, 3,147.73 lakh and 6,952.08 lakh, respectively, will be incurred in Phase I (Table 5.58.). A budgetary provision of Rs. 9,556.87 lakh has been made for Conservation interventions in Phase I of the project.

Table 5.59. Year-wise cost summary for Supporting Activities (Cost Rs. in Lakhs)

S. no.	Supporting Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Awareness generation	70.00	100.00	70.00	40.00	40.00	**320.00**
2	Capacity building and value-chain development	90.00	120.00	75.00	45.00	45.00	**375.00**
3	Entry point activities	150.00	0.00	0.00	0.00	0.00	**150.00**
4	Nursery improvement and fire protection	100.00	120.00	120.00	100.00	100.00	**540.00**
5	Research	75.00	60.00	75.00	75.00	50.00	**335.00**
6	Monitoring and evaluation	100.00	200.00	200.00	200.00	130.00	**830.00**
	Total	**585.00**	**600.00**	**540.00**	**460.00**	**365.00**	**2,550.00**

Table 5.60. Year-wise details of C.2 Supporting Activities pertaining to Field activities, contingency and miscellaneous expenses (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Field activities, contingency and miscellaneous costs	110.00	110.00	110.00	95.00	75.00	**500.00**

Table 5.61. Year-wise details of C.3 Supporting Activity on PMU (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Recurring	70.00	140.00	120.00	100.00	100.00	**530.00**
2	Non-recurring	40.00	10.00	4.00	4.00	4.00	**62.00**
	Total	**110.00**	**150.00**	**124.00**	**104.00**	**104.00**	**592.00**

Table 5.62. Area in Natural Landscape (unit-ha)

Division	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	
Agra Soc. For. Div.	65.00	50.00	65.00	0.00	115.00	115.00	115.00	115.00	115.00
Auraiya	170.00	80.00	170.00	20.00	250.00	270.00	270.00	270.00	270.00
Baghpat	36.00	0.00	36.00	0.00	36.00	36.00	36.00	36.00	36.00
Banda	100.00	0.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00
Chitrakoot	160.00	70.00	160.00	0.00	230.00	230.00	230.00	230.00	230.00
Etawah Soc. For.	6,907.32	0.00	6,907.32	0.00	6,907.32	6,907.32	6,907.32	6,907.32	0.00
Firozabad Soc. For.	125.00	20.00	125.00	0.00	145.00	145.00	145.00	145.00	145.00
Gautam Budhha Nagar	10.00	0.00	10.00	0.00	10.00	10.00	10.00	10.00	10.00
Hamirpur	1,410.00	675.00	1,410.00	0.00	2,085.00	2,085.00	2,085.00	2,085.00	2,085.00
Jhansi	390.87	397.10	390.87	80.25	787.97	868.22	868.22	868.22	858.27
Kanpur Dehat	221.00	142.00	221.00	0.00	363.00	363.00	363.00	363.00	363.00
Kanpur Nagar Soc. For. Div	920.74	183.64	920.74	0.00	1,104.38	1,104.38	1,104.38	1,104.38	857.49
Lalitpur	209.44	125.62	209.44	0.00	335.06	335.06	335.06	335.06	335.06
Mathura	140.00	100.00	140.00	0.00	240.00	240.00	240.00	240.00	240.00
Orai Soc. For. Div	1,280.00	735.19	1,280.00	0.00	2,015.19	2,015.19	2,015.19	2,015.19	2,015.19
Saharanpur	26.50	0.00	26.50	0.00	26.50	26.50	26.50	26.50	26.50
Shivalik	4.00	0.00	4.00	0.00	4.00	4.00	4.00	4.00	4.00
Eco Task Force area	200.00	200.00	200.00	200.00	400.00	600.00	600.00	600.00	600.00
National Chambal Sanct. Proj. Agra	359.26	0.00	359.26	0.00	359.26	359.26	359.26	359.26	359.26
Chitrakoot For. & WL Div.	40.00	30.00	40.00	0.00	70.00	70.00	70.00	70.00	70.00
Total	**12,775.13**	**2,808.54**	**12,775.13**	**300.25**	**15,583.68**	**15,883.92**	**15,883.92**	**15,883.92**	**8,719.76**

Details of area under natural landscape for undertaking forestry interventions in 20 forest divisions and by Eco task force in Phase I & II of the project in the state of Uttar Pradesh have been provided in Table 5.62.

Table 5.63. Area in Agriculture Landscape (unit - ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Agra Soc. For. Div.	16.40	0.00	16.40	0.00	16.40	16.40	16.40	16.40	0.00
Auraiya	287.00	0.00	287.00	0.00	287.00	287.00	287.00	287.00	245.00
Baghpat	4.50	0.00	4.50	0.00	4.50	4.50	4.50	4.50	0.00
Chitrakoot	10.00	0.00	10.00	0.00	10.00	10.00	10.00	10.00	0.00
Etawah Soc. For.	19.70	13.20	19.70	0.00	32.90	32.90	32.90	32.90	13.20
Fatehpur	0.40	0.00	0.40	0.00	0.40	0.40	0.40	0.40	0.00
Firozabad	24.00	10.00	24.00	0.00	34.00	34.00	34.00	34.00	10.00
Gautam Budhha Nagar	3.00	0.00	3.00	0.00	3.00	3.00	3.00	3.00	0.00
Hathras	100.00	100.00	100.00	0.00	200.00	200.00	200.00	200.00	100.00
Jhansi	8.00	4.00	8.00	0.00	12.00	12.00	12.00	12.00	4.00
Kanpur Dehat	467.00	85.00	467.00	0.00	552.00	552.00	552.00	552.00	524.00
Kanpur Nagar Soc. For. Div	40.00	10.00	40.00	0.00	50.00	50.00	50.00	50.00	40.00
Mathura	266.00	100.00	266.00	0.00	366.00	366.00	366.00	366.00	366.00
Muzaffarnagar	32.00	12.00	32.00	0.00	44.00	44.00	44.00	44.00	12.00
Orai Soc. For. Div	264.00	209.00	264.00	60.00	473.00	533.00	533.00	533.00	269.00
Prayagraj	4.00	26.35	4.00	0.00	30.35	30.35	30.35	30.35	26.35
Agra Soc. For. Div.	16.40	0.00	16.40	0.00	16.40	16.40	16.40	16.40	0.00
Total	**15,46.00**	**569.55**	**1,546.00**	**60.00**	**2,115.55**	**2,175.55**	**2,175.55**	**2,175.55**	**1,609.55**

Table 5.64. Area in Urban/peri-urban Landscape (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Auraiya	53.00	20.00	53.00	0.00	73.00	73.00	73.00	73.00	73.00
Baghpat	22.00	7.00	21.00	0.00	28.00	28.00	28.00	29.00	24.00
Chitrakoot	51.60	20.00	47.00	0.00	67.00	67.00	67.00	71.60	67.00
Etawah Soc. For.	590.00	0.00	590.00	0.00	590.00	590.00	590.00	590.00	0.00
Fatehpur	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00
Firozabad Soc. For.	10.00	0.00	10.00	0.00	10.00	10.00	10.00	10.00	10.00
Kanpur Nagar Soc. For. Div	12.50	12.50	12.50	0.00	25.00	25.00	25.00	25.00	25.00
Kaushambi	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00
Lalitpur	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
Mathura	14.00	31.00	14.00	0.00	45.00	45.00	45.00	45.00	45.00
Muzaffarnagar	59.00	32.00	59.00	0.00	91.00	91.00	91.00	91.00	91.00
Orai Soc. For. Div	78.30	40.00	77.50	0.00	117.50	117.50	117.50	118.30	117.50
Prayagraj	0.00	50.58	0.00	0.00	42.50	42.50	42.50	50.58	42.50
Saharanpur	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
Shamli	30.00	15.00	30.00	0.00	45.00	45.00	45.00	45.00	35.00
Shivalik	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
Chitrakoot For. & WL Div.	2.00	0.00	2.00	0.00	2.00	2.00	2.00	2.00	2.00
Total	**928.30**	**228.08**	**918.00**	**0.00**	**1,138.00**	**1,138.00**	**1,138.00**	**1,156.38**	**534.00**

Table 5.65. Area in Conservation Intervention (unit -ha)

Division	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Maint.
Agra Soc. For. Div.	127.52	116.32	127.52	0.00	243.83	243.83	243.83	243.83	243.83
Auraiya	1,035.42	0.00	1,035.42	0.00	1,035.42	1,035.42	1,035.42	1,035.42	1,031.92
Baghpat	41.00	0.00	41.00	0.00	41.00	41.00	41.00	41.00	41.00
Chitrakoot	0.00	20.00	0.00	0.00	20.00	20.00	20.00	20.00	20.00
Etawah Soc. For.	6,932.85	0.00	6,932.85	0.00	6,932.85	6,932.85	6,932.85	6,932.85	0.00
Firozabad Soc. For.	221.01	221.01	221.01	186.11	442.02	628.13	628.13	628.13	628.13
Firozabad Soc. For. Div.	8.00	0.00	8.00	0.00	8.00	8.00	8.00	8.00	8.00
Ghaziabad	5.00	0.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00
Jhansi	910.76	882.33	910.76	122.00	1,793.09	1,915.09	1,915.09	1,915.09	1,915.09
Kanpur Dehat	631.08	0.00	631.08	0.00	631.08	631.08	631.08	631.08	631.08
Lalitpur	459.14	382.47	459.14	200.16	841.61	1,041.76	1,041.76	1,041.76	1,041.76
Meerut	246.50	47.50	246.50	22.70	294.00	316.70	316.70	316.70	316.70
Orai Soc. For. Div	1,886.10	1,212.00	1,886.10	0.00	3,098.10	3,098.10	3,098.10	3,098.10	3,098.10
Saharanpur	107.20	101.00	107.20	0.00	208.20	208.20	208.20	208.20	208.20
Shamli	15.00	18.17	15.00	0.00	33.17	33.17	33.17	33.17	33.17
Shivalik	848.08	543.16	848.08	246.64	1,391.24	1,637.88	1,637.88	1,637.88	1,637.88
National Chambal Sanct. Proj. Agra	7.5	0	7.5	0	7.5	7.5	7.5	7.5	7.5
Total	**13,612.15**	**3,543.95**	**13,612.15**	**777.61**	**17,156.10**	**17,933.71**	**17,933.71**	**17,933.71**	**10,997.36**

Table 5.66. Cost for Natural Landscape (Rs. in lakh)

Division	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand Total
	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Total Maint.	Maint.	
Agra Soc. For. Div.	44.51	35.95	24.33	0.00	50.93	47.48	36.60	80.47	159.34	45.66	285.47
Auraiya	116.42	57.53	63.64	15.10	113.24	106.78	88.12	189.05	371.78	109.84	670.67
Baghpat	22.45	0.00	16.77	0.00	19.63	14.54	9.98	22.45	60.92	9.37	92.74
Banda	68.48	0.00	37.44	0.00	48.12	34.18	28.70	68.48	148.44	26.03	242.95
Chitrakoot	76.86	38.29	55.57	0.00	96.57	85.10	66.43	115.15	303.67	81.62	500.44
Etawah Soc. For.	1,178.85	0.00	521.56	0.00	483.39	419.21	451.38	1,178.85	1,875.54	0.00	3,054.39
Firozabad Soc. For.	85.60	14.38	46.80	0.00	68.01	52.83	43.06	99.99	210.69	44.04	354.71
Gautam Budhha Nagar	6.51	0.00	4.94	0.00	5.67	4.27	3.01	6.51	17.88	2.60	27.00
Hamirpur	965.61	485.37	527.86	0.00	943.77	822.96	646.98	1,450.98	2,941.58	755.02	5,147.58
Jhansi	158.48	150.86	89.47	17.20	197.59	189.92	147.23	326.54	624.21	195.99	1,146.73
Kanpur Dehat	151.35	102.11	82.74	0.00	162.16	147.28	114.40	253.46	506.57	139.15	899.17
Kanpur Nagar Soc. For. Div	188.79	46.06	29.58	0.00	46.80	46.41	42.27	234.85	165.06	52.25	452.16
Lalitpur	58.39	44.27	23.99	0.00	50.56	47.77	38.28	102.66	160.60	44.09	307.35
Mathura	82.42	61.81	60.30	0.00	117.78	106.98	74.07	144.23	359.13	89.77	593.13
Orai Soc. For. Div	827.54	482.77	443.79	0.00	828.43	736.66	577.08	1,310.30	2,585.96	686.76	4,583.03
Saharanpur	15.60	0.00	11.41	0.00	13.73	9.95	6.56	15.60	41.66	6.90	64.15
Shivalik	1.72	0.00	1.23	0.00	1.46	1.10	0.88	1.72	4.66	1.04	7.42
Eco Task Force area	460.00	483.00	0.00	507.15	0.00	0.00	0.00	1,450.15	0.00	0.00	1,450.15
National Chambal Sanct. Proj. Agra	62.40	0.00	6.55	0.00	6.88	7.22	6.86	62.40	27.51	8.00	97.91
Chitrakoot For. & WL Div.	15.09	16.32	10.62	0.00	24.38	23.82	18.81	31.42	77.63	26.01	135.06
Total	**4,587.08**	**2,018.73**	**2,058.59**	**539.45**	**3,279.09**	**2,904.46**	**2,400.69**	**7,145.26**	**10,642.83**	**2,324.14**	**20,112.23**

Table 5.67. Cost for Agriculture Landscape (Rs. in lakh)

Division	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Total Maint.	Maint.	
Agra Soc. For. Div.	8.20	0.00	2.15	0.00	2.26	2.37	2.49	8.20	9.28	0.00	17.48
Auraiya	142.92	0.00	89.97	0.00	82.93	58.57	47.81	142.92	279.28	63.78	485.98
Baghpat	2.25	0.00	0.59	0.00	0.62	0.65	0.68	2.25	2.55	0.00	4.80
Chitrakoot	5.00	0.00	1.31	0.00	1.38	1.45	1.52	5.00	5.66	0.00	10.66
Etawah Soc. For.	9.85	6.93	2.59	0.00	4.53	4.76	5.00	16.78	16.88	2.11	35.76
Fatehpur	0.20	0.00	0.05	0.00	0.06	0.06	0.06	0.20	0.23	0.00	0.43
Firozabad	12.00	5.25	3.15	0.00	4.69	4.92	5.17	17.25	17.92	1.60	36.77
Gautam Budhha Nagar	1.50	0.00	0.39	0.00	0.41	0.43	0.46	1.50	1.70	0.00	3.20
Hathras	50.00	52.50	13.13	0.00	27.56	28.94	30.39	102.50	100.02	15.95	218.47
Jhansi	4.00	2.10	1.05	0.00	1.65	1.74	1.82	6.10	6.26	0.64	13.00
Kanpur Dehat	314.64	61.12	168.02	0.00	248.50	197.05	160.77	375.76	774.34	163.14	1,313.24
Kanpur Nagar Soc. For. Div	19.93	5.25	11.65	0.00	12.20	9.32	8.11	25.18	41.29	9.41	75.87
Mathura	139.86	52.25	92.88	0.00	126.60	95.16	72.19	192.11	386.84	114.34	693.28
Muzaffarnagar	16.00	6.30	4.20	0.00	6.06	6.37	6.69	22.30	23.32	1.91	47.53
Orai Soc. For. Div	132.00	109.73	34.65	33.08	65.19	77.13	80.98	274.80	257.94	52.97	585.71
Prayagraj	2.00	13.82	0.53	0.00	5.05	5.11	4.89	15.82	15.57	5.33	36.72
Agra Soc. For. Div.	8.20	0.00	2.15	0.00	2.26	2.37	2.49	8.20	9.28	0.00	17.48
Auraiya	142.92	0.00	89.97	0.00	82.93	58.57	47.81	142.92	279.28	63.78	485.98
Total	**860.34**	**315.25**	**426.32**	**33.08**	**589.70**	**494.02**	**429.03**	**1,208.67**	**1,939.06**	**431.16**	**3,578.89**

Table 5.68. Cost for Urban/peri-urban Landscape (Rs. in lakh)

Division	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	total Maint.	Maint.	
Auraiya	872.68	82.38	117.15	0.00	118.13	75.17	57.94	955.06	368.39	58.09	1,381.54
Baghpat	69.38	4.33	10.37	0.00	14.67	13.24	10.46	73.71	48.73	11.31	133.75
Chitrakoot	228.83	82.38	126.59	0.00	96.76	50.21	22.99	311.20	296.55	23.40	631.15
Etawah Soc. For.	1,641.00	0.00	184.01	0.00	171.11	179.54	188.46	1,641.00	723.13	0.00	2,364.13
Fatehpur	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.30
Firozabad Soc. For.	250.00	0.00	15.12	0.00	15.88	16.67	17.50	250.00	65.17	18.38	333.55
Kanpur Nagar Soc. For. Div	49.04	51.49	34.32	0.00	46.02	18.84	10.29	100.52	109.48	8.26	218.26
Kaushambi	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.15
Lalitpur	25.00	0.00	1.51	0.00	1.59	1.67	1.75	25.00	6.52	1.84	33.35
Mathura	140.30	92.68	18.38	0.00	78.51	35.64	29.30	232.98	161.83	25.27	420.08
Muzaffarnagar	34.73	19.78	25.41	0.00	45.05	39.57	27.22	54.51	137.24	32.42	224.18
Orai Soc. For. Div	387.65	164.76	209.11	0.00	179.56	88.37	42.36	552.41	519.41	40.92	1,112.73
Prayagraj	0.00	125.46	0.00	0.00	7.86	17.05	16.19	125.46	41.10	32.88	199.44
Saharanpur	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	1.50
Shamli	11.91	9.27	10.83	0.00	18.54	16.82	12.07	21.18	58.26	13.20	92.64
Shivalik	3.92	0.00	2.75	0.00	0.80	0.67	0.12	3.92	4.33	0.26	8.52
Chitrakoot For. & WL Div.	50.00	0.00	3.02	0.00	3.18	3.33	3.50	50.00	13.03	3.68	66.71
Total	**3,766.39**	**632.52**	**758.59**	**0.00**	**797.64**	**556.79**	**440.15**	**4,398.91**	**2553.17**	**269.91**	**7,221.99**

Table 5.69. Cost for Conservation Intervention (Rs. in lakh)

Division	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Total Maint.	Maint.	
Agra Soc. For. Div.	51.01	48.85	0.00	0.00	0.00	7.38	7.07	99.86	14.45	15.93	130.24
Auraiya	513.97	0.00	13.44	0.00	14.11	74.14	15.56	513.97	117.25	68.98	700.20
Baghpat	15.80	0.00	0.89	0.00	0.94	1.97	1.03	15.80	4.83	2.17	22.80
Chitrakoot	0.00	2.10	0.00	0.00	0.22	0.23	0.24	2.10	0.70	0.52	3.32
Default areas	2,160.00	1,020.60	252.00	0.00	383.67	402.84	422.99	3,180.60	1,461.51	588.88	5,230.99
Etawah Soc. For.	1,219.75	0.00	41.78	0.00	46.97	52.57	58.62	1,219.75	199.93	0.00	1,419.68
Firozabad Soc. For.	88.40	92.82	0.00	82.08	0.00	12.79	13.43	263.30	26.22	53.88	343.41
Firozabad Soc. For. Div.	16.00	0.00	3.36	0.00	3.53	3.70	3.89	16.00	14.48	4.08	34.57
Ghaziabad	10.00	0.00	1.05	0.00	1.10	1.16	1.22	10.00	4.53	1.28	15.80
Jhansi	156.50	116.66	15.88	6.73	28.37	30.14	31.65	279.88	106.03	48.28	434.19
Kanpur Dehat	262.03	0.00	2.52	0.00	2.65	38.96	2.92	262.03	47.04	42.95	352.03
Lalitpur	134.05	82.85	11.40	28.11	20.33	26.64	24.91	245.01	83.28	45.18	373.47
Meerut	12.33	2.49	0.65	1.25	0.81	0.92	0.96	16.07	3.34	1.33	20.73
Orai Soc. For. Div	229.03	88.20	24.89	0.00	34.73	37.62	38.29	317.23	135.53	51.93	504.70
Saharanpur	13.98	17.22	0.99	0.00	1.92	2.67	3.40	31.20	8.98	5.42	45.60
Shamli	30.00	38.16	3.15	0.00	7.31	7.68	8.06	68.16	26.21	13.34	107.70
Shivalik	294.03	206.08	0.50	108.77	1.30	42.81	30.19	608.88	74.81	112.94	796.62
National Chambal Sanct. Proj. Agra	15.00	0.00	0.79	0.00	0.83	0.87	0.91	15.00	3.39	0.96	19.35
Total	**5,273.88**	**1,716.02**	**373.28**	**226.93**	**548.79**	**752.62**	**665.34**	**7,216.83**	**2,340.04**	**1,066.34**	**10,623.22**

Table 5.70. Division-wise area and cost summary for different landscapes (Area in ha and cost in lakh rupees)

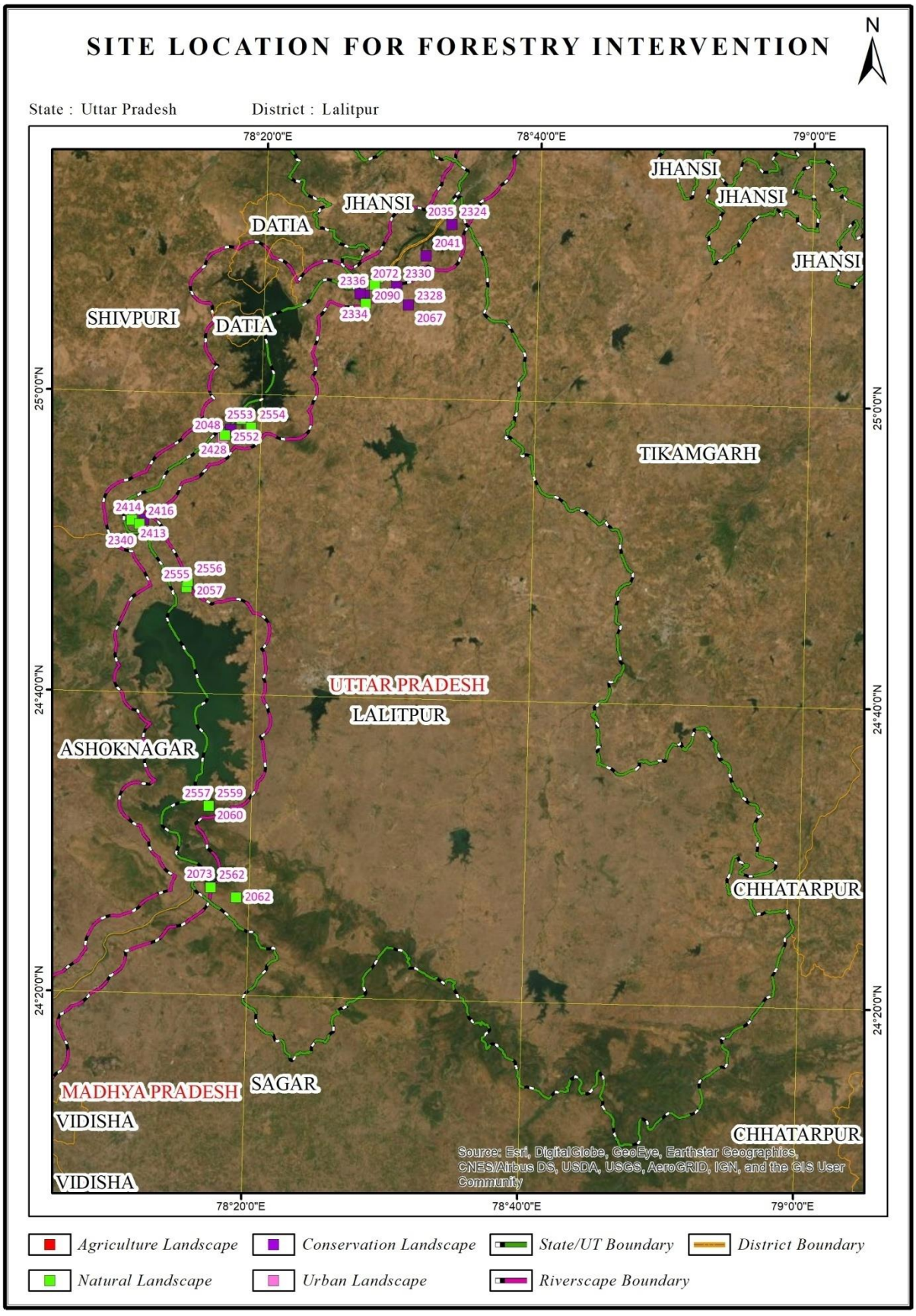
	Natural			Agriculture			Urban/peri-urban			Conservation			Total		
	Area	Cost		Area	Cost		Area	Cost		Area	Cost		Area	Cost	
Division	Est.	Est.	Maint.	Est.	Est.	Maint	Est.	Est.	Maint.	Est.	Est.	Maint.	Est.	Est.	Maint.
Agra Soc. For. Div.	115.00	80.47	159.34	16.40	8.20	9.28	0.00	0.00	0.00	243.83	99.86	14.45	375.23	188.53	183.07
Auraiya	270.00	189.05	371.78	287.00	142.92	279.28	73.00	955.06	368.39	1,035.42	513.97	117.25	1,665.42	1,801.00	1,136.71
Baghpat	36.00	22.45	60.92	4.50	2.25	2.55	29.00	73.71	48.73	41.00	15.80	4.83	110.50	114.21	117.03
Banda	100.00	68.48	148.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	68.48	148.44
Chitrakoot	230.00	115.15	303.67	10.00	5.00	5.66	71.60	311.20	296.55	20.00	2.10	0.70	331.60	433.46	606.57
Default areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,180.60	1,461.51	0.00	3,180.60	1,461.51
Etawah Soc. For.	6,907.32	1,178.85	1,875.54	32.90	16.78	16.88	590.00	1,641.00	723.13	6,932.85	1,219.75	199.93	14,463.07	4056.38	2,815.48
Fatehpur	0.00	0.00	0.00	0.40	0.20	0.23	0.60	0.30	0.00	0.00	0.00	0.00	1.00	0.50	0.23
Firozabad	0.00	0.00	0.00	34.00	17.25	17.92	0.00	0.00	0.00	0.00	0.00	0.00	34.00	17.25	17.92
Firozabad Soc. For.	145.00	99.99	210.69	0.00	0.00	0.00	10.00	250.00	65.17	628.13	263.30	26.22	783.13	613.29	302.08
Firozabad Soc. For. Div.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	16.00	14.48	8.00	16.00	14.48
Gautam Budhha Nagar	10.00	6.51	17.88	3.00	1.50	1.70	0.00	0.00	0.00	0.00	0.00	0.00	13.00	8.01	19.58
Ghaziabad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10.00	4.53	5.00	10.00	4.53
Hamirpur	2,085.00	1,450.98	2,941.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,085.00	1,450.98	2,941.58
Hathras	0.00	0.00	0.00	200.00	102.50	100.02	0.00	0.00	0.00	0.00	0.00	0.00	200.00	102.50	100.02
Jhansi	868.22	326.54	624.21	12.00	6.10	6.26	0.00	0.00	0.00	1,915.09	279.88	106.03	2,795.31	612.52	736.50
Kanpur Dehat	363.00	253.46	506.57	552.00	375.76	774.34	0.00	0.00	0.00	631.08	262.03	47.04	1,546.08	891.25	1,327.95
Kanpur Nagar Soc. For. Div	1,104.38	234.85	165.06	50.00	25.18	41.29	25.00	100.52	109.48	0.00	0.00	0.00	1,179.38	360.55	315.82
Kaushambi	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.15	0.00	0.00	0.00	0.00	0.30	0.15	0.00
Lalitpur	335.06	102.66	160.60	0.00	0.00	0.00	1.00	25.00	6.52	1,041.76	245.01	83.28	1,377.82	372.67	250.40
Mathura	240.00	144.23	359.13	366.00	192.11	386.84	45.00	232.98	161.83	0.00	0.00	0.00	651.00	569.31	907.80
Meerut	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	316.70	16.07	3.34	316.70	16.07	3.34
Muzaffarnagar	0.00	0.00	0.00	44.00	22.30	23.32	91.00	54.51	137.24	0.00	0.00	0.00	135.00	76.81	160.56
Orai Soc. For. Div	2,015.19	1,310.30	2,585.96	533.00	274.80	257.94	118.30	552.41	519.41	3,098.10	317.23	135.53	5,764.59	2,454.74	3,498.84
Prayagraj	0.00	0.00	0.00	30.35	15.82	15.57	50.58	125.46	41.10	0.00	0.00	0.00	80.93	141.29	56.67
Saharanpur	26.50	15.60	41.66	0.00	0.00	0.00	3.00	1.50	0.00	208.20	31.20	8.98	237.70	48.30	50.64
Shamli	0.00	0.00	0.00	0.00	0.00	0.00	45.00	21.18	58.26	33.17	68.16	26.21	78.17	89.33	84.47
Shivalik	4.00	1.72	4.66	0.00	0.00	0.00	1.00	3.92	4.33	1,637.88	608.88	74.81	1,642.88	614.52	83.80
Eco Task Force area	600.00	1,450.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.00	1,450.15	0.00
National Chambal Sanct. Proj. Agra	359.26	62.40	27.51	0.00	0.00	0.00	0.00	0.00	0.00	7.50	15.00	3.39	366.76	77.40	30.90
Chitrakoot For. & WL Div.	70.00	31.42	77.63	0.00	0.00	0.00	2.00	50.00	13.03	130.00	52.00	7.52	202.00	133.42	98.19
Total	**15,883.92**	**7,145.26**	**10,642.83**	**2,175.55**	**1,208.67**	**1,939.06**	**1,156.38**	**4,398.91**	**2,553.17**	**1,04,933.71**	**7,216.83**	**2,340.04**	**12,4149.56**	**19,969.67**	**17,475.10**

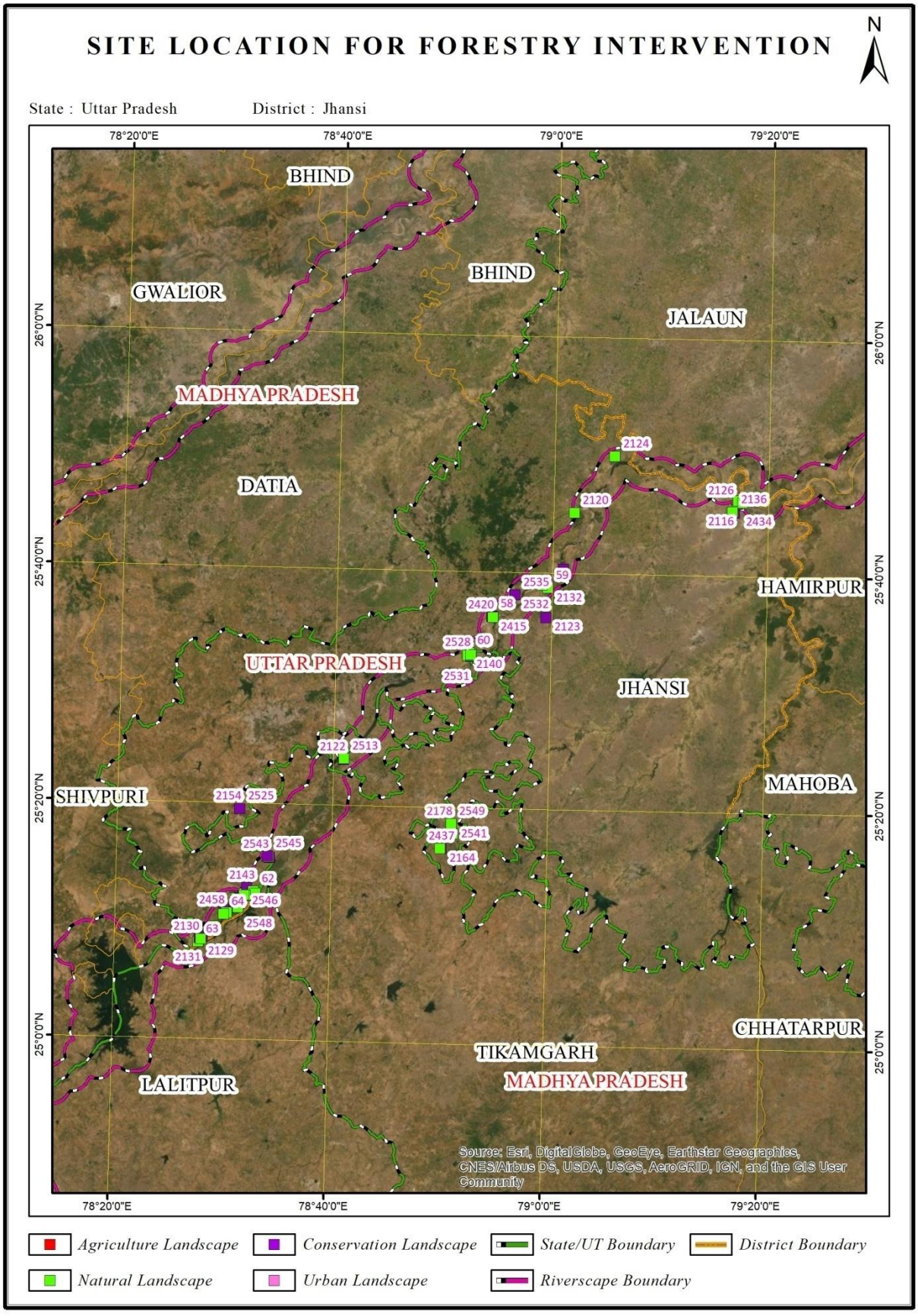
Table 5.71. Division-wise area and cost summary (Area in ha and cost in lakh rupees)

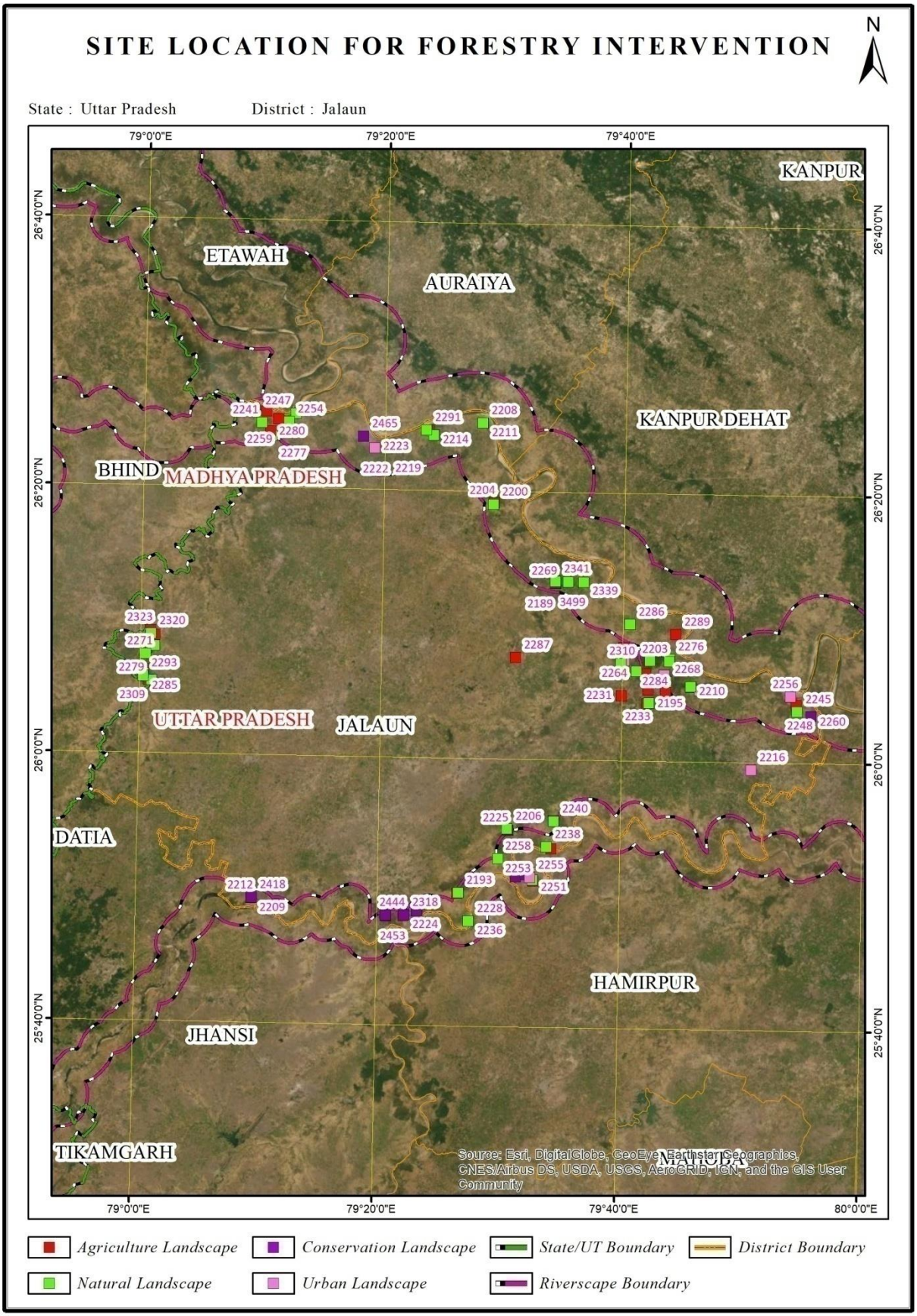
Division	Phase I			Phase II	Grand total cost
	Area	Cost		cost	
	Est.	Est.	Maint.	Maint.	
Agra Soc. For. Div.	375.23	188.53	183.07	61.59	433.19
Auraiya	1,665.42	1,801.00	1,136.71	300.69	3,238.39
Baghpat	110.50	114.21	117.03	22.85	254.09
Banda	100.00	68.48	148.44	26.03	242.95
Chitrakoot	331.60	433.46	606.57	105.54	1,145.57
Default areas	0.00	3,180.60	1,461.51	588.88	5,230.99
Etawah Soc. For.	14,463.07	4,056.38	2,815.48	2.11	6,873.96
Fatehpur	1.00	0.50	0.23	0.00	0.73
Firozabad	34.00	17.25	17.92	1.60	36.77
Firozabad Soc. For.	783.13	613.29	302.08	116.30	1,031.67
Firozabad Soc. For. Div.	8.00	16.00	14.48	4.08	34.57
Gautam Budhha Nagar	13.00	8.01	19.58	2.60	30.20
Ghaziabad	5.00	10.00	4.53	1.28	15.80
Hamirpur	2,085.00	1,450.98	2,941.58	755.02	5,147.58
Hathras	200.00	102.50	100.02	15.95	218.47
Jhansi	2,795.31	612.52	736.50	244.90	1,593.92
Kanpur Dehat	1,546.08	891.25	1,327.95	345.24	2,564.44
Kanpur Nagar Soc. For. Div	1,179.38	360.55	315.82	69.92	746.29
Kaushambi	0.30	0.15	0.00	0.00	0.15
Lalitpur	1,377.82	372.67	250.40	91.10	714.17
Mathura	651.00	569.31	907.80	229.37	1,706.48
Meerut	316.70	16.07	3.34	1.33	20.73
Muzaffarnagar	135.00	76.81	160.56	34.34	271.71
Orai Soc. For. Div	5,764.59	2,454.74	3,498.84	832.58	6,786.17
Prayagraj	80.93	141.29	56.67	38.21	236.16
Saharanpur	237.70	48.30	50.64	12.32	111.26
Shamli	78.17	89.33	84.47	26.54	200.34
Shivalik	1,642.88	614.52	83.80	114.24	812.56
Eco Task Force area	600.00	1,450.15	0.00	0.00	1,450.15
National Chambal Sanct. Proj. Agra	366.76	77.40	30.90	8.96	117.26
Chitrakoot For. & WL Div.	202.00	133.42	98.19	37.99	269.59
Total	**37,149.56**	**19,969.67**	**17,475.10**	**4,091.56**	**41,536.32**

Table 5.72. Model-wise area and cost summary (Area in ha and cost in lakh rupees)

Landscape	Phase I		Phase II	Grand total
	Area	Cost	Cost	Cost
Natural	**15,883.92**	**17,788.09**	**2,324.14**	**20,112.23**
YM/UP/NL/01	2,703.00	5,676.06	1,007.97	6,684.02
YM/UP/NL/02	585.00	1,113.06	245.47	1,358.54
YM/UP/NL/03	448.50	940.94	167.24	1,108.18
YM/UP/NL/04	2,235.00	4,717.94	794.07	5,512.01
YM/UP/NL/05	203.00	160.16	30.72	190.88
YM/UP/NL/06/A	2,073.94	578.46	68.94	647.40
YM/UP/NL/06/B	58.17	12.83	0.97	13.80
YM/UP/NL/06/C	40.00	10.89	0.96	11.85
YM/UP/NL/07	600.00	1,450.15	0.00	1,450.15
YM/UP/NL/08	6907.32	3,054.39	0.00	3,054.39
YM/UP/NL/09	30.00	73.19	7.81	81.00
Agriculture	**2,175.55**	**3,147.73**	**431.16**	**3,578.89**
YM/UP/AL/01	1,006.70	1,019.32	80.36	1,099.68
YM/UP/AL/02	604.85	921.37	177.25	1,098.62
YM/UP/AL/03	564.00	1207.03	173.55	1,380.58
Urban	**1,156.38**	**6,952.08**	**269.91**	**7,221.99**
YM/UP/UL/01	279.50	2,340.28	88.65	2,428.93
YM/UP/UL/02	40.00	84.18	23.46	107.64
YM/UP/UL/03	18.38	9.39	0.00	9.39
YM/UP/UL/04	164.00	344.62	60.16	404.78
YM/UP/UL/06	14.00	8.53	0.00	8.53
YM/UP/UL/07	19.50	613.92	40.66	654.59
YM/UP/UL/08	26.00	1,029.44	47.78	1,077.22
YM/UP/UL/09	595.00	2,521.71	9.19	2,530.90
Conservation Interventions	**17,933.71**	**9,556.87**	**1,066.34**	**10,623.22**
YM/UP/CI/01	4,519.30	276.81	22.05	298.86
YM/UP/CI/02/A	1,252.60	579.28	94.72	674.00
YM/UP/CI/02/B	211.48	97.77	17.57	115.34
YM/UP/CI/02/C	2,120.55	665.81	89.42	755.23
YM/UP/CI/02/D	1.90	0.28	0.02	0.30
YM/UP/CI/02/F	24.00	10.99	1.53	12.52
YM/UP/CI/02/G	2,719.36	1,250.20	187.77	1,437.98
YM/UP/CI/03	71.00	256.50	39.81	296.31
YM/UP/CI/04	77.17	222.19	24.57	246.76
YM/UP/CI/05	6,936.35	1,554.94	0.00	1,554.94
YM/UP/CI/06	0.00	4,642.11	588.88	5,230.99
Total	**37,149.56**	**37,444.76**	**4,091.56**	**41,536.32**


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Uttar Pradesh
District : Lalitpur
78°20'0"E
78°40'0"E
79°0'0"E
25°0'0"N
24°40'0"N
24°20'0"N
JHANSI
DATIA
SHIVPURI
TIKAMGARH
UTTAR PRADESH
LALITPUR
ASHOKNAGAR
CHHATARPUR
MADHYA PRADESH
SAGAR
VIDISHA
2035
2324
2041
2072
2330
2336
2090
2328
2334
2067
2553
2554
2048
2552
2428
2414
2416
2413
2340
2555
2556
2057
2557
2559
2060
2073
2562
2062
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Uttar Pradesh
District : Jhansi
78°20'0"E
78°40'0"E
79°0'0"E
79°20'0"E
26°0'0"N
25°40'0"N
25°20'0"N
25°0'0"N
BHIND
BHIND
GWALIOR
JALAUN
MADHYA PRADESH
DATIA
HAMIRPUR
UTTAR PRADESH
JHANSI
MAHOBA
SHIVPURI
CHHATARPUR
TIKAMGARH
MADHYA PRADESH
LALITPUR
2124
2120
2126
2136
2116
2434
59
2535
2132
2420
58
2532
2415
2123
2528
60
2140
2531
2122
2513
2154
2525
2178
2549
2437
2541
2164
2543
2545
2143
62
2458
64
2546
2548
2130
63
2129
2131
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Uttar Pradesh
District : Jalaun
79°0'0"E
79°20'0"E
79°40'0"E
80°0'0"E
26°40'0"N
26°20'0"N
26°0'0"N
25°40'0"N
KANPUR
ETAWAH
AURAIYA
KANPUR DEHAT
BHIND
MADHYA PRADESH
UTTAR PRADESH
JALAUN
DATIA
HAMIRPUR
JHANSI
TIKAMGARH
2241
2247
2254
2280
2259
2277
2465
2223
2291
2214
2208
2211
2222
2219
2204
2200
2269
2341
2339
2189
3499
2286
2289
2287
2310
2203
2276
2264
2268
2284
2231
2210
2195
2233
2256
2245
2248
2260
2216
2323
2320
2271
2279
2293
2285
2309
2225
2206
2240
2238
2258
2253
2255
2251
2193
2212
2418
2209
2444
2318
2228
2224
2453
2236
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary

Chapter 6

RAJASTHAN

6.1. INTRODUCTION

Rajasthan, situated in the north-western part of the country, is the largest state of the country spread over an area of 3,42,239 km^2, which is 10.40% of the geographical area of the country. The state is located from 23°4' N to 30°11' N latitude and 69°29' E to 78°17' E longitude. It is recognised as India's desert state (Fig.6.1) and, as a result, people uphold high level of sensitivity to water conservation. The state has a fascinating history and is culturally vibrant. With the Thar Desert and the Ranthambore National Park – home of the Royal Bengal tiger – Rajasthan presents a unique natural environment. Rajasthan has 33 districts and 297 cities and 297 towns (Economic Review, 2014-15).



Fig. 6.1. A typical landscape of Rajasthan
Source: https://www.britannica.com/place/Rajasthan

6.2. GEOGRAPHY

The State has 4 distinct regions namely, the western desert (Thar), the eastern rocky and sandy plains, the Aravalli hills and the south-eastern plateau. The Tropic of Cancer passes through its southern tip, i.e., in the Banswara district. The state has a maximum length of 869 km from west to east and 826 km from north to south. On the west, the state's boundary forms the Indo-Pak international border. The state shares inter-state border with Punjab and Haryana states in the north, Uttar Pradesh in the east, Madhya Pradesh in the southeast and Gujarat in the southwest. Four physiographic divisions of Rajasthan are as follows:

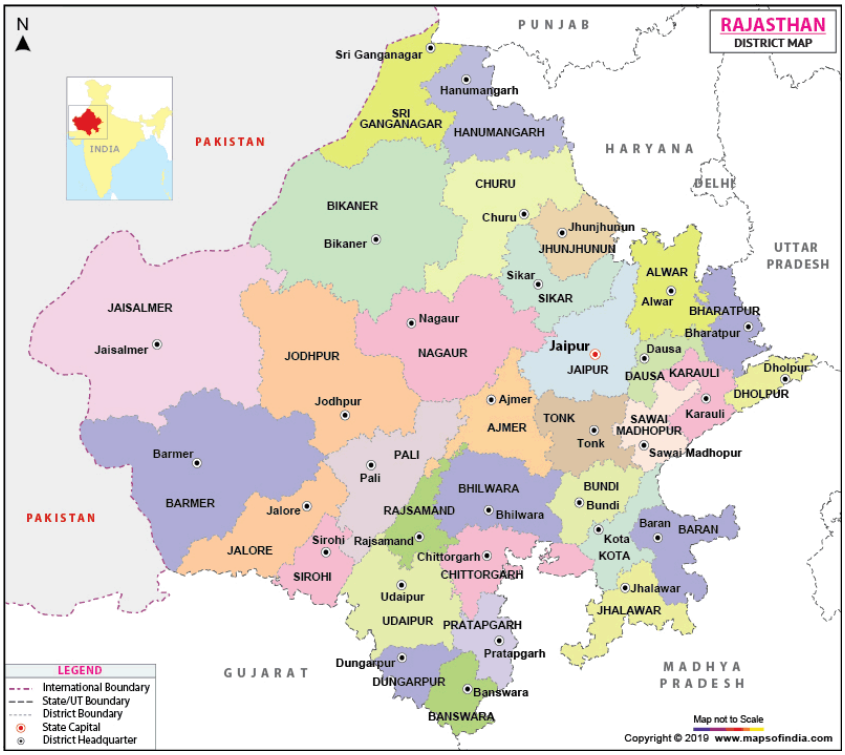


Fig. 6.2. The location of Rajasthan
(***Source:*** Maps of India)

6.2.1. The Western Sandy Plain Region is covered under Hanumangarh, Sri Ganganagar, Bikaner, Jaisalmer, Barmer, Jalore, Sirohi, Pali, Jodhpur, Nagaur, Churu, Sikar and Jhunjhunu districts covering an area of about 1,96,747 km^2.

6.2.2. Aravalli Range and Hilly Region is distributed in Alwar, Jaipur, Ajmer, Rajsamand, Udaipur, Sirohi and south-west part of Tonk district. This region extends over 692 km running from Palanpur in Banaskantha district of Gujarat to Delhi with an average height of 600 m. The highest peak of Aravalli is Gurushikhar (1,722 m) in Mount Abu (Sirohi). Aravalli Range starts in Sirohi and ends at Khetri in Jhunjhunu district in Rajasthan.

6.2.3. The Eastern Plain Region occupies about 23.3% of total area of Rajasthan and distributed in Tonk, Bundi, Amjer, Sawai Madhopur, Bhilwara, Chittorgarh, Kota and Bhatratpur districts.

6.2.4. The South-East Rajasthan Plateau comprises the eastern and south-eastern parts of the state and is known as Hadoti. It is situated in Bhilwara, Bundi, Kota, Baran and Jhalawar districts with about 9.6% area of Rajasthan. East of the plateau has a general slope toward Gwalior and is catchment of river Betwa.

6.3. GEOLOGY

Rajasthan forms north-western part of the Indian Shield. The entire rock system of the state belongs to Palaeozoic, Proterozoic and Archaen era. Its rocks range in age from one of the oldest (more than 3500 M yrs. age) to recent, displaying a wide range of rocks, mineral deposits and geologic processes (Fig.6.3).

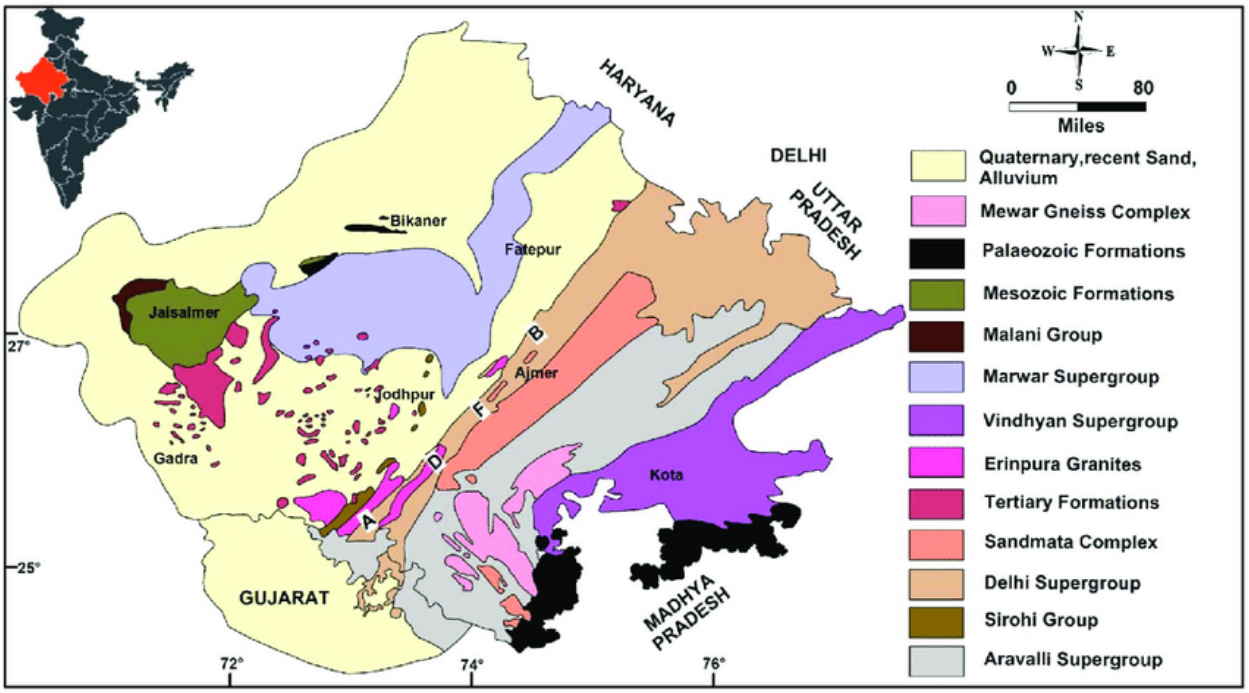


Fig. 6.3. Simplified geological map of Rajasthan showing the location of Aravalli-Delhi Fold Belt

(***Source:*** Research Gate**,** Modified after Kilaru *et al.*, 2013)

6.4. TOPOGRAPHY AND SOILS

Climate, vegetation and topography are the soil-forming factors that act on a range of rock formations and parent materials. These together give rise to different kinds of soils.

6.4.1. Topography

The major part of Rajasthan is dominated by parched and dry areas. Wind, water and extremes of temperatures have created diverse topographic features, *viz*., hills, intermontane rocky uplands, rocky gravelly piedmonts, flat buried piedmonts, saline alluvial plains, sand dunes, graded river beds, shallow saline depressions, sand dunes, younger alluvial plains, water bodies, etc.

6.4.2. Soils

The Aravallis divide Rajasthan into two parts: the eastern and the western region. Soil fertility decreases from east and northeast to west and northwest. Desert soil is the most widespread in the state occurring to the west of Aravallis. This soil is very poor in nutrient status. Sand dunes, rock outcrops and hillocks are common. Soluble salt content and pH are high. Mixed red and black soils are found in eastern parts of Chittorgarh, Bhilwara, Dungarpur, Banswara and Bhilwara districts. Medium black soil occurs in Kota, Bundi and Jhalawar in the southeastern part of the state. Alluvial soil occurs in Alwar, Bharatpur, Jaipus, Sawai Madhopur in northeastern part of the state. Brown soils are common in Tonk, Bundi, Sawai Madhopur, Bhilwara, Udaipur and Chittorgarh districts). Hill soils occur in the hilly tracts of Sirohi, Pali, Nagaur, Udaipur, Rajsamand, Chittorgarh, Bhilwara and Ajmer districts. Saline Sodic soils are observed in the depressions like the Pachpadra, Sambhar, Didwana, Ranns of Jalore and Barmer. Most soils of

Rajasthan are deficient in nitrogen (N) while Phosphorus (P) is low to medium, whereas potassium (K) is adequate. Nearly 18% of soils in semi-arid eastern plain have salinity and alkalinity problem.

6.5. CLIMATE

Rajasthan experiences hot summers and mild winters. Absolute maximum temperature generally ranges between 43º and 48ºC, while minimum temperature ranges between -2º and 10 ºC. The mean monthly maximum temperature over a large part of Rajasthan during May and June is about 45ºC while mean monthly minimum temperature during this period is about 23ºC. In summer, the maximum temperature sometimes reaches close to 50ºC at few places. Dust storms of hot dry wind are common during the summer season. December and January are the coldest month, the mean monthly temperature being 12.9 ºC. The absolute minimum temperature sometimes falls below the freezing point at Ganganagar and Bikaner.

Rainfall is very low, highly erratic and within the state it decreases from East to West and from South East to North West. About 90% of the annual rainfall occurs during July to September. The region experiences frequent droughts. Annual rainfall varies from 100 mm to 400 mm (average 531 mm). The number of rainy days in Jaisalmer, Jhalawar and Mount Abu are 10, 40, to 408, respectively. A trend of slight increase in rainfall in western Rajasthan and a decrease in eastern Rajasthan has been recorded during 1951-2007 (Kharol *et al.,* 2013).

6.6. RIVER SYSTEM AND HYDROLOGY

The rivers of the Rajasthan are rainfed and are represented by 14 major basins (Fig 6.4). The rivers can be divided into three main categories based on their drainage pattern: (a) rivers that drain into Arabian Sea like Mahi, Sabarmati and Luni, (b) rivers that drain into Bay of Bengal like Banas, Chambal and Banganga; and (c) rivers with inland drainage like Sahibi, Kantali, Kankani and Ghaghar (Kumar *et al.,* 2010). About 60.2% of the area of the state relates to inland drainage system. The Aravalli range forms the main watershed for Rajasthan. The area to the west of the Aravalli is dry, sparsely populated, and the west-flowing water ultimately drains into the Arabian Sea. The eastern part is humid, densely populated and the rainwater flows in the north-east direction to merge with Yamuna-Ganga and drain into the Bay of Bengal. Other regions mostly rely on surface water brought by Indira Gandhi Canal. Banas basin is the largest with drainage area of 45,833 km^2 area, followed by Luni (37,363 km^2) and Chambal (31,360 km^2).

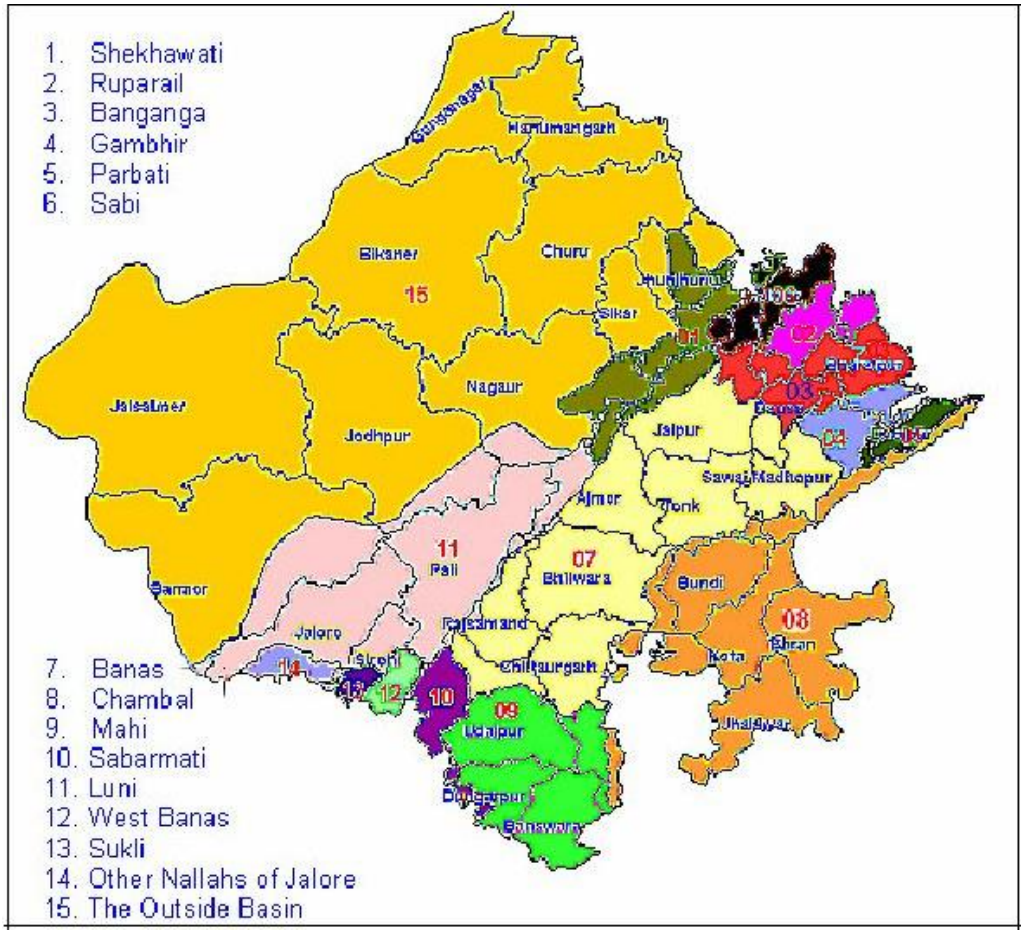


Fig. 6.4. Different river basins in Rajasthan
(***Source:*** http://www.rajirrigation.gov.in)

6.6.1. Tributaries of Yamuna

a. Chambal

Chambal is the only perennial river of Rajasthan (Fig. 6.5), which enters this state from Madhya Pradesh at Chaurasigarh, Chambal flows northwards along the eastern border of Rajasthan with Madhya Pradesh and enters Uttar Pradesh where it meets Yamuna. The total length of Chambal in the state of Rajasthan is 497.08 km. The entire Chambal River basin extends over Madhya Pradesh, Rajasthan and Uttar Pradesh covering around 93 tehsils and 24 districts (Hussain and Badola, 2001).

Chambal is one of the largest rivers in Rajasthan and carries clean water which can be used for drinking, irrigation and other activities. The Chambal basin lies between latitudes 22° 27' N and 27° 20' N and longitudes 73° 20' E and 79° 15' E. The basin is bounded by the Vindhyan mountain ranges on the south, east and west, and by the Aravalli hills on the north-west (Jain *et al.*, 2007).

b. Banas

Banas (Fig. 6.6) is the principal tributary of Chambal River. Banas, rises in the Aravalli near Kumbhalgarh in Rajsamand district and collects water of the Mewar plateau. It is 555.24 km in length.

c. Gambhir

Gambhir River originates near Mhow in district Indore, Madhya Pradesh and enters Rajasthan in Karauli district. Thereafter, it flows in the border area of Rajasthan, Madhya Pradesh and Uttar Pradesh. It joins Shipra River in Ujjain district, Madhya Pradesh, which later merges into Chambal River in Mandsaur district, Madhya Pradesh. It is a seasonal river and its length in Rajasthan state is 22.28 km.

d. Kalisindh

It originates in the Vindhya hills in Madhya Pradesh and enters Rajasthan in Jhalawar district. After flowing for about 408.16 km, it joins Chambal in Kota district (Jain *et al.*, 2007). The length of Kalisindh in Rajasthan is 273.45 km.

e. Mej

Mej River originates in Mandalgarh tehsil in Bhilwara district. It joins Chambal River in Kota district (Jain *et al.*, 2007) and flows for 189.66 km in Rajasthan state.

f. Parvati

Parvati River originates in the Vindhyan hills in Sehore district, Madhya Pradesh and enters Rajasthan in Baran district. It joins Chambal in Sawai Madhopur (Jain *et. al.*, 2007) and has a total length of 195.81 km in Rajasthan.



Fig. 6.5. Chambal River near Dhaulpur
(***Source:*** Project Team**)**

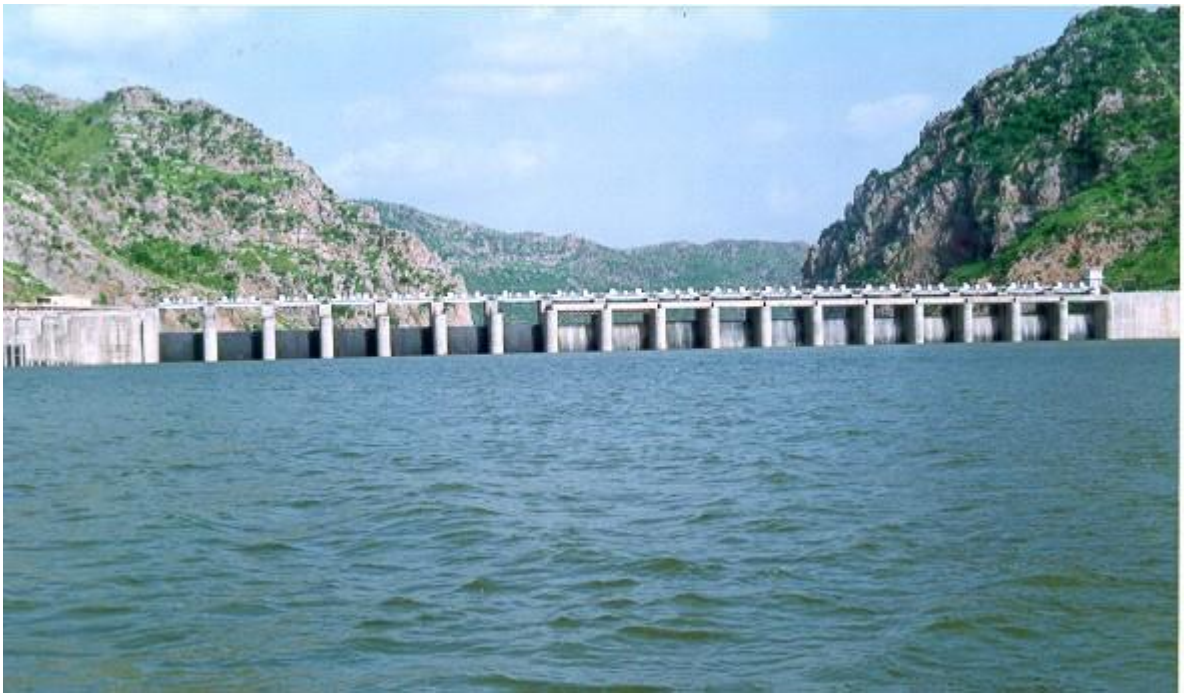


Fig. 6.6. Banas River
(***Source:*** https://www.rajras.in/)

6.6.2. Other Water Bodies and Aquifers

Water resources in Rajasthan are only about 1% of the total surface water resources of India. There are 203 major and medium tanks and reservoirs in the state, which store about 13.72 billion cubic metre (BCM) water at their full capacity and a reduced volume of 11.51 BCM during dry years. In addition, there are large numbers of minor rainwater harvesting structures with a storage capacity of about 2.28 BCM, thus increasing the total storage at full-capacity level to 16 BCM. However, during droughts, the estimated total surface water availability generally reduces to 12.88 BCM resulting in a shortfall of about 3.12 BCM. The annual per capita water availability was 2,181 m^3 in 1961 that decreased to 699 m^3 in 2011 and is likely to decrease to 604 m^3 by 2021, 439 m^3 by the year 2050. An estimate indicates 1,437 MCM surplus water in the River Chambal, whereas there is requirement of water in other basins including Banas, Banganga, Gambhir and Parbati (Vyas *et al.*, 2016).

The number of natural wetlands, especially small (size <2.25 ha) is 2,263 (Table 6.1). The man-made reservoir/barrage (219) and tank/pond (1,038) are in good number and cover a substantial area (24,098 ha) (FSI, 2019).

Table 6.1. Wetlands (in ha) inside the Recorded Forest Area (or Green Wash) in Rajasthan

Wetland category	No. of wetlands	Total wetlands area
Inland wetlands – Natural		
Lake/Pond	20	1,177
Waterlogged	5	1,195
River/Stream	259	19,147
Sub-Total	**284**	**21,519**
Inland wetlands – Man-made		
Reservoir/Barrage	219	16,401
Tank/Pond	1,038	7,697
Waterlogged	16	3,037
Salt Pan	2	929
Sub-Total	**1,275**	**28,064**
Coastal wetlands – Natural		
Intertidal mud flat	1	4,386
Salt Marsh	3	109
Sub-total	**4**	**4,495**
Wetlands (<2.25 ha)	2,263	2,263
Total	**3,826**	**56,341**
Total recorded forest (or Green Wash) area (in ha)		**33,07,212**
Per cent of wetland area inside recorded forest (or Green Wash) area		**1.70%**

The highest per capita water availability of 1,798 m^3 is in the Chambal basin, followed by the Sabarmati (1,729 m^3) and the Mahi (1,120 m^3), whereas the lowest (190 m^3) is in the Banganga basin (https://www.rajras.in/index.php/important-rivers-lakes-dams-rajasthan-ebookpdf).

The numbers of critical and over-exploited blocks have increased from 140 to 166 between 2004 and 2009. Out of total of 239 assessment units (Block/Mandal/Taluka) in the states, 166 have been categorized as 'over-exploited' as on 31st March 2009. There are 25 'critical assessment units and one block (Taranagar) having saline ground water. The amount of surface water considered for planning the artificial recharge is 860 MCM. The areas feasible for artificial recharge have been demarcated into following three categories, *viz*., i. areas showing declining trend (more than 0.2 m yr^{-1}) and water level between 3 and 9 bgl, ii. areas showing declining trend (more than 0.1 m yr^{-1}) and water level between 9 and 20 m bgl and iii. water level more than 20 m bgl (Fig. 6.7). In Yamuna basin, the rechargeable areas for aquifers fall in the districts of Ajmer, Bharatpur, Bhilwara, Bundi and Dholpur only (CGWB, 2013).

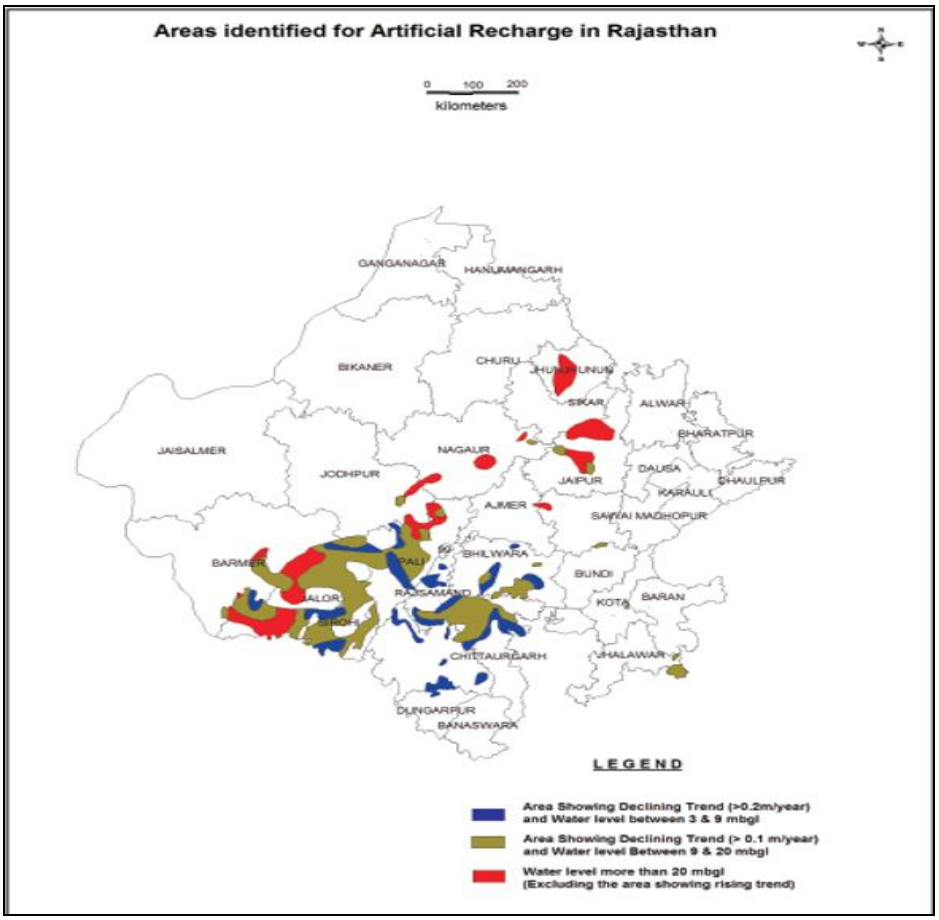


Fig. 6.7. Areas suitable for artificial recharge in Rajasthan
(***Source:*** CGWB, 2013)

6.6.3. Issues about Water Resources

Water quality of rivers in Rajasthan is measured at 17 locations on 11 rivers and among them 14 locations are non-complying to the water quality criteria with respect to BOD (CPCB, 2015). These 14 locations are on 8 rivers: Banas, Chambal, Chappi, Ghaggar, Kali Sindh, Parvati, Jawai and Ujad. These rivers are classified in priority class I, II, III and V based on the level of BOD.

Table 6.2. Polluted river stretches in Rajasthan

S. no.	River name	Stretch identified	Town identified	Approximate length of the stretch (km)
1.	Banas	Along Bisalpur Dam, Swaroopganj, Newta Dam	Bisalpur, Sirohi, Swaroopganj, Tonk, Bhilwara	60
2.	Chambal	Sawai Madhopur to Kota	Sawai Madhopur, Kota	65
3.	Chappi	Chhapi Dam, Jhalawar to Chhapihera	Chhapihera, Thonawad, Arnia, Methoon, Jhalawar	20
4.	Ghaggar	Surewala to Hamumangarh	Hanumangarh	15
5.	Kali Sindh	Barod to Gadepan	Borkhera, Baldara	20
6.	Parvati	Khatoli, Kota to Todra	Mohammadpur, Khatoli	10
7.	Jawai	Jawai Dam Sena to Galthani	Sena, Galthani	10
8.	Ujad	Mori (Bhim Sagar Dam) to Anghora	Mori	2

Activities, e.g., sand mining (Fig.6.8), extraction and diversion of water (6.9), fishing and riparian cultivation by flattening ravines, etc. are disrupting the water flow in Chambal, polluting and fragmenting its aquatic ecosystem and the forest landscape that support more than 550 species**.** Quality and quantity of water are important parameters of river health. Barring a few stretches — for example, Kota-Keshoriapatan belt where a minor tributary brings industrial effluents — the Chambal's water is of an admirable 'A' category as per the Central Pollution Control Board standards. However, water quantity — water depth and flow — is a source of concern from point of river ecology. According to studies conducted by the Wildlife Institute of India (WII), the Chambal's water flow receded to as low as 16.38 m^3 s^{-1}(or 16,380 L s^{-1}) during June-July in 2009 while the average lean flow was 58.53 m^3s^{-1} in April and peak monsoon flow was 2,074.28 m^3s^{-1} in August. The lean flow works out to be less than 3% of the peak flow. An acute decline in population of gharials during 1999-2006 has led to the change in their status to "critically endangered". However, the gharial population is above the 1,100-mark as many young gharials are being released here under a re-stocking programme **(**Mazoomdaar, 2013) (Fig.6.10).



Fig. 6.8. Sand mining along the river Chambal is threatening the existence of wildlife (***Source:*** https://www.cnbctv18.com/wildlife/demand-for-freshwater-poses-a-threat-to-chambal-river-4658821.htm)

Besides being home to many endangered species, Chambal is also one of the most significant breeding sites for threatened birds such as the Indian skimmer and black-bellied tern. As water level starts rapidly dropping from April onward in Chambal, many of the nesting hitherto river islands become connected with either bank, facilitating access to unfamiliar land predators such as dogs, jackals and hyenas which then easily predate on the birds' eggs and chicks. Humans too start using these stretches to cross to the other side, often with their cattle. This results in additional accidental trampling of eggs. All this has resulted in very low nest survival of these threatened birds, thereby, endangering their long-term survival prospects in the region

According to scientists and wildlife researchers that have been working in the region for a while, the whole area is marked with hundreds of small developmental projects which alone may not have a significant impact on the ecology but together, the cumulative impact of such projects is heavy on river Chambal and its ecology (Aggarwal, 2019a).



Fig. 6.9. Rana Pratap Sagar Dam on Chambal River
(***Source:*** https://www.youtube.com)



Fig. 6.10. Conservation of gharial in National Chambal Sanctuary
(***Source:*** https://www.nativeplanet.com/travel-guide/into-the-badlands-of-imperiled-gharials-and-red-rooftop-turtles-chambal-wildlife-sanctuary)

6.7. FORESTS AND VEGETATION

Rajasthan, the largest state of India according to geographical area is a forest deficient state and ranks 15th in terms of the RFA. The Recorded Forest Area (RFA) in the state is 32,737 km^2 of which 12,475 km^2 is Reserved Forest, 18,217 km^2 is Protected Forest and 2,045 km^2 is Unclassed

Forests (FSI, 2019).Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Oct to December 2017, the forest cover in the state is 16,629.51 km^2 which is 4.86 % of the state's geographical area (Fig.6.11). In terms of forest canopy density classes, the state has 77.81 km^2 under Very Dense Forest (VDF), 4,341.90 km^2 under Moderately Dense Forest (MDF) and 12,209.80 km^2 under Open Forest (OF; Table 6.3). Forest Cover in the state has increased by 57.51 km^{2}as compared to the previous assessment reported in ISFR 2017.

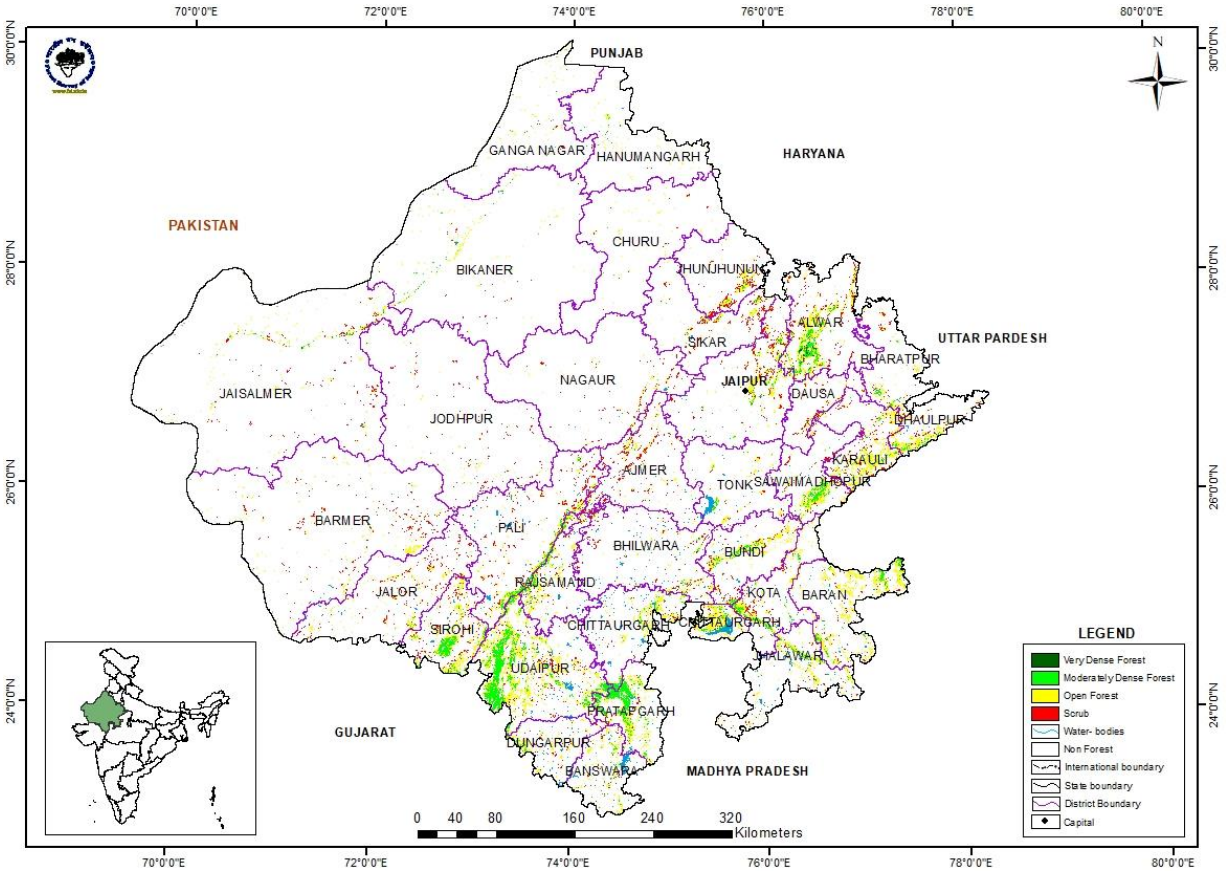


Fig. 6.11. Forest cover map of Rajasthan
(***Source:*** FSI, 2019)

Table 6.3. Forest cover (km^2) in Rajasthan

Class	**Area**	**% of GA**
Very dense forest	77.81	0.02
Moderately dense forest	4,341.90	1.27
Open forest	12,209.80	3.57
Total	**16,629.51**	**4.86**
Scrub	4,760.04	1.39

(***Source:*** FSI, 2019)

An inverse relationship between forest area and altitude exists in Rajasthan and the highest forest area of 11,948 km^2 is recorded in the 0-500m zone. (Table 6.4) Same is true for scrub, another type of vegetation (FSI, 2019).

Table 6.4. Altitude-wise forest cover (km^2) in Rajasthan

Altitude zone (m)	Geographical area	Very dense forest	Mod. dense forest	Open forest	Total	Scrub
0-500	3,24,954	27	2,538	9,383	11,948 (71.84%)	4,016
500-1,000	17,070	51	1,690	2,777	4,518 (27.17%)	740
1,000-2,000	215	0	114	50	164 (0.99%)	4
Total	**3,42,239**	**78**	**4,342**	**12,210**	**16,630**	**4,760**

(***Source:*** FSI, 2019)

There are two major forest types in Rajasthan, i.e., Tropical Dry Deciduous and Tropical Thorn Forests. Another forest type reported was subtropical hill forest exists in Mt. Abu area of Sirohi district that has semi-evergreen and evergreen forest owing to its towering height and relatively high rainfall in Rajasthan. These are dominated mostly by dry teak forests, *Anogeissus pendula* forest, mixed deciduous forests, which are further divided in almost 31 sub types of forests including plantation and *Prosopis juliflora* (Singh, 2014). Tropical Thorn Forests are found in western Rajasthan like Jodhpur, Pali, Jalore, Barmer, Jaisalmer, Bikaner, Nagaur, Churu, etc. Tropical Dry Deciduous Forests are found in patches in eastern and northern slopes of Aravalli, which turns lush green during monsoon period and dominated by *A. pendula*. Forests of Alwar, Dholpur and Bharatpur exhibits such characteristics, but also observed along the dry riverbeds in arid districts of Rajasthan.

The wide range of topographical, environmental and pedological variation in Rajasthan has resulted in a rich variety of flora and fauna available either in protected or outside protected areas (Table 6.5).

Table 6.5. Floral and faunal diversity of Rajasthan

Plant diversity			Animal diversity	
	Type	**Number**	**Type**	**Number**
Higher plant forms	Wild	1,715	Fish	114
	Horticultural	320	Amphibians	14
	Total	2,035	Reptiles	67
Lower plant forms	Liverworts/Horn worts	37	Mammals	87
	Mosses	42	Birds	570
	Ferns	60		
	Total	139		

(***Source:*** FSI, 2019)

6.8. WILDLIFE

Despite hostile terrain and climatic conditions Rajasthan is the abode of a number of animals and birds. Five national parks, 25 wildlife sanctuaries and 11 conservation reserves constitute the Protected Area network of the state covering 2.92% of its geographical area. There are 3 Project Tiger (Ranthambhore, Sariska and Mukundra Hills) and two Ramsar (Keoladeo Ghana sanctuary and Sambhar lake) sites (FSI, 2019). Vast size and latitudinal variations ranging between 1,700 m and zero mean average sea level leads varied vegetation of semi-evergreen forests (Mount Abu) to dry grasslands of the desert. Different sanctuaries and parks coupled with a large number of

sacred groves attract herds of species from all over to their temporary habitat that provides comfortable subsistence. It is a habitat of tigers and many other endangered species. The leopard is also found here in forests and open degraded forest areas as well. Other species includes Indian gazelles or chinkaras, black bucks, Indian foxes, great Indian bustards, the Nilgai, and wild cats. Most outstanding feature of the wildlife fauna in Luni basin area is presence of five to ten thousand Black bucks (*Antelope cervicapra rajputanae)*, around the villages of Bishnoi community which hold them in veneration. Bishnoi communities also aggressively protect the wildlife. Reported literature indicates that Dhawa, Gudha Bishnoian and Hingoli areas are the major localities where very large herds of black bucks are still found. These are by far the largest population of this animal found at a place in whole of India. A fair number of the Indian Gazelle (*Gazella bennettii*) are also available in the region. While Black buck are found mainly in the south-eastern villages, the Chinkara is also found in grasslands in the dune areas.

The National Chambal Sanctuary (NCS) is home to many species like the critically endangered gharial, red-crowned roof turtle and endangered Ganges river dolphin, crocodile, smooth-coated otter, striped hyena, Indian wolf, rhesus macaque, langur, golden jackal, Bengal fox, common palm civet, small Asian mongoose, Indian grey mongoose, jungle cat, wild boar, sambar, nilgai, blackbuck, Indian gazelle, northern palm squirrel, Indian crested porcupine, Indian hare, Indian flying fox and Indian long-eared hedgehog (Aggarwal, 2019a).

6.9. AGROECOSYSTEM

Various challenges in the form of climatic vagaries and frequent droughts exist in Rajasthan which is predominantly an agrarian state. About 51% area is under cultivation (Table 6.6). About 64.2 % of total rural working population is directly dependent on agriculture as cultivators and agriculture labours. Agriculture, including animal husbandry, contributed just 24.59 % to the State Gross Domestic Product (GDP). Of the 18.17 Mha area under cultivation, only 20% land is irrigated. Ground water is available only at a depth of 30 to 61 m. Rajasthan farmers depend on different sources of irrigation that include tube wells, wells and tanks. The rivers from Punjab in the north, the Narmada River in the south and the Agra canals from Haryana and Uttar Pradesh provide water to the dry land of Rajasthan for drinking and irrigation purposes. Indira Gandhi Canal provides irrigation in north-western part of Rajasthan.

Table 6.6. Land use pattern

Land use type	**Area (in '000 ha)**	**Percentage**
Geographical area	34,224	
Reporting area for land utilization	34,267	100.00
Forests	2,740	8.00
Not available for land cultivation	4,343	12.67
Permanent pastures and other grazing lands	1,674	4.88
Land under misc. tree crops and groves	26	0.08
Culturable wasteland	4,038	11.78
Fallow land other than current fallows	2,069	6.04
Current fallows	1,856	5.42
Net area sown	**17,521**	**51.13**

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2014-15

6.9.1. Agriculture

Depending upon climatic and edaphic conditions and availability of water coriander, cumin, guar, moth, bajra, rapeseed, isabgol and mustard are the crops that have got dominance in the

production in present days. Bajra is the main cereals for the Kharif crop and wheat is the main crop for Rabi with maximum area under cultivation. Total area under cereals production is 60,60,185 ha, under pulses production is 32,31,088 ha. The irrigation penetration is very low because of irregular and scarce rainfall, depleting ground level water and only a few perennial rivers flowing in the state and only confined to south-eastern part of the state. However, increased availability of water through Indira Gandhi Canal in Ganganagar and Hanumangarh areas, there is paddy cultivation. Some places of Rajasthan that have black soil nurture the growth of major cash crops like cotton, whereas some regions support tobacco. Total food grain production in the state was 22.13 Mt in the year 2017-18.

Apart from agriculture crops an assortment of fruits and vegetables are also cultivated in Rajasthan. These include mehandi (*Lawsonia inermis*) and fruits like Kinnow Mandarin (*Citrus nobilis* × *Citrus deliciosa*), oranges (*Citrus aurantium*), guava (*Psidium guajava*), lemon (*Citrus limon*), pomegranate (*Punica granatum*) and mango (*Mangifera indica*).

6.9.2. Animal Husbandry

Animal husbandry is a major economic activity of this dry state. Some communities are specially known for rearing of small ruminants, cattle and camel. During 1956-2012, there was an increase in population of buffalo by about 300%, whereas the population of the camel decreased by about 49.5% during the period (Gaur *et al.*, 2018). Sacred forests and pastures attached to deities were also maintained as *oran*, *gochar* and *bir*, to sustain the livestock population. Almost all the villages have an area marked for activities such as animal grazing and fuelwood collection. The vast open scrublands and community pastures supported the large livestock population in the region. Income from livestock accounts for 30 to 50% of the rural households' income, with wide variation in region and households. This sector has the highest potential for rural self-employment generation at the lowest possible investment per unit.

6.9.3. Agroforestry

Traditionally people in western Rajasthan promote and maintain trees like khejri (*Prosopis cineraria*), rohida (*Tecomella undulata*), babool (*Acacia nilotica*), kumat (*Acacia senegal*) and jal (*Salvadora* spp.) and few shrubs like bordi (*Zizyphus nummularia*), kair (*Capparis decidua*) and occasional grasses like dhaman (*Cenchrus ciliaris*), sewan (*Lasiurus sindicus*), gramna (*Panicum antidotale*), etc., depending on the agro-climatic conditions (Harsh *et al.*, 1992; Tewari *et al.*, 2007; Bhati *et al.*, 2017). In eastern Rajasthan, *Acacia nilotica* is a common tree of cultivated fields. Commonly grown crops in association of these trees were bajra (*pearl millet*), moth bean (*Phaseolus aconitifolius*), mung bean (*Vigna radiata*), cluster bean (*Cymopsis tetragonoloba*) and sesame (*Sesamum indicum*) under mixed cropping in general (Singh and Pandey, 2011). In addition, people are also following agroforestry practices involving fast growing species like *Ailanthus excelsa* (ardu).

6.9.4. Fisheries

Rajasthan has a large area of inland water bodies which offer potential for development of both intensive and extensive system of culture-based fisheries. The state has 0.42 Mha of inland water bodies in the form of reservoir (0.12Mha.), tanks and ponds (0.18 Mha) and rivers (0.03 Mha). Besides, there exists 0.004 Mha brackish water bodies and perennial flowing system, 207 km of Indira Gandhi Feeder Canal and about 442 km under the *Indira Gandhi Nahar Pariyojana* in north-west Rajasthan. Fish production has increased up to 57.14 thousand tons in 2018 (fisheries.rajasthan.gov.in).

6.10. DEMOGRAPHY

Human population of Rajasthan was recorded as 6.86 crore during the Population Census, 2011. Out of this, 75.1% was rural population. Population density is significantly less in western districts like Barmer and Jaisalmer, where people live in groups of the hamlets (village) surrounded by the sand dunes. The population density in the state has increased by about 22 %, i.e., from 165 km^{-2} in 2001 to 201 km^{-2} in 2011.

6.11. INDUSTRIES

Kota, Jaipur, Udaipur, Jodhpur, Bhilwara, etc. are major industrial areas in Rajasthan. The main industries of Rajasthan include textile, rugs, woollen goods, vegetable oil and dyes. Heavy industries consist of copper and zinc smelting and the manufacture of railway rolling stock. The other industries related to private sector include steel, cement, ceramics and glass wares, electronic, leather and footwear, stone and chemical industries. Rajasthan is the second-largest mineral producing state and the sole producer of lead and zinc in India. The state has one of the highest limestone reserves, making it a hub for cement industries. Largescale extraction of marble, granite and other rocks and minerals takes place in the state for supply to other parts of the country.

The state is home to over 850 factories in the food processing sector. The state is a popular tourist destination and it attracted about 59 million tourists including foreign tourists during 2019. The state has the solar potential of 142 GW, highest among Indian states, and wind potential of 18.7 GW (www.investindia.gov.in › state › rajasthan). The total installed power capacity is nearly 23,000 MW.

6.12. RIVERSCAPE ANALYSIS

6.12.1. Remote Sensing and GIS Methodology

Image processing and GIS tools used in the present assessment were ERDAS Imagine, Geomedia Professional, ArcGIS along with other software packages. The GIS softwares provide the tool needed to store, analyse and display geographic information.

6.12.2. Satellite Data Used

Landsat-8 satellite data for the month of Feb to April 2019 has been used for preparation of Land use/ Land cover map of the riverscape. The Row, Path along with Date of Pass of the satellite data used in the current study for the parts of states of and covering the riverscape is given in Table 6.7a

Table 6.7a. List of data downloaded for the study

Path	Row	Date of Pass	Satellite
145	041	05-04-2019	Landsat-8
145	042	05-04-2019	Landsat-8
146	041	28-04-2019	Landsat-8
146	042	12-04-2019	Landsat-8
146	043	27-03-2019	Landsat-8
146	044	27-03-2019	Landsat-8
147	042	18-03-2019	Landsat-8
147	043	18-03-2019	Landsat-8
148	043	09-03-2019	Landsat-8

6.12.3. Ancillary data

Almost all of the ancillary information has been taken from various Government of India sources. Information about the state and district boundaries for the riverscape taken up for analysis were obtained from the Survey of India. Basin boundary, Catchment boundary, Sub-Catchment boundary, Watershed boundary and Micro-watershed boundaries where obtained from Soil and Land Use Survey of India, New Delhi. Village and Tehsil boundaries were obtained from the published document "Administrative Atlas of Rajasthan" by Census of India (2011). Forest Type and Forest Density data were obtained in digital format from Forest Survey of India. Soil map and soil depth information was obtained from published maps of National Bureau of Soil Survey & Land Use Planning, Nagpur. Soil erosion data which is the backbone of multi-criterion analysis was obtained in GIS format from the Indian Institute of Soil & Water Conservation, Dehradun. Topographical sheets on 1:50,000 scale obtained from Survey of India have been used for Geo-reference only. Bhuvan data was also referred, wherever required for the preparation of land use map.

6.12.4. Bank-line and Highest Flood Level

For the identification of the riverscape the year 2013 was denoted as the highest flood level year based on literature review and stakeholders' consultation at various levels. Then, a post-monsoon satellite image of the year 2013 was used to create the bank-line of the main stem and selected tributaries of the Yamuna River (Chambal, Gambhir, Banas, Kalisindh, Mej and Parbati)

The area in the riverscape is 6755.30 km^2 which comprises 15.33% of the total geographical area of the riverscape of all the seven states taken together.

Table 6.7b. Spatial extent of project-area in the state

State	Geographical coordinate (from-to)		Total riverscape area in state (km^2)	Percent of the entire riverscape area
	Lat. ^oN	Long. ^oE		
Rajasthan	23° 41' 42.590" to 27° 18' 19.584"	73° 32' 10.057" to 78° 12' 31.277"	6755.30	15.33

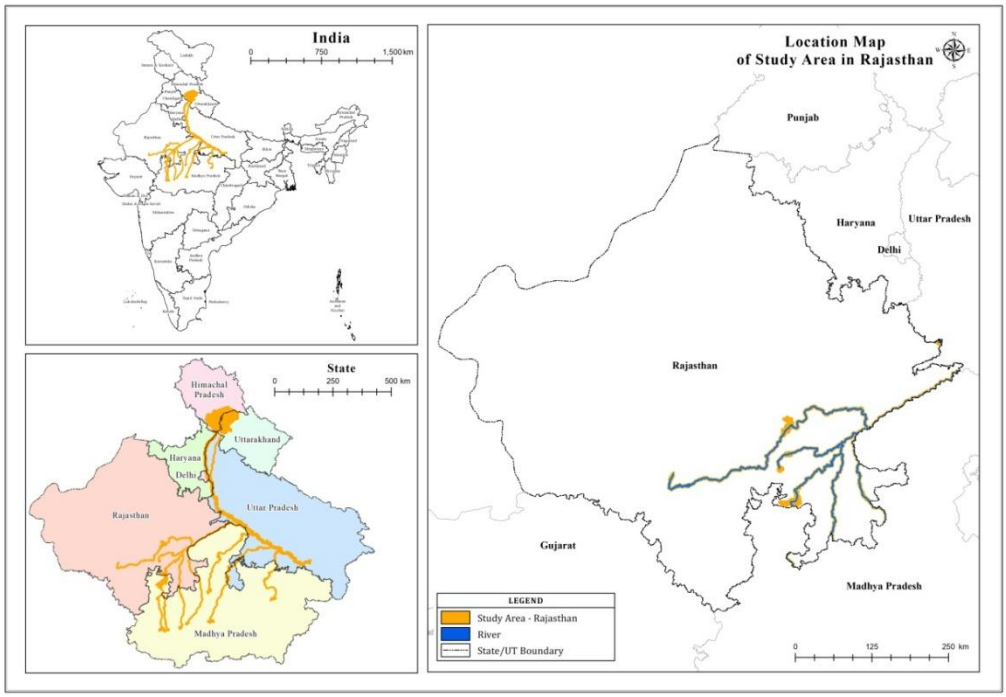


Fig. 6.12. Location map of study area in Rajasthan

Table 6.8. exhibits the length and riverscape area of the six selected tributaries of Yamuna in Rajasthan. Among all the rivers, Banas River covers an area of 2,671.37 km^2. Banas is a rainfed river and originates in Khamnor Hills of the Aravalli Range. Chambal River covers an area of 4.25% area of total riverscape area while Kalisindh River covers 701.68 km^2 area. Kalisindh joins the Chambal at downstream of Sawai Madhopur in Rajasthan. The longest river is Banas (555.24 km) followed by the Chambal and the Parvati while the shortest ones are the Gambhir (22.28 km) and the Yamuna (22.98 km).

Table 6.8. Area covered under the riverscape of different rivers of Rajasthan

River	Area (km^2)	River length (km)
Banas	2,671.37	555.24
Chambal	1,875.32	497.08
Gambhir	42.29	22.28
Kalisindh	701.68	173.45
Mej	778.79	189.66
Parvati	610.28	195.81
Yamuna	75.57	22.98
Total	**6,755.30**	**1,656.50**

6.12.5. Land Use Land Cover

A total of 15 major land use land cover types i.e., Agriculture, barren, canal, cloud shadow, cloud, gullied/ravinous land, industrial area, mining/mining Dump, mod. Dense forest, open forest, river (dry)/ river sand, river (perennial), scrub, settlement, waterbody have been mapped in the riverscape. The distribution of area under different land cover and land use classes of the Rajasthan riverscape is given in Table 6.9. and Fig. 6.13.

Table 6.9. Distribution of area under different land use and land cover categories in the Yamuna Riverscape of Rajasthan

LULC category	Area (km^2)							
	Banas	**Chambal**	**Gambhir**	**Kalisindh**	**Mej**	**Parvati**	**Yamuna**	**Total**
Agriculture	1,551.22	658.24	25.77	435.12	435.58	372.85	56.49	3,535.27
Barren	71.70	37.43	0.73	7.32	26.22	1.48	0.01	144.89
Canal	0.06	2.30	-	0.47	0.42	1.76	-	5.01
Cloud	2.60	-	-	-	-	-	-	2.60
Cloud Shadow	0.69	-	-	-	-	-	-	0.69
Gullied/Ravinous Land	76.03	184.51	-	37.17	44.75	46.73	-	389.19
Industrial Area	0.26	5.53	-	0.11	-	1.91	-	7.81
Mining/Mining Dump	4.67	-	-	2.21	-	0.12	-	7.00
Mod. Dense Forest	28.35	72.08	-	14.89	15.97	6.40	4.81	142.50
Open Forest	104.98	163.59	-	12.86	62.17	66.88	5.69	416.17
Plantation		-	-	0.18	-	-	-	0.18
River (Dry)/River Sand	196.75	67.18	0.22	17.46	7.89	36.10	0.41	326.01
River (Perennial)	63.13	248.81	0.64	38.22	9.79	24.56	2.05	387.20
Scrub	509.38	379.75	14.44	118.33	167.02	43.51	1.41	1,233.84
Settlement	54.65	54.25	0.49	16.76	8.71	6.91	2.60	144.37
Waterbody	6.90	1.65	-	0.58	0.27	1.07	2.10	12.57
Total	**2,671.37**	**1,875.32**	**42.29**	**701.68**	**778.79**	**610.28**	**75.57**	**6,755.30**

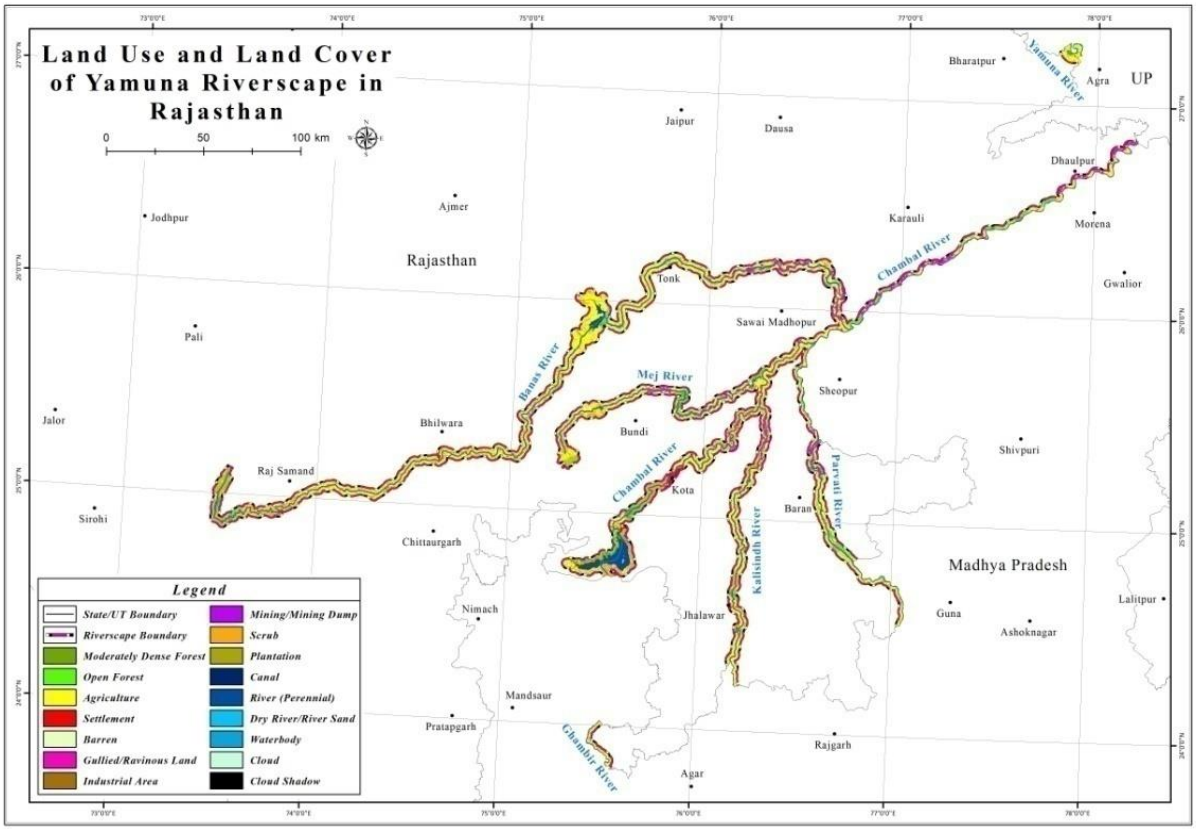


Fig. 6.13. Land use and land cover in Yamuna Riverscape
(Based on information from SLUSI, New Delhi)

6.12.6. Soil Erosion

Area prone to soil erosion of the seven river area of the Rajasthan is categorised in to different soil erosion classes (Table 6.10). Soil erosion classes help to predict the land potential, land use as well as requirements of suitable protection measures. The distribution of area under different erosion classes, *viz.*, Less than 5 t $ha^{-1}yr^{-1}$, 5 to 10 t $ha^{-1}yr^{-1}$,10 to 20 t $ha^{-1}yr^{-1}$, 20 to 40 t $ha^{-1}yr^{-1}$, more than 40 t $ha^{-1}yr^{-1}$ and non-soil. It is observed that class-3 type soil erosion area is dominant in this riverscape (Fig.6.14).

Table 6.10. Area of various riverscape cover under different soil erosion class of Rajasthan

Soil Erosion Class ($t\ ha^{-1}yr^{-1}$)	Area (km^2)							
	Banas	**Chambal**	**Gambhir**	**Kalisindh**	**Mej**	**Parvati**	**Yamuna**	**Total**
<5	70.76	132.50	-	-	-	-	-	203.26
5-10	623.37	241.23	11.2	92.04	11.28	28.06	-	1,007.18
10-20	981.16	670.57	9.67	365.71	250.18	359.32	55.16	2,691.77
20-40	309.39	226.35	9.60	76.14	405.64	94.71	3.73	1,125.56
>40	144.69	146.34	5.42	51.11	89.41	-	0.81	437.78
Non-soil	542.00	458.33	6.40	116.68	22.28	128.19	15.87	1,289.75
Total	**2,671.37**	**1,875.32**	**42.29**	**701.68**	**778.79**	**610.28**	**75.57**	**6,755.30**

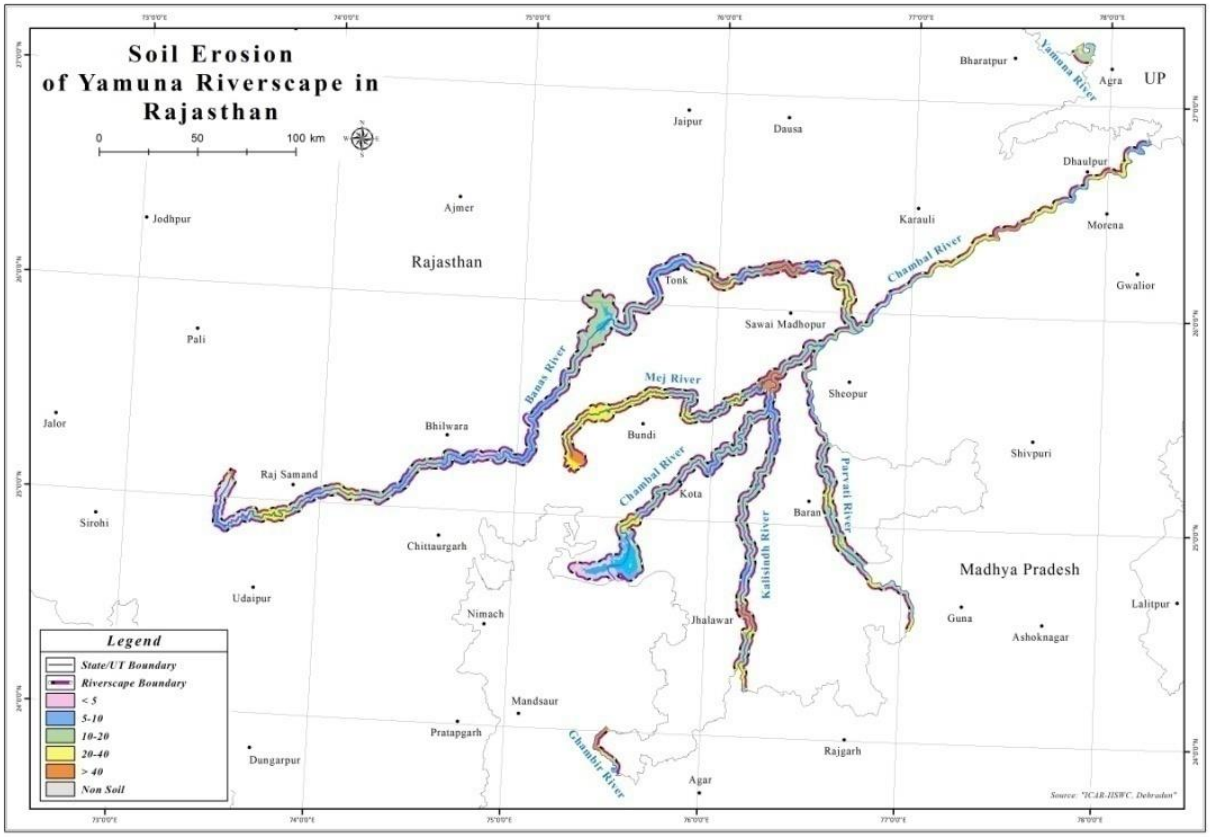


Fig. 6.14. Soil erosion classes in the Yamuna Riverscape
(Based on information from ICAR-IISWC, Dehradun)

6.12.7. Forest Cover

Forest cover in the riverscape area in the state is distributed into four classes i.e. moderately dense forest, non-forest, open forest and scrub forest. On the basis of data showed in Table 6.11. The maximum area of riverscape falls under the non-forest cover (73.47%) followed by 18.26% (scrub), 6.16% (open forest) and 2.11% (moderately dense forest).

Table 6.11. Distribution of forest cover of the Rajasthan riverscape

Forest cover	Area (km^2)							
	Banas	**Chambal**	**Gambhir**	**Kalisindh**	**Mej**	**Parvati**	**Yamuna**	**Total**
Open forest	104.98	163.59	-	12.86	62.17	66.88	5.69	416.17
Mod. dense forest	28.35	72.08	-	14.89	15.97	6.40	4.81	142.50
Scrub	509.38	379.75	14.44	118.33	167.02	43.51	1.41	1,233.84
Non-forest	2,028.66	1,259.9	27.85	555.6	533.63	493.49	63.66	4,962.79
Grand Total	**2,671.37**	**1,875.32**	**42.29**	**701.68**	**778.79**	**610.28**	**75.57**	**6,755.30**

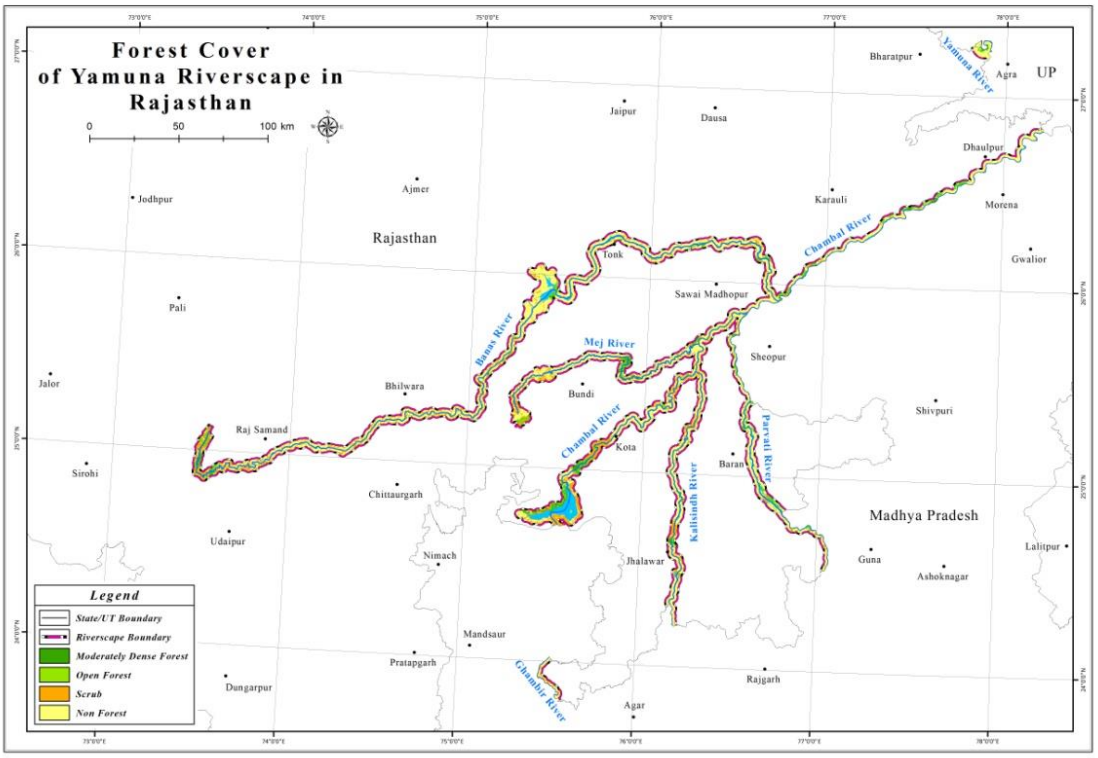


Fig. 6.15. Forest cover in the Yamuna Riverscape
(Based on information from FSI, Dehradun)

6.12.8. Prioritisation of Sites for Forestry Interventions

A multi-stakeholder approach was followed for preparing the DPR on rejuvenation of Yamuna through Forestry Interventions. It included extensive consultation and review of literature, reports, primary and secondary data collection, its analysis, expert consultations with institutes, individuals and various stakeholders (Central and state government departments, State Forest Departments of seven states, research institutions/scientific departments dealing with forestry, environment, river conservation, environment; civil society, non-governmental organisations in this field, defence and paramilitary forces, other interest groups).

Priority criteria: For the purpose of preparation of DPR and for identification of priority areas for the proposed treatment/forestry interventions in the Yamuna riverscape, GIS-assisted decision making process by way of geospatial analysis and modelling was used. GIS was used to generate different layers within the riverscape like land use, soil erosion rates and slope of the topography (Refer Uttarakhand Chapter Table 1.15a).

6.12.9. Priority classes

Statistical analysis of the area estimates show that 2,120 km^2 area comes in high, 3,410 km^2 area in medium and 1,224 km^2 area in low priority region for Rajasthan State as given in Table 6.12 and Fig. 6.16.

Table 6.12. Priority classes of treatment area in the riverscape

Forest Cover	Area (km^2)							
	Banas	**Chambal**	**Gambhir**	**Kalisindh**	**Mej**	**Parvati**	**Yamuna**	**Total**
Low	537.03	443.13	3.90	97.42	23.71	107.20	11.87	1,224.26
Medium	1,567.01	794.34	20.86	405.08	213.42	352.98	57.22	3410.91
High	567.33	637.85	17.53	199.18	541.66	150.10	6.48	2,120.13
Grand Total	**2,671.37**	**1,875.32**	**42.29**	**701.68**	**778.79**	**610.28**	**75.57**	**6,755.30**

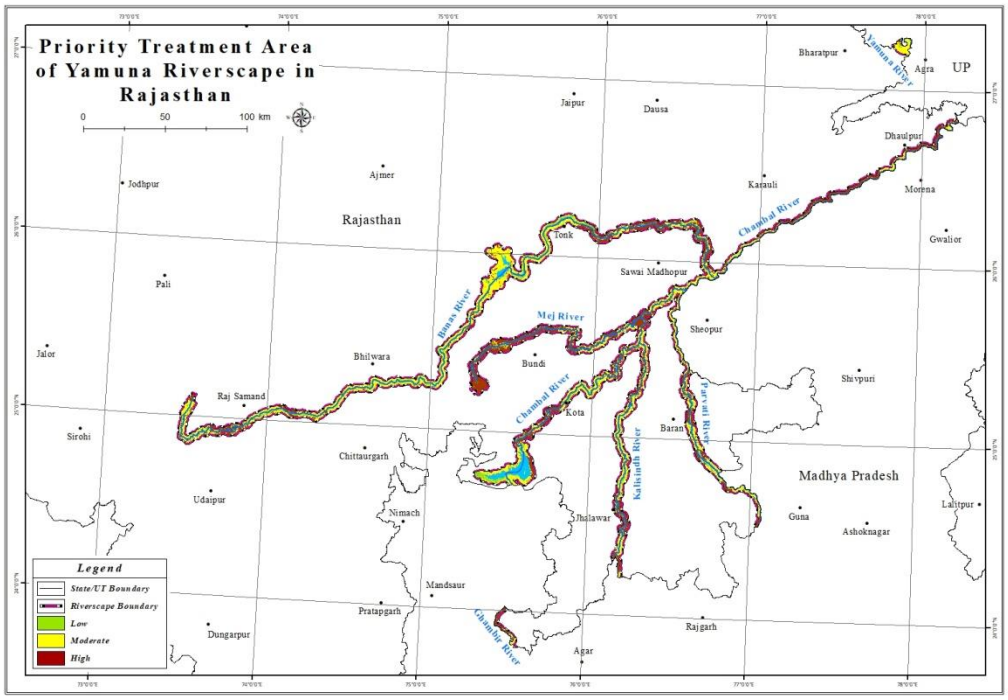


Fig. 6.16. Priority treatment area in the Yamuna Riverscape

6.12.10. Watersheds

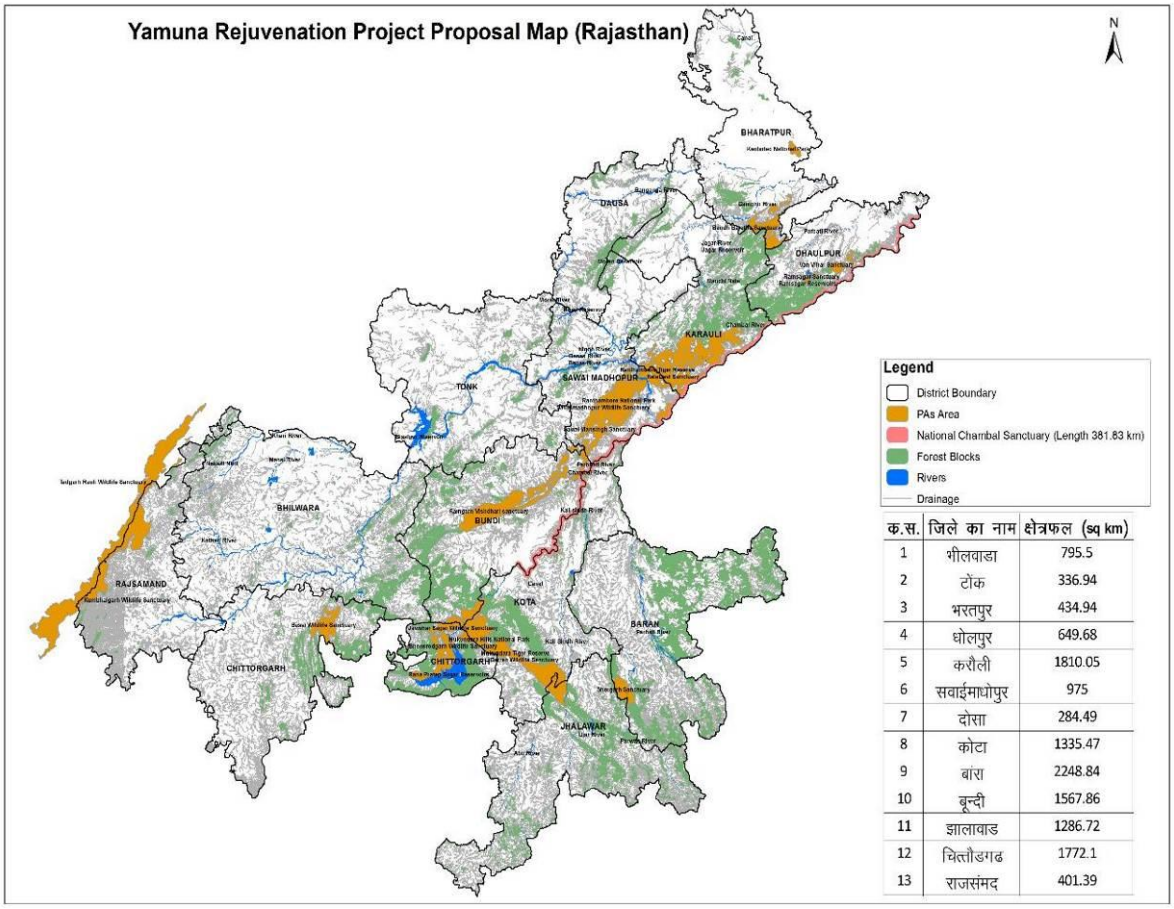
During the Second Consultation Meeting for the state on June 22, 2020 organised through video conferencing (Fig. 6.17), the SFD stressed the need for treatment of watersheds in Yamuna basin in the state. Consensus emerged that sites in the watershed that have been treated during the last ten years would not treated. Degraded sites outside the riverscape would thus also be taken up for treatment under the DPR. The area of respective watershed is displayed in Table 6.13 and Fig. 6.18. The total area of watersheds is 13,907.98 km^2 which is almost double of the riverscape area (6,755.30 km^2). Suitable areas in the watershed identified and proposed by SFD will be treated under the DPR.



Fig. 6.17. Second Consultation Meeting of FRI with Rajasthan SFD through video conferencing

Table 6.13. Extent of watersheds in Yamuna Basin

S. no.	District	Area (km^2)
1.	Bhilwara	795.50
2.	Tonk	336.94
3.	Bharatpur	434.94
4.	Dhaulpur	649.68
5.	Karauli	1810.05
6.	Sawai Madhopur	975.00
7.	Dausa	284.49
8.	Kota	1335.47
9.	Banas	2248.84
10.	Boondi	1567.86
11.	Jhalawar	1286.72
12.	Chittorgarh	1772.10
13.	Rajsamand	410.39
	Total	**13907.98**



क.स.	जिले का नाम	क्षेत्रफल (sq km)
1	भीलवाड़ा	795.5
2	टोंक	336.94
3	भरतपुर	434.94
4	धोलपुर	649.68
5	करौली	1810.05
6	सवाईमाधोपुर	975
7	दोसा	284.49
8	कोटा	1335.47
9	बांरा	2248.84
10	बून्दी	1567.86
11	झालावाड	1286.72
12	चित्तौडगढ	1772.1
13	राजसंमद	401.39

Fig. 6.18. Watersheds proposed for treatment
(*Source:* Rajasthan Forest Department)

6.13. PROPOSED FORESTRY/CONSERVATION INTERVENTIONS

For addressing the challenges and problems highlighted above, various forestry interventions have been proposed in this DPR. Three landscapes in the delineated riverscape have been identified for proposing the forestry interventions:

(iv) Natural landscape
(v) Agricultural landscape
(vi) Urban/Peri-urban landscape

In the state of Rajasthan 2 km buffer zone along both banks of tributaries of River Yamuna (Chambal, Banas, Gambhir, Kalisindh, Mej) are part of the riverscape in the state. Models have been developed with landscape-specific approach in the DPR. The following general prescriptions are made for all models:

a) Native species of tree, shrub and herbs will be planted. Traditional horticultural crops which have long been in cultivation in the region are also included in agricultural and urban landscapes. Mixed crops that would promote biodiversity will be raised as far as possible in preference to pure plantation. Species that provide economically useful non-wood forest produce (NWFP) will be planted to the extent of 70% or more by number. Effort would be made to produce industrial surpluses of select raw material in consultation with local nutraceutical, food processing and other NWFP-based industries.

b) Digging of pits, contour trenches, protection trenches, fencing etc will be carried out sufficiently before planting operation according to the standard practice in the plantation area.
c) Site-specific modifications in the models are permitted provided they capture the essence of the respective models. The rates prevailing in SFD at the site and time of operation would be applicable. The DFOs at time of implementation of the project will have the power to make site-specific modifications in prescriptions to suit the site conditions within the total budget proposed in the DPR for the Division. The flexibility applies to choice of species, site, model, quantity of work and timing of activities.
d) Species will be selected in consultation with industries /market experts to plant species that would create industry-level surpluses.
e) Seed or other propagules of forest tree species will be sourced from natural forests and plantations, especially seed orchards, plus trees or seed production areas, wherever available in sufficient quantity, aiming at quality seed. Seed would not be purchased from market for plantation in natural landscape.
f) Survival of plants will be ensured by providing life-saving irrigation; the frequency of irrigation would vary with weather conditions. Casualty replacement will be done according to the existing norms of the state. If such norms are not existing, prescriptions in the respective models will be referred to.
g) During site preparation prior to plantation work, seedlings already growing in the site would be retained, nurtured (through soil working, manure, irrigation operations) and protected.
h) Complete removal of ground vegetation would not be done during rehabilitation of weed-infested areas, Partial removal of invasive weeds would be done followed by artificial regeneration to facilitate gradual replacement of the weeds with economically and ecologically useful species.
i) Biofertilizerssuch as arbuscular mycorrhiza (AM), Organic manures will be applied in nurseries and plantations to boost plant growth. Eco-friendly plant protection measures (e.g. physical or mechanical methods, use of natural products, etc.) will be adopted to manage weed and pest without resorting to use of synthetic products. Tall seedlings may be planted to achieve greater survival in areas with high biotic disturbances.
j) Effective protection will be provided to the planted seedlings against biotic and abiotic stresses through watch & ward, public awareness besides fence, cattle-proof trenches, etc. according to the site.

The list of proposed treatment sites is provided in Annexure 5 of this Volume of DPR (i.e., Volume II).

6.14. NATURAL LANDSCAPE

YM/RJ/NL/01: Rehabilitation of degraded forest

Many forest areas are degraded and suffer from problems of poor forest cover, soil erosion and grazing by domestic animals along with poor water holding capacity and low rainfall. In this model 400 plants/ha will be planted in pits. Soil and moisture conservation activities will be carried out in advance work as well as planting year. The existing plants will be supported by silvicultural practices like cutting back, pruning and making crescent-shaped ridges on the lower side of seedlings. This model is broadly similar to the traditional RDF-I model of SFD.

Table 6.14. Models for River Yamuna and its tributaries in Rajasthan

Forestry interventions	
Model no.	**Natural landscape**
YM/RJ/NL/01	Rehabilitation of degraded forest
YM/RJ/NL/02	Assisted natural regeneration
YM/RJ/NL/03	Biodiversity conservation
YM/RJ/NL/04	Rehabilitation of *Lantana*-infested forest area
YM/RJ/NL/05	Rehabilitation of *Prosopis*-infested forest area
YM/RJ/NL/06	Contour trenching and seeding
YM/RJ/NL/07	Deep contour trenching and seeding
YM/RJ/NL/08	Contour bunding and seeding
YM/RJ/NL/09	Afforestation and SMC by Eco Task Force
	Agricultural landscape
YM/RJ/AL/01	Planting of fruit plants by farmers
YM/RJ/AL/02	Planting of forestry plants by farmers
YM/RJ/AL/03	Silvipasture on community land
	Urban/Peri-Urban landscape
YM/RJ/UL/01	Eco-park development
Conservation interventions	
YM/RJ/CI/01	Water storage bodies/structures
YM/RJ/CI/01/A	SMC - Mini percolation tank/ Naadi/ Water harvesting structure
YM/RJ/CI/01/B	SMC – Tanka
YM/RJ/CI/02	Managing water flow, soil moisture and sedimentation
YM/RJ/CI/02/A	SMC - Loose stone check dam
YM/RJ/CI/02/B	SMC - Pucca check dam
YM/RJ/CI/02/C	SMC - Anicut
YM/RJ/CI/02/D	SMC - Gabion

YM/RJ/CI/02/E	SMC - Stone wall
YM/RJ/CI/02/F	SMC - Pucca wall
YM/RJ/CI/02/G	SMC - Silt detention structure (SDS)
YM/RJ/CI/02/H	SMC - Miscellaneous structures
YM/RJ/CI/02/I	SMC - Mixed structures
YM/RJ/CI/03	Riparian wildlife management
YM/RJ/CI/04	Wetland management

Important elements of this model (ha^{-1}) are as under:

i. Fencing of area by stone wall and/or trench.
ii. Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges.
iii. Contour trenches totalling 200 m.
iv. Additional *in-situ* soil and moisture conservation works during advance work year and planting year.
v. Four hundred seedlings ha^{-1} will be planted in pits.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species inside plantation area

Tree: *Anogeissus pendula, Acacia nilotica, Acacia leucophloea, Azadirachta indica, Emblica officinalis, Pithecellobium dulce, Butea monosperma, Diospyros melanoxylon, Holoptelea integrifolia, Pongamia pinnata, Ailanthus excelsa,* etc.

Shrub: *Ziziphus nummularia, Carissa carandas, Adhatoda vasica, Commiphora wightii, Capparis zeylanica, Capparis decidua, Grewia villosa,* etc.

Grass: *Cenchrus ciliaris, C. setigerus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Themeda triandra, Apluda mutica, Eremopogon foveolatus, Lasiurus scindicus,*etc.

Table 6.15. Cost norm for YM/RJ/NL/01

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Advance work (Year 1)		
Microplanning and preparing management plan		550
Survey and alignment, removal of invasive woody weeds		1,450
Stone wall fence (2.10 m high)/ fence with RCC posts of 2.70 m height having six-line barbed wire fence of 1.50 m height	60 m	18,000
Digging trenches of different sizes as in the SFD standard ANR model	200 m	16,000
Digging of pits (0.60 x (0.70+0.50)/2)	400	16,000
In-situ soil and moisture conservation works (e.g. check dam, contour trench, earthen bud, percolation tank)		4,100
Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings		1,070
Cost of nursery stock of trees including 20% extra for culling	400 + 80 plants	3,500
Cost of nursery stock of trees in 30 cm x 25 cm bags (including 20% extra for culling)	200 + 40 plants	1,050
Cost of tree seeds and grass seed/slips (quantity twice the SFD standard ANR model)	-	500
Manure, organic plant protection consumables		1,500
Digging of water storage pond/buying tank	Double of SFD norm	800
Watch and ward (for 4 months)		770
Contingency		2,000
Total		**67,290**
Planting and establishment year (Year 2)		
Maintenance of seedlings in nursery (incl. 20% for beating up)	400+80	900
Maintenance of seedlings in 15 cm x 10 cm bags (incl. 20% for beating up)	200+40	300
In-situ soil and moisture conservation works (e.g., check dam, contour trench, earthen bud, percolation tank)		4,100
Digging of 30 cm x 30 cm cross section trench along inner side of stone wall fence and seed sowing	60 m	1,080

Sowing/ dibbling of seed of tree, grass, shrub, medicinal plant species along ridges of trench, ditch fence	460 m	260
Sowing/ dibbling of grass seed, raking in interspace		500
Planting of tree seedlings in pits (incl. transportation cost)	400 plants	2,200
Transport and planting seedlings of 15 cm x 10 cm bags	200	670
Manure, organic plant protection measures		2,000
Making of crescent-shaped mounds below planted seedlings, dibbling 3 seeds of thorny species	400	1,400
Weeding and hoeing, repair of mounds (twice)	800	2,750
Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x (4 times)	1,600	29,100
Weeding on contour trenches, bunds etc., singling		560
Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings	120	450
Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
Raising of 20% plants for casualty replacement		350
Construction of approach road, inspection path		400
Contingency	Lumpsum	1,500
Total		**50,820**

Maintenance cost			
Year 3	20% beating up (Plant maintenance in nursery + planting)	80	2,600
	Weeding and hoeing 2 times, repair of fences	800	2,710
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 8 times	3,200	58,200
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Contingency	Lumpsum	1,000
	Total		**66,810**
Year 4	15% beating up (Plant + planting)	60 plants	1,800
	Silvicultural operations and maintenance, protection from fence	Lumpsum	520
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 7 times	2,800	50,925
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**55,545**
Year 5	5% beating up (Plant + planting)	20 plants	680
	Silvicultural operations and maintenance of fence, frost protection	Lumpsum	540
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**3,520**
Year 6			**2,300**
Year 7			**2,300**

Table 6.16. Year-wise cost summary for YM/RJ/NL/01

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	67,290
Year 2 (Planting and establishment)	50,820
Year 3 (1st maintenance year)	66,510
Year 4 (2nd maintenance year)	55,245
Year 5 (3rd maintenance year)	3,220
Year 6 (4th maintenance year)	2,300
Year 7 (5th maintenance year)	2,300
Total	**2,48,585**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

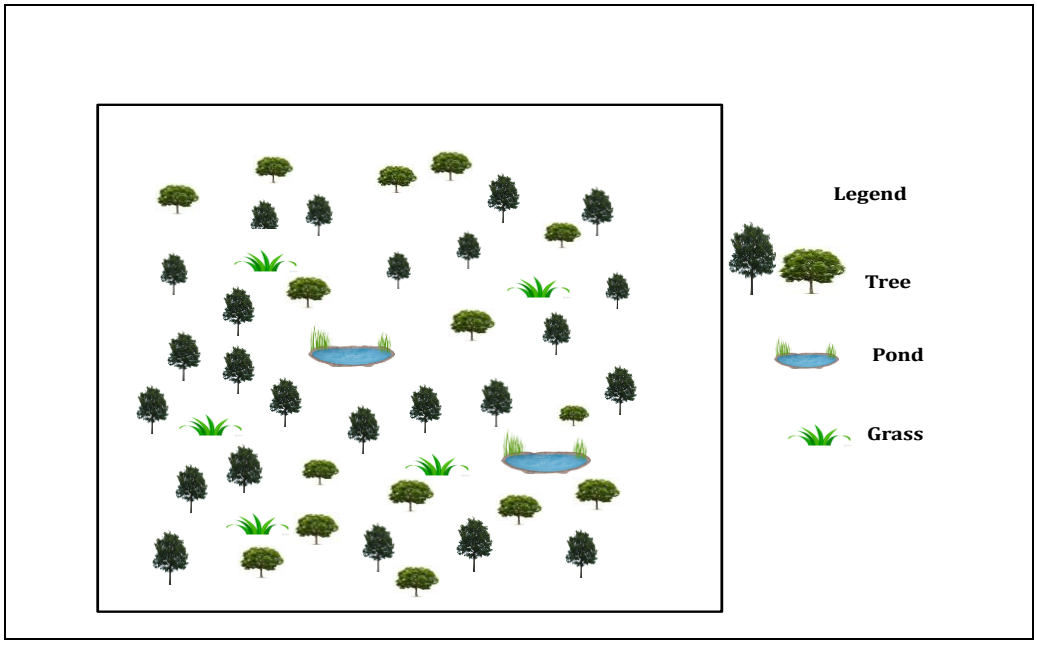


Fig. 6.19.Illustration of rehabilitation of degraded forest

YM/RJ/NL/02: Assisted Natural Regeneration (ANR)

This model is broadly similar to the traditional ANR model of SFD and will be applied in forest areas in which gaps, existing in the canopy, are smaller than those in the model YM/RJ/NL/02. Natural regeneration needs to be supported through protection from biotic agencies, and practices like cutting back, pruning and crescent-shaped ridges. Natural regeneration further needs to be supplemented by planting of 200 seedlings per hectare and sowing of tree and grass seedlings on contour trenches.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species inside plantation area

Tree:*Anogeissus pendula, Acacia nilotica, Acacia leucophloea, Azadirachta indica, Emblica officinalis, Pithecellobium dulce, Butea monosperma, Diospyros melanoxylon, Holoptelea integrifolia, Pongamia pinnata, Ailanthus excelsa,* etc.

Shrub: *Ziziphus nummularia, Carissa carandas, Adhatoda vasica, Commiphora wightii, Capparis zeylanica, Capparis decidua, Grewia villosa,* etc.

Grasse:*Cenchrus ciliaris, C. setigerus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Themeda triandra, Apluda mutica, Eremopogon foveolatus, Lasiurus scindicus,* etc.

Important elements of this model (ha^{-1}) are as under:

i. Fencing of area by stone wall and/or trench.
ii. Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges.

iii. Staggered contour trenches totalling 200 m.
iv. Additional *in-situ* soil and moisture conservation works.
v. Two hundred pits.
vi. Two hundred seedlings ha^{-1}will be planted in pits.

Table 6.17. Cost norm for YM/RJ/NL/02

Particular		**Quantity ha^{-1}**	**Rs. ha^{-1}**
Advance work (Year 1)			
Microplanning and preparing management plan			550
Survey and alignment, removal of invasive woody weeds			1,450
Stone wall fence (2.10 m high)/ fence with RCC posts of 2.70 m height having six-line barbed wire fence of 1.50 m height		60 m	18,000
Digging trenches of different sizes as in the SFD standard ANR model		200 m	16,000
Digging of pits (0.60 x (0.70+0.50)/2)		200	8,000
In-situ soil and moisture conservation works (e.g. check dam, contour trench, earthen bud, percolation tank)			4,100
Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings			1,070
Cost of nursery stock of trees in 30 cm x 25 cm bags (including 20% extra for culling)		200 +40 plants	1,910
Cost of tree seeds and grass seed/slips		-	450
Manure, organic plant protection consumables			1,500
Digging of water storage pond/buying tank		Double of SFD norm	800
Watch and ward (for 4 months)			770
Contingency			1,800
Total			**56,400**
Planting and establishment (Year 2)			
Maintenance of seedlings in nursery (incl. 20% for beating up)		200+40	450
Digging of 30 cm x 30 cm cross section trench along inner side of stone wall fence and seed sowing		60 m	1,080
Sowing/ dibbling of seed of tree, grass, shrub, medicinal plant species along ridges of trench, ditch fence		460 m	260
Sowing of grass seed, raking in interspace			1,300
Planting of tree seedlings in pits (incl. transportation cost)		200 plants	1,360
Making of crescent-shaped mounds below planted seedlings, dibbling 3 seeds of thorny species		200	680
Weeding and hoeing, repair of mounds (twice)		400	1,360
Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 6 times		1,200	21,900
Weeding on contour trenches, bunds etc., singling			560
Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings			1,070
Watch and ward 12 months (every day of month, sunrise to sunset)			2,300
Raising of 20% plants for casualty replacement			350
Construction of approach road, inspection path			400
Contingency		Lumpsum	1,500
Total			**34,570**
Maintenance cost			
Year 3	20% beating up (Plant maintenance in nursery + planting)	40	1,330
	Weeding and hoeing 2 times, repair of fences	400	1,360
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 8 times	1,600	29,100
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300

	Contingency	Lumpsum	500
	Total		**34,590**
Year 4	15% beating up (Plant + planting)	30 plants	1,000
	Silvicultural operations and maintenance, protection from fence	Lumpsum	520
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 7 times	1,400	25,465
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**29,285**
Year 5	5% beating up (Plant + planting)	10 plants	340
	Silvicultural operations and maintenance of fence, frost protection	Lumpsum	540
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 6 times	1,200	21,900
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**25,080**
Year 6			**2,300**
Year 7			**2,300**

Table 6.18. Year-wise cost summary for YM/RJ/NL/02

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	56,400
Year 2 (Planting and establishment)	34,570
Year 3 (1st maintenance year)	34,590
Year 4 (2nd maintenance year)	29,285
Year 5 (3rd maintenance year)	25,080
Year 6 (4th maintenance year)	2,300
Year 7 (5th maintenance year)	2,300
Total	**1,84,525**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

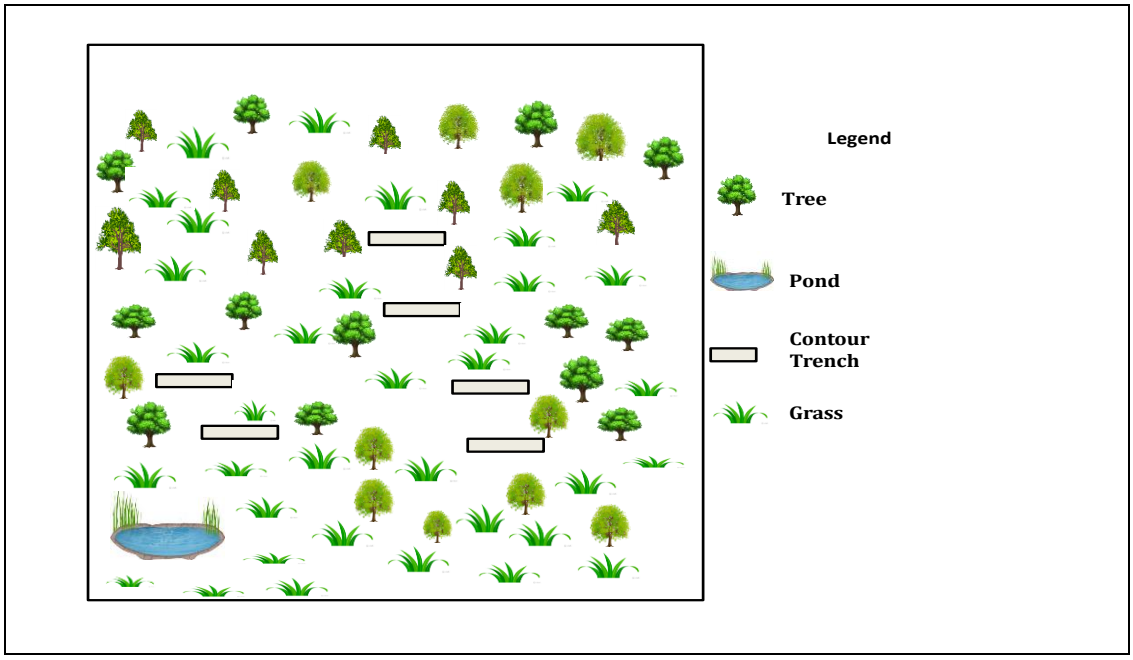


Fig. 6.20. Illustration of assisted natural regeneration

YM/RJ/NL/03: Biodiversity conservation

This model will be applied in wildlife-rich areas to conserve biodiversity. In this model, the forest area will be closed for protection against damage by animals, soil moisture conservation measures will be applied to promote regeneration and seed of shrubs and ground vegetation species, including medicinal plants, will be sown on contour trenches. Seedlings of tree species will not be planted, however, natural regeneration will be supported by cultural operations such as cutting back and making of crescent-shaped ridges on lower side of seedlings.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Shrub/Herb: *Commiphora wightii, Rauvolfia serpentina, Chlorophytum tuberosum, Urginea indica, Curcuma caesia, Andrographis paniculata, Plumbago zeylanica, Carissa carandas, Adhatoda vasica, Capparis zeylanica, Capparis decidua, Dioscorea* spp., *Withania somnifera*,etc.

Table 6.19. Cost norm for YM/RJ/NL/03

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Advance work (Year 1)		
Microplanning and preparing management plan		550
Survey and alignment of pits, marking of segments/plots		450
Fencing by stone and/or by ditch		
a) Stone wall fence (1.20 m high), 0.80 m at base and 0.60 m at top	30 m	6,400
b) Ditch fencing 1.20 m deep, 1.50 m wide at top and 0.90 m at base	30 m	6,950
Digging 400 m staggered contour trenches 45 cm x 45 cm cross section on	400 m	10,650

middle slopes and V-ditch as per site requirement		
Cost of collection and purchase of seeds/cuttings of shrubs and medicinal plants	Lumpsum	225
In-situ soil and moisture conservation works (e.g. check dam, contour trench, earthen bud, percolation tank, etc)	Lumpsum	5,700
Restoration of natural regeneration by cut back, cultural operations and by making crescent shaped ridges on lower side of seedlings and saplings	Lump sum	2,135
Construction of approach road, inspection path and walking trail	Lumps um	1,590
Watch and ward (for 4 months)		770
Contingency		1500
Total		**36,920**
Sowing and establishment (Year 2)		
In-situ soil and moisture conservation works (e.g. check dam, contour trench, earthen bud, percolation tank, etc)	Lumpsum	2,820
Digging of 30 cm x 30 cm cross section trench along inner side of stone wall fence and seed sowing	30 m	700
Sowing/ dibbling of seed of shrub, medicinal plant species along ridges of trench, ditch fence	430 m	240
Weeding and hoeing (2 times) on trenches, V-ditches	Lumpsum	1,180
Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
Contingency		1,500
Total		**8,740**
Year 3		
Repair of fence		220
Weeding and hoeing		600
Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
Contingency		300
Total		**3,420**
Year 4		
Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
Total		**2,300**

Table 6.20. Year-wise cost summary for YM/RJ/NL/03

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	36,920
Year 2 (Sowing and establishment)	8,740
Year 3 (1st maintenance year)	3,420
Year 4 (2nd maintenance year)	2,300
Total	**51,380**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 6.21. Biodiversity conservation
(***Source:*** https://www.facebook.com/saveABDP/,
http://iced.cag.gov.in/wp-content/uploads/C-13/slkothari%20sir.pdf)

YM/RJ/NL/04: Rehabilitation of Lantana-infested forest area

Areas infested with *Lantana camara* will be treated with this model for the purpose of replacing this invasive species with ecologically more useful trees species. *L. camara* is usually present in patches occupying about 50% area of the forest; it will be uprooted from the patches and 200 seedlings of trees will be planted per hectare forest area in pits in vacated areas so that space is not available for invasion by Lantana. The plant density will thus be double of density in the model in assisted natural regeneration. Contour trenches will be also be dug in the gaps and sown with grass/tree seeds. Weeding will be done for three years to ensure that Lantana does not regrow.

Important elements of this model (ha^{-1}) are as under:

i. Fencing of area by stone wall and/or trench.
ii. Uprooting of Lantana in patches of infestation.
iii. Two hundred pits (assuming 50% areaha^{-1} is infested).
iv. Two hundred seedlings/ha will be planted in pits.
v. Staggered contour trenches totalling 200 m.
vi. Restoration of natural regeneration by cutting back, pruning and crescent-shaped ridges.
vii. Additional *in-situ* soil and moisture conservation works.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species inside plantation area

Tree:*Anogeissus pendula, Acacia nilotica, Acacia leucophloea, Azadirachta indica, Emblica officinalis, Pithecellobium dulce, Butea monosperma, Diospyros melanoxylon, Holoptelea integrifolia, Pongamia pinnata, Ailanthus excelsa,* etc.

Shrub:*Ziziphus nummularia, Carissa carandas, Adhatoda vasica, Commiphora wightii, Capparis zeylanica, Capparis decidua, Grewia villosa,* etc.

Grass:*Cenchrus ciliaris, C. setigerus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris*

dolichostachya, Themeda triandra, Apluda mutica, Eremopogon foveolatus, Lasiurus scindicus, etc.

Table 6.21. Cost norm for YM/RJ/NL/04

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Advance work (Year 1)		
Microplanning and preparing management plan		550
Survey and alignment		450
Uprooting of *Lantana camara*	5,000 m^2	4,600
Stone wall fence (2.10 m high)/ fence with RCC posts of 2.70 m height having six-line barbed wire fence of 1.50 m height	60 m	18,000
Digging trenches of different sizes as in the SFD standard ANR model	200 m	16,000
Digging of pits (0.60 x (0.70+0.50)/2)	200	8,000
In-situ soil and moisture conservation works (e.g., check dam, contour trench, earthen bud, percolation tank)		4,100
Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings		1,070
Cost of nursery stock of trees in 30 cm x 25 cm bags (including 20% extra for culling)	200 +40 plants	1,910
Cost of tree seeds and grass seed/slips	-	450
Manure, organic plant protection consumables		1,500
Digging of water storage pond/buying tank	Double of SFD norm	800
Watch and ward (for 4 months)		770
Contingency		1,800
Total		**60,000**
Planting and establishment (Year 2)		
Maintenance of seedlings in nursery (incl. 20% for beating up)	200+40	450
Digging of 30 cm x 30 cm cross section trench along inner side of stone wall fence and seed sowing	60 m	1,080
Sowing/ dibbling of seed of tree, grass, shrub, medicinal plant species along ridges of trench, ditch fence	460 m	260
Sowing of grass seed, raking in interspace		1,300
Planting of tree seedlings in pits (incl. transportation cost)	200 plants	1,360
Making of crescent-shaped mounds below planted seedlings, dibbling 3 seeds of thorny species	200	680
Weeding and hoeing, repair of mounds (twice)	400	1,360
Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 6 times	1,200	21,900
Weeding on contour trenches, bunds etc., singling		560
Uprooting of *Lantana* sprouts/seedlings, restoration of natural regeneration of trees by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings		1,370
Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
Raising of 20% plants for casualty replacement		350
Construction of approach road and inspection path		400
Contingency	Lumpsum	1,500
Total		**34,870**

Maintenance cost			
Year 3	20% beating up (Plant maintenance in nursery + planting)	40	1,330
	Weeding and hoeing (2 times), repair of fences	400	1,360
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 8 times	1,600	29,100
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Contingency	Lumpsum	500
	Total		**34,590**
Year 4	15% beating up (Plant + planting)	30 plants	1,000
	Silvicultural operations and maintenance, protection from fence	Lumpsum	520
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 7 times	1,400	25,465
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**29,285**
Year 5	5% beating up (Plant + planting)	10 plants	340
	Silvicultural operations and maintenance of fence, frost protection	Lumpsum	540
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 6 times	1,200	21,900
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**25,080**
Year 6			**2,300**
Year 7			**2,300**

Table 6.22. Year-wise cost summary for YM/RJ/NL/04

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	60,000
Year 2 (Planting and establishment)	34,870
Year 3 (1st maintenance year)	34,590
Year 4 (2nd maintenance year)	29,285
Year 5 (3rd maintenance year)	25,080
Year 6 (4th maintenance year)	2,300
Year 7 (5th maintenance year)	2,300
Total	**1,88,425**

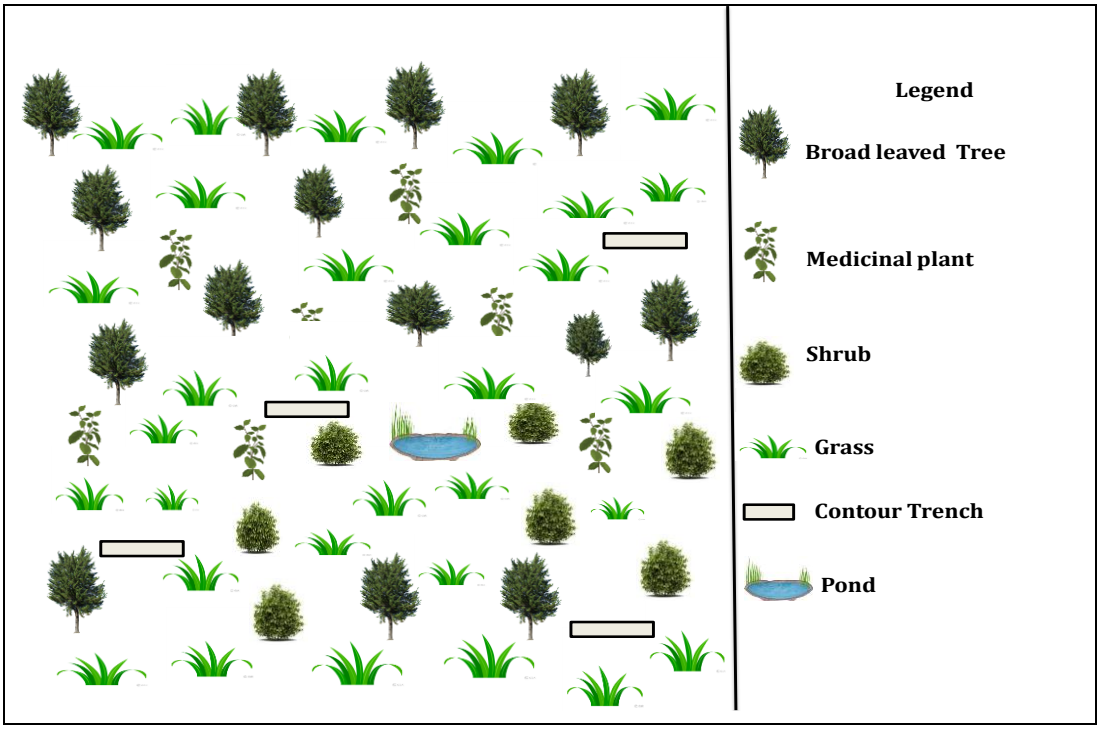


Fig. 6.22. Illustration of rehabilitation of Lantana infested areas

YM/RJ/NL/05: Rehabilitation of *Prosopis*-infested forest area

Areas infested with *P. juliflora* will be treated with this model with the purpose of replacing this invasive species with ecologically more useful trees species. *P.juliflora* is usually present in patches occupying about 50 % area of the forest. It is more deep-rooted and grows faster than *Lantana. P. juliflora* will be uprooted with JCB from the patches and 200 seedlings of trees will be planted per hectare forest area in pits in vacated areas so that space is not available for invasion by this invasive species. The plant density will thus be double of density in the model in assisted natural regeneration. Contour trenches will be also be dug in the gaps and sown with grass/tree seeds. Weeding will be done for three years to ensure that *Lantana* does not regrow.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species inside plantation area

Tree:*Anogeissus pendula, Acacia nilotica, Acacia leucophloea, Azadirachta indica, Emblica officinalis, Pithecellobium dulce, Butea monosperma, Diospyros melanoxylon, Holoptelea integrifolia, Pongamia pinnata, Ailanthus excelsa,* etc.

Shrub:*Ziziphus nummularia, Carissa carandas, Adhatoda vasica, Commiphora wightii, Capparis zeylanica, Capparis decidua, Grewia villosa,* etc.

Grass:*Cenchrus ciliaris, C. setigerus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Themeda triandra, Apluda mutica, Eremopogon foveolatus, Lasiurus scindicus,* etc.

Important elements of this model (ha^{-1}) are as under:

i. Fencing of area by stone wall and/or trench.
ii. Uprooting of *P.juliflora* in patches of infestation.
iii. Two hundred pits (assuming 50% area ha^{-1} is infested).
iv. Two hundred seedlings ha^{-1} will be planted in pits.
v. Staggered contour trenches totalling 200 m.
vi. Restoration of natural regeneration by cutting back, pruning and crescent-shaped ridges.
vii. Additional *in-situ* soil and moisture conservation works.

Table 6.23. Cost norm for YM/RJ/NL/05

Particular	**Quantity ha^{-1}**	**Rs. ha^{-1}**
Advance work (Year 1)		
Microplanning and preparing management plan		550
Survey and alignment		450
Uprooting of *P. juliflora* with JCB	5,000 m^2	3,200
Stone wall fence (2.10 m high)/ fence with RCC posts of 2.70 m height having six-line barbed wire fence of 1.50 m height	60 m	18,000
Digging trenches of different sizes as in the SFD standard ANR model	200 m	16,000
Digging of pits (0.60 x (0.70+0.50)/2)	200	8,000
In-situ soil and moisture conservation works (e.g. check dam, contour trench, earthen bud, percolation tank)		4,100
Restoration of natural regeneration by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings		1,070
Cost of nursery stock of trees in 30 cm x 25 cm bags (including 20% extra for culling)	200 +40 plants	1,910
Cost of tree seeds and grass seed/slips	-	450
Manure, organic plant protection consumables		1,500
Digging of water storage pond/buying tank	Double of SFD norm	800
Watch and ward (for 4 months)		770
Contingency		1,800
Total		**58,600**
Planting and establishment (Year 2)		
Maintenance of seedlings in nursery (incl. 20% for beating up)	200+40	450
Digging of 30 cm x 30 cm cross section trench along inner side of stone wall fence and seed sowing	60 m	1,080
Sowing/ dibbling of seed of tree, grass, shrub, medicinal plant species along ridges of trench, ditch fence	460 m	260
Sowing of grass seed and raking in interspace		1,300
Planting of tree seedlings in pits (incl. transportation cost)	200 plants	1,360
Making of crescent-shaped mounds below planted seedlings, dibbling 3 seeds of thorny species	200	680
Weeding and hoeing, repair of mounds (twice)	400	1,360
Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 6 times	1,200	21,900
Weeding on contour trenches, bunds etc., singling		560
Uprooting of *Prosopis* sprouts/seedlings, restoration of natural regeneration of trees by cutting back, pruning, crescent-shaped ridges on lower side of seedlings and saplings		2,000
Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
Raising of 20% plants for casualty replacement		350
Construction of approach road, inspection path		400

Contingency	Lumpsum	1,500
Total		**35,500**

Maintenance cost			
Year 3	20% beating up (Plant maintenance in nursery + planting)	40	1,330
	Uprooting of *Prosopis* and other weeds, hoeing 4 times, repair of fence		3,000
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 8 times	1,600	29,100
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Contingency	Lumpsum	500
	Total		**36,230**
Year 4	15% beating up (Plant + planting)	30 plants	1,000
	Uprooting of *Prosopis*, Silvicultural operations and maintenance, protection from frost	Lumpsum	2,200
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 7 times	1,400	25,465
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**30,965**
Year 5	5% beating up (Plant + planting)	10 plants	340
	Uprooting of *Prosopis*, Silvicultural operations and maintenance, protection from frost	Lumpsum	1,540
	Irrigation of seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 6 times	1,200	21,900
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Total		**26,080**
Year 6			**2,300**
Year 7			**2,300**

Table 6.24. Year-wise cost summary for YM/RJ/NL/05

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	58,600
Year 2 (Planting and establishment)	35,500
Year 3 (1st maintenance year)	36,230
Year 4 (2nd maintenance year)	30,965
Year 5 (3rd maintenance year)	26,080
Year 6 (4th maintenance year)	2,300
Year 7 (5th maintenance year)	2,300
Total	**1,91,975**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

Treatment of gullies and steep slopes through vegetative measures with soil conservation

There are many forest areas which are already well vegetated, but are suffering from problem of soil erosion and scarcity of soil moisture; slopes will be broken through contour bund or contour trench. The quantity of these need-based works will vary with site. Sowing of seeds of trees, shrubs and grasses will be done on the contour bunds and trenches.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree:*Anogeissus pendula, Acacia nilotica, Acacia leucophloea, Azadirachta indica, Emblica officinalis, Pithecellobium dulce, Butea monosperma, Diospyros melanoxylon, Holoptelea integrifolia, Pongamia pinnata,* etc.

Shrub:*Ziziphus nummularia, Carissa carandas, Adhatoda vasica, Commiphora wightii, Capparis zeylanica, Capparis decidua, Grewia villosa,* etc.

Grass:*Cenchrus ciliaris, C. setigerus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Themeda triandra, Apluda mutica*, *Eremopogon foveolatus, Lasiurus scindicus,* etc.

YM/RJ/NL/06: Contour trenching and seeding

YM/RJ/NL/07: Deep contour trenching and seeding

YM/RJ/NL/08: Contour bunding and seeding

Table 6.25. Cost norms for YM/RJ/NL/06 to YM/RJ/NL/08

Activity	Cost of soil work (Rs.)	Cost of seed and sowing	Estt. cost	Maint. cost	Total cost (Rs. m^{-3} or ha)
YM/RJ/NL/06 Contour trenching and seeding 3 m x 0.45 m x .45 m size; quantity as per requirement of particular site (200 trenches or 121.5 m^3 will be equivalent to 1 ha)	Rs.177.53 m^{-3} (or Rs, 21,570 ha^{-1}	Rs.10 m^{-3} or Rs.1,215 ha^{-1}	Rs.187.53 m^{-3} or Rs.22,785 ha^{-1}	(Rs.18.75 m^{-3} or Rs.2,279 ha^{-1}) x 5 yrs = Rs.93.75m^{-3} or Rs.11,395 ha^{-1}	Rs.281.28m^{-3} or Rs.34,180 ha^{-1}
YM/RJ/NL/07 Deep contour trenching and seeding 3 m x 0.45 m x 0.60 m size; quantity as per requirement of particular site (200 trenches or 162 m^3 will be equivalent to 1 ha)	Rs.177.53 m^{-3} (or Rs, 28,760 ha^{-1})	Rs.10 m^{-3} or Rs.1,620 ha^{-1}	Rs.187.53 m^{-3} or Rs.30,380 ha^{-1}	(Rs.18.75m^{-3} or Rs.3,038 ha^{-1} x 5 yrs = Rs.93.75 m^{-3} or Rs.15,190 ha^{-1}	Rs.281.28 m^{-3} or Rs.45,570 ha^{-1}
YM/RJ/NL/08 Contour bunding and seeding 30 cm top to 60 cm base height x 30 cm x 1 m; quantity as per requirement of particular site (750 m or 101.25 m^3 will be equivalent to 1 ha)	Rs.14 m^{-1} (or Rs.10,500 ha^{-1})	Rs.2 m^{-1} (or Rs.1,500 ha^{-1})	Rs.16 m^{-1} (or Rs.12,000 ha^{-1})	Rs.1.60 m^{-1} (or Rs.1,200 ha^{-1}) x 5 yrs = Rs.8 m^{-1} (or Rs.6,000 ha^{-1})	Rs.24 m^{-1} (or Rs.18,000 ha^{-1})

Table 6.26. Year-wise cost summary for YM/RJ/NL/06 to YM/RJ/NL/08 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/RJ/NL/06 Contour trenching and seeding						
22,785	2,279	2,279	2,279	2,279	2,279	**34,180**
YM/RJ/NL/07 Deep contour trenching and seeding						
22,785	2,279	2,279	2,279	2,279	2,279	**34,180**
YM/RJ/NL/08 Contour bunding and seeding						
12000	1,200	1,200	1,200	1,200	1,200	**18,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/RJ/NL/09: Afforestation and SMC by Eco Task Force

Ecological units of the Territorial Army, called Eco Task Force (ETF), have been carrying out afforestation works in difficult and inaccessible areas for over last three decades. These are manned by a mixture of regular army personnel and young ex-service men. ETFs are funded by state governments and the Ministry of Environment, Forest and Climate Change, GoI. The ETFs, through tree plantation, have performed admirably in restoration of sites affected by mining in the Mussoorie hills of Uttarakhand, sand dune stabilisation in the Thar Desert of Rajasthan and afforestation in harsh sites in other states such as Himachal Pradesh, Assam, etc. ETFs are effectively carrying out plantation works at sites allotted by Uttar Pradesh SFD along the Ganga River near Prayagraj.

It is proposed that inhospitable sites in difficult terrain measuring 800 ha will be assigned by SFD to Eco-Tack Force for carrying out afforestation activities. Models under natural landscape or their combinations suitable to the area, will be implemented.

Cost norm for YM/RJ/NL/09 (Rs. ha^{-1})

Rs. 2,30,000 ha^{-1}is proposed tentatively. Eight hundred ha is proposed to be treated in the state.

Table 6.27. Year-wise cost summary for YM/RJ/NL/09 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,30,000	0	0	0	0	0	**2,30,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

6.15. AGRICULTURAL LANDSCAPE

YM/RJ/AL/01: Planting of saplings of fruit plants by farmers

Tree planting is expected to benefit the river and general environment of the area in many ways in the long run. Saplings of plants are proposed to be distributed to farmers for planting in their private agricultural land in the riverscape. The aftercare of plants will be done by the farmers. Trees in private land are grown by farmers in the form of block plantation (either in association with agricultural crop or, alternatively, without agricultural crop, i.e., as solo crop) or in form of bund plantation (always in association with agricultural crops).

Under this model, fruit plants will be distributed to farmers which will be planted and maintained by the beneficiary farmers themselves. Fruit plants will be supplied with help of the state's agriculture department. Payment to farmers will be made by the SFD on the basis of survival achieved.

Plant Species Recommended

Fruit species of the area recommended by Agriculture Department /Horticulture Department will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree/shrub: Grafted plants of horticultural varieties of *Emblica officinalis, Ziziphus nummularia, Carissa carandas, Punica granatum, Citrus* spp.,etc.

Cost norm for YM/RJ/AL/01 (Rs. ha^{-1}):

Cost of tree sapling, including carriage to village (Year 1): Rs. plant^{-1}.
Planting and maintenance cost during planting year (Year 1): Rs. 50 plant^{-1}.
Maintenance cost in Year 2: Rs. 25 plant^{-1}.
Maintenance cost in Year 3: Rs. 20 plant^{-1}.
Maintenance cost in Year 4: Rs. 15 plant^{-1}.
Maintenance cost in Year 5: Rs. 10 plant^{-1}.
i.e. Rs.195 plant^{-1}**or Rs 97,500 ha^{-1}.**

Table 6.28. Year-wise cost summary for YM/RJ/AL/01 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
62,500	12,500	10,000	7,500	5,000	**97,500**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/RJ/AL/02: Planting of saplings of forestry plants by farmers

This model is similar to YM/RJ/AL/01 except that instead of horticultural species, the forestry species will be distributed to farmers.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Prosopis cineraria, Azadirachta indica,Tecomella undulata, Ailanthus excelsa, Moringa oleifera, Anogeissus pendula, Acacia nilotica, Acacia leucophloea, Emblica officinalis, Pithecellobium dulce, Holoptelea integrifolia, Pongamia pinnata,* etc.

Cost norm for YM/RJ/AL/02 (Rs. ha^{-1}):

Cost of tree sapling, including carriage to village (Year 1): Rs. 50 plant^{-1}.
Planting and maintenance cost during planting year (Year 1): Rs. 50 plant^{-1}.Maintenance cost in Year 2: Rs. 25 plant^{-1}.
Maintenance cost in Year 3: Rs. 25 plant^{-1}.
Maintenance cost in Year 4: Rs. 25 plant^{-1}.
Maintenance cost in Year 5: Rs. 25 plant^{-1}.
i.e. Rs. 200 plant^{-1}**or Rs 1,00,000 ha^{-1}.**

Table 6.29. Year-wise cost summary for YM/RJ/AL/02 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
50,000	12,500	12,500	12,500	12,500	**1,00,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/RJ/AL/03: Silvipasture on community land

This model will be applied in common lands in the villages for producing grass and tree leaf fodder to augment the supply of fodder. The fodder thus produced will be shared by the entire local community. For development of silvipasture, 800 slips of grass and 200 plants on indigenous tree species will be planted. This model is similar to the SFD model 'Silvi-pastoral plantation in non-IGNP areas' will be implemented.

Plant Species Recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species inside plantation area

Tree:*Anogeissus pendula, Acacia nilotica, Acacia leucophloea, Azadirachta indica, Ailanthus excelsa, Emblica officinalis, Pithecellobium dulce, Butea monosperma, Diospyros melanoxylon, Holoptelea integrifolia, Pongamia pinnata,* etc.

Shrub:*Ziziphus nummularia, Carissa carandas, Adhatoda vasica, Commiphora wightii, Capparis zeylanica, Capparis decidua, Grewia villosa,* etc.

Grass:*Lasiurus scindicus, Cenchrus ciliaris, C. setigerus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Themeda triandra, Apluda mutica, Eremopogon foveolatus,* etc.

The following cost norms are prescribed:

Table 6.30. Cost norm for YM/RJ/AL/03

Particular	Quantity ha^{-1}	Rs. ha^{-1}
Advance work (Year 1)		
Microplanning and preparing management plan		550
Survey and alignment, removal of invasive woody weeds		1,450
Stone wall fence (2.10 m high)/ fence with RCC posts of 2.70 m height having six-line barbed wire fence of 1.50 m height	60 m	18,000
Digging of pits (0.45 x 0.45 x 0.45 m)	200	2,600
In-situ soil and moisture conservation works (e.g. check dam, contour trench, earthen bud, percolation tank)		4,100
Quality seed of sewan grass, khejari, ber and other indigenous species (Rate double of Non-IGNP silvi-pastoral model)	6 kg	1,300
Cost of nursery stock of trees including 20% extra for culling	200 + 40 plants	1,900
Raising of sewan grass and plants in 10 cm x 15 cm bags		
a) Sewan grass (800+20% extra)	960 slips	1,950
b) Other indigenous species like khejari, ber, raunj, etc. (200 + 20%)	240 plants	500
Manure, organic plant protection consumables		200
Digging of water storage pond/buying tank		850
Watch and ward for 4 months (every day of the month, morning to evening average 12 hrs d^{-1})		770
Contingency (tools, sign board, cattle guard hut, labour amenities, etc.)		2,000
Total		**36,170**
Planting and establishment (Year 2)		
Maintenance of seedlings in nursery (incl. 20% for beating up)	200+40	450
Maintenance of sewan grass and indigenous species		
a) Sewan grass (800+20% extra)	960 slips	1,150
b) Other indigenous species like khejari, ber, raunj, etc. (200 + 20%)	240 plants	300

Digging of trench 20 cm deep x 30 cm at bottom and 50 cm at top for purpose of irrigation	600 m	1,060
Transport of 220 plants including loading, unloading (upto 5 km)	220	360
Transport of 800 grass slips and 220 plants in 10 cm x 15 cm bags plants including loading, unloading (upto 5 km)	1,000	740
Sowing of grass seeds	Lumpsum	200
Planting of 200 plants	200	1,100
Planting of 800 grass slips and 200 pre-germinated plants including local transport	1,000	2,500
Manure, organic plant protection measures for 200 plants	200	500
Weeding and hoeing 200 plants	200	600
Hoeing of 200 plants (3 times)	600 m	1,060
Irrigation of 200 seedlings in pits with 30 L water plant^{-1} brought from average 5 km x 4 times	800	14,550
Raising of 40 plants for casualty replacement	40	320
Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
Construction of approach road, inspection path		400
Contingency (labour amenities, unforeseen expenses)	Lumpsum	1,000
Total		**28,590**

Maintenance cost			
Year 3	20% beating up (Plant maintenance in nursery + planting)	40	560
	Irrigation of plants before casualty replacement 160 plants two waterings	320	3,640
	Irrigation of plants after casualty replacement 200 plants two waterings	400	4,520
	Hoeing of 200 plants x 3 times	600 m	1,060
	Raising of 15% plants for casualty replacement	30	240
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Contingency (labour amenities, unforeseen expenses)	Lumpsum	500
	Total		**12,820**
Year 4	15% beating up (Plant maintenance in nursery + planting)	30	420
	Weeding and hoeing of 200 plants (2 times)	400	715
	Irrigation of plants before casualty replacement 170 plants one watering	170	1,933
	Irrigation of plants after casualty replacement (200 plants one watering)	200	2,260
	Raising of 5% plants for casualty replacement	10	80
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Contingency (labour amenities, unforeseen expenses)	Lumpsum	400
	Total		**8,108**
Year 5	5% beating up (Plant maintenance in nursery + planting)	10	140
	Irrigation of plants before casualty replacement 190 plants two waterings	190	2,150
	Irrigation of plants after casualty replacement (200 plants one watering)	200	2,260
	Weeding and hoeing of 200 plants (2 times)	400	715
	Watch and ward 12 months (every day of month, sunrise to sunset)		2,300
	Contingency (labour amenities, unforeseen expenses)	Lumpsum	400
	Total		**7,965**
Year 6	Watch and ward 12 months (every day of month, sunrise to sunset)		**2,300**
Year 7	Watch and ward 12 months (every day of month, sunrise to sunset)		**2,300**

Table 6.31.Year-wise cost summary for YM/RJ/AL/03

Year	Rs. ha^{-1}
Year 1 (Advance work)	36,170
Year 2 (Planting and establishment)	28,590
Year 3 (1st maintenance year)	12,820
Year 4 (2nd maintenance year)	8,108
Year 5 (3rd maintenance year)	7,965
Year 6 (4th maintenance year)	2,300
Year 7 (5th maintenance year)	2,300
Total	**98,253**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

6.16. URBAN/PERI-URBAN LANDSCAPE

YM/RJ/UL/01: Eco-park development

Eco-park is a mini ecological park or an amusement park which does not hamper the natural environment of the area. Generally, a particular area of a forest is demarcated and brought under intensive management for this purpose and the beauty offered by the nature is opened to the visitors. Sometimes, forest areas having special natural features are selected for eco-park development. Landscaping and beautification are proposed to be done for urban and peri-urban landscapes of frequent public visitation to bring forth aesthetics and entertainment coupled with natural awareness. The natural layout of the land will be manoeuvred in such a way that the aesthetic beauty will be enhanced without much investment. Landscaped area will be designed to afford good soil, moisture and biodiversity conservation. *Nakshatra vatika, Rashivatika, Nav-grahvatika, Panchvati vatika, Dhanvantari vatika* etc. will be established within the park for awareness generation, yoga, meditation and spiritual fulfilment. Site-specific activities will be carried out at different places in harmony with the site conditions. An eco-park will have better facilities than riverfront development to facilitate the visitors.

The proportion of ornamental plants will be relatively more in eco-park than in the riverfront development model. An eco-park may have vegetative and non-vegetative components:

Vegetative part: Miscellaneous ornamental species.

Non-vegetative part: Fencing, stairs, pathways, walking trails, stone pitching, rain shelter, benches, public utilities, parking area, information centre, children playing area, pond beautification, landscaping etc. as per site-specific requirement.

List of illustrative plant types for plantation miscellaneous/ ornamental plants:

Lawn grasses, hedge plants, shrubs, creepers, hanging plants, grove of ornamental trees, fruit trees and ornamental bamboos, flowering herbs/shrubs, cacti, ferns, palms, aquatic plants, medicinal plants, etc.

Table 6.32. Cost norm for YM/RJ/UL/01

Model	Estt. cost (Rs. in lakh ha^{-1})	Maint. cost (Rs. in lakh ha^{-1})	Total cost (Rs. in lakh ha^{-1})
Eco-park development	25.00	7.20 (12,000 mo^{-1} for 5 yrs)	32.20

Table 6.33. Year-wise cost summary for YM/RJ/UL/01 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
25,00,000	1,44,000	1,44,000	1,44,000	1,44,000	1,44,000	**32,20,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

6.17. CONSERVATION INTERVENTIONS

YM/RJ/CI/01: Water storage bodies/structures

Ponds, water percolation tanks and other water storage bodies or structures will be created in forest areas where sites have been proposed by the forest department. The stored water will increase ground water recharge, reduce problem of soil erosion, provide drinking water for animals and improve the site quality. Planting work will not be done. These interventions will be carried out as per rates existing at the site, some of which are too complex to be generalised as they depend on location and detailed specifications of the structure.

Table 6.34. Cost norms for YM/RJ/CI/01/A and YM/RJ/CI/01/B

Model	Estt. cost (Rs.)	Maint. cost (Rs.)	Total cost (Rs.)
YM/RJ/CI/01/A SMC - Mini percolation tank/ Naadi/ Water harvesting structure	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/01/B SMC – Tanka	Site-specific requirement	Site-specific requirement	Site-specific cost

Table 6.35. Year-wise cost summary for YM/RJ/CI/01/A and YM/RJ/CI/01/B

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/RJ/CI/01/A to YM/RJ/CI/01/B						
80% of SFD estimate	-	-	10% of SFD estimate	-	10% of SFD estimate	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 6.23. Water storage bodies or structures model
(***Source***: https://en.wikipedia.org/wiki/Johad)

YM/RJ/CI/02: Managing water flow, soil moisture and sedimentation

There are several sites where problem of soil erosion is present. The soil loose showing incidence of erosion of the upper soil layer and/or gully formation. Loose stone check dam, pucca check dam, brushwood check dam and dry gully plugs will be created where they are expected to be effective. In some sites where the above structures are not likely to sustain the pressure of flowing water, spur, spillway and sidewall will be erected. Planting of trees will not be done on these structures. The remaining forest area will not be treated. These interventions will be carried out as per rates existing at the site, some of which are too complex to be generalised as they depend on location and detailed specifications of the structure.

Table 6.36. Cost norms for YM/RJ/CI/02/A and YM/RJ/CI/02/H

Model	**Estt. cost (Rs. m^{-3})**	**Maint. cost (Rs. m^{-3})**	**Total cost (Rs. m^{-3})**
YM/RJ/CI/02/A (SMC - Loose stone check dam)	213	21.3 x 5 yrs =106.50 for 5 yrs	319.5
YM/RJ/CI/02/B* (SMC - Pucca check dam)	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/02/C* (SMC - Anicut)	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/02/D* (SMC - Gabion)	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/02/E* (SMC - Stone wall)	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/02/F* (SMC - Pucca wall)	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/02/G* (SMC – silt detention structure)	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/02/H* (SMC - Miscellaneous structures)	Site-specific requirement	Site-specific requirement	Site-specific cost
YM/RJ/CI/02/I* (SMC - Mixed	Site-specific	Site-specific requirement	Site-specific cost

structures)	requirement		

* Requirement is given in monetary terms as rates vary widely with site. Miscellaneous structures include inspection path, etc. not covered in above model. Mixed structures include a combination of above structures within a site.

Table 6.37. Year-wise cost summary for YM/RJ/CI/02/A and YM/RJ/CI/02/H

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/RJ/CI/02/A						
213	21.30	21.30	21.30	21.30	21.30	**319.50**
YM/RJ/CI/02/B to YM/RJ/CI/02/I						
80% of SFD estimate	-	-	10% of SFD estimate	-	10% of SFD estimate	**Site-specific cost**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 6.24. Managing water flow, soil moisture and sedimentation
(***Source:*** Project Team**)**



Fig. 6.25. Anicut
(***Source:*** Project Team**)**



Fig. 6.26. Illustration of a percolation tank
(***Source:*** https://www.researchgate.net/figure/A-percolation-tank-about-to-get-dry-towards-beginning-of-summer-Location-Village_fig4_221920829)



Fig. 6.27. SMC- stone wall
(***Source:*** Project Team**)**

YM/RJ/CI/03: Riparian wildlife management

For providing a good habitat for wildlife, various activities have been proposed as part of aforesaid models. Under this model on riparian wildlife management, water ponds will be created in wildlife-rich area for providing drinking water for the wild animals. Fodder grasses and wild fruit tree species will be planted in the surrounding area to provide a wholesome environment for the animals.

Table 6.38. Cost norm for YM/RJ/CI/03

Model	**Estt. cost (Rs. ha^{-1})**	**Maint. cost (Rs. ha^{-1})**	**Total cost (Rs. ha^{-1})**
Riparian wildlife management* (YM/RJ/CI/03)	2.00 lakh ha^{-1}	1.00 lakh (10% of estt. cost yr^{-1} for 5 yrs)	3.00 lakh ha^{-1}

Table 6.39. Year-wise cost summary for YM/RJ/CI/03 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,00,000	20,000	20,000	20,000	20,000	20,000	**3,00,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

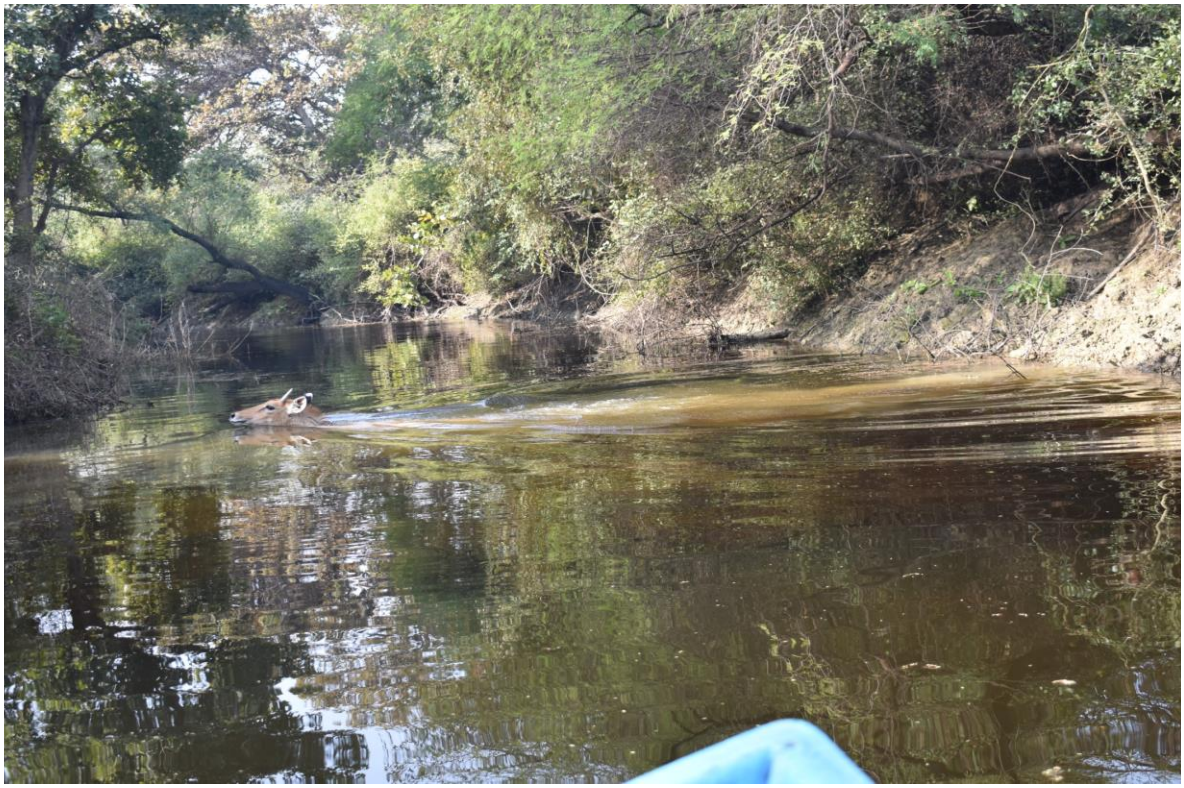


Fig. 6.28. Riparian wildlife management
(***Source:*** Project Team**)**

YM/RJ/CI/04: Wetland management

Under this model, water ponds will be created or dug deeper for collecting water to prevent runoff or check inundation in surrounding areas. Removal of water hyacinth and other aquatic weeds will be carried out. Population of fish of native species will be augmented. Water-logging tolerant plant species will be planted wherever possible.

Table 6.40.Cost norm for YM/RJ/CI/04

Model	Estt. cost (Rs. ha^{-1})	Maint. cost (Rs. ha^{-1})	Total cost (Rs. ha^{-1})
Wetland management (YM/RJ/CI/04)	Site-specific requirement	Site-specific requirement	Site-specific cost

Table 6.41. Year-wise cost summary for YM/RJ/CI/04

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
80% of SFD estimate	-	-	10% of SFD estimate	-	10% of SFD estimate	Site-specific cost

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 6.29. Wetland management
(***Source:*** Project Team**)**

A model on 'Rehabilitation of soil and moisture conservation structures' was initially proposed to be deployed in sites in forest areas in the catchment area of Yamuna where no other model is proposed to be used. This model aimed to strengthen the soil and water conservation measures in different areas in the riverscape at a modest scale through need-based repair/ development of low-cost structures such as contour trenches, contour bunds, check dams, brushwood check dams, ponds, gully plugs, etc. As all the target areas of this model were included by SFD in other models after the Second Consultation Meeting, no area is now proposed in this model, Hence, this model has been dropped.

6.18. SUPPORTING ACTIVITIES

Other activities such as awareness generation, capacity building, monitoring, research, nursery development, development of value chain, protection against fire, etc. are essential to facilitate the forestry interventions and are considered vital for successful and effective execution of proposed forestry interventions.

The strategies and specific interventions for these important supporting activities are provided in Volume 1 of the DPR.

A multi-tiered mechanism has been suggested for monitoring of the project (Fig. 6.30).

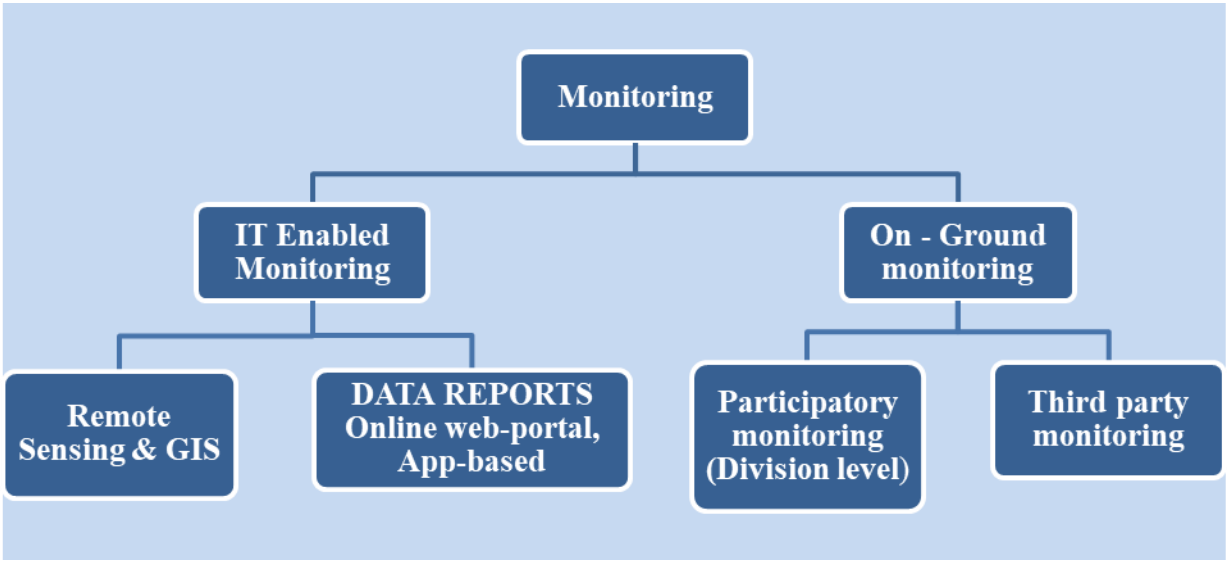


Fig. 6.30. A multi -tiered monitoring mechanism for forestry interventions for Rejuvenation of Yamuna River

6.19. BUDGET ESTIMATE

The physical and financial projections for all the forestry interventions, supporting activities to be undertaken for the cost, duration as well as various divisions in Rajasthan are given in Table 6.42 to 6.59. The total budget proposed for Implementing Agency in the state is Rs. 2,26,825.50 lakh (or Rs. 2,268.26 crore) (Table 6.42).

An allocation of Rs. 1,24,562.70 lakh (about 54.92% of the budget outlay) has been made for plantations and treatment models in three landscapes while an amount of Rs. 85,350.60 lakh (38.63%) is provisioned for Conservation interventions. For supporting activities like awareness generation, research activities, capacity building, nursery establishment/improvement, fire protection, monitoring and evaluation, etc. an amount of Rs. 12,288.20 lakh is allocated. Supportive field activities and miscellaneous expenses will be met through an allocation of Rs. 2,200 lakh, while Rs. 2,424 lakh is provided for Project Management Unit in the state (Table 6.43).

Indexing of cost

The budget for the project has been prepared on the basis of rates applicable during April 2020. The cost of the project may be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI).

Table 6.42. Component/Activity-wise budget allocation for Rajasthan

S. no.	Component and /or Activity	Amount (Rs. In lakh)	Allocation (%)
Implementation of Forestry Interventions in river basin area in Rajasthan		**2,26,825.50**	**100.00**
A.	**Plantations and treatment models in three categories of landscape**	**1,24,562.70**	**54.92**
A.1	Natural Landscapes	1,23,752.16	
A.2	Agriculture Landscapes	543.70	
A.3	Urban and Peri-Urban Landscapes	266.84	
B.	**Conservation interventions**	**85,350.60**	**37.63**
	Total (A+B)	**2,09,913.31**	
C.	**Supporting activities**	**16,912.20**	**7.46**
C.1	Awareness generation, research activities, capacity building, nursery establishment/ Improvement, fire protection, value-chain development, monitoring and evaluation, etc.	**12,288.20**	
C.2	Field activities, contingency and miscellaneous expenses	**2,200.00**	
C.3	Cost of PMU in Rajasthan	**2,424.00**	

Table 6.43. Year-wise Year-wise cost summary for supporting activities (cost Rs. in lakh)

S. no.	Particular	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	Total
	Supporting activities						
1.	Awareness generation, research activities, capacity building, nursery establishment/ Improvement, fire protection, value-chain development, monitoring and evaluation, etc.	2,900.00	2,750.00	2,850.00	1,990.00	1,798.20	**12,288.20**
2.	Field activities, contingency and miscellaneous expenses	485.00	485.00	485.00	380.00	365.00	**2,200.00**
3.	Cost of PMU in Rajasthan	**430.00**	**470.00**	**558.00**	**458.00**	**508.00**	**2,424.00**
	Total	**3,815.00**	**3,705.00**	**3,893.00**	**2,828.00**	**2,671.20**	**16,912.20**

Table 6.44. Plantation /treatment area summary for Forestry Interventions (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II	No. of sites
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	
Natural	24,428.02	21,649.05	24,428.02	13,385.00	46,077.07	59,462.07	57,852.07	59,462.07	56,022.07	730
Agriculture	337.80	157.50	337.80	18.00	495.30	513.30	513.30	513.30	182.50	90
Urban/ peri-urban	8.00	0.00	8.00	0.00	8.00	8.00	8.00	8.00	8.00	3
Conservation	1,41,189.08	1,27,076.90	1,41,189.08	94,557.01	2,68,265.98	3,62,822.99	3,62,822.99	3,62,822.99	1,60,445.49	865
Total	**1,65,962.90**	**1,48,883.45**	**1,65,962.90**	**1,07,960.01**	**3,14,846.35**	**4,22,806.36**	**4,21,196.36**	**4,22,806.36**	**2,16,658.06**	**1688**

Forestry interventions in the three landscapes will cover an area of 59,983.37 ha and Conservation interventions will be implemented on 3,62,822.99 ha area (notional) in Rajasthan (Table 6.44).

Table 6.45. Cost summary for Forestry Interventions (Rs. in lakh)

	Year1	Year 2		Year 3		Year 4	Year 5	Phase I			Phase II	Grand total
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**Total**		
Natural	14,252.93	13,813.51	8,725.03	8,705.01	17,907.75	22,961.65	19,863.27	36,771.44	69,457.71	1,06,229.15	17,523.01	1,23,752.16
Agriculture	196.72	84.87	45.52	9.57	63.35	60.81	54.56	291.16	224.25	515.41	28.29	543.70
Urban/ peri-urban	200.00	0.00	12.10	0.00	12.70	13.34	14.00	200.00	52.13	252.13	14.70	266.84
Conservation	24,524.85	22,779.32	121.72	17,612.46	195.72	3,657.07	3,492.49	64,916.63	7,467.01	72,383.64	12,966.96	85,350.60
Total	**39,174.49**	**36,677.70**	**8,904.36**	**26,327.04**	**18,179.53**	**26,692.87**	**23,424.33**	**1,02,179.23**	**77,201.10**	**1,79,380.34**	**3,05,32.97**	**2,09,913.31**

For interventions in Natural, Agriculture, Urban/Peri-urban landscape an amount of Rs. 106,229.15 lakh, 515.41 lakh and 252.13 lakh, respectively, has been provisioned in Phase I. For Conservation interventions Rs. 72,383.64 lakh has been allocated (Table 6.45).

Table 6.46. Year-wise cost summary for C.1 supporting activities (Cost Rs.in Lakhs)

S. no.	Supporting Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Awareness generation	350.00	500.00	500.00	200.00	200.00	**1,750.00**
2	Capacity building and value-chain development	450.00	500.00	500.00	300.00	300.00	**2,050.00**
3	Entry point activities	750.00	0.00	0.00	0.00	0.00	**750.00**
4	Nursery improvement and fire protection	500.00	500.00	600.00	400.00	400.00	**2,400.00**
5	Research	250.00	250.00	250.00	190.00	200.00	**1,140.00**
6	Monitoring and evaluation	600.00	1,000.00	1,000.00	900.00	698.20	**4,198.20**
	Total	**2,900.00**	**2,750.00**	**2,850.00**	**1,990.00**	**1,798.20**	**12,288.20**

Table 6.47. Year-wise cost summary for C.2 Field activities, contingency and miscellaneous expenses (Cost Rs. in lakh)

S. no.	Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Field activities, contingency and miscellaneous costs	485.00	485.00	485.00	380.00	365.00	**2,200.00**

Table 6.48. Year-wise details C.3 PMU (Cost Rs. in lakh)

S. no.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Recurring	350.00	450.00	550.00	450.00	500.00	**2,300.00**
2	Non-recurring	80.00	20.00	8.00	8.00	8.00	**124.00**
	Total	**430.00**	**470.00**	**558.00**	**458.00**	**508.00**	**2,424.00**

Details of area under natural landscape for undertaking forestry interventions in 14 forest divisions and by Ecotask force in Yamuna catchment in Rajasthan have been provided in Table 6.49.

Table 6.49. Area in Natural Landscape (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Phase II**
Baran	3,151.98	2,714.26	3,151.98	0.00	5,866.24	5,866.24	5,766.24	5,866.24	5,716.24
Bharatpur	0.00	50.00	0.00	50.00	50.00	100.00	100.00	100.00	100.00
Bhilwara	658.04	356.79	658.04	90.00	1,014.83	1,104.83	1,104.83	1,104.83	1,104.83
Bundi	500.00	950.00	500.00	0.00	1,450.00	1,450.00	1,450.00	1,450.00	1,450.00
Dholpur	546.00	368.00	546.00	300.00	914.00	1,214.00	1,214.00	1,214.00	1,214.00
Eco Task Force	200.00	400.00	200.00	200.00	600.00	800.00	800.00	800.00	800.00
Jhalawar	1,330.00	1,900.00	1,330.00	0.00	3,230.00	3,230.00	3,230.00	3,230.00	3,230.00
Karoli DCF	220.00	80.00	220.00	100.00	300.00	400.00	340.00	400.00	300.00
Kota - Mukandra Hills Tiger Reserve	150.00	250.00	150.00	0.00	400.00	400.00	250.00	400.00	0.00
Kota WL	600.00	200.00	600.00	0.00	800.00	800.00	800.00	800.00	800.00
NCS Sawai Madhopur	13,227.00	12,120.00	13,227.00	10,655.00	25,347.00	36,002.00	34,852.00	36,002.00	33,362.00
Rajsamand For. & WL	1,148.00	245.00	1,148.00	165.00	1,393.00	1,558.00	1,408.00	1,558.00	1,408.00
Sawai Madhopur DCF	2,350.00	1,900.00	2,350.00	1,700.00	4,250.00	5,950.00	5,950.00	5,950.00	5,950.00
Tonk Distt	250.00	115.00	250.00	125.00	365.00	490.00	490.00	490.00	490.00
Udaipur	97.00	0.00	97.00	0.00	97.00	97.00	97.00	97.00	97.00
Total	**24,428.02**	**21,649.05**	**24,428.02**	**13,385.00**	**46,077.07**	**59,462.07**	**57,852.07**	**59,462.07**	**56,022.07**

Table 6.50. Area in Agriculture Landscape (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Baran	246.00	64.00	246.00	10.00	310.00	320.00	320.00	320.00	74.00
Bhilwara	11.30	0.00	11.30	0.00	11.30	11.30	11.30	11.30	0.00
Dholpur	0.00	60.00	0.00	0.00	60.00	60.00	60.00	60.00	60.00
Rajsamand Forest & WL	7.00	8.00	7.00	5.00	15.00	20.00	20.00	20.00	20.00
Tonk District	73.50	25.50	73.50	3.00	99.00	102.00	102.00	102.00	28.50
Total	**337.80**	**157.50**	**337.80**	**18.00**	**495.30**	**513.30**	**513.30**	**513.30**	**182.50**

Table 6.51. Area in Urban/peri-urban landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Rajsamand For. & WL	8.00	0.00	8.00	0.00	8.00	8.00	8.00	8.00	8.00
Total	**8.00**	**0.00**	**8.00**	**0.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**

Table 6.52. Area in Conservation Intervention (unit-ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Baran	3,070.08	685.20	3,070.08	0.00	3,755.28	3,755.28	3,755.28	3,755.28	2,131.02
Bhilwara	23,943.69	31,147.02	23,943.69	590.00	55,090.71	55,680.71	55,680.71	55,680.71	14,025.62
Bundi	1,787.85	0.00	1,787.85	0.00	1,787.85	1,787.85	1,787.85	1,787.85	715.14
DCF (Project) Tonk	7,288.25	10,757.71	7,288.25	8,694.02	18,045.96	26,739.98	26,739.98	26,739.98	10,695.99
Dholpur	22.50	10.00	22.50	95.00	32.50	127.50	127.50	127.50	132.33
Jhalawar	545.25	242.50	545.25	0.00	787.75	787.75	787.75	787.75	6,443.57
Karoli DCF	4,847.69	4,562.47	4,847.69	7,678.37	9,410.17	17,088.54	17,088.54	17,088.54	7,086.51
Kota - Mukandra Hills Tiger Reserve	3,920.50	1,547.50	3,920.50	0.00	5,468.00	5,468.00	5,468.00	5,468.00	2,262.20
Kota WL	1,515.90	1,503.59	1,515.90	0.00	3,019.48	3,019.48	3,019.48	3,019.48	4,974.01
Rajsamand For. & WL	2,620.51	1,095.12	2,620.51	427.50	3,715.62	4,143.12	4,143.12	4,143.12	1,721.19
S.P.R & E.O, Banas Project	15,531.96	13,859.27	15,531.96	15,762.92	29,391.23	45,154.15	45,154.15	45,154.15	18,061.66
Sawai Madhopur DCF	9,987.50	11,901.30	9,987.50	13,098.00	21,888.80	34,986.80	34,986.80	34,986.80	13,994.72
Sawai Madhopur Distt	10,273.28	10,100.99	10,273.28	9,609.69	20,374.27	29,983.96	29,983.96	29,983.96	11,993.58
Soil Conservation (Banas Project)	41,587.19	31,083.91	41,587.19	30,791.51	72,671.10	10,3462.60	10,3462.60	10,3462.60	41,385.04
Tonk Distt	14,048.28	8,580.34	14,048.28	7,810.00	22,628.62	30,438.62	30,438.62	30,438.62	24,743.45
Udaipur	198.65	0.00	198.65	0.00	198.65	198.65	198.65	198.65	79.46
Total	**1,41,189.08**	**1,27,076.90**	**1,41,189.08**	**94,557.01**	**2,68,265.98**	**3,62,822.99**	**3,62,822.99**	**3,62,822.99**	**1,60,445.49**

Table 6.53. Cost for Natural Landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Total maint.**	**Maint.**	
Baran	1,778.52	1,683.15	1,148.02	0.00	2,426.36	2,470.84	1,969.83	3,461.67	8,015.06	1,010.53	12,487.26
Bharatpur	0.00	30.77	0.00	32.30	19.57	41.52	40.84	63.07	101.92	60.35	225.35
Bhilwara	301.48	195.18	175.81	60.77	323.75	353.77	255.79	557.42	1,109.12	206.56	1,873.10
Bundi	336.45	671.22	266.81	0.00	898.91	1,051.18	662.97	1,007.67	2,879.87	140.07	4,027.60
Dholpur	310.94	225.22	199.52	192.55	360.59	484.32	461.79	728.70	1,506.22	396.78	2,631.70
Eco Task Force	460.00	966.00	0.00	507.15	0.00	0.00	0.00	1,933.15	0.00	0.00	1,933.15
Jhalawar	894.96	1,342.44	709.70	0.00	2,039.80	2,313.40	1,342.46	2,237.39	6,405.37	300.00	8,942.76
Karoli DCF	117.63	41.94	70.80	52.18	100.97	120.06	88.62	211.75	380.45	54.38	646.58
Kota - Mukandra Hills Tiger Reserve	55.38	96.92	13.77	0.00	29.75	13.89	6.99	152.30	64.39	0.00	216.69
Kota WL	363.65	126.00	228.05	0.00	323.30	298.51	241.36	489.65	1,091.22	112.76	1,693.63
NCS Sawai Madhopur	7,402.49	7,039.28	4,510.61	6,571.44	8,990.77	12,688.18	11,912.02	21,013.21	38,101.59	12,531.91	71,646.71
Rajsamand For. & WL	648.85	151.36	389.57	108.38	504.89	530.91	455.47	908.58	1,880.83	284.73	3,074.15
Sawai Madhopur DCF	1,377.10	1,169.07	875.96	1,098.31	1,682.31	2,337.83	2,208.72	3,644.48	7,104.82	2,272.69	13,021.98
Tonk Distt	148.65	74.98	100.25	81.94	168.04	222.46	185.67	305.56	676.43	146.41	1,128.40
Udaipur	56.84	0.00	36.16	0.00	38.75	34.77	30.75	56.84	140.42	5.84	203.10
Total	**14,252.93**	**13,813.51**	**8,725.03**	**8,705.01**	**17,907.75**	**22,961.65**	**19,863.27**	**36,771.44**	**69,457.71**	**17,523.01**	**1,23,752.16**

Table 6.54. Cost for Agriculture Landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Total Maint.**	**Maint.**	
Baran	145.75	33.60	32.29	5.51	37.71	35.77	32.03	184.86	137.79	13.48	336.13
Bhilwara	6.62	0.00	1.48	0.00	1.34	1.18	1.01	6.62	5.02	0.00	11.64
Dholpur	0.00	31.50	0.00	0.00	8.27	8.68	9.12	31.50	26.07	9.57	67.14
Rajsamand Forest & WL	2.53	3.04	2.10	1.99	3.51	3.50	2.25	7.56	11.36	3.12	22.04
Tonk District	41.81	16.73	9.65	2.07	12.53	11.68	10.17	60.61	44.02	2.12	106.75
Total	**196.72**	**84.87**	**45.52**	**9.57**	**63.35**	**60.81**	**54.56**	**291.16**	**224.25**	**28.29**	**543.70**

Table 6.55. Cost for Urban/peri-urban Landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Total Maint.**	**Maint.**	
Rajsamand Forest & WL	200.00	0.00	12.10	0.00	12.70	13.34	14.00	200.00	52.13	14.70	266.84
Total	**200.00**	**0.00**	**12.10**	**0.00**	**12.70**	**13.34**	**14.00**	**200.00**	**52.13**	**14.70**	**266.84**

Table 6.56. Cost for Conservation Intervention (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	Est.	Est.	Maint.	Est.	Maint.	Maint.	Maint.	Total Est.	Total Maint.	Maint.	
Baran	545.56	123.90	5.73	0.00	6.94	78.34	24.30	669.46	115.31	105.85	890.62
Bhilwara	3,831.32	5,232.70	0.04	104.08	0.04	554.38	757.22	9,168.10	1,311.68	1,477.70	11,957.47
Bundi	286.06	0.00	0.00	0.00	0.00	41.39	0.00	286.06	41.39	45.64	373.08
DCF (Project) Tonk	1,166.12	1,807.30	0.00	1,533.63	0.00	168.74	261.52	4,507.04	430.26	940.96	5,878.26
Dholpur	10.80	1.68	0.00	16.76	0.00	1.56	0.24	29.24	1.81	7.09	38.13
Jhalawar	280.56	407.40	0.00	0.00	0.00	40.60	58.95	687.96	99.55	109.75	897.26
Karoli DCF	783.87	774.17	0.87	1,364.94	1.72	115.14	113.96	2,922.97	231.69	664.90	3,819.56
Kota - Mukandra Hills Tiger Reserve	857.28	259.98	26.25	0.00	27.56	116.81	68.01	1,117.26	238.63	170.27	1,526.16
Kota WL	436.86	398.64	0.00	0.00	0.00	63.21	57.68	835.50	120.90	133.29	1,089.69
Rajsamand For. & WL	425.32	184.33	0.64	75.41	0.71	61.41	27.40	685.06	90.15	120.04	895.26
S.P.R & E.O, Banas Project	2,485.11	2,328.36	0.00	2,780.58	0.00	359.60	336.92	7,594.05	696.51	1,613.89	9,904.45
Sawai Madhopur DCF	1,598.00	1,999.42	0.00	2,310.49	0.00	231.23	289.32	5,907.91	520.55	1,276.86	7,705.32
Sawai Madhopur Distt	1,643.73	1,696.97	0.00	1,695.15	0.00	237.85	245.55	5,035.84	483.40	1,048.70	6,567.94
Soil Conservation (Banas Project)	6,653.95	5,222.10	0.00	5,431.62	0.00	962.83	755.65	17,307.67	1,718.48	3,547.18	22,573.33
Tonk Distt	3,488.52	2,342.40	88.20	2,299.82	158.76	619.39	495.75	8,130.74	1,362.10	1,699.77	11,192.61
Udaipur	31.78	0.00	0.00	0.00	0.00	4.60	0.00	31.78	4.60	5.07	41.45
Total	**24,524.85**	**22,779.32**	**121.72**	**17,612.46**	**195.72**	**3,657.07**	**3,492.49**	**64,916.63**	**7,467.01**	**12,966.96**	**85,350.60**

Table 6.57. Division –wise area and cost summary for different landscape (Area in ha and Cost in lakh rupees)

	Natural			Agriculture			Urban/ peri-urban			Conservation			Total		
Division	**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**	
	Est.	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**
Baran	5,866.24	3,461.67	8,015.06	320.00	184.86	137.79	0.00	0.00	0.00	3,755.28	669.46	115.31	9,941.52	4,316.00	8,268.16
Bharatpur	100.00	63.07	101.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	63.07	101.92
Bhilwara	1,104.83	557.42	1,109.12	11.30	6.62	5.02	0.00	0.00	0.00	55,680.71	9,168.10	1,311.68	56,796.85	9,732.14	2,425.82
Bundi	1,450.00	1,007.67	2,879.87	0.00	0.00	0.00	0.00	0.00	0.00	1,787.85	286.06	41.39	3,237.85	1,293.72	2,921.26
DCF (Project) Tonk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26,739.98	4,507.04	430.26	26,739.98	4,507.04	430.26
Dholpur	1,214.00	728.70	1,506.22	60.00	31.50	26.07	0.00	0.00	0.00	127.50	29.24	1.81	1,401.50	789.44	1,534.09
Eco Task Force	800.00	1,933.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	800.00	1,933.15	0.00
Jhalawar	3,230.00	2,237.39	6,405.37	0.00	0.00	0.00	0.00	0.00	0.00	787.75	687.96	99.55	4,017.75	2,925.35	6,504.92
Karoli DCF	400.00	211.75	380.45	0.00	0.00	0.00	0.00	0.00	0.00	17,088.54	2,922.97	231.69	17,488.54	3,134.72	612.14
Kota - Mukandra Hills Tiger Reserve	400.00	152.30	64.39	0.00	0.00	0.00	0.00	0.00	0.00	5,468.00	1,117.26	238.63	5,868.00	1,269.56	303.02
Kota WL	800.00	489.65	1,091.22	0.00	0.00	0.00	0.00	0.00	0.00	3,019.48	835.50	120.90	3,819.48	1,325.15	1,212.12
NCS Sawai Madhopur	36,002.00	21,013.21	38,101.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36,002.00	21,013.21	38,101.59

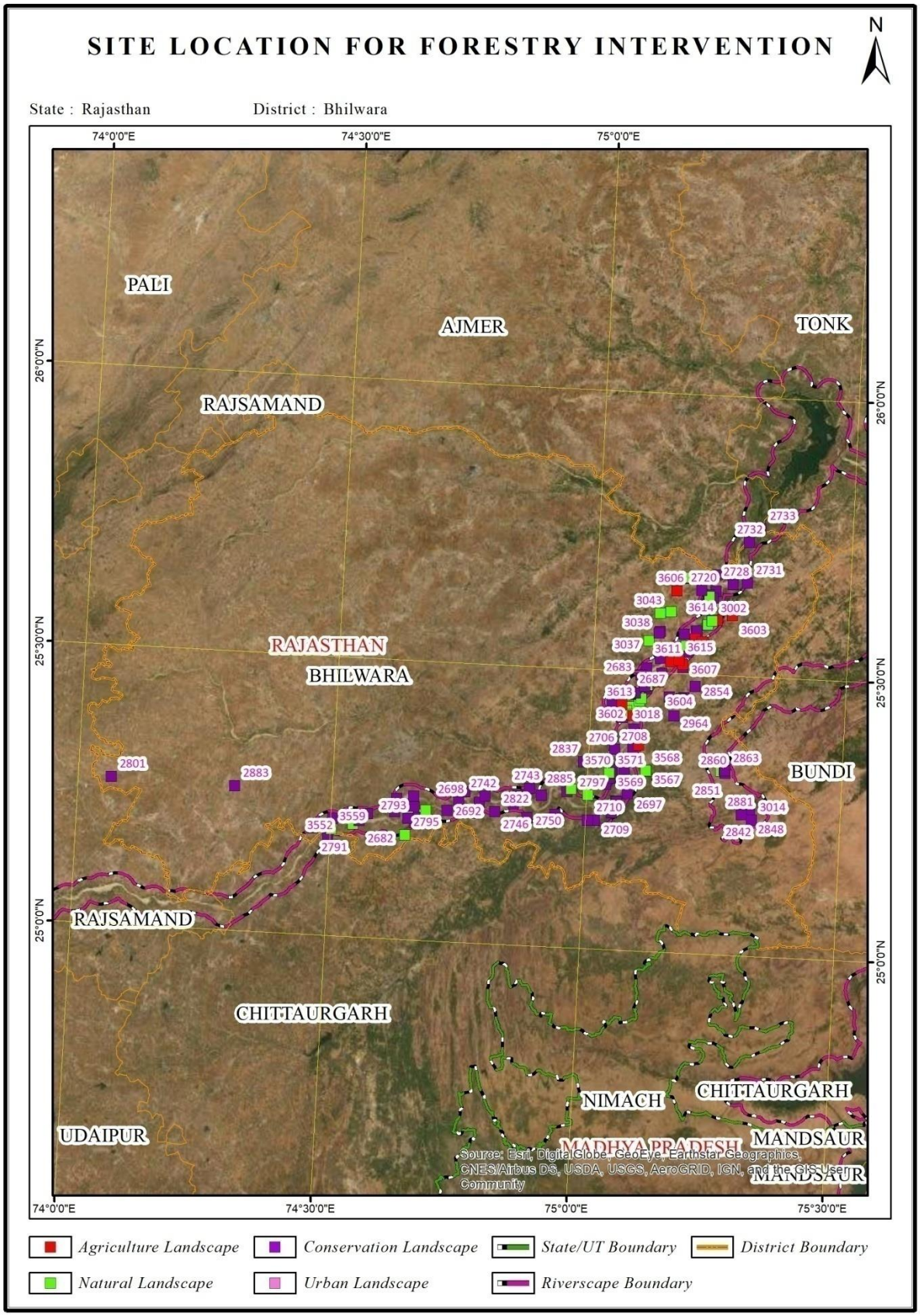
	Natural			Agriculture			Urban/ peri-urban			Conservation			Total		
Division	**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**	
	Est.	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**	**Est.**	**Est.**	**Maint**
Rajsamand For. & WL	1,558.00	908.58	1,880.83	20.00	7.56	11.36	8.00	200.00	52.13	4,143.12	685.06	90.15	5,729.12	1,801.21	2,034.48
S.P.R & E.O, Banas Project	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45,154.15	7,594.05	696.51	4,5154.15	7,594.05	696.51
Sawai Madhopur DCF	5,950.00	3,644.48	7,104.82	0.00	0.00	0.00	0.00	0.00	0.00	34,986.80	5,907.91	520.55	40,936.80	9,552.39	7,625.37
Sawai Madhopur Distt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29,983.96	5,035.84	483.40	29,983.96	5,035.84	483.40
Soil Conservation (Banas Project)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,03,462.60	17,307.67	1,718.48	1,03,462.60	17,307.67	1,718.48
Tonk Distt	490.00	305.56	676.43	102.00	60.61	44.02	0.00	0.00	0.00	30,438.62	8,130.74	1,362.10	31,030.62	8,496.91	2,082.55
Udaipur	97.00	56.84	140.42	0.00	0.00	0.00	0.00	0.00	0.00	198.65	31.78	4.60	295.65	88.63	145.02
Total	**59,462.07**	**36,771.44**	**69,457.71**	**513.30**	**291.16**	**224.25**	**8.00**	**200.00**	**52.13**	**3,62,822.99**	**64,916.63**	**7,467.01**	**4,22,806.36**	**1,02,179.23**	**77,201.10**

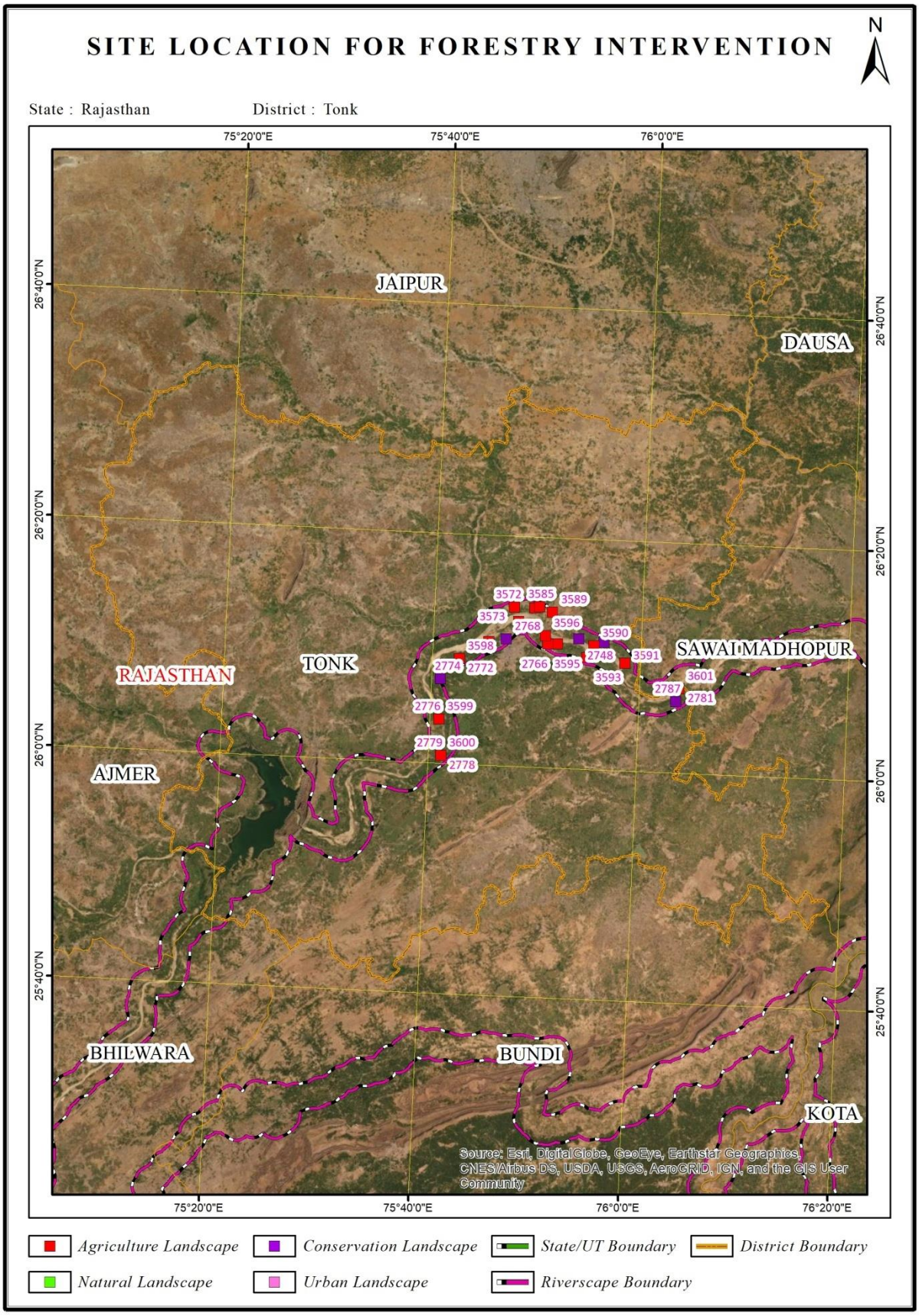
Table 6.58. Division and phase- wise area and cost summary (Area in ha and Cost in lakh rupees)

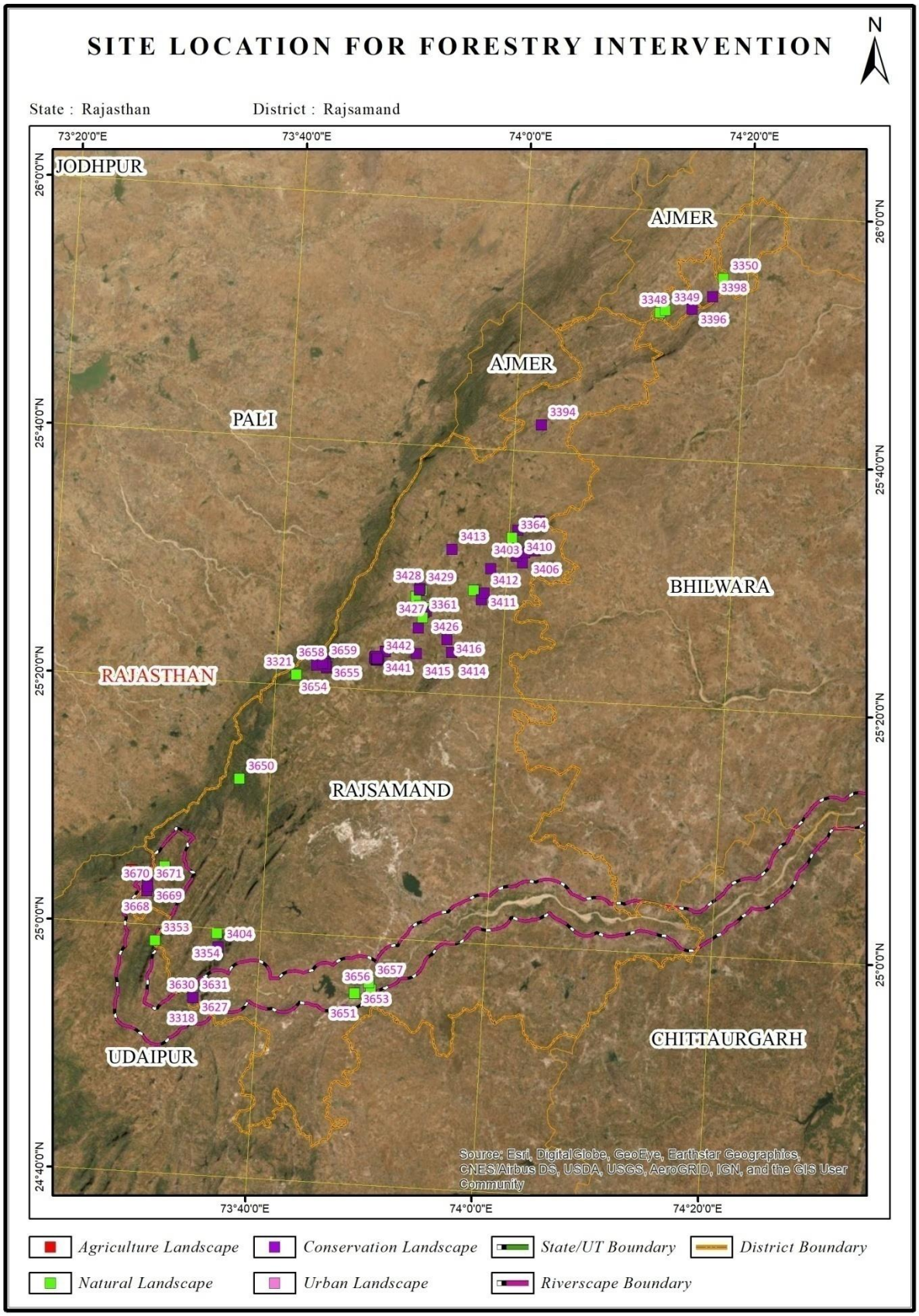
	Phase I			Phase II	Grand total
Division	**Area**	**Cost**		**Cost**	
	Est.	**Est.**	**Maint.**	**Maint.**	**Cost**
Baran	9,941.52	4,316.00	8,268.16	1,129.86	13,714.01
Bharatpur	100.00	63.07	101.92	60.35	225.35
Bhilwara	56,796.85	9,732.14	2,425.82	1,684.26	13,842.21
Bundi	3,237.85	1,293.72	2,921.26	185.71	4,400.69
DCF (Project) Tonk	26,739.98	4,507.04	430.26	940.96	5,878.26
Dholpur	1,401.50	789.44	1,534.09	413.44	2,736.97
Eco Task Force	800.00	1,933.15	0.00	0.00	1,933.15
Jhalawar	4,017.75	2,925.35	6,504.92	409.75	9,840.02
Karoli DCF	17,488.54	3,134.72	612.14	719.28	4,466.13
Kota - Mukandra Hills Tiger Reserve	5,868.00	1,269.56	303.02	170.27	1,742.85
Kota WL	3,819.48	1,325.15	1,212.12	246.06	2,783.33
NCS Sawai Madhopur	36,002.00	21,013.21	38,101.59	12,531.91	71,646.71
Rajsamand For. & WL	5,729.12	1,801.21	2,034.48	422.60	4,258.29
S.P.R & E.O, Banas Project	45,154.15	7,594.05	696.51	1,613.89	9,904.45
Sawai Madhopur DCF	40,936.80	9,552.39	7,625.37	3,549.55	20,727.30
Sawai Madhopur Distt	29,983.96	5,035.84	483.40	1,048.70	6,567.94
Soil Conservation (Banas Project)	1,03,462.60	17,307.67	1,718.48	3,547.18	22,573.33
Tonk Distt	31,030.62	8,496.91	2,082.55	1,848.30	12,427.76
Udaipur	295.65	88.63	145.02	10.91	244.55
Total	**4,22,806.36**	**1,02,179.23**	**77,201.10**	**30,532.97**	**2,09,913.31**

Table 6.59. Model-wise area and cost summary (Area in ha and Cost in lakh rupees)

	Phase I		Phase II	Grand total
Landscape	**Area**	**Cost**	**Cost**	**Cost**
Natural	**59,462.07**	**1,06,229.15**	**17,523.01**	**1,23,752.16**
YM/RJ/NL/01	6,429.00	17,130.27	696.32	17,826.59
YM/RJ/NL/02	3,944.00	7,161.71	1,009.76	8,171.48
YM/RJ/NL/03	4,650.00	2,520.34	35.52	2,555.86
YM/RJ/NL/04	1,860.00	3,531.06	362.29	3,893.35
YM/RJ/NL/05	40,674.20	73,601.68	15,372.12	88,973.80
YM/RJ/NL/06	462.87	151.88	16.70	168.58
YM/RJ/NL/07	588.67	189.77	29.48	219.25
YM/RJ/NL/08	53.33	9.30	0.82	10.11
YM/RJ/NL/09	800.00	1,933.15	0.00	1,933.15
Agriculture	**513.30**	**515.41**	**28.29**	**543.70**
YM/RJ/AL/01	258.79	261.93	2.12	264.04
YM/RJ/AL/02	234.51	234.56	23.05	257.62
YM/RJ/AL/03	20.00	18.92	3.12	22.04
Urban/ peri-urban	**8.00**	**252.13**	**14.70**	**266.84**
YM/RJ/UL/01	8.00	252.13	14.70	
Conservation	**3,62,822.99**	**72,383.64**	**12,966.96**	**85,350.60**
YM/RJ/CI/01/A	4,722.41	869.06	156.75	1,025.81
YM/RJ/CI/01/B	13.70	2.51	0.35	2.86
YM/RJ/CI/02/A	2.23	135.77	16.87	152.64
YM/RJ/CI/02/B	369.55	68.14	10.81	78.95
YM/RJ/CI/02/C	10,581.80	1,951.91	312.75	2,264.67
YM/RJ/CI/02/D	270.23	49.64	7.57	57.21
YM/RJ/CI/02/E	27,705.50	5,294.11	737.83	6,031.94
YM/RJ/CI/02/F	1,500.00	277.81	48.32	326.13
YM/RJ/CI/02/G	143.85	26.72	3.72	30.45
YM/RJ/CI/02/H	67.20	12.53	1.75	14.28
YM/RJ/CI/02/I	3,14,953.25	57,963.13	10,725.95	68,689.08
YM/RJ/CI/03	1,145.00	3,225.71	537.51	3,763.22
YM/RJ/CI/04	1,348.28	2,506.58	406.78	2,913.36
Total	**4,22,806.36**	**1,79,380.34**	**30,532.97**	**2,09,913.31**


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Rajasthan
District : Bhilwara
74°0'0"E
74°30'0"E
75°0'0"E
75°30'0"E
26°0'0"N
25°30'0"N
25°0'0"N
PALI
AJMER
TONK
RAJSAMAND
RAJASTHAN
BHILWARA
BUNDI
CHITTAURGARH
NIMACH
MANDSAUR
UDAIPUR
MADHYA PRADESH
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Rajasthan
District : Tonk
75°20'0"E
75°40'0"E
76°0'0"E
76°20'0"E
26°40'0"N
26°20'0"N
26°0'0"N
25°40'0"N
JAIPUR
DAUSA
TONK
SAWAI MADHOPUR
RAJASTHAN
AJMER
BHILWARA
BUNDI
KOTA
3572
3585
3589
3573
2768
3596
3590
3598
2748
3591
2774
2772
2766
3595
3593
3601
2787
2781
2776
3599
2779
3600
2778
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Rajasthan
District : Rajsamand
73°20'0"E
73°40'0"E
74°0'0"E
74°20'0"E
26°0'0"N
25°40'0"N
25°20'0"N
25°0'0"N
24°40'0"N
JODHPUR
AJMER
PALI
BHILWARA
RAJASTHAN
RAJSAMAND
UDAIPUR
CHITTAURGARH
3350
3398
3348
3349
3396
3394
3364
3413
3403
3410
3406
3428
3429
3412
3427
3361
3411
3426
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3659
3442
3416
3321
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3441
3415
3414
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3670
3671
3669
3668
3353
3404
3354
3630
3631
3627
3318
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3657
3653
3651
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Agriculture Landscape
Conservation Landscape
State/UT Boundary
District Boundary
Natural Landscape
Urban Landscape
Riverscape Boundary

Chapter 7

MADHYA PRADESH

7.1. INTRODUCTION

Madhya Pradesh is located in the heart of the country and lies over a transitional area between the Indo-Gangetic plain in the north and the Deccan plateau in the south. The state covers a geographical area of 3,08,245 km^2 and extends between 21°17' N to 26°52' N latitude and 74°08' E to 82°49' E longitudes. Its physiography is characterized by low hills, extensive plateaus and river valleys. The state can be divided into four regions, *viz*., the low-lying areas in north and north-west of Gwalior, Malwa Plateau, Satpuda and Vindhyan Ranges. It is the second largest state in terms of area and fifth largest in terms of population. It borders the states of Uttar Pradesh to the northeast, Chhattisgarh to the southeast, Maharashtra to the south, Gujarat to the west and Rajasthan to the northwest (Fig.7.1). Madhya Pradesh is administratively divided into 10 divisions, i.e., Bhopal, Chambal, Gwalior, Indore, Jabalpur, Narmadapuram, Rewa, Sagar, Shahdol and Ujjain with a total of 52 districts.



Fig.7.1.District map of Madhya Pradesh
(***Source:*** National Informatics Centre, Madhya Pradesh)

7.2. GEOGRAPHY

Geographically, the state has varied geo-structural divisions. Being located towards the northern part of the Deccan Plateau, this state is mainly a land of plateaus and mountain ranges. Towards the northern side of the river Chambal and Sone, lie the medium highland that got created by the Vindhya rocks, Granite Gneiss and Deccan Trap. This is a triangular shaped plateau between the

Aravalli range and the valleys of the Sone and Narmada rivers. River Yamuna forms its northern boundary.

7.3. GEOLOGY

The oldest group of rocks comprising of Archaeans and Proterozoic formation constitute nearly 45% area of the state. The next younger formation of Carboniferous to lower Cretaceous comprising Gondwana Super Group covers 10% area while the formation of Cretaceous to Paleocene comprising mostly of Deccan Trap basalt constitutes 38% area of the state. According to Crawford (1969), the Chambal river valley is part of the Vindhyan system which consists of massive sandstone, slate and limestone, of perhaps pre-Cambrian age, resting on the surface of older rocks. Hillocks and plateaus represent the major landforms of the Chambal valley (Fig.7.2). The Chambal basin is characterized by an undulating floodplain, gullies and ravines.

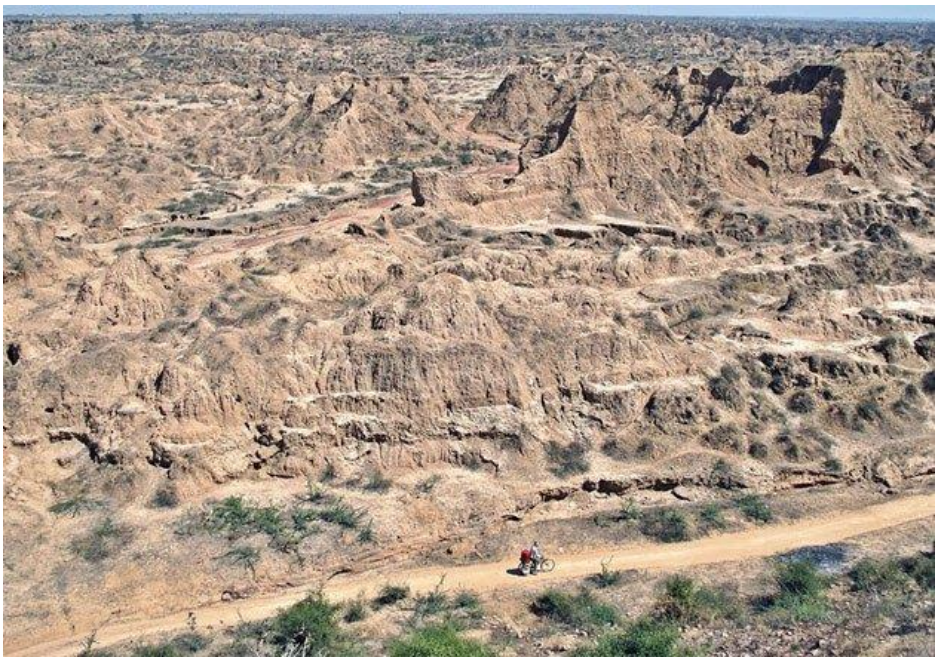


Fig. 7.2. Ravines of Chambal Valley
(***Source:*** https://www.indiatvnews.com/news/india/mp-govet-to-make-badlands-of-chambal-cultivable)

7.4. SOILS

Soils of Madhya Pradesh vary as per the structure, colour, texture and composition in the different regions. Madhya Pradesh is that part of the peninsular plateau of India where residual soils are found in an extensive area. The rock formation determines the soil structure and composition in this state. As a result of this, organic materials are found at a large scale in soils. Madhya Pradesh comprises of a variety of soils ranging from rich clayey to gravelly. The major groups of soils found in the state can be divided into five major categories namely alluvial soil, black soil or regur soil (medium and deep black, shallow and medium black, mixed red and black coloured), clayey soil, mixed soil and red and yellow soil.

7.5. CLIMATE

It has a subtropical climate. Hot dry summer extends from April to June followed by monsoon from July to September; the winter months (November to February) are cool and relatively dry. The average rainfall is about 1,370 mm and it decreases from east to west. Summer mean maximum temperature rises to about 42.5^{o}C in northern parts and the average temperature during winters is as low as 10^{o}C again in the north while it varies from 10^{o} - 15^{o}C in the south (Gosain and Rao, 2018).

7.6. WATER RESOURCES AND HYDROLOGY

7.6.1. River System

Ten major rivers originate from the State. As Madhya Pradesh is in the centre of India, most of the rivers are interstate rivers. The rivers Chambal, Sindh, Betwa, Ken flow northward and meet with Yamuna whereas the river Sone falls directly into the Ganga. Narmada, Tapi and Mahi rivers flow westward and meet the Arabian Sea whereas Wainganga and Pench rivers meet the Godavari in the south. Annual runoff from these rivers within the state is estimated 81,719 hm, out of which about 49,743 hm can be harnessed for irrigation purpose. The Narmada is the longest river in Madhya Pradesh. It flows westward through a rift valley, with the Vindhya ranges sprawling along its northern bank and the Satpura range of mountains along the southern. The state can be divided onto eight major river basins, the details of which are as follows: the Ganga, Yamuna, Chambal, Sindh, Betwa, Ken, Son, Ton and Narmada basins (Fig.7.3).

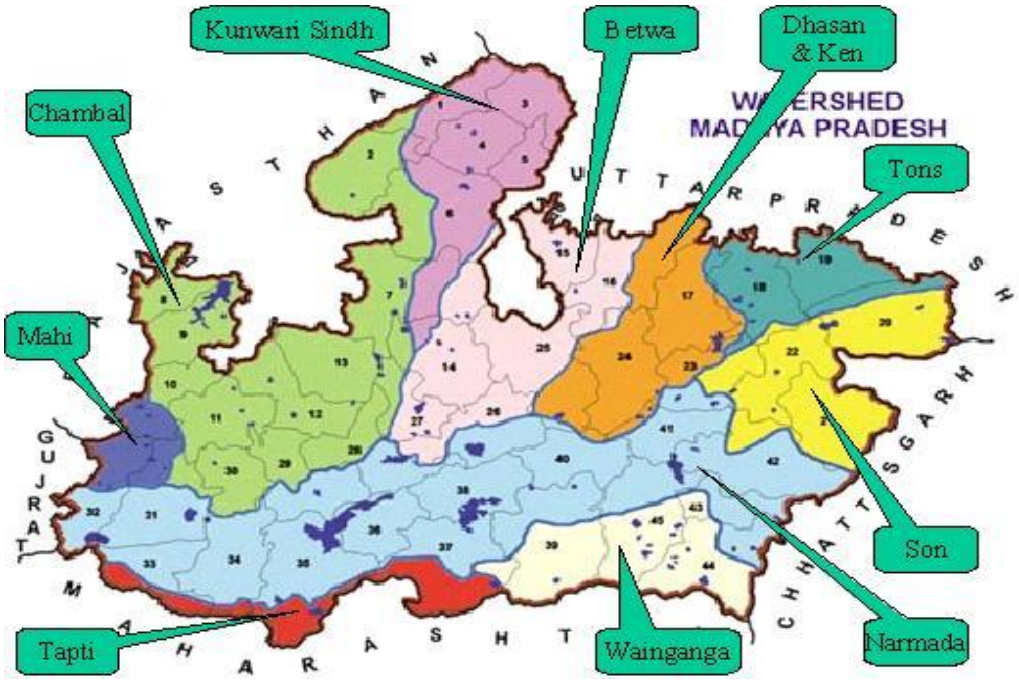


Fig. 7.3. River basins in Madhya Pradesh
(***Source:*** Water Resources Department, Madhya Pradesh)

7.6.2. Tributaries of Yamuna River

Chambal River

The Chambal River originates from Indore district (Janapao Hills, Vindhya Range) and meets River Yamuna in Etawah district of UP. The river flows through three Indian states: Madhya Pradesh, Rajasthan and Uttar Pradesh. The Chambal also forms part of the Rajasthan-Madhya Pradesh boundary. It is the second biggest tributary of the Yamuna River which is the largest tributary of the Ganges (Fig.7.4). Total catchment area of the Chambal in Madhya Pradesh is 59,940 km^2. Total length of the river is 936 km, out of which the initial 320 km lies in Madya Pradesh, 226 km in Rajasthan, 216 km makes the boundary between Madhya Pradesh and Rajasthan, 112 km makes the boundary between Madhya Pradesh and Uttar Pradesh and 64 km in Uttar Pradesh before confluence in Yamuna River. The Kali Sindh, Parvati, Kuno, Newaj and Shipra are the main tributaries of River Chambal (Rawan, 2017). The Chambal – Betwa – Ken catchment (watershed of Yamuna; total area 1,25,080 km^2) comprises Khargone, northern part of Jhabua, Dhar, Ujjain, northern part of Indore, Shajapur, northern Dewas, Sehore, Bhopal, Raigarh, Vidisha, northern Raisen, Guna, Shivpuri, Morena, Gwalior, Bhind, Datia, Tikamgarh, Chhatarpur, Damoh and western part of Panna. The total quantity of surface and ground water in Chambal catchments areas of MP is 45 and 5 km^3, respectively (MP ENVIS, 2018).

From an economic point of view, the Chambal River is very important to India as it houses four dams. The oldest of these, the Gandhi Sagar is located at the entrance of the Kanjarda Plateau. Another dam, near Kota, was started in 1952 as part of India's first five-year plan. The Jawahar Sagar dam was the third to be built on the Chambal, and the last dam is the Rana Pratap Sagar Dam (www.waterdatabase.com › rivers › chambal-river)



Fig.7.4. Chambal Valley in Madhya Pradesh

(***Source:*** https://timesofindia.indiatimes.com/travel/destinations/journey-through-the-national-chambal-sanctuary-in-chambal-valley-india/photostory)

Betwa River

The Betwa drains off the Deccan plateau. Originating in Kumra village in Raisen district of Madhya Pradesh, the river Betwa, a tributary of the Yamuna, flows for 610 km. It rises in the Vindhya Range just north of Hoshangabad in Madhya Pradesh and flows north-east through

Madhya Pradesh to Uttar Pradesh from Orchha (Fig.7.5). It joins the river Yamuna in Hamirpur. The Betwa takes along with it the water of the eastern Malwa plateau. The tributaries of Betwa are Bina, Yamini, Dhasan and Ken. In ancient times, the Betwa was known as *Vetrawati* (www.mptourandtravels.com › rivers › betwa). Nearly half of its course is not navigable. The Betwa is dammed at Dukwan and Deogarh.



Fig.7.5. Historical town of Orchha on the bank of Betwa River
(***Source:*** https://www.britannica.com/place/Orchha-historical-India)

Ken River

The Ken River originates near village Ahirgawan on the north-west slopes of Barner Range in Katni district and travels a distance of 427 km, before merging with the Yamuna at Chilla village, district Banda in Uttar Pradesh at 25°46′N 80°31′E. It has an overall drainage basin of 28,058 km^2, out of which 12,620 km^2 belongs to Sonar River, its largest tributary, whose entire basin lies in Madhya Pradesh. Along its 427 km course, it receives water from its own tributaries such as Bawas, Dewar, Kaith and Baink on the left bank, and Kopra and Bearma of the right. Out of its total length of 427 km, it flows for 292 km in Madhya Pradesh, 84 km in Uttar Pradesh, and 51 km forms the boundary between the two states (117.252.14.242 › Gangakosh › tributaries › ken_betwa).

7.6.3. Other Water Bodies and Aquifers

In M.P., the total number of natural and man-made wetlands of different sizes is 8,540, which has 5,636 wetlands (<2.25 ha), 2,019 tanks and ponds and 239 of rivers and streams (Table 7.1; FSI, 2019). Compared to other states of the Yamuna Basin, 1.83% of wetland area inside Recorded Forest (or Green Wash) Area is relatively higher.

Madhya Pradesh is a land locked state and is drained by five major river basins, namely, the Ganga (tributaries of Yamuna), Narmada, Godavari, Tapi and Mahi. The surface water resources have been calculated district wise by considering Strange's Table showing depth of

runoff as percentage of total monsoon rainfall and yield of runoff per square kilometer in mcm for average catchment. Based on the National Hydrograph Monitoring data, the areas suitable for artificial recharge have been identified and segregated into two categories, *viz*., (i) depth to water level < 3 m bgl and declining trend of 0.10 m yr^{-1}, and (ii)depth to water level >3 m bgl and declining trend of 0.10 m yr^{-1} (Fig.7.6) (CGWB, 2013).From these, the rechargeable areas for aquifers in the Yamuna basin fall in the districts of Chhatarpur, Datia, Guna, Gwalior, etc.

Table 7.1. Wetlands inside the recorded forest area (or green wash) in Madhya Pradesh

Wetland category	**No. of wetlands**	**Total wetland area (ha)**
Inland wetlands-natural		
Lake/Pond	9	22
Waterlogged	1	4
River/Stream	239	71,090
Sub-Total	**249**	**71,116**
Inland wetlands-man-made		
Reservoir/Barrage	636	80,246
Tank/Pond	2,019	5,575
Sub-total	**2,655**	**85,821**
Wetland (<2.25 ha)	5,636	5,636
Total	**8,540**	**1,62,573**
Total recorded forest (or green wash) area (in ha)		**88,95,601**
Per cent of wetland area inside recorded forest (or green wash) area		**1.83%**

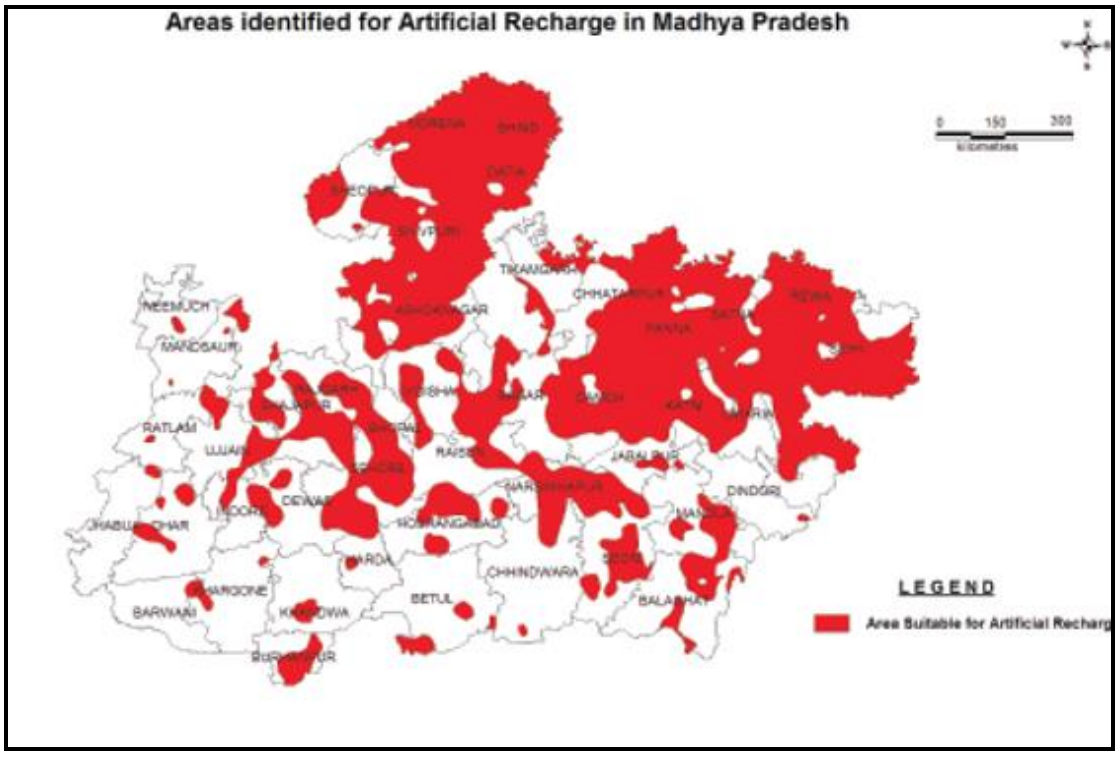


Fig.7.6. Areas suitable for artificial recharge in M.P.

(***Source:*** CGWB, 2013)

7.6.4. Issues about Water Resources

The rivers in Madhya Pradesh are monitored at 96 locations on 41 rivers. Among these, 45 locations do not comply with the Water Quality Criteria. These 45 locations are situated on 21 rivers, *viz*., Banjar, Betwa, Bichia, Chambal, Chillar, Denwa, Gohad, Gour, Jammer, Kalisot, Khan, Kolar, Kshipra, Kunda, Malei, Narmada, Parvati, Shivna, Tapi, Tons and Wainganga. The polluted rivers in Madhya Pradesh are in 5 priority classes (Class I, II, III, IV and V). The details of polluted river stretches are provided in Table 7.2.

Table 7.2. Polluted river stretches in Madhya Pradesh

S. no.	River name	Stretch identified	Town identified	Approx. length of the stretch (km)
1	Betwa	Mandideep to Vidisha	Mandideep, Vidisha, Bhopal, Raisen	70
2	Tons	Chakghat to Chapper	Gargata, Chakghat, Chapper	5
3	Chambal	Nagda to Rampura	Nagda, Rampura	150
4	Parvati	Batawada to Pilukhedi	Batawada, Pilukhedi, Narsinghgarh	80
5	Kshipra	Siddhawat to Triveni Sangam,	Ujjain	8

While assessing the water quality of the Chambal, it was noticed that on all the three indices, *viz*., Ecological Quality Index (EQI), River Pollution Index (RPI) and Overall Index of Pollution (OIP), river health falls within an average range. Based on indices, it was strongly recommended that industrial effluents discharging into Chambal River need to be duly treated and desilting should be done periodically to counter act the effect of enormous pollution (Kumar, 2014).

The Ganga River Dolphin and Crocodile are reliable indicator species to understand the health of a river ecosystem that is threatened by human activities (Fig.7.7). Conservation of these species cannot be delayed, because their habitat is more vulnerable because of anthropogenic pressures and destruction due to construction of dams and barrages. Altered flow through water extraction changes the natural environmental conditions prevailing in the river stretch. The sustained and heavy exploitation of small fish through the widespread use of non-traditional fishing nets in the river is affecting the prey base of the Ganges River dolphin and crocodiles. Sand mining and laying of roads up to the riverbank has led to a reduction in the nesting sites of crocodiles, turtles, and birds. Excessive grazing and removal of biomass for fuelwood has increased the soil erosion and ravine formation. Although the Chambal is considered one of the least polluted rivers of the country, in recent years some stretches have been severely affected by sewage and industrial waste that has, in turn, affected the physical and chemical characteristics of the river. The cumulative anthropogenic impacts may lead to extinction of these unique populations. In light of the results of this study, conservation management recommendations have been made. These include highlighting the need for habitat management, control of illegal activities, and long-term monitoring programmes (Singh and Rao, 2017).

The National Green Tribunal has sought response from the Centre and others on a plea challenging the environment clearance granted to the ambitious Ken-Betwa river inter-linking project. The Rs 18,000 crore project aims to link the Ken River in Madhya Pradesh and the Betwa River in Uttar Pradesh to transfer surplus water of one river to another (PTI, 2017).



Fig.7.7. Dolphin conservation in National Chambal Sanctuary
(***Source:*** https://www.patrika.com/gwalior-news/dolphin-conservation-in-chambal)

7.7. FOREST AND VEGETATION

Madhya Pradesh is a forest rich state and is ranked first among the states in terms of the RFA. The State has a sizeable tribal and rural population which is dependent on the forests for their livelihood and basic needs. As per the Champion and Seth Classification of Forest Types (1968), the forests in Madhya Pradesh belong to five Forest Type Groups, which are further divided into 21 Forest Types. Madhya Pradesh is a pioneering state in the implementation of the Joint Forest Management (JFM) movement in the country. The state has a strong JFM network through 15,228 JFMC/VSS/EDCs covering an area of 66,874 km^2. Recorded Forest Area (RFA) in the State is 94,689 $km^2$of which 61,886 km^2 is Reserved Forests, 31,098 km^2 is Protected Forests and 1,705 km^2 is Unclassed Forests (Fig.7.8; FSI, 2019).

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Oct 2017 to January 2018, the forest cover in the state is 77,482.49 km^2 which is 25.14 % of the state's geographical area as per the India State of Forest Report 2019 (FSI, 2019). In terms of forest canopy density classes, the state has 6,676.02 km^2 under Very Dense Forest (VDF), 34,341.40 km^2 under Moderately Dense Forest (MDF) and 36,465.07 km^2 under Open Forest (OF) (Table 7.3). Forest Cover in the state has increased by 68.49 km^2 as compared to the previous assessment reported in ISFR 2017.

Table 7.3. Forest cover (km^2) of Madhya Pradesh

Class	Area	Per cent of GA
VDF	6,676.02	2.17
MDF	34,341.40	11.14
OF	36,465.07	11.83

Total	**77,482.49**	**25.14**
Scrub	6,001.91	1.95

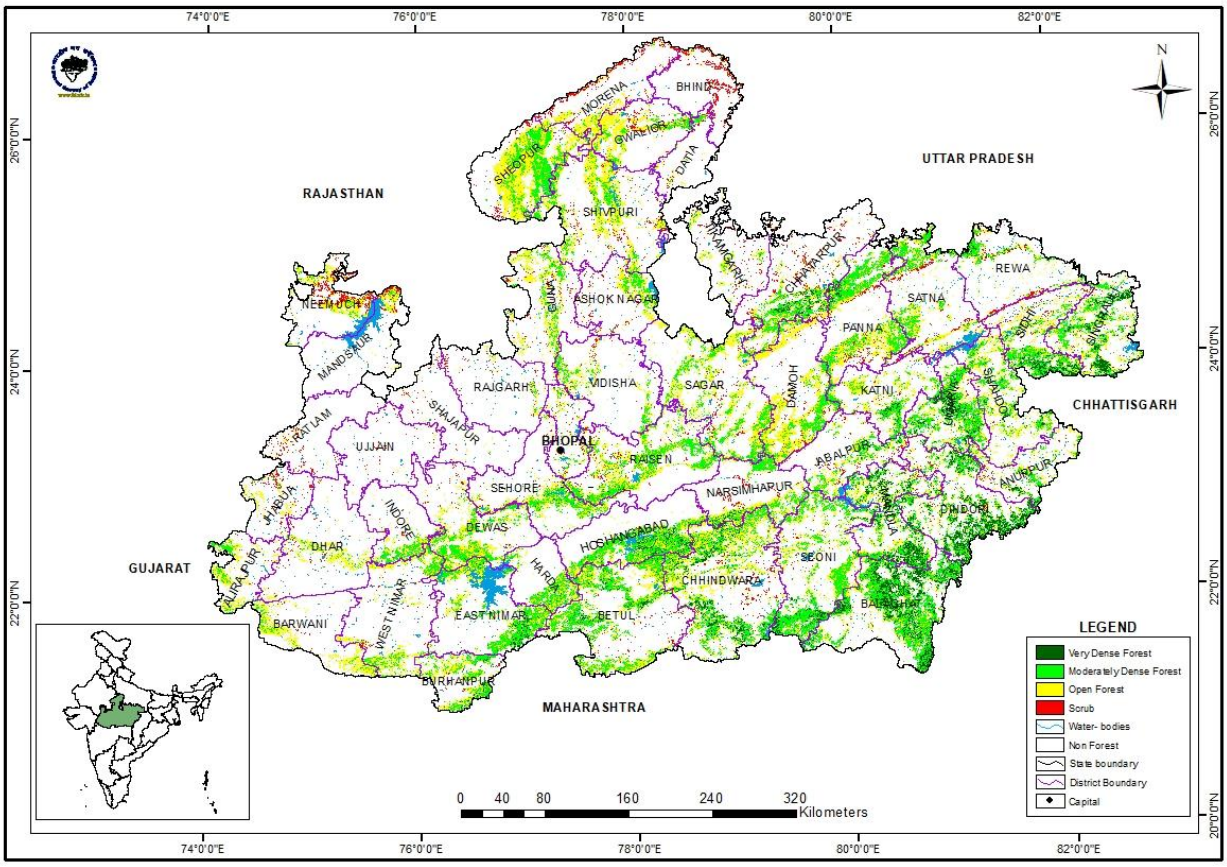


Fig.7.8. Forest cover map of Madhya Pradesh
(***Source:*** FSI, 2019)

The forest cover, irrespective of density, is maximum (48,827 km^2) in lowest altitudinal zone (0-500 m) and its area showed declining values with increase in altitude (Table 7.4). The same trend was observed for scrub.

Table 7.4. Altitude-wise forest cover (km^2) in Madhya Pradesh

Altitude zone (m)	Geographical area	Very dense	Moderately dense	Open	Total	Scrub
0-500	2,31,982	2,098	21,093	25,636	48,827 (5.39%)	4,866
500-1,000	75,712	4,465	13,098	10,739	28,302 (36.53%)	1,129
1,000-2,000	558	113	150	90	353 (0.45%)	7
Total	**3,08,252**	**6,676**	**34,341**	**36,465**	**77,482**	**6,002**

Madhya Pradesh is one of the most blessed states of India in terms of natural resources, including rich and diverse forests. Teak and sal forests are the pride of the state. The dense forests of teak lie in Jabalpur, Seoni, Balaghat, Panna, Sehore, Dewas, Hoshangabad, Harda, Betul, Sagar, Chhindwara and Mandla districts. Similarly, the sal forests are mainly located in Mandla, Dindori, Balaghat, Sidhi, Umaria, Anuppur and Shahdol districts (MPENVIS, 2018).

The significant natural resources of the state are being conserved and harnessed through innovative measures like community participation and decentralisation. Joint Forest Management Committees are involved in protection and management of about 70% of the forest area. Forests and forest produce based industries make an important contribution to the economy of the state. Owing to economic importance of forest wealth, efforts are being made for the systematisation of the trade of forest produce in the state. The state takes care of the trade of nationalised forest produce, *viz.*, tendu leaf, sal seed and kullu gum. In addition, a number of forest produce like aonla, harrar, lac, achar, mahua, etc. are also being collected and traded through a network of Cooperative Societies (MPENVIS, 2018). Aonla, gum, tendu leaf, sal seed, harrar and various medicinal plants of Madhya Pradesh are in great demand in national and international markets. Tendu leaf collection activities alone account for an income of about Rs. 1,450 M every year to the forest dwellers.

7.8. WILDLIFE

Ten national parks and 25 wildlife sanctuaries constitute the Protected Area Network of the State, covering 3.51% of its geographical area (Fig.7.9). There are 6 Tiger Reserves in the State covering an area of 6,117.26 km^2. Eco-sensitive zones have been declared for 19 protected areas. The state, with a population of 526 Tigers, is recognized as Tiger State of India, as per the 'All India Tiger Estimation 2018' released recently (FSI, 2019).The endangered Royal Bengal Tiger, Asiatic Lion, Gharial, Wild Boar, Blue Bull, Chital, Sambar, Civet, are species that can be sighted commonly.

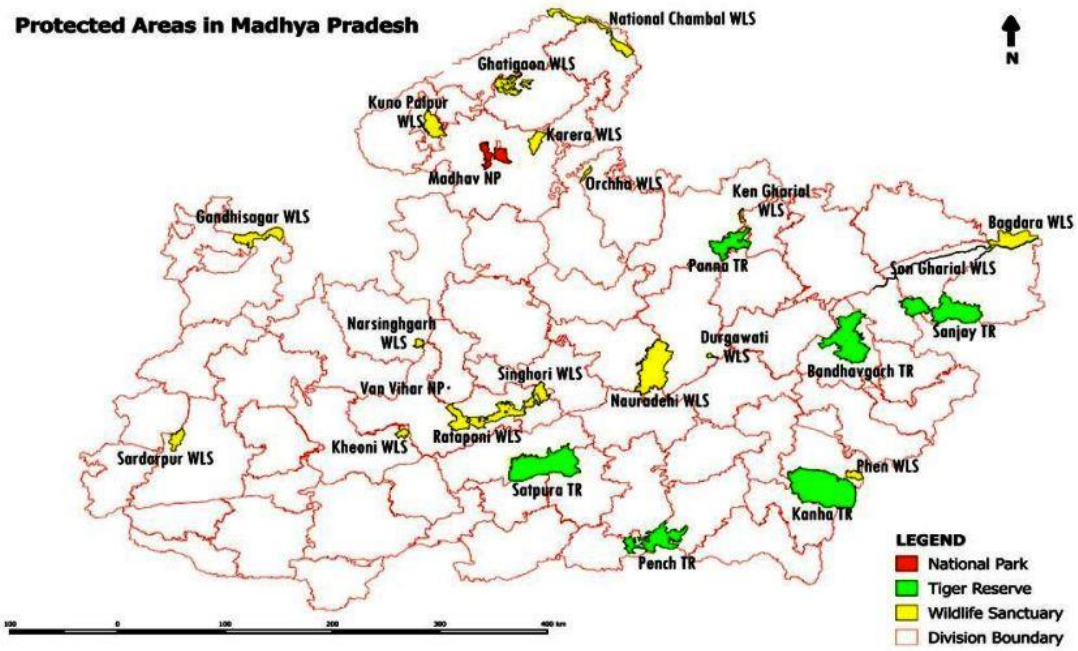


Fig.7.9. Protected Areas in Madhya Pradesh
(***Source:*** http://www.mp.gov.in/en/web/guest/forest)

7.9. AGRO-ECOSYSTEM

The agro-ecosystem is a system composed of population, natural resources and economic activities related in a dynamic interaction in terms of socio-ecological and socio-economic relations conditioned by endogenous and exogenous factors. With time, the agro-ecosystem undergoes changes. By analysing the agro-ecosystem dynamics over a period of time, one can plan the agro-ecosystem for higher level of production and productivity, achieving higher level of resource use and environmental efficiency and maximise food as well as livelihood security (Singh and Singh, 2007). Madhya Pradesh, with its large area, enjoys diverse climatic and soil conditions suitable for a broad range of agricultural products. Agriculture sector in Madhya Pradesh forms the backbone of its economy and around 50% area is under cultivation (Table 7.5). It contributes almost one-fourth of the Gross State Domestic Product (GSDP) and is the main source of employment for over 65% of the population and constitutes about 60-75% the rural income. The 19th Livestock census 2012 has reported a total livestock population of 36.33 M.

According to Census 2011, 69.8% of total workers, and 85.6% of the total workers in rural areas are dependent on agriculture for livelihood in the State, as compared to 72.3% in rural India. Thus, significant proportion of rural population is dependent directly or indirectly on this sector. Madhya Pradesh was honoured with 'Krishi Karman Award' for the five consecutive years from 2011-12 to 2015-16. The state has recorded 18% agriculture growth during the last five years (www.slbcmadhyapradesh.in › docs › State Overview).

Agro-climatic diversity and topographical variations enable the state to grow a wide range of cereals, pulses, oilseeds and cash crops, besides being home to myriad varieties of plant species, both in forest areas and outside. The state is a large producer of soybean and wheat. The famous Sharbati variety of wheat is grown in Sehore, Vidisha and Ashok Nagar districts, and in some parts of Bhopal and Hoshangabad. Madhya Pradesh leads in the production of gram, linseed, green pea, garlic and coriander. The state is also a major producer of linseed, mustard, sunflower and safflower. Various tropical fruits and vegetables and spices like coriander, chili and garlic are also widely grown. Areas under cultivation of safflower and sunflower are also expanding (www.slbcmadhyapradesh.in › agriculture).

Table 7.5. Land use pattern in Madhya Pradesh

Land use type	**Area ('000 ha)**	**Percentage**
Geographical area	30,825	
Reporting area for land utilization	30,756	100.00
Forests	8,694	28.27
Not available for land cultivation	3,506	11.40
Permanent pastures and other grazing lands	1,303	4.24
Land under misc. tree crops and groves	20	0.06
Culturable wasteland	1,010	3.29
Fallow land other than current fallows	483	1.57
Current fallows	389	1.26
Net area sown	**15,351**	**49.91**

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2014-15.

7.10. DEMOGRAPHY

As per the 2011 census, Madhya Pradesh has a population of 72.63 M accounting to 6% of the country's population. The rural and urban population stands at 72.37 and 27.63%, respectively. Tribal population of the state is 21.09%. The population density of the state is 236 km^{-2} which is much lower than the national average. The population growth of the state is 20.35% (Census India, 2011). The literacy rate of Madhya Pradesh is 70.6%.

7.11. INDUSTRIES

Madhya Pradesh has a strong base of mineral resources and accounts for 14% of India's total cement production. It is the largest producer of copper and diamond in India. The state has an oil refinery at Bina. The installed power capacity of the state is over 23,400 MW; 35% of which is contributed by renewable energy sources. The key industries are automobiles, pharmaceuticals, textile, food processing, engineering, agriculture equipment manufacturing and information technology.

7.12. RIVERSCAPE ANALYSIS

7.12.1. Remote Sensing and GIS Methodology

The image processing and GIS tools used in the present assessment were ERDAS Imagine, Geomedia Professional, ArcGIS along with other software packages. The GIS software provide the tool needed to store, analyze and display geographic information.

7.12.2. Satellite Data Used

Landsat-8 satellite data for the month of Febuary to April 2019 has been used for preparation of Land use/Land cover map of the riverscape. The Row, Path along with Date of Pass of the satellite data used in the current study for the parts of states of and covering the riverscape is given in Table 7.6a.

Table 7.6a. List of data downloaded for the study

State	Path	Row	Date of pass	Satellite
Madhya Pradesh	143	043	22-03-2019	Landsat-8
Madhya Pradesh	144	042	13-03-2019	Landsat-8
Madhya Pradesh	144	043	29-03-2019	Landsat-8
Madhya Pradesh	145	041	05-04-2019	Landsat-8
Madhya Pradesh	145	042	05-04-2019	Landsat-8
Madhya Pradesh	145	043	05-04-2019	Landsat-8
Madhya Pradesh	145	044	05-04-2019	Landsat-8
Madhya Pradesh	146	041	28-04-2019	Landsat-8
Madhya Pradesh	146	042	12-04-2019	Landsat-8
Madhya Pradesh	146	043	27-03-2019	Landsat-8
Madhya Pradesh	146	044	27-03-2019	Landsat-8
Madhya Pradesh	147	043	18-03-2019	Landsat-8
Madhya Pradesh	147	044	18-03-2019	Landsat-8

7.12.3. Ancillary Data

Almost all of the ancillary information has been taken from various Government of India sources. Information about the state and district boundaries for the riverscape taken up for

analysis was obtained from the Survey of India. Basin boundary, Catchment boundary, Sub-Catchment boundary, Watershed boundary and Micro-watershed boundaries where obtained from Soil and Land Use Survey of India, New Delhi. Village and Tehsil boundaries were obtained from the published document "Administrative Atlas of Madhya Pradesh" by Census of India (2011). Forest Type and Forest Density data were obtained in digital format from Forest Survey of India. Soil map and soil depth information was obtained from published maps of National Bureau of Soil Survey & Land Use Planning, Nagpur. Soil erosion data which is the backbone of multi-criterion analysis was obtained in GIS format from the Indian Institute of Soil & Water Conservation, Dehradun. Topographical sheets on 1:50,000 scale obtained from Survey of India have been used for Geo-reference only. Bhuvan data was also referred, wherever required for the preparation of land use map.

7.12.4. Bank-Line and Highest Flood Level

For the identification of the riverscape the year 2013 was denoted as the highest flood level year based on literature review and stakeholder's consultation on various levels. Then, a post-monsoon satellite image of the year 2013 was used to create the bank-line of the main stem and considered tributaries of the Yamuna River (Chambal, Ken, Betwa, Sind, Gambhir, Kalisind, Parvati) in Madhya Pradesh.

7.12.5. Spatial Extent

The riverscape zone for Madhya Pradesh state lies between latitude 22° 26' 08.544" to 26° 54' 12.361"N, longitudes 75° 16' 41.584" to 80° 24' 37.041"E and occupies geographical area of 11,949.15 km^2. Details of the influence zone under consideration from the viewpoint of DPR are shown in Fig. 7.10 and spatial extents are presented in Table 7.6b. The area in the riverscape comprises 3.87 % of the geographical area of the state.

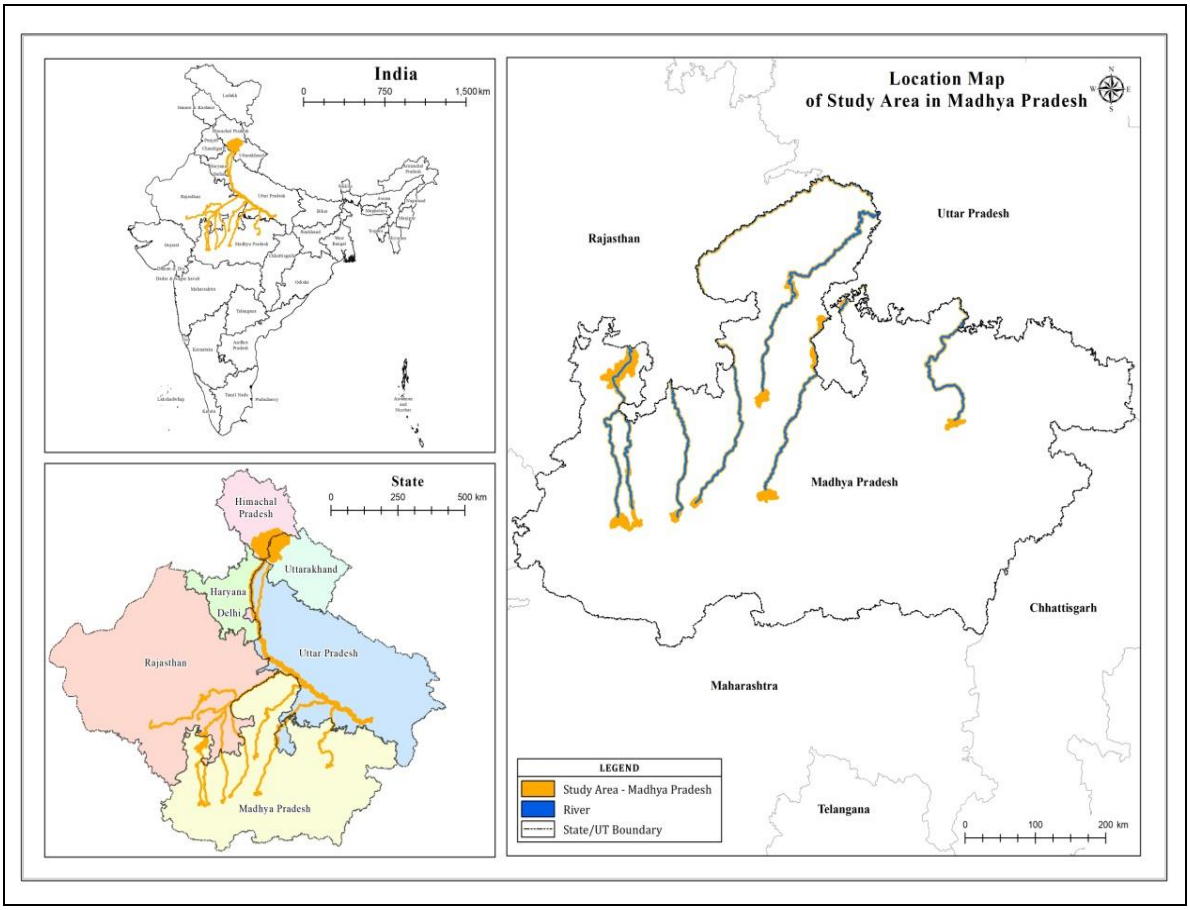


Fig.7.10. Location map of study area in Madhya Pradesh

Table 7.6b. Spatial extent of project-area in the state

Geographical area(km^2)	Geographical coordinates (from-to)		Area in riverscape (in km^2)	Percent of total riverscape geographical area (%)	Percent area of geographical area of state
	Lat. N	Long. E			
3,08,245	22° 26' 08.544" to 26° 54' 12.361"	75° 16' 41.584" to 80° 24' 37.041"	11,949.15	27.11	3.87

The area in the riverscape is 11,949.15 km^2 which comprises 27.11% of the geographical area of the entire riverscape. The state has eight major rivers, *viz*. Chambal, Sindh, Betwa, Parvati, Ken, Kalisindh, Godar (Yamuna), Gambhir. The river length and area of each river is shown in Table 7.7.

Table 7.7. Major rivers length and area of Madhya Pradesh

S. no.	Name	River length (km)	Area (km^2)
1	Betwa River	374.76	1,846.57
2	Chambal River	685.61	3,335.15
3	Gambhir River	189.13	880.75

4	Godar(Yamuna) River	13.05	14.97
5	Kalisindh River	234.71	1,018.26
6	Ken River	303.49	1,347.86
7	Parvati River	355.43	1,321.23
8	Sindh River	469.94	2,184.36
	Total	**2,626.1**	**11,949.15**

7.12.6. Land Use and Land Cover

A total of 14 major land use and land cover types, i.e., agriculture, barren, canal, gullied/ravinous land, industrial area, mining/mining dump, mod. dense forest, open forest, plantation, river(dry)/ river sand, river (perennial), scrub, settlement, waterbody have been mapped in the riverscape. Agriculture covers maximum area 7,617.22 km^2 of the riverscape, followed by scrub land 1,091.64 km^2 and 857.53 km^2 is open forest. Plantation in the influence zone covers the least area of 1.14 km^2. The distribution of area under different land cover and land use classes of each river is given in Table 7.8.

Table 7.8. Distribution of area of different land use and land cover categories of each river in the riverscape (km^2)

Land use and land cover	Betwa	Chambal	Gambhir	Godar	Kali-sindh	Ken	Parvati	Sindh	Total area
Agriculture	1,074.15	2,058.02	720.91	5.34	779	701.29	1,045.13	1,233.38	7,617.22
Barren	24.53	161.05	3.56	0.00	4.66	35.84	20.91	18.66	269.21
Canal	0.22	0.19	0.00	0.00	0.00	1.29	0.87	0.57	3.14
Gullied/Ravinous land	3.13	290.41	0.00	0.03	0.00	60.93	38.37	175.01	567.88
Industrial area	0.56	15.7	0.18	0.00	0.00	0.34	0.98	0.00	17.76
Mining/Mining dump	3.71	3.54	0.98	0.00	0.49	0.00	0.26	0.33	9.31
Mod. dense forest	123.57	36.64	5.81	1.41	9.14	137.42	13.4	159.5	486.89
Open forest	247.41	129.38	9.07	2.25	17.82	189.49	58.85	203.26	857.53
River (dry)/River sand	25.08	82.25	16.17	2.18	19.53	33.2	39.46	26.92	244.79
River (perennial)	128.07	225.61	10.89	1.91	31.04	45.78	17.2	81.86	542.36
Scrub	176.26	267.18	77.37	1.85	125.39	123.88	66.93	252.78	1,091.64
Settlement	37.87	62.01	34.04	0.00	30.63	14.09	18.39	31.49	228.52
Waterbody	2.01	2.81	1.66	0.00	0.37	4.25	0.48	0.19	11.77
Plantation	0.00	0.36	0.11	0.00	0.2	0.06		0.41	1.14
Total									**11,949.15**

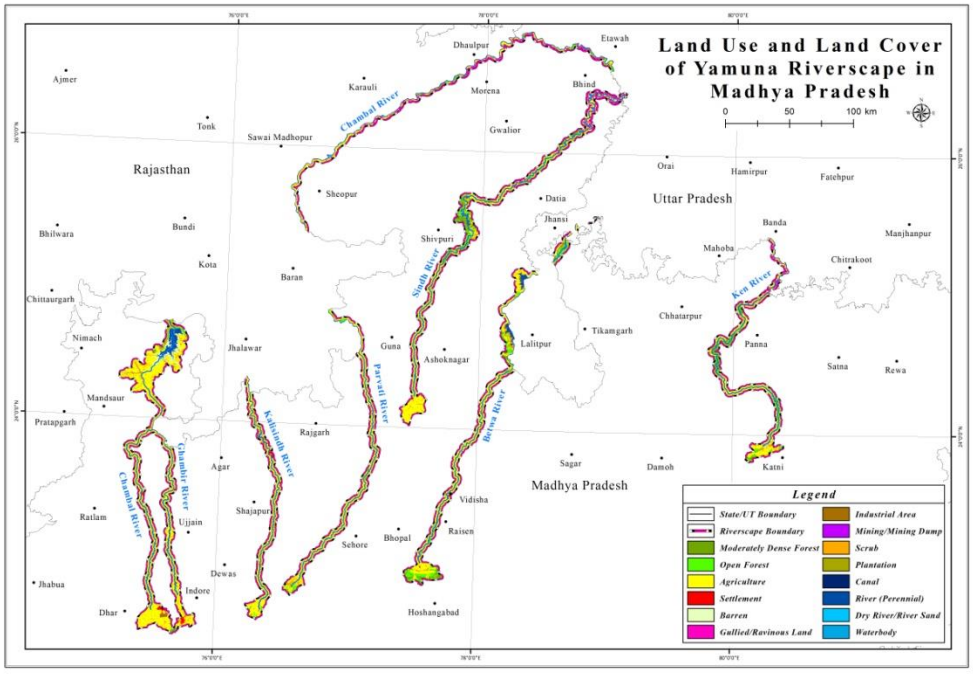


Fig. 7.11. Land use and land cover in Yamuna Riverscape
(Based on information from SLUSI, New Delhi)

7.12.7. Altitude

The area in the riverscape was grouped into 4 elevation classes. The area under different elevation class of each river is given in Table 7.9.

Table 7.9. Area under different elevation classes (km^2)

S. no.	Elevation Class (m)	Betwa	Chambal	Gambhir	Godar	Kali - sindh	Ken	Parvati	Sindh	Total area
1	<250	275.48	804.52	738.48	14.97	956.08	657.46	128	974.96	4,549.95
2	>250 to <500	1,543.85	2,423.86	142.2		62.18	669.26	1,150.19	1,209.4	7,200.94
3	>500 to <750	27.24	106.62	0.07			21.14	43.04		198.11
4	>750 to <1,000		0.15							0.15
	Total									**11,949.15**

7.12.8. Slope

Slope of land is an important locality factor influencing the soil and water runoff and suitability of the area for forestry interventions. Lands with steep slopes are prone to soil erosion and hence do not support growth of most of the plant species unless suitable stabilization measures are adopted. The land in Madhya Pradesh has been grouped into 10 classes of slope from less than 0.25 to more than 40^o. The distribution of areas under different slope classes is given in Table 7.10. The maximum area of Madhya Pradesh falls in slope class 3, i.e., 5 to 10^o slope.

Table 7.10. Distribution of area under different slope categories of each river (km^2)

S.no.	Slope Classes (^{0})	Betwa	Chambal	Gambhir	Godar	Kali-sindh	Ken	Parvati	Sindh	Total area
1	Less than 2.5	260.29	614.17	129.21	2.65	127.42	115.06	168.95	266.78	1,684.53
2	>2.5 to <5	371.46	660.03	194.83	2.82	224.4	250.76	288.35	465.59	2,458.24
3	>5 to <10	777.74	1,364.84	387.2	6.01	455.71	562.61	589.12	951.02	5,094.25
4	>10 to <15	339.5	569.58	150.47	2.74	179.98	283.4	235.89	389.57	2,151.13
5	>15 to <20	71.04	100.59	17.11	0.61	26.27	86.75	34.28	72.85	409.5
6	>20 to <25	16.53	16.65	1.32	0.1	3.3	26.15	3.34	21.05	88.44
7	>25 to <30	6.69	6.04	0.44	0.02	0.95	12.27	0.89	11.45	38.75
8	>30 to <35	2.43	2.24	0.15	0.02	0.2	6.15	0.29	4.63	16.11
9	>35 to <40	0.72	0.73	0.02		0.03	2.79	0.09	1.19	5.57
10	> 40	0.17	0.28				1.92	0.03	0.23	2.63
	Total									**11,949.15**

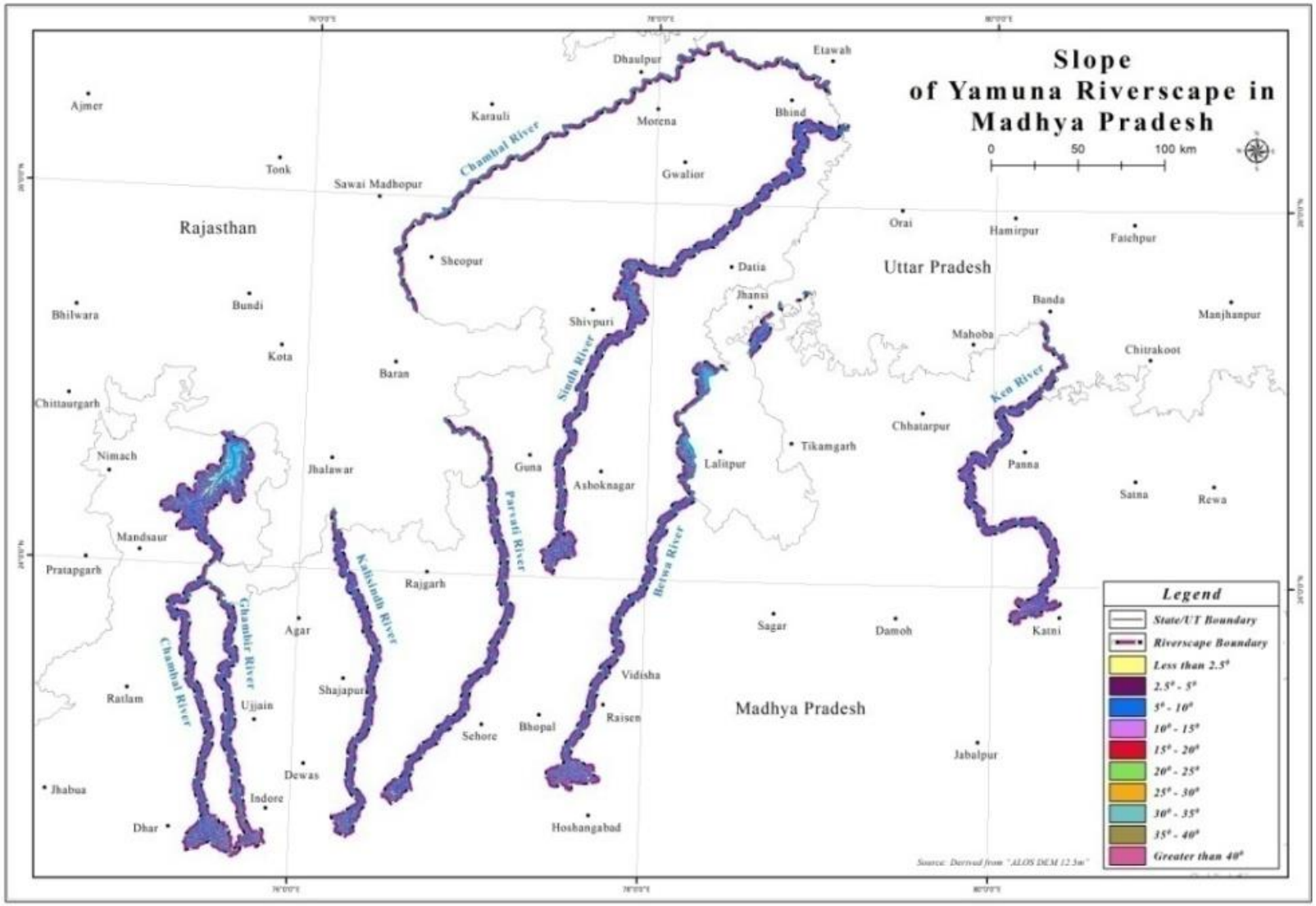


Fig. 7.12. Slope in Yamuna Riverscape in the State
(Based on information from NBSSLUP, Nagpur)

7.12.9. Soil Erosion

A total six categories of the erosion classes have been mapped in Madhya Pradesh, *viz*., less than 5, 5 to 10, 10 to 20, 20 to 40 and more than 40 t km^{-2} yr^{-1}. An area of 1,689.79 km^2 falls in the sixth class of non-soil category. These areas may not be suitable for forest plantations. The distribution of areas under different erosion classes and their area is given in Table 7.11. and Fig. 7.13.

Table 7.11. Distribution of area under different soil erosion categories (km^2)

S.no.	Soil erosion class (tkm^{-2} yr^{-1})	Betwa	Chambal	Gambhir	Godar	Kali-sindh	Ken	Parvati	Sindh	Total area(km^2)
1	<5	503.68	816.29	277.07	10.07	275.09	236.25	233.4	689.06	3,040.91
2	5-10	625.23	490.79	177.9	4.9	178.13	258.39	236.53	355.27	2,327.14
3	10-20	343.16	363.16	258.27		176.01	293.7	310.12	563.46	2,307.88
4	20-40	142.44	259.74	152.47		328.08	183.6	349.91	286.01	1,702.25
5	>40	32.12	321.51	1.78		59.93	264.76	144.77	56.31	881.18
6	Non-soil	199.94	1,083.66	13.26		1.02	111.16	46.5	234.25	1,689.79
	Total									**11,949.15**

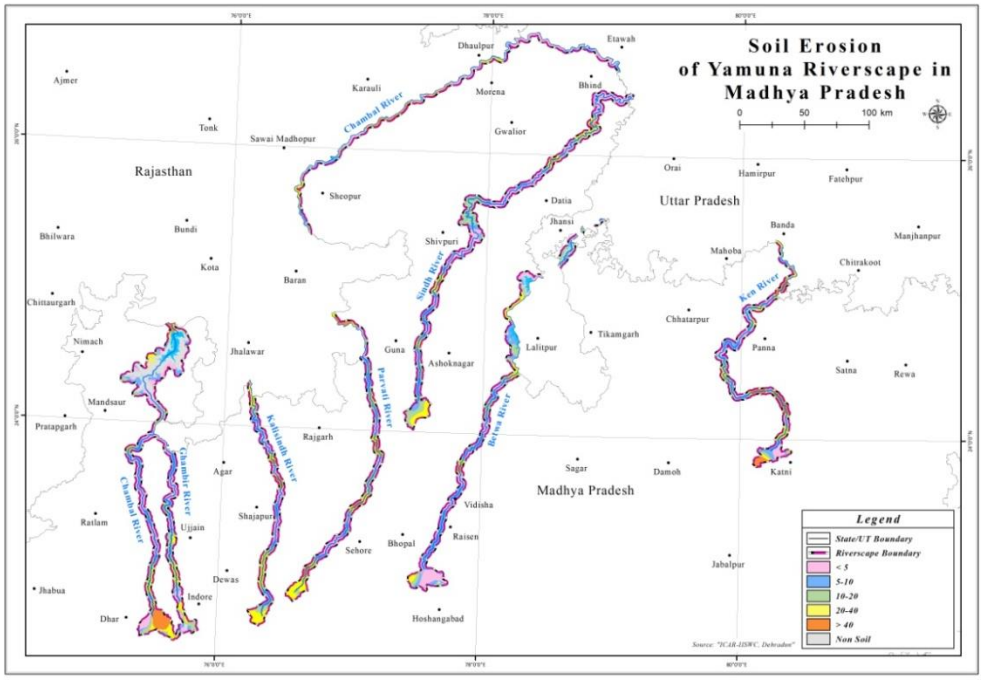


Fig.7.13.Soil erosion classes in Yamuna Riverscape area
(Based on information from ICAR-IISWC, Dehradun)

7.12.10. Soil Depth

Soil depth is one of the most important factors governing the selection of species for plantation. The depth of soil is very important for the penetration of the roots of tree species. Seven depth

classes *viz*., deep, moderately deep, non-soil, shallow, slightly deep, very shallow and extremely shallow have been mapped in Madhya Pradesh. These areas could be suggested as suitable for plantations based on other ground parameters. The distribution of area under different soil depth classes is given in Table 7.12.

Table 7.12. Distribution of area under different soil depth categories of each river (km^2)

S. no.	Soil depth	Betwa	Chambal	Gambhir	Godar	Kali-sindh	Ken	Parvati	Sindh	Total area
1	Deep	1,004.12	2,246.07	819.86	10.05	810.08	460.93	1,111.3	1,410.01	7,872.42
2	Moderately deep	3.45	268			12.48	145.48	52.58	187.78	669.77
3	Non-soil	180.4	592.38	13.25	4.92	1.03	104.88	46.04	234.25	1,177.15
4	Shallow	300.55	132.09	47.64		108.54	175.78	30.49	25.47	820.56
5	Slightly deep	207.19	22.6			76.82	350.95	80.82	61.05	799.43
6	Very shallow	150.86	63.84				105.71		265.8	586.21
7	Extremely shallow		10.17			9.31	4.13			23.61
	Total									**11,949.15**

7.12.11. Aspect

The aspect map has been derived from the ASTER DEM. A total of 9 classes, *viz*., flat, north, north-east, east, south-east, south, south-west, west and north-west have been analyzed in the Madhya Pradesh area. The distribution of areas under different aspect classes and their area is given in Table 7.13.

Table 7.13. Distribution of area under different aspect categories of each river(km^2)

S. no.	Aspect	Betwa	Chambal	Gambhir	Godar	Kali-sindh	Ken	Parvati	Sindh	Total area
1	Flat (-1)	105.88	334.61	41.13	1.51	31.45	19.95	45.56	69.29	649.38
2	North (0-22.5, 337.5-360)	223.08	390.15	106.91	1.85	125.42	172.26	159.54	269.51	1,448.72
3	Northeast (22.5-67.5)	214.11	369.25	102.92	1.98	121.12	159.89	154.58	257.52	1,381.37
4	East (67.5-112.5)	222.75	374.09	107.13	1.97	126.6	166.37	163.43	269.64	1,431.98
5	Southeast (112.5-157.5)	218.69	365.92	103.83	1.77	122.49	173.92	158.32	268.38	1,413.32
6	South (157.5-202.5)	216.57	368.51	104.59	1.59	121.79	169.49	158.06	268.38	1,408.98
7	Southwest (202.5-247.5)	207.59	363.19	101.45	1.36	118.94	154.22	155.72	254.23	1,356.7
8	West (247.5-292.5)	217.81	383.37	107.62	1.37	126.24	160.63	165.58	263.17	1,425.79
9	Northwest (292.5-337.5)	220.09	386.06	105.17	1.57	124.21	171.13	160.44	264.24	1,432.91
	Total									**11,949.15**

7.12.12. Forest Cover and Forest Type

The forest cover of Madhya Pradesh is divided into four types namely, moderately dense forest, non-forest, open forest, scrub. The maximum area 9,513.09 km^2 is non-forest. Also, Madhya Pradesh state has three types of forest, *viz*., non-forest, scrub and tropical dry deciduous forest. Area wise distribution of forest cover and forest type is given in Tables 7.14, Fig.7.14 andTable 7.15, Fig. 7.15, respectively.

Table 7.14. Distribution of forest cover of the state (km^2)

S. no.	Forest cover	Betwa	Chambal	Gambhir	Godar	Kali-sindh	Ken	Parvati	Sindh	Total area
1	Open forest	247.41	129.38	9.07	2.25	17.82	189.49	58.85	203.26	857.53
2	Mod. dense forest	123.57	36.64	5.81	1.41	9.14	137.42	13.4	159.5	486.89
3	Scrub	176.26	267.18	77.37	1.85	125.39	123.88	66.93	252.78	1,091.64
4	Non-forest	1,299.33	2,901.95	788.5	9.46	865.91	897.07	1,182.05	1,568.82	9,513.09
	Total									**11,949.15**

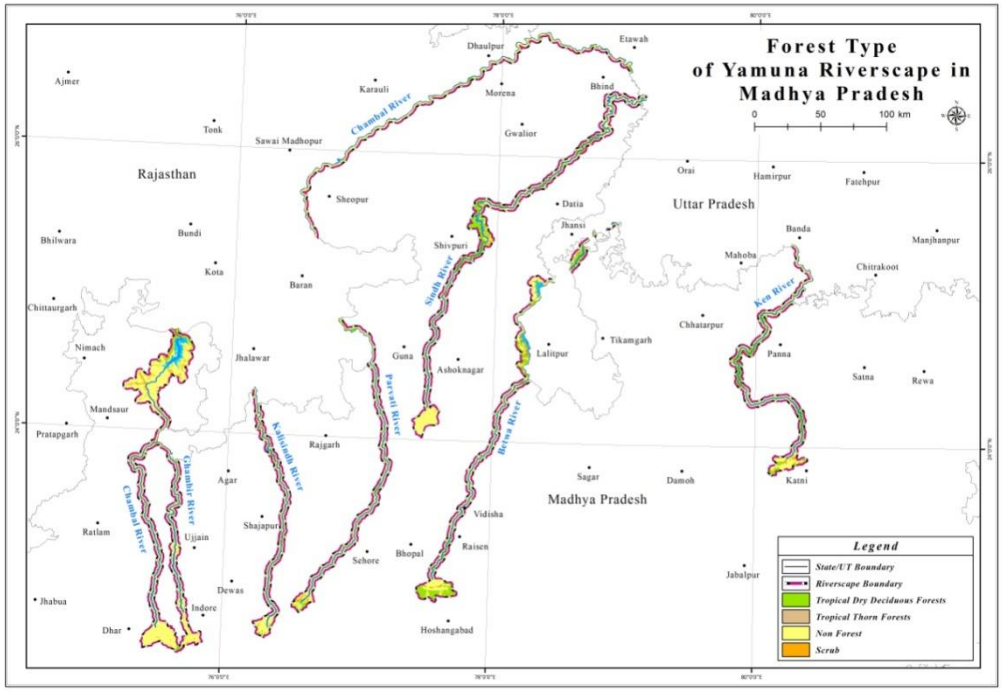


Fig.7.14. Forest types in the Riverscape
(Based on information from FSI, Dehradun)

Table 7.15. Distribution of forest type of the state (km^2)

S. no.	Forest type	Betwa	Chambal	Gambhir	Godar	Kali-sindh	Ken	Parvati	Sindh	Total area
1	Non-forest	1,299.33	2,901.95	788.5	9.46	865.91	897.07	1,182.05	1,568.82	9,513.09
2	Scrub	176.26	267.18	77.37	1.85	125.39	123.88	66.93	252.78	1,091.64
3	Tropical dry deciduous forests	370.98	122.05	14.88	2.41	26.96	326.91	72.25	342.49	1,278.93
4	Tropical thorn forests	0.0**0**	43.97	0.00	1.25	0.00	0.00	0.00	20.27	65.49
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11,949.15**

7.12.13. Prioritisation of Sites for Forestry Interventions

A multi-stakeholder approach was followed for preparing the DPR on rejuvenation of Yamuna through Forestry Interventions. It included extensive consultation and review of literature, reports, primary and secondary data collection, its analysis, expert consultations with institutes, individuals and various stakeholders (Central and state government departments, State Forest Departments of seven states, research institutions/scientific departments dealing with forestry, environment, river conservation, environment; civil society, non-governmental organisations in this field, defence and paramilitary forces, other interest groups).

Priority criteria: For the purpose of preparation of DPR and for identification of priority areas for the proposed treatment/forestry interventions in the Yamuna Riverscape, GIS-assisted decision making process by way of geospatial analysis and modelling was used. GIS was used to generate different layers within the riverscape like land use, soil erosion rates, and slope of the topography (Refer Uttarakhand Chapter Table 1.15a).

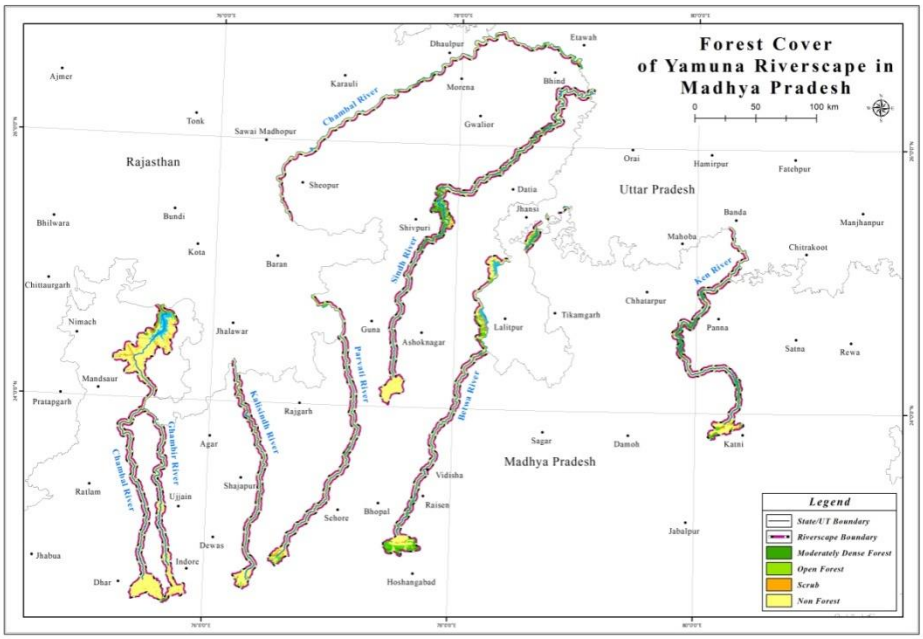


Fig.7.15. Forest cover in the Riverscape
(Based on information from FSI, Dehradun)

7.12.14. Priority Classes

Statistical analysis of the area estimates show that 2,908.66 km^2 area is in high priority region, 5,287.73 km^2 area is in medium priority and 3,752.76 km^2 area is in low priority region for Madhya Pradesh State as given in Table 7.16. and Fig. 7.16.

Table 7.16. Area (km^2) of priority treatment areas of each river of the state

S. no.	Priority class	Betwa	Chambal	Gambhir	Godar	Kalisindh	Ken	Parvati	Sindh	Total area(km^2)
1	High	250.53	636.9	165.92	0.03	380.31	504.2	496.19	474.58	2,908.66
2	Medium	990.85	1,161.69	433.87	8.78	395.48	598.25	534.64	1,164.17	5,287.73
3	Low	605.19	1,536.56	280.96	6.16	242.47	245.41	290.4	545.61	3,752.76
	Total									**11,949.15**

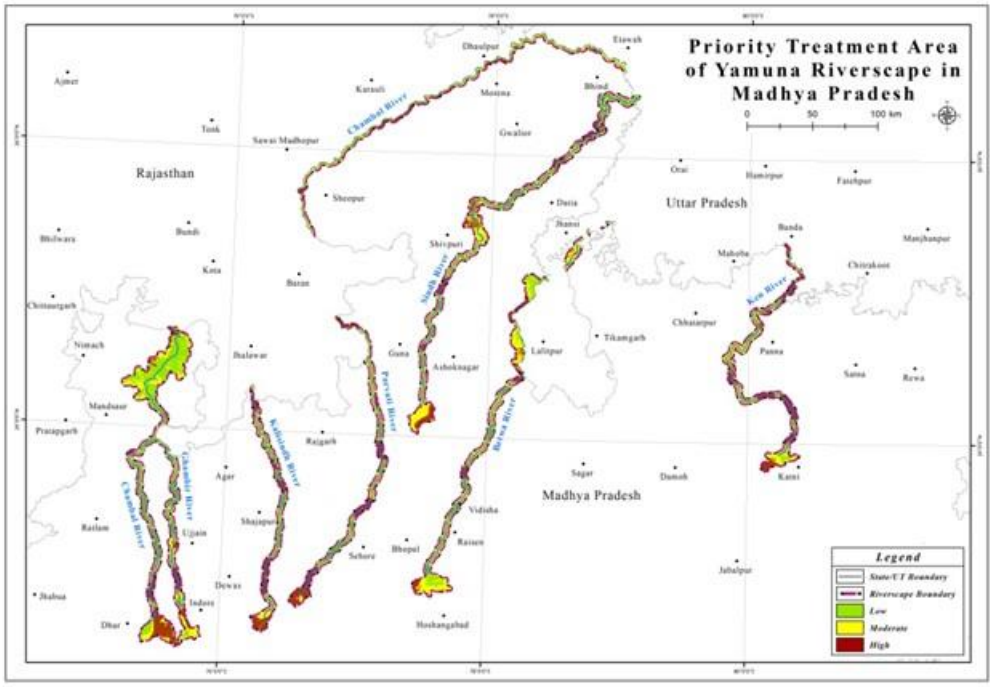


Fig. 7.16. Priority treatment area in the Riverscape

7.13. PROPOSED FORESTRY INTERVENTIONS

For addressing the challenges and problems highlighted above, various forestry interventions have been proposed in this DPR. Three landscapes in the delineated riverscape have been identified for proposing the forestry interventions:

(i) Natural landscape
(ii)Agricultural landscape
(iii)Urban of Peri-urban landscape

In the state of Madhya Pradesh 2 km buffer zone along both banks of tributaries of Yamuna (Chambal, Ken, Betwa, Sind, Gambhir, Kalisind and Parvati) are part of the riverscape in the state.

Models have been developed with landscape-specific approach in the DPR. The list of models is given in Table 7.17. However, the following general prescriptions are made for all models:

a) Native species of tree, shrub and herbs will be planted. Traditional horticultural crops which have long been in cultivation in the region are also included in agricultural and urban landscapes. Mixed crops that would promote biodiversity will be raised as far as possible in preference to pure plantation. Species that provide economically useful non-wood forest produce (NWFP) will be planted to the extent of 70% or more by number. Effort would be made to produce industrial surpluses of select raw material in consultation with local nutraceutical, food processing and other NWFP-based industries.
b) Digging of pits, contour trenches, protection trenches, fencing etc. will be carried out sufficiently before planting operation according to the standard practice in the plantation area.
c) Site-specific modifications in the models are permitted provided they capture the essence of the respective models. The rates prevailing in SFD at the site and time of operation would be applicable. The DFOs at time of implementation of the project will have the power to make site-specific modifications in prescriptions to suit the site conditions within the total budget proposed in the DPR for the Division. The flexibility applies to choice of species, site, model, quantity of work and timing of activities.
d) Species will be selected in consultation with industries /market experts to plant species that would create industry-level surpluses.
e) Seed or other propagules of forest tree species will be sourced from natural forests and plantations, especially seed orchards, plus trees or seed production areas, wherever available in sufficient quantity, aiming at quality seed. Seed would not be purchased from market for plantation in natural landscape.
f) Survival of plants will be ensured by providing life-saving irrigation; the frequency of irrigation would vary with weather conditions. Casualty replacement will be done according to the existing norms of the state. If such norms are not existing, prescriptions in the respective models will be referred to.
g) During site preparation prior to plantation work, seedlings already growing in the site would be retained, nurtured (through soil working, manure, irrigation operations) and protected.
h) Complete removal of ground vegetation would not be done during rehabilitation of weed-infested areas, Partial removal of invasive weeds would be done followed by artificial regeneration to facilitate gradual replacement of the weeds with economically and ecologically useful species.
i) Biofertilizers such as arbuscular mycorrhiza (AM), organic manures will be applied in nurseries and plantations to boost plant growth. Eco-friendly plant protection measures (e.g. physical or mechanical methods, use of natural products, etc.) will be adopted to manage weed and pest without resorting to use of synthetic products. Tall seedlings may be planted to achieve greater survival in areas with high biotic disturbances.
j) Effective protection will be provided to the planted seedlings against biotic and abiotic stresses through watch & ward, public awareness besides fence, cattle-proof trenches, etc. according to the site.

The list of proposed treatment sites is provided in Annexure 6 of this Volume of DPR (i.e., Volume II).

Table 7.17. Treatment models for Yamuna and its tributaries in Madhya Pradesh

Model	Natural landscape
YM/MP/NL/01	Afforestation in open forest areas
YM/MP/NL/02	Assisted natural regeneration
YM/MP/NL/03	Rehabilitation of forest infested with high-density invasive weeds
YM/MP/NL/04	Rehabilitation of forest infested with moderate-density invasive weeds
YM/MP/NL/05	Rehabilitation of forest infested with low-density invasive weeds
YM/MP/NL/06	Removal of high-density invasive weeds
YM/MP/NL/07	Removal of moderate-density invasive weeds
YM/MP/NL/08	Grassland development in wildlife areas
YM/MP/NL/09	Grass with moisture conservation
YM/MP/NL/10	Treatment ofgullies and slopes through vegetative measures with soil and moisture conservation
YM/MP/NL/10/A	Earthen check dam
YM/MP/NL/10/B	Contour trench
YM/MP/NL/10/C	Contour bund
YM/MP/NL/11	Ecorestoration by Eco Task Force
	Agricultural landscape
YM/MP/AL/01	Planting of saplings of fruit plants by farmers
YM/MP/AL/02	Planting of saplings of forestry plants by farmers
	Urban/Peri-Urban landscape
YM/MP/UL/01	Eco-park
YM/MP/UL/02	Floodplain treatment
	Conservation interventions
YM/MP/CI/01	Water storage bodies/structures
YM/MP/CI/01/A	SMC- *Kachcha* pond, *dabra dabri*
YM/MP/CI/01/B	Pitched pond
YM/MP/CI/01/C	Percolation tank
YM/MP/CI/02	Managing water flow, soil moisture and sedimentation
YM/MP/CI/02/A	SMC - Loose boulder check dam/structure
YM/MP/CI/02/B	SMC - Anicut
YM/MP/CI/02/C	SMC - Stopdam
YM/MP/CI/02/D	SMC – *Kharanja* (brick/stone passage)
YM/MP/CI/02/E	SMC – *Rapta* (causeway)
YM/MP/CI/02/F	SMC - Protection wall along riverbank/treatment site
YM/MP/CI/02/G	Mixed soil and moisture conservation
YM/MP/CI/03	Rehabilitation of soil and moisture conservation structures

7.14. NATURAL LANDSCAPE

YM/MP/NL/01: Afforestation in open forest areas

This model will be applied in forest areas that have poor crown cover. The terrain of the proposed sites is sloped and the soil is poor in nutritional status. The sites are infested with

Lantana of moderate density. Some seedlings and trees already exist in such sites, but their density is quite low.Such saplings and trees will be retained and supported through soil working activities. Contour trenches, 256 ha^{-1}, will be dug and direct sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Grass seeds/slips will be planted at six points along the trench. More than one seed may be sown per spot to ensure seedling establishment at each spot

Planting of seedlings will be done in pits of 0.45 m x 0.45 m x 0.45 m size at density of 256 pits $ha^{-1}$and maintained for five years after the planting year. *Kachcha* water pond(s) of total 50 m^3 storage capacity will be created as a part of this model outside the plantation area for free access of grazing animals. 500 m^2 strip of grass will be planted around this pond which will be protected with brushwood fence during first year. *Kachcha* water pond(s), with base of stone or some impermeable or semi-permeable material, of total 25 m^3 will be created inside the plantation to store water for a longer period of time for irrigation of plants; after two years the stone at the base will be removed to facilitate ground water recharge.

The areas where this model is proposed to be implemented have high incidence of grazing. Barbed wire fence alone is not effective. Bio-fence takes longer time to establish. A combination of both will be used.

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on contour trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilemalaxum, I. prostratum, Apludamutica*, *Vetiveria zizanioides,* etc.

Species in pits

Tree and shrub: *Azadirachta indica, Madhuca indica, Anogeissus latifolia, Acacia nilotica, Dalbergia sissoo, Albizia lebbeck, Emblica officinalis, Pithecellobium dulce, Terminalia alata, Terminalia chebula, Terminalia arjuna, Brideliaretusa, Holoptelea integrifolia, Bombax ceiba,* etc.

Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.

Important elements (ha^{-1}):

i. Fencing with chain link fence all around.
ii. Two hundred fifty six contour trenches of 3 m length.
iii. Sowing of tree and grass seeds/slips on contour trenches.
iv. Two hundred fifty six pits of 0.45 m x 0.45 m x 0.45 m size.
v. Planting of seedlings in pits.
vi. Application of manure / vermi-compost to plants in the pits.
vii. Beating up of 20% plants in pits in the first year, 15% in second year and 5% in third year.
viii. Maintenance for 5 years including weeding and hoeing, maintenance of fence, watch and ward.
ix. Kachcha pond 50 m^3 (1 m^3 = 1,000 L) outside the plantation area in nearby place alongwith 500 m^2 strip of grass.

x. *Kachcha* water pond of 25 m^3 having base of stone pitching or some impermeable or semi-permeable material.

Table 7.18. Budget norm for YM/MP/NL/01

Particular	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Cleaning of plantation area by cutting bushes (excluding *Lantana*)	1 ha	4 mdays ha^{-1}	1,232.00
Alignment			
a) Pits	200 no.	2.5 mdays /1,000	154.00
b) Contour trenches	300 no.	0.15 mdays/100	1,386.00
Soil work			
a) Pits (45 cm x 45 cm x 45 cm)	200 no.	5 mdays/100	3,080.00
b) Contour trenches (3.00 m x 0.60 m x 0.45 m)	300 no.	0.33 $trench^{-1}$	30,492.00
Chain link fence	100 m	450	45,000.00
Miscellaneous advance silvicultural works	1 ha	1.2 mdays ha^{-1}	369.60
Making of inspection path			
a) 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
b) 1 m wide path inside plantation	50 m	Lump sum	110.00
Cost of seed			
a) Quality seed for pits (200 plants + 20% for culling)	240 plants	Lump sum	240.00
b) Quality seed of trees for contour trenches (300 trenches)	14 kg	100 kg^{-1}	1,400,00
c) Grass seed	9 kg	120 kg^{-1}	1,080.00
Cost of plant (incl. 20% culling for obtaining quality stock) for pits	240	5.60 mdays /100 plant	4,139.52
Plantation sign board (per 25 ha)	1	Rs. 3,500/25 ha	140.00
Contingency			1,000.00
Total			88,797.73 **or 88,798**
Planting year			
Refilling/dressing pits and trenches			
a) Refilling pits (45 cm x 45 cm x 45 cm)	200 no.	1.5 mdays /100 pits	924.00
b) Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	300 no.	Rs. 2.25 $trench^{-1}$	675.00
c) Dressing contour trenches	300 no.	Rs. 2 $trench^{-1}$	600.00
Transportation of plants to roadhead	200 no.	0.912 mdays /100	561.80
Local transport of plants	200 no.	0.4 mdays/100	224.72
Planting in pits	200 plants	1.8 mdays /100	1,108.80
Sowing of tree seeds on contour trenches (100 trenches)at three points per trench	900 m	Lumpsum	600.00
Re-sowing of tree seeds on contour trenches to ensure targeted germination on trenches	600 m	Lumpsum	450.00
Sowing of grass seed along contour trench (six points $trench^{-1}$)	1,800 seed	0.16 mdays/ 100 seed	887.04
Application of manure, AM, micronutrients	1,100 plants		
a) Plants in pits	200	Rs. 5.80 $plant^{-1}$	1,160.00
b) Seedlings on contour trenches	900	Rs. 2.50 $plant^{-1}$	2,250.00
Weeding and hoeing			
a) Around pits (three times)	200 pits x 3	1.5 mday/ 100	2,772.00
b) On contour trenches (three times)	300 trenches x 3	0.01 mdays/ 100	2,772.00
c) On cattle-proof trenches	40 m x 3	Rs.1.11 m^{-1}	133.20

Irrigation of plants 6 times			
a) Plants in pits	200 plants x 6	1.25 mdays/100	4,620.00
b) Seedlings on contour trenches at half of normal rate of plants in pits	900 x 6	0.62 mdays/ 100	10,311.84
Raising of plants for beating up casualties (20% failure)	40 no.	5.6 mdays/ 100	689.92
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 9 months (Average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	9 months	10.80 mdays yr^{-1}	2,494.80
Contingency	Lump sum		2,000.00
Total			35,373.72 **or 35,374**

Maintenance cost			
Year 3			
20% beating up of planted seedlings (labour)	40 plants	1.5 mdays/ 100	184.80
Weeding and hoeing (3 times yr^{-1})			
a) Around pits (three times)	200 pits x 3	1.5 mdays/100	2,772.00
b) On contour trenches	300 trenches x 3	0.01 mdays $trench^{-1}$	2,772.00
Irrigation of plants (12 times)			
a) Plants in pits	200 plants x 12	1.25 mdays/100	9,240.00
b) Seedlings on contour trenches at half of normal rate of plants in pits	900 x 12	0.62 mdays/ 100	20,623.68
Application of manure, AM, micronutrients			
a) Plants in pits	200 plants	Rs. 5.80 $plant^{-1}$	1,160.00
b) Seedlings on contour trenches	900	Rs. 2.50 $plant^{-1}$	2,250.00
Raising of plants for beating up casualties (15% casualty)	30 no.	5.6 mdays/ 100	517.44
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			43,484.92 **or 43,485**
Year 4			
15% beating up of planted seedlings (labour)	30 plants	1.5 mdays/ 100	138.60
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	200 pits x 1	1.5 mdays/ 100	924.00
b) On contour trenches	300 trenches x 1	0.01mdays $trench^{-1}$	924.00
Irrigation of plants (6 times)			
a) Plants in pits	200 plants x 6	1.25 mdays/100	4,620.00
b) Seedlings on contour trenches at half of normal rate of plants in pits	900 x 6	0.62 mdays/ 100	10,311,84
Application of manure, AM, micronutrients			
a) Plants in pits	200 plants	Rs. 5.80 $plant^{-1}$	1,160.00
b) Seedlings on contour trenches	900	Rs. 2.50 $plant^{-1}$	2,250.00
Raising of plants for beating up casualties (5% casualty)	10 no.	5.6 mdays/ 100	172.48
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40

Contingency		Lumpsum	500.00
Total			14,015.48 **or 14,015**
Year 5			
5% beating up of planted seedlings	10 plants	1.5 mdays/ 100	46.20
Weeding and hoeing (1 time yr^{-1})			
a) Around pits	200 pits x 1	1.5 mdays/ 100	924.00
b) On contour trenches	300 trenches x 1	0.01 mdays trench	924.00
Irrigation of plants (3 times)			
a) Plants in pits	200 plants x 3	1.25 mdays/100	2,310.00
b) Seedlings on trenches at half of normal rate of plants in pits	900 x 3	0.62 mdays/ 100	5,152.92
Application of manure, AM, micronutrients			
a) Plants in pits	200 plants	Rs. 5.80 $plant^{-1}$	1,160.00
b) Seedlings on contour trenches	900	Rs. 2.50 $plant^{-1}$	2,250.00
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	200.00
Total			16,293.52 or **16,294**
Year 6			
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	100
Total			3,426.40 or **3,426**
Year 7			**3,326**

Table 7.19. Cost summary for YM/MP/NL/01

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	88,798
Year 2 (Planting and establishment)	35,374
Year 3 (1^{st} maintenance)	43,485
Year 4 (2^{nd} maintenance)	14,015
Year 5 (3^{rd} maintenance)	16,294
Year 6 (4^{th} maintenance)	3,426
Year 7 (5^{th} maintenance)	3,326
Total	**2,04,718**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

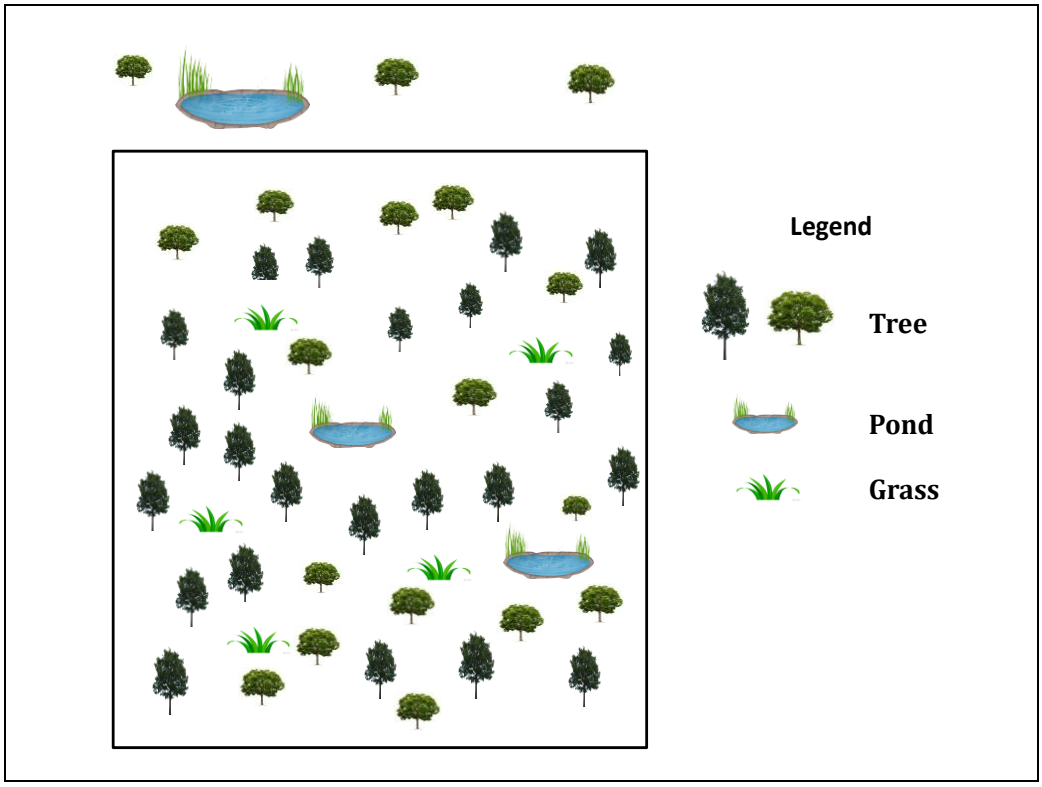


Fig.7.17. Illustration of afforestation in open forest areas

YM/MP/NL/02: Assisted Natural Regeneration (ANR)

This model will be applied in moist forest areas with good overwood where natural regeneration is not able to establish due to damage by grazing animals and competition from weeds. The regeneration needs to be protected from grazing animals, supported through soil and moisture conservation and supplemented through sowing in blanks.

In this model, the area will be fenced with cattle-proof trench and bio-fence. *Thawla* will be made around the seedlings and contour trenches will be dug in patches where regeneration is poor. Shoots of existing saplings and poles will be tended to give them improved form. The soil along the trenches will be seeded with indigenous tree and grass species. Sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Grass will be sown at six points along the trench. More than one seed may be sown per spot to ensure seedling establishment at each spot.

Species recommended

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species on contour trenches

Tree and shrub: *Azadirachta indica, Madhuca indica, Anogeissus latifolia, Acacia nilotica, Dalbergia sissoo, Albizia lebbeck, Emblica officinalis, Pithecellobium dulce, Terminalia alata, Terminalia chebula, Terminalia arjuna, Brideliaretusa, Holoptelea integrifolia, Bombax ceiba,* etc.

Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apludamutica, Vetiveria zizanioides,* etc.

Important elements (ha^{-1}):

i. Fencing with animal-proof trench and bio-fence.
ii. Making of *thawla* and tending of shoot of available saplings/poles.
iii. Hundred contour trenches of size 3 m x 0.45 m x 0.45 m.
iv. Sowing of tree and grass seeds/slips on contour trenches.
v. Maintenance for 5 years after planting year including weeding and hoeing.

Table 7.20. Budget norm for YM/MP/NL/02

Particular	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Cleaning of plantation area by cutting bushes (excluding *Lantana*)	1 ha	4 mdays ha^{-1}	1,232.00
Alignment of contour trenches	100 no.	0.15 mdays/ 100	46.20
Digging of contour trenches (3.00 m x 0.60 m x 0.45 m)	100 no.	0.33 $trench^{-1}$	10,164.00
Protective structure all around			
a) Cattle-proof trench (1.50 m x 0.90 m x 0,75 m)	60 m	0.6 mday m^{-1}	11,088.00
b) Stone wall (1.50 m x 0.90 m x 0,75 m)	40 m	0.7 mday m^{-1}	8,624.00
Tending of shoots of existing saplings and poles	1 ha	1.2 mdays ha^{-1}	369.60
Thawla making around 750 seedlings	750	Lumpsum	2,250.00
Making of inspection path			
a) 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
b) 1 m wide path inside plantation	50 m	Lump sum	110.00
Quality seed of trees for contour trenches (100 trenches)	4 kg	100 kg^{-1}	400,00
Grass seed	3 kg	120 kg^{-1}	360.00
Plantation sign board (per 25 ha)	1	Rs. 3,500/25 ha	140.00
Contingency			1,000.00

Total			35,758.41**or 35,758**
Planting year			
Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	100 no.	Rs. 2.25 trench^{-1}	225.00
Dressing contour trenches	100 no.	Rs. 2 trench^{-1}	200.00
Seed sowing			
a) Sowing of tree seeds on contour trenches (100 trenches) at three points per trench	300 m	Lumpsum	200.00
b) Re-sowing of tree seeds on contour trenches to ensure targeted germination on trenches	200 m	Lumpsum	150.00
c) Sowing of grass seed along contour trench (six points trench^{-1})	600 seed	0.16 mdays/ 100 seed	295.68
d) Sowing of seed on bund along cattle-proof trench (trees/shrubs other than *P. juliflora*) in three lines at double of normal rates	60 m	5 mdays km^{-1}	92.40
Application of manure, AM, micronutrients	300 plants	Rs. 2.50 plant^{-1}	750.00
Weeding and hoeing			
a) On contour trenches (three times)	100 trenches x 3	0.01 mdays trench^{-1}	924.00
b) On cattle-proof trenches	40 m x 3	Rs. 1.11 m^{-1}	133.20
Irrigation of plants 3 times at half of normal rate of plants in pits	300 plants x 3	0.62mdays/ 100	1,718.64
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 9 months (Average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	9 months	10.80 mdays yr^{-1}	2,494.80
Contingency	Lump sum		1,000.00
Total			8,322.32 **or 8,322**

Maintenance cost			
Year 3			
Weeding, hoeing on contour trenches 3 times yr^{-1}	100 trenches x 3	0.01mdays trench^{-1}	924.00
Irrigation of plants 6 times at half of normal rate of plants in pits	300 plants x 6	0.62 mdays/ 100	3,437.28
Application of manure, AM, micronutrients	300 plants	Rs. 2.50 plant^{-1}	750.00

Repair of animal-proof trench	60 m	0.07 mdays m^{-1}	1,617.00
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			12,418.08 or **12,418**
Year 4			
Weeding, hoeing on contour trenches 1 time yr^{-1}	100 trenches x 1	0.01 mdays $trench^{-1}$	308.00
Irrigation of plants 2 times at half of normal rate of plants in pits	300 plants x 2	0.62 mdays/ 100	1,145.76
Application of manure, AM, micronutrients	300 plants	Rs. 2.50 $plant^{-1}$	750.00
Repair of animal-proof trench	60 m	0.07 mdays m^{-1}	1,617.00
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			9,371.96 **or 9,372**
Year 5			
Weeding, hoeing contour trenches 1 time yr^{-1}	100 trenches x 1	0.01 mdays $trench^{-1}$	308.00
Repair of animal-proof trench	60 m	0.2 mdays m^{-1}	3,696.00
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	200.00
Total			7,530.40 or **7,530**
Year 6			**3,326**
Year 7			**3,326**

Table 7.21. Cost summary for YM/MP/NL/02

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	35,758
Year 2 (Planting and establishment)	8,322
Year 3 (1^{st} maintenance)	12,418
Year 4 (2^{nd} maintenance)	9,372
Year 5 (3^{rd} maintenance)	7,530
Year 6 (4^{th} maintenance)	3,326
Year 7 (5^{th} maintenance)	3,326
Total	**80,052**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

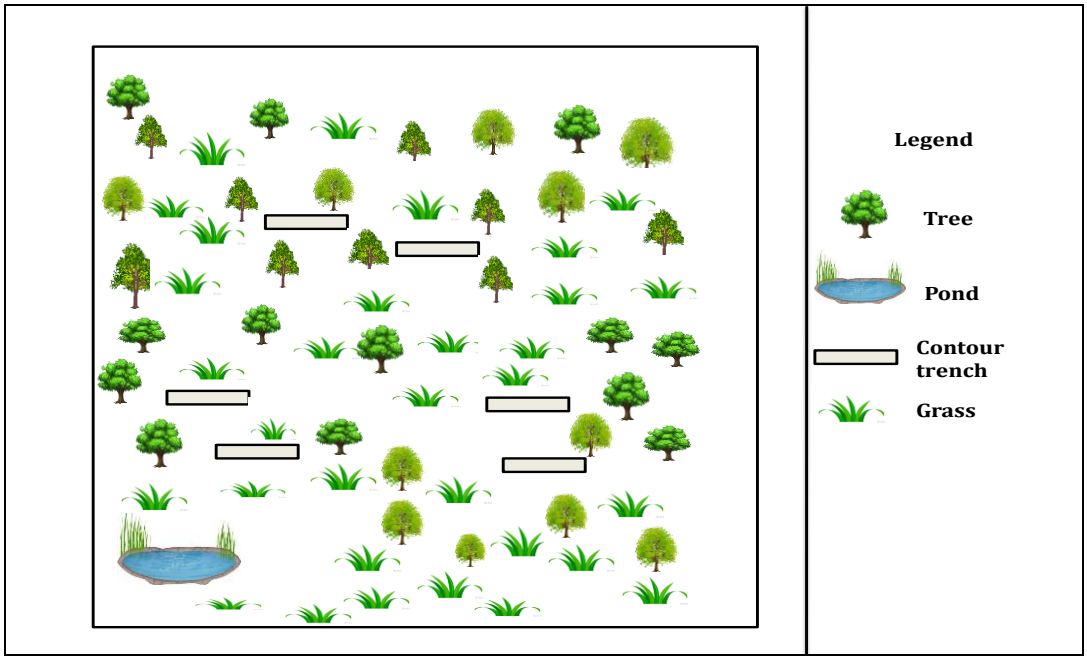


Fig.7.18. Illustration of assisted natural regeneration

YM/MP/NL/03: Rehabilitation of forest infested with high-density invasive weeds

This model will be applied in areas having dense (more than 1,500 plants ha^{-1}) growth of invasive weed. *Lantana* has invaded the area due to its prolific reproduction and wide adaptability and need to be Lantana. Cattle-proof trench will be dug all around the area and bio-fence will be raised. Removal of *Lantana* from entire area would be undesirable as it would result in deterioration of the site, hence a total of 5,000 m^2 area per ha will be cleared in alternating strips. Improved moisture conservation would create conditions favourable for regeneration of native species and would help in suppression of Lantana, therefore 128 contour trenches/ha will be dug in the cleared space. The soil along the contour trenches will be seeded with indigenous tree and grass species. Sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Grass will be sown at six points along the trench. More than one seed may be sown per spot to ensure seedling establishment at each spot. The site will be maintained for five years.

As most of the sites for this model have rugged topography, steep to moderate slopes and loose soil, earthen check dams or similar structures (e.g. brushwood check dam, loose boulder check dam, etc.) have also been provided.

Species recommended

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Species on protection trenches

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Species on contour trenches

Tree and shrub: *Azadirachta indica, Madhuca indica, Anogeissus latifolia, Acacia nilotica, Dalbergia sissoo, Albizia lebbeck, Emblica officinalis, Pithecellobium dulce, Terminalia alata, Terminalia chebula, Terminalia arjuna, Brideliaretusa, Holoptelea integrifolia, Bombax ceiba,* etc.

Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.
Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apludamutica, Vetiveria zizanioides,* etc.

Important elements (ha^{-1})

i. Fencing with Cattle-proof trench and bio-fence.
ii. One hundred twenty eight contour trenches of size 3 m x 0.45 m x 0.45 m.
iii. Earthen check dams (3.00 m x 0.90 m x 0.45 m), 100 no. or other size/no. equivalent to 121.5 m^3or brushwood check dam or other structuresof equivalent value.
iv. Sowing of tree and grass seeds on contour trenches and earthen check dams.
v. Maintenance for 5 years after planting year including weeding and hoeing.

Table 7.22. Budget norm for YM/MP/NL/03

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Removal of high-density *Lantana* (>1500 bushes ha^{-1})	5,000 m^2	22 mdays ha^{-1}	3,388.00
Alignment of contour trenches	128 no.	0.15 mdays/ 100	59.14
Digging of contour trenches (3.00 m x 0.60 m x 0.45 m)	128 no.	0.33 $trench^{-1}$	13,009.92
Preparation of earthen check dams (3.00 m x 0.90 m x 0.45 m, 100 no. or other size/no. equivalent to 121.5 m^3or brushwood check dam or other structures of equivalent value	121.5 m^2	0.6 mdays m^{-3}	22,453.20
Protective structure all around			
a) Cattle-proof trench (1.50 m x 0.90 m x 0,75 m)	60 m	0.6 mday m^{-1}	11,088.00
b) Stone wall (1.50 m x 0.90 m x 0,75 m)	40 m	0.7 mday m^{-1}	8,624.00
Tending of shoots of existing saplings and poles	5,000 m^2	1.2 mdays ha^{-1}	184.80
Thawla making around 750 seedlings/poles	750	Lumpsum	2,250.00
Making of inspection path			
a) 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
b) 1 m wide path inside plantation	50 m	Lump sum	110.00
Quality seed of trees for contour trenches (128 trenches)	5.12 kg	100 kg^{-1}	512.00
Grass seed for contour trenches	3.84 kg	120 kg^{-1}	460.80

Seed for earthen check dams (other than *P. juliflora*) (at double of normal rate)	Equivalent to 100 earthen check dams	15.50 earthen check dam^{-1}	1,550.00
Plantation sign board (per 25 ha)	1	Rs. 3,500/25 ha	140.00
Contingency			1,200.00
Total			65,407.47 **or 65,407**
Planting year			
Removal of *Lantana* at half of normal rate for the area	5,000 m^2	11 mdays ha^{-1}	1,694.00
Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	128 no.	Rs. 2.25 trench^{-1}	288.00
Dressing contour trenches	128 no.	Rs. 2 trench^{-1}	256.00
Dressing earthen check dams	100 no.	Rs. 3.08 earthen check dam^{-1}	308.00
Seed sowing			
a) Sowing of tree seeds on contour trenches (128 trenches) at three points per trench	384 m	Lumpsum	256.00
b) Re-sowing of tree seeds on contour trenches to ensure targeted germination on trenches	256 m	Lumpsum	170.67
c) Sowing of grass seed along contour trench (six points trench^{-1})	768 seed	0.16 mdays/ 100 seed	378.47
d) Sowing of tree and grass seed on earthen check dam	100 earthen check dams	Rs. 1.33 earthen check dam^{-1}	1,330.00
e) Re-sowing of tree and grass seed on earthen check dam	100 earthen check dams	Rs. 0.88 earthen check dam^{-1}	880.00
f) Sowing of seed on bund along cattle-proof trench (trees/shrubs other than *P. juliflora*) in three lines at double of normal rates	60 m	5 mdays km^{-1}	92.40
g) Dibbling of seed in vacant spaces 3 m below contour trenches	384 no.	0.2 mdays/ 100	236.55
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 plant^{-1}	960.00
Weeding and hoeing			
a) On contour trenches (three times)	128 trenches x 3	0.01mdays trench^{-1}	1,182.72
b) On cattle-proof trenches	40 m x 3	Rs. 1.11 m^{-1}	133.20
Irrigation of plants 3 times at half of normal rate of plants in pits	384 plants x 3	0.62 mdays/ 100	2,217.50
Repair of animal-proof trench	60 m	0.07 mdays m^{-1}	1,293.60

Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 9 months (Average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	9 months	10.80 mdays yr^{-1}	2,494.80
Contingency	Lump sum		1,200.00
Total			15,510.51 **or 15,511**

Maintenance cost			
Year 3			
Removal of *Lantana* at one-fourth of normal rate for the area	5,000 m^2	5.5 mdays ha^{-1}	847.00
Weeding, hoeing on contour trenches 3 times yr^{-1}	128 trenches x 3	0.01mdays $trench^{-1}$	1,182.72
Irrigation of plants 6 times at half of normal rate of plants in pits	384 plants x 6	0.62 mdays/ 100	4,399.72
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 $plant^{-1}$	960.00
Repair of animal-proof trench	60 m	0.14mdays m^{-1}	2,587.20
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 12 months (Average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			15,666.44 **or 15,666**
Year 4			
Removal of *Lantana* at one-tenth of normal rate for the area	5,000 m^2	2.2 mdays ha^{-1}	33.88
Weeding, hoeing on contour trenches 1 time yr^{-1}	128 trenches x 1	0.01 mdays $trench^{-1}$	394.24
Irrigation of plants 2 times at half of normal rate of plants in pits	384 plants x 2	0.62 mdays/ 100	1,466.58
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 $plant^{-1}$	960.00
Repair of animal-proof trench	60 m	0.20mdays m^{-1}	3,696.00
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			10,377.10 **or 10,377**
Year 5			
Weeding, hoeing contour trenches 1 time yr^{-1}	128 trenches x 1	0.01 mdays $trench^{-1}$	394.24
Repair of animal-proof trench	60 m	0.20mdays m^{-1}	3,696.00
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	200.00
Total			9,341.44

			or 9,341
Year 6			**3,326**
Year 7			**3,326**

Table 7.23. Cost summary for YM/MP/NL/03 (Rehabilitation of forest infested with high-density invasive weeds)

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	65,407
Year 2 (Planting and establishment)	15,511
Year 3 (1st maintenance)	15,666
Year 4 (2nd maintenance)	10,377
Year 5 (3rd maintenance)	9,341
Year 6 (4th maintenance)	3,326
Year 7 (5th maintenance)	3,326
Total	**1,22,954**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

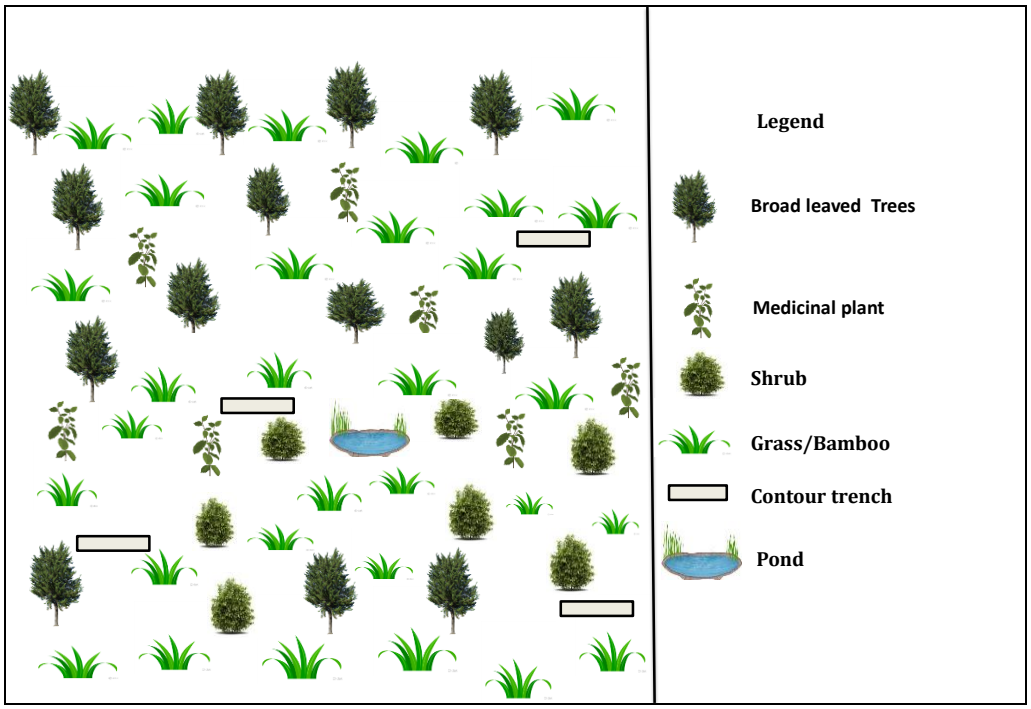


Fig.7.19. Illustration of rehabilitation of invasive species infested areas

YM/MP/NL/04: Rehabilitation of forest infested with moderate-density invasive weeds

This model will be applied in conditions similar to the previous model except that the density of invasive weed is 500-1,500 ha^{-1} which is less than the previous model. *Lantana* has invaded the area due to its prolific reproduction and wide adaptability and need to be removed. Cattle-proof trench will be dug all around the area and bio-fence will be raised. Removal of *Lantana* from entire area would be undesirable as it would result in deterioration of the site, hence a total of 5,000 m^2 area per ha will be cleared in alternating strips. Improved moisture conservation would create conditions favourable for regeneration of native species and would help in suppression of

Lantana, therefore 128 contour trenches/ha will be dug in the cleared space. The soil along the contour trenches will be seeded with indigenous tree and grass species. Sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Grass will be sown at six points along the trench. More than one seed may be sown per spot to ensure seedling establishment at each spot. The site will be maintained for five years.

As most of the sites for this model have rugged topography, steep to moderate slopes and loose soil, earthen check dams or similar structures (e.g. brushwood check dam, loose boulder check dam, etc.) have also been provided.

Plant species recommended: Same as for YM/MP/NL/03.

Important elements (ha^{-1}):

i. Fencing with Cattle-proof trench and bio-fence.
ii. One hundred twenty eight contour trenches of size 3 m x 0.45 m x 0.45 m.
iii. Earthen check dams (3.00 m x 0.90 m x 0.45 m), 100 no. or other size/no. equivalentto 121.5 m^3or brushwood check dam or other structuresof equivalent value.
iv. Sowing of tree and grass seeds on contour trenches and earthen check dams.
v. Maintenance for 5 years after planting year including weeding and hoeing.

Table 7.24. Budget norm for YM/MP/NL/04

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Removal of medium-density *Lantana* (500^{-1},500 bushes ha^{-1})	5,000 m^2	12.5 mdays ha^{-1}	1,925.00
Alignment of contour trenches	128 no.	0.15 mdays/ 100	59.14
Digging of contour trenches (3.00 m x 0.60 m x 0.45 m)	128 no.	0.33 $trench^{-1}$	13,009.92
Preparation of earthen check dams (3.00 m x 0.90 m x 0.45 m, 100 no. or other size/no. equivalent to 121.5 m^3or brushwood check dam or other structures of equivalent value	121.5 m^2	0.6 mdays m^{-3}	22,453.20
Protective structure all around			
a) Cattle-proof trench (1.50 m x 0.90 m x 0,75 m)	60 m	0.6 mday m^{-1}	11,088.00
b) Stone wall (1.50 m x 0.90 m x 0,75 m)	40 m	0.7 mday m^{-1}	8,624.00
Tending of shoots of existing saplings and poles	5,000 m^2	1.2 mdays ha^{-1}	184.80
Thawla making around 450 seedlings/poles	450	Lumpsum	1,350.00
Making of inspection path			

a) 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
b) 1 m wide path inside plantation	50 m	Lump sum	110.00
Quality seed of trees for contour trenches (256 trenches)	5.12 kg	100 kg^{-1}	512.00
Grass seed for contour trenches	3.84 kg	120 kg^{-1}	460.80
Seed for earthen check dams (other than *P. juliflora*) (at double of normal rate)	Equivalent to 100 earthen check dams	15.50 earthen check dam^{-1}	1,550.00
Plantation sign board (per 25 ha)	1	Rs. 3,500/25 ha	140.00
Contingency			1,000.00
Total			62,841.47 **or 62,841**
Planting year			
Removal of *Lantana* at half of normal rate for the area	5,000 m^2	6.25 mdays ha^{-1}	962.50
Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	128 no.	Rs. 2.25 $trench^{-1}$	288.00
Dressing contour trenches	128 no.	Rs. 2 $trench^{-1}$	256.00
Dressing earthen check dams	100 no.	Rs. 3.08 earthen check dam^{-1}	308.00
Seed sowing			
a) Sowing of tree seeds on contour trenches (128 trenches) at three points per trench	384 m	Lumpsum	256.00
b) Re-sowing of tree seeds on contour trenches to ensure targeted germination on trenches	256 m	Lumpsum	170.67
c) Sowing of grass seed along contour trench (six points $trench^{-1}$)	768 seed	0.16 mdays/ 100 seed	378.47
d) Sowing of tree and grass seed on earthen check dam	100 earthen check dams	Rs. 1.33 earthen check dam^{-1}	1,330.00
e) Re-sowing of tree and grass seed on earthen check dam	100 earthen check dams	Rs. 0.88 earthen check dam^{-1}	880.00
f) Sowing of seed on bund along cattle-proof trench (trees/shrubs other than *P. juliflora*) in three lines at double of normal rates	60 m	5 mdays km^{-1}	92.40
g) Dibbling of seed in vacant spaces 3 m below contour trenches	384 no.	0.2 mdays/ 100	236.55
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 $plant^{-1}$	960.00
Weeding and hoeing			

a) On contour trenches (three times)	128 trenches x 3	0.01 mdays trench^{-1}	1,182.72
b) On cattle-proof trenches	40 m x 3	Rs. 1.11 m^{-1}	133.20
Irrigation of plants 3 times at half of normal rate of plants in pits	384 plants x 3	0.62 mdays/ 100	2,217.60
Repair of animal-proof trench	60 m	0.07 mdays m^{-1}	1,293.60
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 9 months (Average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	9 months	10.80 mdays yr^{-1}	2,494.80
Contingency	Lump sum		800.00
Total			14,379.11 **or 14,379**

Maintenance cost			
Year 3			
Removal of *Lantana* at one-fourth of normal rate for the area	5,000 m^2	5.5 mdays ha^{-1}	847.00
Weeding, hoeing on contour trenches 3 times yr^{-1}	128 trenches x 3	0.01mdays trench^{-1}	1,182.72
Irrigation of plants 6 times at half of normal rate of plants in pits	384 plants x 6	0.62 mdays/ 100	4,399.72
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 plant^{-1}	960.00
Repair of animal-proof trench	60 m	0.14 mdays m^{-1}	2,587.20
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			15,666.44 **or 15,666**
Year 4			
Removal of *Lantana* at one-tenth of normal rate for the area	5,000 m^2	2.2 mdays ha^{-1}	33.88
Weeding, hoeing on contour trenches 1 time yr^{-1}	128 trenches x 1	0.01 mdays trench^{-1}	394.24
Irrigation of plants 2 times at half of normal rate of plants in pits	384 plants x 2	0.62 mdays/ 100	1,466.58
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 plant^{-1}	960.00
Repair of animal-proof trench	60 m	0.20 mdays m^{-1}	3,696.00
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			10,377.10 **or 10,377**
Year 5			

Weeding, hoeing contour trenches (1 time yr^{-1})	128 trenches x 1	0.01 mdays $trench^{-1}$	394.24
Repair of animal-proof trench	60 m	0.20 mdays m^{-1}	3,696.00
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	200.00
Total			9,341.44 **or 9,341**
Year 6			**3,326**
Year 7			**3,326**

Table 7.25. Cost summary for YM/MP/NL/04

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	62,841
Year 2 (Planting and establishment)	14,379
Year 3 (1^{st} maintenance)	15,666
Year 4 (2^{nd} maintenance)	10,377
Year 5 (3^{rd} maintenance)	9,341
Year 6 (4^{th} maintenance)	3,326
Year 7 (5^{th} maintenance)	3,326
Total	**1,19,256**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/MP/NL/05: Rehabilitation of forest infested with low-density invasive weeds

This model will be applied in conditions similar to the previous model except that the density of invasive weed is negligible (less than 500 plants ha^{-1}). The invasive weed will be removed. Cattle-proof trench will be dug all around the area and bio-fence will be raised. Removal of *Lantana* from entire area would be undesirable as it would result in deterioration of the site, hence a total of 5,000 m^2 area per ha will be cleared in alternating strips. Improved moisture conservation would create conditions favourable for regeneration of native species and would help in suppression of *Lantana*, therefore 128 contour trenches/ha will be dug in the cleared space. The soil along the contour trenches will be seeded with indigenous tree and grass species. Sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Grass will be sown at six points along the trench. More than one seed may be sown per spot to ensure seedling establishment at each spot. The site will be maintained for five years.

As most of the sites for this model have rugged topography, steep to moderate slopes and loose soil, earthen check dams or similar structures (e.g. brushwood check dam, loose boulder check dam, etc.) have also been provided.

Plant species recommended: Same as for YM/MP/NL/03.

Important elements (ha^{-1})

i. Fencing with Cattle-proof trench and bio-fence.
ii. One hundred twenty eight contour trenches of size 3 m x 0.45 m x 0.45 m.
iii. Earthen check dams (3.00 m x 0.90 m x 0.45 m), 100 no. or other size/no. equivalent to 121.5 m^3or brushwood check dam or other structuresof equivalent value.

iv. Sowing of tree and grass seeds on contour trenches and earthen check dams.
v. Maintenance for 5 years after planting year including weeding and hoeing.

Table 7.26. Budget norm for YM/MP/NL/05

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Removal of low-density *Lantana* (500-1500 bushes ha^{-1})	5,000 m^2	8 mdays ha^{-1}	1,232.00
Alignment of contour trenches	128 no.	0.15 mdays/ 100	59.14
Digging of contour trenches (3.00 m x 0.60 m x 0.45 m)	128 no.	0.33 trench^{-1}	13,009.92
Preparation of earthen check dams (3.00 m x 0.90 m x 0.45 m, 100 no. or other size/no. equivalent to 121.5 m^{3}or brushwood check dam or other structures of equivalent value	121.5 m^2	0.6 mdays m^{-3}	22,453.20
Protective structure all around			
a) Cattle-proof trench (1.50 m x 0.90 m x 0,75 m)	60 m	0.6 mday m^{-1}	11,088.00
b) Stone wall (1.50 m x 0.90 m x 0,75 m)	40 m	0.7 mday m^{-1}	8,624.00
Tending of shoots of existing saplings and poles	5,000 m^2	1.2 mdays ha^{-1}	184.80
Thawla making around 200 seedlings/poles	200	Lumpsum	600.00
Making of inspection path			
a) 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
b) 1 m wide path inside plantation	50 m	Lump sum	110.00
Quality seed of trees for contour trenches (256 trenches)	5.12 kg	100 kg^{-1}	512.00
Grass seed for contour trenches	3.84 kg	120 kg^{-1}	460.80
Seed for earthen check dams (other than *P. juliflora*) (at double of normal rate)	Equivalent to 100 earthen check dams	15.50 earthen check dam^{-1}	1,550.00
Plantation sign board (per 25 ha)	1	Rs. 3,500/25 ha	140.00
Contingency			1,000.00
Total			61,398.47 **or 61,398**
Planting year			
Removal of *Lantana* at half of normal rate for the area	5,000 m^2	4 mdays ha^{-1}	616.00

Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	128 no.	Rs. 2.25 trench^{-1}	288.00
Dressing contour trenches	128 no.	Rs. 2 trench^{-1}	256.00
Dressing earthen check dams	100 no.	Rs. 3.08 earthen check dam^{-1}	308.00
Seed sowing			
a) Sowing of tree seeds on contour trenches (128 trenches) at three points per trench	384 m	Lumpsum	256.00
b) Re-sowing of tree seeds on contour trenches to ensure targeted germination on trenches	256 m	Lumpsum	170.67
c) Sowing of grass seed along contour trench (six points trench^{-1})	768 seed	0.16 mdays/ 100 seed	378.47
d) Sowing of tree and grass seed on earthen check dam	100 earthen check dams	Rs. 1.33 earthen check dam^{-1}	1,330.00
e) Re-sowing of tree and grass seed on earthen check dam	100 earthen check dams	Rs. 0.88 earthen check dam^{-1}	880.00
f) Sowing of seed on bund along cattle-proof trench (trees/shrubs other than *P. juliflora*) in three lines at double of normal rates	60 m	5 mdays km^{-1}	92.40
g) Dibbling of seed in vacant spaces 3 m below contour trenches	384 no.	0.2 mdays/ 100	236.55
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 plant^{-1}	960.00
Weeding and hoeing			
a) On contour trenches (three times)	128 trenches x 3	0.01 mdays trench^{-1}	1,182.72
b) On cattle-proof trenches	40 m x 3	Rs. 1.11 m^{-1}	133.20
Irrigation of plants 3 times at half of normal rate of plants in pits	384 plants x 3	0.62 mdays/ 100	2,217.60
Repair of animal-proof trench	60 m	0.07 mdays m^{-1}	1,293.60
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	9 months	10.80 mdays yr^{-1}	2,494.80
Contingency	Lump sum		800.00

Total			14,032.61 **or 14,033**

Maintenance cost			
Year 3			
Removal of *Lantana* at one-fourth of normal rate for the area	5,000 m^2	2 mdays ha^{-1}	308.00
Weeding, hoeing on contour trenches 3 times yr^{-1}	128 trenches x 3	0.01mdays $trench^{-1}$	1,182.72
Irrigation of plants 6 times at half of normal rate of plants in pits	384 plants x 6	0.62 mdays/ 100	4,399.72
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 $plant^{-1}$	960.00
Repair of animal-proof trench	60 m	0.14 mdays m^{-1}	2,587.20
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			14,627.44 **or 14,627**
Year 4			
Removal of *Lantana* at one-tenth of normal rate for the area	5,000 m^2	0.8 mdays ha^{-1}	15.40
Weeding, hoeing on contour trenches 1 time yr^{-1}	128 trenches x 1	0.01 mdays $trench^{-1}$	394.24
Irrigation of plants 2 times at half of normal rate of plants in pits	384 plants x 2	0.62 mdays/ 100	1,466.58
Application of manure, AM, micronutrients	384 plants	Rs. 2.50 $plant^{-1}$	960.00
Repair of animal-proof trench	60 m	0.20 mdays m^{-1}	3,696.00
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			10,358.62 **or 10,359**
Year 5			
Weeding, hoeing contour trenches (one time yr^{-1})	128 trenches x 1	0.01 mdays $trench^{-1}$	394.24
Repair of animal-proof trench	60 m	0.20 mdays m^{-1}	3,696.00
Repair of protection wall	40 m	0.14 mdays m^{-1}	1,724.80
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mdays yr^{-1}	3,326.40
Contingency		Lumpsum	200.00
Total			9,341.44 **or 9,341**
Year 6			**3,326**
Year 7			**3,326**

Table 7.27. Cost summary for YM/MP/NL/05

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	61,398
Year 2 (Planting and establishment)	14,033
Year 3 (1^{st} maintenance)	14,627

Year 4 (2nd maintenance)	10,359
Year 5 (3rd maintenance)	9,341
Year 6 (4th maintenance)	3,326
Year 7 (5th maintenance)	3,326
Total	**1,16,410**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/MP/NL/06: Removal of high-density invasive weeds

This model will be applied in Madhav National Park, Shivpuri in sites having high-density (more than 1,500 plants ha^{-1}) infestation by invasive weeds. Protection from cattle is not required in the area. *Lantana* will be removed from half of the area so as not to expose the soil that would otherwise risk site deterioration. Ground water recharge will be improved through contour trenches at a modest density of 64 contour trenches per ha. The soil along the trenches will be seeded with indigenous tree and grass species. Sowing of seeds of indigenous trees will be carried out at three points (one each at both ends and in the middle) on the soil heaped along the trench. Grass will be sown at six points along the trench. More than one seed may be sown per spot to ensure seedling establishment at each spot. These steps will encourage regeneration of native vegetation and reduce the probability of invasion of *Lantana* after the project activities are over. The site will be maintained for five years.

Important elements (ha^{-1}):

i. Sixty four contour trenches of size 3 m x 0.45 m x 0.45 m.
ii. Sowing of tree and grass seeds on contour trenches.
iii. Maintenance for 5 years after planting year including weeding and hoeing.

Species recommended

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree and shrub: *Azadirachta indica, Madhuca indica, Anogeissus latifolia, Acacia nilotica, Dalbergia sissoo, Albizia lebbeck, Emblica officinalis, Pithecellobium dulce, Terminalia alata, Terminalia chebula, Terminalia arjuna, Brideliaretusa, Holoptelea integrifolia, Bombax ceiba,* etc.

Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apludamutica, Vetiveria zizanioides,* etc.

Table 7.28. Budget norm for YM/MP/NL/06

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Removal of high-density *Lantana* (>1,500 bushes ha^{-1})	5,000 m^2	22 mdays ha^{-1}	3,388.00

Alignment of contour trenches	64 no.	0.15 mdays/ 100	29.57
Digging of contour trenches (3.00 m x 0.60 m x 0.45 m)	64 no.	0.33 trench^{-1}	6,504.96
Seed of trees for contour trenches (64 trenches)	2.56 kg	100 kg^{-1}	256.00
Grass seed	1.92 kg	120 kg^{-1}	230.40
Contingency			400.00
Total			10,947.53 **or 10,948**
Planting year			
Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	64 no.	Rs. 2.25 trench^{-1}	144.00
Removal of *Lantana* at half of normal rate for the area	5,000 m^2	11 mdays ha^{-1}	1,694.00
Dressing contour trenches	64 no.	Rs. 2 trench^{-1}	128.00
Seed sowing			
a) Sowing of tree seeds on contour trenches (64 trenches) at three points per trench	192 m	Lumpsum	128.00
b) Re-sowing of tree seeds on contour trenches to ensure targeted germination on trenches	128 m	Lumpsum	55.33
c) Sowing of grass seed along contour trench (six points trench^{-1})	384 seed	0.16 mdays/ 100 seed	189.24
d) Dibbling of seed in vacant spaces 3 m below contour trenches	192 no.	0.2 mdays/ 100	118.27
Application of manure, AM, micronutrients	192 plants	Rs. 2.50 plant^{-1}	480.00
Weeding, hoeing on contour trenches (three times)	64 trenches x 3	0.01 mdays trench^{-1}	591.36
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Contingency	Lump sum		300.00
Total			3,966.80 **or 3,967**

Maintenance cost			
Year 3			
Removal of *Lantana* at one-fourth of normal	5,000 m^2	5.5 mdays ha^{-1}	847.00

rate for the area			
Weeding, hoeing on contour trenches 3 times yr^{-1}	64 trenches x 3	0.01mdays $trench^{-1}$	691.36
Irrigation of plants 6 times at half of normal rate of plants in pits	192 plants x 6	0.62 mdays/ 100	2,199.86
Application of manure, AM, micronutrients	192 plants	Rs. 2.50 $plant^{-1}$	480.00
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Contingency		Lumpsum	200.00
Total			4,556.82 **or 4,557**
Year 4			
Removal of *Lantana* at one-tenth of normal rate for the area	5,000 m^2	2.2 mdays ha^{-1}	338.80
Weeding, hoeing on contour trenches 1 time yr^{-1}	64 trenches x 1	0.01 mdays trench^{-1}	197.11
Irrigation of plants 2 times at half of normal rate of plants in pits	192 plants x 2	0.62 mdays/ 100	733.29
Application of manure, AM, micronutrients	192 plants	Rs. 2.50 $plant^{-1}$	480.00
Contingency		Lumpsum	100.00
Total			1,849.20 **or 1,849**
Year 5			
Weeding, hoeing contour trenches (one time yr^{-1})	64 trenches x 1	0.01 mdays trench^{-1}	197.12
Contingency		Lumpsum	100.00
Total			297.12 or **297**

Table 7.29.Cost summary for YM/MP/NL/06

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	10,948
Year 2 (Planting and establishment)	3,967
Year 3 (1st maintenance)	4,557
Year 4 (2nd maintenance)	1,849
Year 5 (3rd maintenance)	297
Total	**21,618**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/MP/NL/07: Removal of moderate-density invasive weeds

Like the previous model, this model too will be applied in Madhav National Park, Shivpuri, but the density of invasive weed in this model is moderate (500-1,500 plants ha^{-1}).

Plant species recommended: Same as for YM/MP/NL/06.

Important elements (ha^{-1}):

i. Sixty four contour trenches of size 3 m x 0.45 m x 0.45 m.
ii. Sowing of tree and grass seeds on contour trenches.
iii. Maintenance for 5 years after planting year including weeding and hoeing.

Table 7.30. Budget norm for YM/MP/NL/07

Particular	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Removal of medium-density *Lantana* (>1,500 bushes ha^{-1})	5,000 m^2	12.5 mdays ha^{-1}	1,925.00
Alignment of contour trenches	64 no.	0.15 mdays/ 100	29.57
Digging of contour trenches (3.00 m x 0.60 m x 0.45 m)	64 no.	0.33 $trench^{-1}$	6,504.96
Seed of trees for contour trenches (64 trenches)	2.56 kg	100 kg^{-1}	256.00
Grass seed	1.92 kg	120 kg^{-1}	230.40
Contingency			400.00
Total			9,484.53 **or 9,485**
Planting year			
Refilling contour trenches (3.00 m x 0.60 m x 0.45 m)	64 no.	Rs. 2.25 $trench^{-1}$	144.00
Removal of *Lantana* at half of normal rate for the area	5,000 m^2	6.25 mdays ha^{-1}	962.50
Dressing contour trenches	64 no.	Rs. 2 $trench^{-1}$	128.00
Seed sowing			
a) Sowing of tree seeds on contour trenches (64 trenches) at two points per trench	128 m	Lumpsum	85.33
b) Re-sowing of tree seeds on contour trenches to ensure targeted germination on trenches	84 m	Lumpsum	56.00
c) Sowing of grass seed along contour trench (six points $trench^{-1}$)	384 seed	0.16 mdays/ 100 seed	189.24
d) Dibbling of seed in vacant spaces 3 m below contour trenches	192 no.	0.2 mdays/ 100	118.72
Application of manure, AM, micronutrients	128 plants	Rs. 2.50 $plant^{-1}$	320.00
Weeding, hoeing on contour trenches (three times)	64 trenches x 3	0.01 mdays $trench^{-1}$	591.36
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40

b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Contingency	Lump sum		300.00
Total			**3,033.75 or 3,034**

Maintenance cost			
Year 3			
Removal of *Lantana* at one-fourth of normal rate for the area	5,000 m^2	5.5 mdays ha^{-1}	847.00
Weeding, hoeing on contour trenches 3 times yr^{-1}	64 trenches x 3	0.01mdays $trench^{-1}$	691.36
Irrigation of plants 6 times at half of normal rate of plants in pits	128 plants x 6	0.62 mdays/ 100	1,466.57
Application of manure, AM, micronutrients	128 plants	Rs. 2.50 $plant^{-1}$	320.00
Fire protection			
a) Creating 6 m wide fire line	0.200 km	1.5 mday km^{-1}	92.40
b) Controlled burning	0.200 km	0.75 mday km^{-1}	46.20
Contingency		Lumpsum	200.00
Total			3,663.53 **or 3,664**
Year 4			
Removal of *Lantana* at one-tenth of normal rate for the area	5,000 m^2	2.2 mdays ha^{-1}	338.80
Weeding, hoeing on contour trenches (one time yr^{-1})	64 trenches x 1	0.01 mdays $trench^{-1}$	197.11
Irrigation of plants 2 times at half of normal rate of plants in pits	128 plants x 2	0.62 mdays/ 100	488.86
Application of manure, AM, micronutrients	128 plants	Rs. 2.50 $plant^{-1}$	320.00
Contingency		Lumpsum	100.00
Total			1,444.77 **or 1,445**
Year 5			
Weeding, hoeing contour trenches (one time yr^{-1})	64 trenches x 1	0.01 mdays $trench^{-1}$	197.12
Contingency		Lumpsum	100.00
Total			297.12 or **297**

Table 7.31. Cost summary for YM/MP/NL/07

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	9,485
Year 2 (Planting and establishment)	3,034
Year 3 (1^{st} maintenance)	3,664
Year 4 (2^{nd} maintenance)	1,445
Year 5 (3^{rd} maintenance)	297
Total	**17,925**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/MP/NL/08: Grassland development in wildlife areas

This model will be implemented for developing rangeland with the objective of producing forage grasses and legumes for wildlife. The site will be fenced with cattle-proof trench and biofence, the land will be ploughed to pulverize the soil and seeds/plants of pasture grass and legumes will

be sown during the monsoon season. *Kachcha* water pond(s)/*dabradabri* with stone pitching of total 50 m^3 storage capacity will be created within the plantation area to store water for drinking by animals. Weeding and hoeing will be done to help establishment of pasture. Suitable organic manures will be applied. After one and a half year the fence will be removed and site will be opened for grazing. Additional *kachcha* water pond(s)/*dabradabri* of total 50,000 litre storage capacity will be created as a part of this model outside the plantation area for free access to grazing animals during the period of development of grassland and also afterwards.

Species recommended

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree and shrub: *Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apludamutica, Vetiveria zizanioides,* etc.

Legume: *Alysicarpus rugosus, A. longifolius, Rhynchosia minima, Indigofera glandulosa, Rhynchosia capitata, Stylosanthes hamata,* etc.

Important elements of the model (ha^{-1}):

Fencing: Cattle-proof trench with bio-fence.
Sowing of pasture grass.
Chowkidar will protect the grassland for one year.

Table 7.32. Budget norm for YM/MP/NL/08

Particular	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Cleaning of area by cutting bushes	1 ha	4 mdays ha^{-1}	1,232.00
Digging out roots of bushes and removal of boulders that may interfere with ploughing by tractor	1 ha	Rs. 2,000	2,000.00
Cattle-proof trench (1.50 m x 0.90 m x 0,75 m) all around	100 m	0.6 mday m^{-1}	18,480.00
Kachcha pond inside plantation area with stone pitching at base			
a) Digging of *Kachcha* pond inside plantation in area of hard rock	25 m^3	128 m^{-3}	3,200.00
b) Providing stone pitching at base (incl. cost of material)	Lump sum		800.00

Digging of *Kachcha* pond outside plantation with *Kachcha* base	50 m^3	128 m^{-3}	6,400.00
Making of inspection path 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
Seed of pasture grasses and legumes	15 kg	120 kg^{-1}	1,800.00
Plantation sign board (per 25 ha)	1	Rs. 3,500/25 ha	140.00
Contingency			1,000.00
Total			35,426.61 **or 35,427**
Planting year			
Ploughing with tractor to pulverize soil	1 ha	Lump sum	2,000.00
Sowing of grass seed in the area	1 ha	Lump sum	1,500.00
Sowing of seed on bund along cattle-proof trench (trees/shrubs other than *P. juliflora*) in three lines at double of normal rates	100 m	5 mdays km^{-1}	154.00
Application of manure, AM, micronutrients		Lump sum	1,000.00
Irrigation of grass and plants on protection trench (one time)	1 ha	Lump sum	1,200.00
Weeding and hoeing			
a) Grassed area to dig out bushes and unpalatable plants (twice)		Lump sum	2,000.00
b) On cattle-proof trenches (twice)	100 m x 2	Rs. 1.11 m^{-1}	222.00
Watch and ward for 9 months (average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	9 months	10.80 mdays yr^{-1}	2,494.80
Contingency		Lump sum	800.00
Total			11,370.80 **or 11,371**

Maintenance cost			
Year 3			
Irrigation of grass and plants on protection trench (one time)	1 ha	Lump sum	1,200.00
Weeding, hoeing of grassed area to dig out bushes and unpalatable plants (one time)	1 ha	Lump sum	1,000.00
Watch and ward for 6 months (average 12 hrs sunrise to sunset, everyday, for 50 ha instead of 26 days mo^{-1} x 8 hrs)	6 months	10.80 mdays yr^{-1}	1,663.20
Uprooting of biofence and levelling off protection trench at the end of year	100 m	Lump sum	1,000.00
Contingency		Lumpsum	500.00

Total			5,363.20 **or 5,363**
Year 4	Maintenance		**1,000**

Table 7.33. Cost summary for YM/MP/NL/08

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	35,427
Year 2 (Planting and establishment)	11,371
Year 3 (1st maintenance)	5,363
Year 4 (2nd maintenance)	1,000
Total	**53,161**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/MP/NL/09: Grass with moisture conservation

This model will be implemented in areas that require measure to reduce soil erosion and conserve moisture for producing forage grasses and legumes. Conservation ditches will be dug to conserve rain water. The conservation ditches may have greater density in depressions. Conservation ditches of 1.5 m width will be constructed in areas having less than 10 % slope. On slopes exceeding 10 percent, the width of conservation ditch will be reduced and number increased accordingly. Check dams may be provided in gullies, if needed in lieu of ditches, within the same cost. Pasture grasses and legumes will be sown in the entire area.

Weeding and hoeing will be done to help establishment of pasture. Suitable organic manures will be applied. After one and a half year the fence will be removed and site will be opened for grazing.

Species recommended for planting

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogonfoveolatus, Sehimanervosum, Heteropogoncontortus, Dichanthiumannulatum, Chrysopogonfulvus, Cynodondactylon, Chrysopogonfulvus,Andropogonpumilus, Brachiariaramosa, Chloris dolichostachya, Cenchrus ciliaris, Themedatriandra, Iseilemalaxum, I. prostratum, Apludamutica, Vetiveriazizanioides,* etc.

Legume:*Alysicarpusrugosus, A. longifolius, Rhynchosia minima, Indigoferaglandulosa, Rhynchosia capitata, Stylosantheshamata*, etc.

Important elements of the model (ha^{-1}):

Fencing: Cattle-proof trench with bio-fence.
Conservation ditches 150 m length, 1.5 m width and 60 cm depth on slopes less than 10 %. On greater slope, the width of ditches will be decreased to suit the slope and total length will be increased.
Grass and legume sowing in entire area.

Table 7.34. Budget norm for YM/MP/NL/09

Particular	**Quantity ha^{-1}**	**Rate**	**Rs. ha^{-1}**
Advance work			

Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Cleaning of area by cutting bushes	1 ha	4 mdays ha^{-1}	1,232.00
Conservation ditches total 150 m length, 1.5 m width and 60 cm depth or equivalent volume (less width and more length on sites with >10 per cent slope)	135 m^3	Lumpsum	12,000.00
Making of inspection path 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
Contingency			400.00
Total			12,006.61 **or 12,007**
Planting year			
Seed of pasture grasses and legumes for sowing on and around conservation ditches	2 kg	120 kg^{-1}	240.00
Sowing of grass seed on and around conservation ditches	750 m^2	Lump sum	120.00
Application of manure, AM, micronutrients		Lump sum	70.00
Contingency		Lump sum	300.00
Total			**730.00 or 730**

Maintenance cost			
Year 3	Maintenance		**750**
Year 4	Maintenance		**750**
Year 5	Maintenance		**750**

Table 7.35. Cost summary for YM/MP/NL/09

Year	**Rs. ha^{-1}**
Year 1 (Advance work)	12,007
Year 2 (Planting and establishment)	730
Year 3 (1st maintenance)	730
Year 4 (2nd maintenance)	730
Year 5 (3rd maintenance)	730
Total	**14,927**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/MP/NL-10: Treatment of gullies and slopes through vegetative measures with soil and moisture conservation

There are many forest areas which are already well vegetated, but are suffering from problem of gully erosion in some spots. Gully plugs and earthen check dams will be prepared in places of problem. Steep slopes are also cause of erosion in some spots; slopes will be broken through contour bund or contour trench. Earthen check dams will be constructed in gullies. The quantity

of these need-based works will vary with site. Sowing of seeds of trees, shrubs and grasses will be done on the earthen check dams, contour bunds and trenches.

Species recommended

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree and shrub: *Azadirachta indica, Madhuca indica, Anogeissus latifolia, Acacia nilotica, Dalbergia sissoo, Albizia lebbeck, Emblica officinalis, Pithecellobium dulce, Terminalia alata, Terminalia chebula, Terminalia arjuna, Brideliaretusa, Holoptelea integrifolia, Bombax ceiba, Acacia nilotica, Acacia catechu, Ziziphus nummularia, Pithecellobium dulce, Agave sisalana,* etc.

Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.

Grass: *Saccharum bengalense, Aristida adscensionis, Eremopogon foveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apludamutica, Vetiveria zizanioides,* etc.

YM/MP/NL/10/A: Earthen check dam

YM/MP/NL/10/B: Contour trench

YM/MP/NL/10/C: Contour bund

Table 7.36. Budget norm for YM/MP/NL/10/A to YM/MP/NL/10/C

Sub-model	Cost of soil work (Rs.)	Cost of seed and sowing	Estt. cost	Maint. cost (yr^{-1})	Total cost (Rs. m^{-3} or ha)
YM/MP/NL/10/A Earthen check dam 3m x 0.60 m x 0.45 m size; quantity as per requirement of particular site (200 no. or 162 m^3 earthen check dams will be equivalent to 1 ha)	Rs. 185 m^{-3} (or Rs. 29,970 ha^{-1}) Rs. 105 m^{-3} (or Rs. 21,000 ha^{-1})	Rs. 18 m^{-3} (or Rs. 2,916 ha^{-1})	Rs. 203 m^{-3} (or Rs. 32,886 ha^{-1})	Rs. 20 m^{-3} (or Rs. 3,240 ha^{-1}) x 5 years = 100 m^{-3} or 16,200 ha^{-1}	Rs. 303 m^{-3} (or Rs. 49,086 ha^{-1})
YM/MP/NL/10/B Contour trench 3 m x 0.45 m x 0.45 m size; quantity as per requirement of particular site (200 trenches or 121.5 m^3 will be equivalent to 1 ha)	Rs. 102 m^{-3} (or Rs. 12,393 ha^{-1})	Rs. 10 m^{-3} or Rs. 1,215 ha^{-1}	Rs. 112 m^{-3} or Rs. 13,608 ha^{-1}	Rs. 11.20 m^{-3} or Rs. 1,360.80 ha^{-1} x 5 years = Rs. 56.00 m^{-3} or Rs. 6,804 ha^{-1}	Rs. 168 m^{-3} or Rs. 20,412 ha^{-1}
YM/MP/NL/10/C Contour bund (40 cm +20 cm)/2 x 25 cm x 1m; quantity as per requirement of particular site (1000 m or 75 m^3 bunds will be equivalent to 1 ha)	Rs. 11.19 m^{-1} (or Rs. 11,190 ha^{-1})	Rs. 3.47 m^{-1} (or Rs. 3,470 ha^{-1})	Rs. 14.66 m^{-1} (or Rs. 14,660 ha^{-1})	Rs. 1.466 m^{-1} (or Rs. 1,466 ha^{-1}) x 5 years = 7.33 m^{-1} or 7,330 ha^{-1}	Rs. 21.99 m^{-1} (or Rs. 21,990 ha^{-1})

Table 7.37. Cost summary for YM/MP/NL/10/A to YM/MP/NL/10/C (Rs. m^{-3})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/MP/NL/10/A Earthen check dam						
32,886	3,240	3,240	3,240	3,240	3,240	49,086
YM/MP/NL/10/B Contour trench						
13,608	1,360.80	1,360.80	1,360.80	1,360.80	1,360.80	20,412
YM/MP/NL/10/CContour bund						
14,660	1,466	1,466	1,466	1,466	1,466	21,990

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

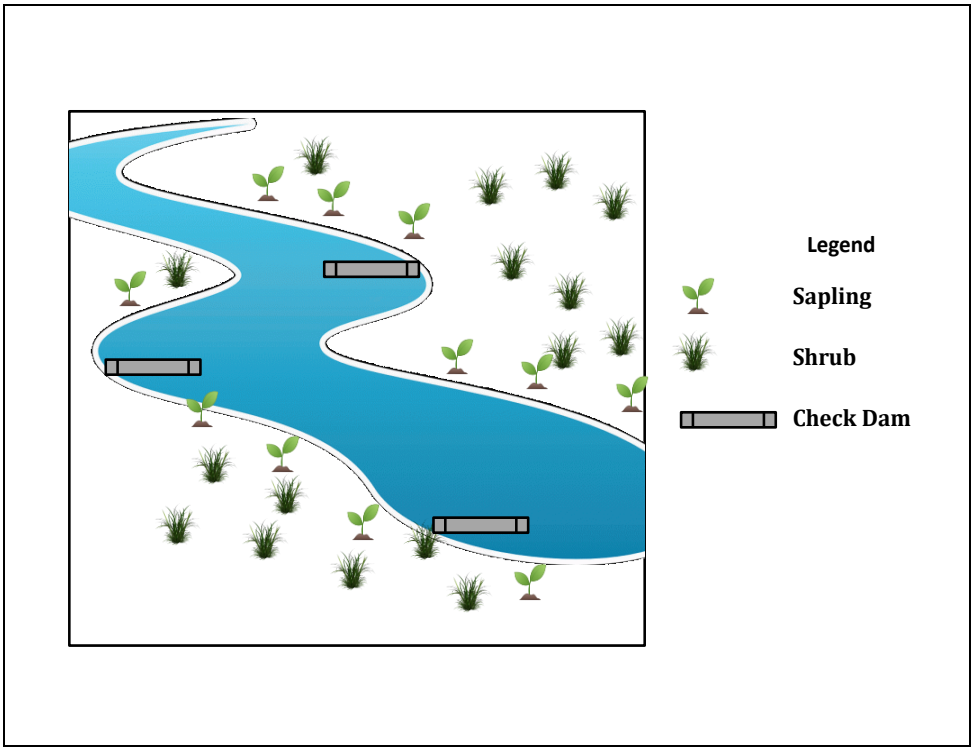


Fig 7.20. Illustration of treatment of gullies and slopes through vegetative measures with soil and moisture conservation

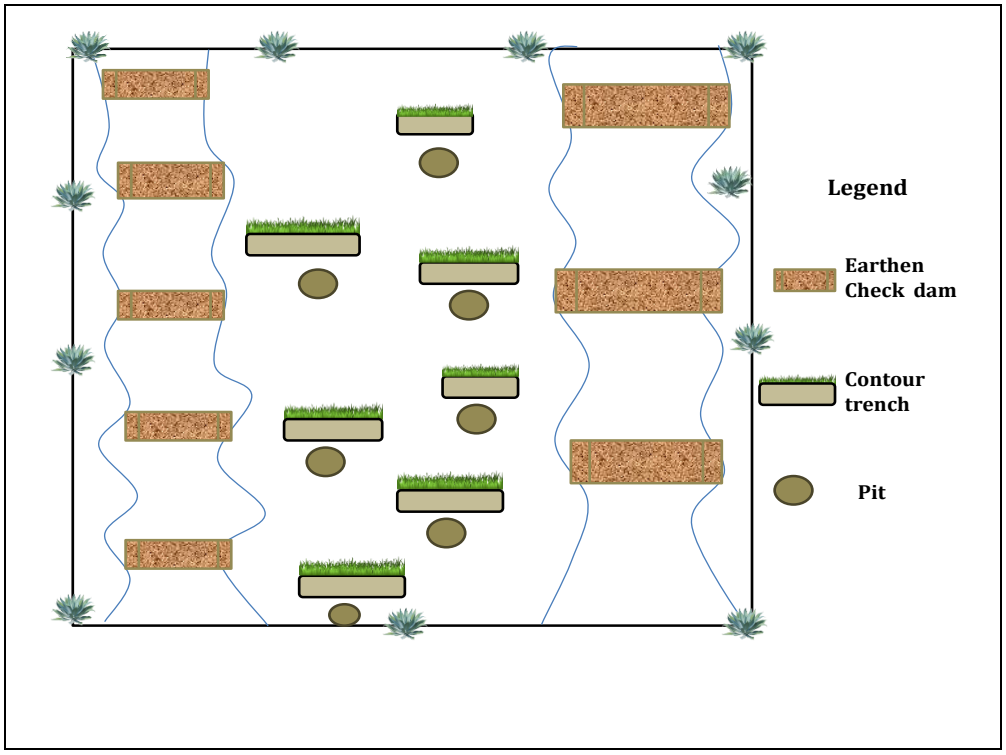


Fig. 7.21. Illustration of earthen check dam

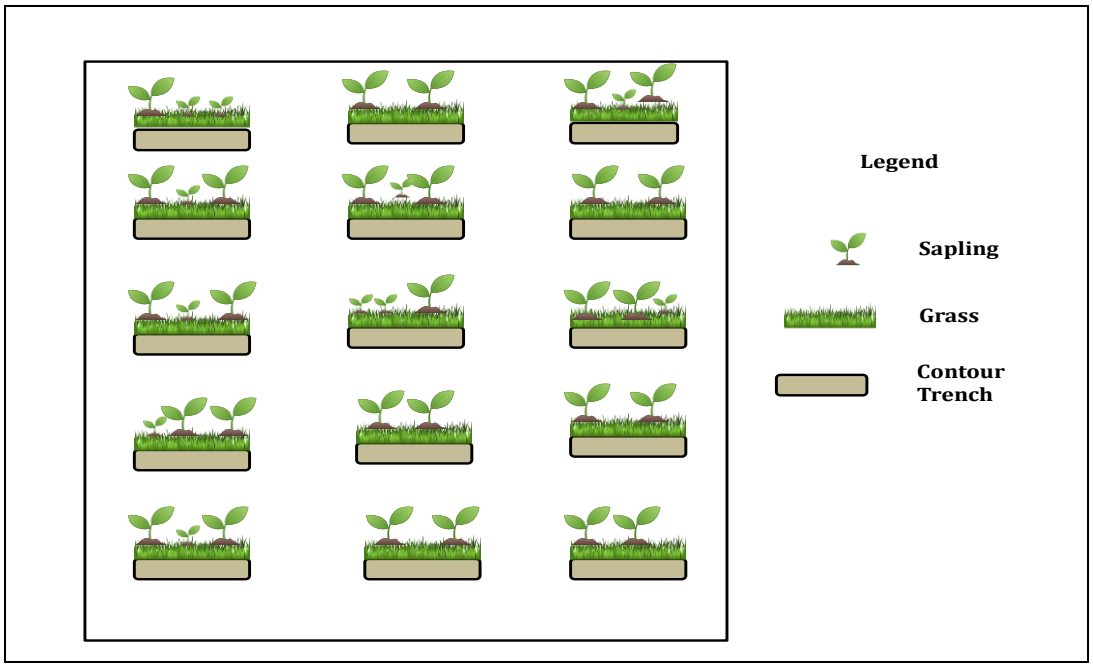


Fig.7.22. Illustration of contour bunding

YM/MP/NL/11: Ecorestoration by Eco Task Force

Ecological units of the Indian Territorial Army, called Eco Task Force (ETF), have been carrying out afforestation works in difficult and inaccessible areas for over last three decades. These are manned by a mixture of regular army personnel and young ex-service men. ETFs are funded by state governments and the Ministry of Environment, Forest and Climate Change, GoI. The ETFs, through tree plantation, have performed admirably in restoration of sites affected by mining in the Mussoorie hills of Uttarakhand, sand dune stabilisation in the Thar Desert of Rajasthan and

afforestation in harsh sites in other states such as Himachal Pradesh, Assam, etc. ETFs are effectively carrying out plantation works at sites allotted by Uttar Pradesh SFD along the Ganga River near Prayagraj.

It is proposed that inhospitable sites in difficult terrain measuring 800 ha will be assigned by SFD to Eco-Tack Force for carrying out afforestation activities. Models under natural landscape or their combinations suitable to the area, will be implemented.

Cost: Rs. 2,40,000 ha^{-1} is proposed tentatively.800 ha is proposed to be treated in the state.

Table 7.38. Cost summary for YM/MP/NL/11

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
2,30,000	0	0	0	0	0	**2,30,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

7.15. AGRICULTURAL LANDSCAPE

YM/MP/AL/01: Distribution of fruit plants to farmers

Tree planting is expected to benefit the river and general environment of the area in many ways in the long run. Saplings of plants are proposed to be distributed to farmers for planting in their private agricultural land in the riverscape. The aftercare of plants will be done by the farmers.

Trees in private land are grown by farmers in the form of block plantation (either in association with agricultural crop or, alternatively, without agricultural crop i.e. as solo crop) or in form of bund plantation (always in association with agricultural crops).

Under this model, fruit plants will be distributed to farmers which will be planted and maintained by the beneficiary farmers themselves. Fruit plants will be supplied with the help of the state's horticulture department. Payment to farmers will be made by the SFD through National Savings Certificate on the basis of survival achieved.

Plant species recommended

Fruit species of the area recommended by Agriculture Department /Horticulture Department will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree/shrub: Grafted plants of horticultural varieties of *Emblica officinalis, Ziziphus nummularia*, *Carissa carandas, Citrus* spp., *Mangiferaindica*, etc.

Budget norm for YM/MP/AL/01 (Rs. ha^{-1})

Cost of tree sapling, including carriage to village (Year 1): Rs. 75 plant^{-1}.
Planting and maintenance cost during planting year (Year 1): Rs. 50 plant^{-1}.
Maintenance cost in Year 2: Rs. 25 plant^{-1}.
Maintenance cost in Year 3: Rs. 20 plant^{-1}.Maintenance cost in Year 4: Rs. 15 plant^{-1}.
Maintenance cost in Year 5: Rs. 10 plant^{-1}.
i.e. Rs. 195 plant^{-1}**or Rs 97,500 ha^{-1}.**

Table 7.39. Cost summary for YM/MP/AL/01 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
62,500	12,500	10,000	7,500	5,000	**97,500**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

YM/MP/AL/02: Distribution of forestry plants to farmers

This model is similar to YM/MP/AL/01 except that instead of horticultural species, the forestry species will be distributed to farmers.

Plant species recommended

Native species of the area prescribed in the Working Plan will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Tree: *Azadirachta indica, Moringa oleifera, Sesbania grandiflora, Schleichera oleosa, Pithecellobium dulce, Brideliaretusa, Holoptelea integrifolia, Pongamia pinnata, Dalbergia sissoo, Syzygium cumini, Madhuca latifolia, Tectona grandis, Feronia limonia, Tecomella undulata*, etc.

Budget norm for YM/MP/AL/02 (Rs. ha^{-1})

Cost of tree sapling, including carriage to village (Year 1): Rs. 50 plant^{-1}.
Planting and maintenance cost during planting year (Year 1): Rs. 50 plant^{-1}.
Maintenance cost in Year 2: Rs. 25 plant^{-1}.Maintenance cost in Year 3: Rs. 25 plant^{-1}.Maintenance cost in Year 4: Rs. 25 plant^{-1}.
Maintenance cost in Year 5: Rs. 25 plant^{-1}. **i.e. Rs. 200** plant^{-1}**or Rs 1,00,000ha^{-1}.**

Table 7.40. Cost summary for YM/MP/AL/02 (Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Total
50,000	12,500	12,500	12,500	12,500	**1,00,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

7.16. URBAN/PERI-URBAN LANDSCAPE

YM/MP/UL/01: Ecopark

Eco-park is a mini ecological park or an amusement park created without hampering the natural environment of the area. Generally a particular area of a forest is demarcated and brought under intensive management for this purpose and the beauty offered by the nature is opened to the visitors. Sometimes forest areas having special natural features are selected for eco-park development. Landscaping and beautification is proposed to be done for urban and peri-urban landscapes of frequent public visitation to bring forth aesthetics and entertainment coupled with natural awareness. The natural layout of the land will be manoeuvred in such a way that the aesthetic beauty will be enhanced without much investment. Landscaped area will be designed to afford good soil, moisture and biodiversity conservation.*Nakshatra vatika, Rashivatika, Nav-grahvatika, Panchvativatika, Dhanvantrivatikas* will be established within the park for awareness generation, yoga, meditation and spiritual fulfilment. Site-specific activities will be carried out at different places in harmony with the site conditions. An eco-park will have better facilities than riverfront development to facilitate the visitors.

The proportion of ornamental plants will be relatively more in eco-park than in the riverfront development model. An eco-park may have vegetative and non-vegetative components:

Vegetative part: Miscellaneous ornamental species.

Non-vegetative part: Fencing, stairs, pathways, walking trails, stone pitching, rain shelter, benches, public utilities, parking area, information centre, children playing area, pond beautification, landscaping etc. as per site-specific requirement.

List of illustrative plant types for plantation miscellaneous/ ornamental plants:
Lawn grasses, hedge plants, shrubs, creepers, hanging plants, grove of ornamental trees, fruit trees and ornamental bamboos, flowering herbs/shrubs, cacti, ferns, palms, aquatic plants, medicinal plants .

Species recommended for planting

Tree and shrub: *Azadiracht aindica, Madhuca indica, Anogeissus latifolia, Acacia nilotica, Dalbergia sissoo, Albizia lebbeck, Emblica officinalis, Pithecellobium dulce, Terminalia tomentosa, Terminalia chebula, Terminalia arjuna, Syzygium cumini, Bridelia retusa, Holoptelea integrifolia, Bombax ceiba,* etc.
Bamboo: *Dendrocalamus strictus, Bambusa bambos,* etc.
Grass: *Saccharum munja, Aristida adscensionis, Eremopogon faveolatus, Sehima nervosum, Heteropogon contortus, Dichanthium annulatum, Chrysopogon fulvus, Cynodon dactylon, Chrysopogon fulvus, Andropogon pumilus, Brachiaria ramosa, Chloris dolichostachya, Cenchrus ciliaris, Themeda triandra, Iseilema laxum, I. prostratum, Apludamutica, Vetiveria zizanioides,* etc.

Table 7.41.Budget norm for YM/MP/UL/01(Rs. ha^{-1})

Model	Estt. cost (Rs. in lakh ha^{-1})	Maint. cost (Rs. in lakh ha^{-1})	Total cost (Rs. in lakh ha^{-1})
Eco-park development	25.00	7.20 (12,000 mo^{-1} for 5 yr)	**32.20**

Table 7.42.Cost summary for YM/MP/UL/01(Rs. ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
25,00,000	1,44,000	1,44,000	1,44,000	1,44,000	1,44,000	**32,20,000**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig.7.23. Illustration of eco-park development

YM/MP/UL/02: Floodplain treatment

Floodplain sites near the river are available where loose, sandy soil is found with gravel and boulder. The soil is very poor in fertility and is frequently inundated by water from the river. Grazing incidence is high. Raising of trees is quite difficult in such conditions. Under this model, water-tolerant or water-loving grasses such *Saccharum* and thorny shrubs/small trees such as *Acacia catechu*, will be established by planting slips of the grass species and dibbling of seeds on such sites. The area will not be fenced. The existing vegetation will not be removed. The seedlings already growing in the area will be protected from animals by surrounding them with pile of brushwood. 8,000 plants of grass will be planted per ha. Pits in this model will be dug at time of planting (not in advance).

Species recommended for planting

Native species of the area, as are prescribed in the Working Plan, will be planted in the model. Few examples of species for the purpose of illustration are as follows:

Grass: *Saccharum bengalense, Saccharum spontaneum, Scirpusaffinis, Cyperus eleusinoides, Cyperus exaltatus, Arundo donax, Phragmites karka, Themeda arundinacea, Vetiveria zizanioides, Cymbopogon flexuosus, Desmostachyabi pinnata, Dichanthium annulatum, Pseudosorghum fasciculare, Cymbopogon jwarancusa, Hygroryza aristata, Panicum paludosum,*etc.

Tree and shrub: *Acacia catechu, Acacia nilotica, Vitex negundo,* etc.

Important elements of the model (ha^{-1}):

Plants per ha: 8,000 plants of grass; dibbling of seeds of shrubs/small thorny trees at 4,000 points

Table 7.43. Budget norm for YM/MP/UL/02

Particular	Quantity ha^{-1}	Rate	Rs. ha^{-1}
Advance work			
Survey and demarcation of area	1 ha	0.45 mdays ha^{-1}	138.60
Cleaning of plantation area by cutting bushes (excluding *Lantana*)	1 ha	4 mdays ha^{-1}	1,232.00
Making of inspection path			
a) 3 m wide path upto plantation for jeep	25 m	30.65 mdays km^{-1}	236.01
b) 1 m wide path inside plantation	50 m	Lump sum	110.00
Plantation sign board (per 25 ha)	1	3,500/25 ha	140.00
Miscellaneous			500.00
Total			986.01 **or 986**
Planting year			
Sowing of seed			
a) Sowing of seed of trees/shrubs	4,000 no.	0.2 mdays/100	2,464.00
b) Sowing of seeds of grasses	8,000 no.	0.16 mdays/100	3,942.40
Re-sowing of seeds of a and b			3,968.56
a) Sowing of seed of trees/shrubs at half of above quantity	2,000 no.	0.2 mdays/100	1,232.00
b) Sowing of seeds of grasses at half of above quantity	4,000 no.	0.16 mdays/100	1,971.20
Making of thawla around existing plants	300 no.	Lump sum	900.00
Application of manure	1 ha	Lump sum	2,000.00
Weeding, hoeing in grass and seedlings area (two times)	1 ha x 2	Lumpsum	600.00
Watch and ward for 9 months (average 12h sunrise to sunset, everyday, for 50 ha instead of 26 d mo^{-1} x 8 h)	9 months	10.80 mdays yr^{-1}	2,494.80
Contingency	Lump sum		500.00
Total			20,072.96 **or 20,073**

Maintenance cost			
Year 3			
Weeding and hoeing in grass and seedlings area	1 ha x 2	Lumpsum	600.00

(two times)			
Irrigation in grass and seedlings area (two times)	1 ha x 2	Lumpsum	2,000.00
Application of manure to pasture grass	250 m^2	Lump sum	50.00
Watch and ward for 12 months (average 12 hs sunrise to sunset, everyday, for 50 ha instead of 26 d mo^{-1} x 8 hs)	12 months	10.80 mds yr^{-1}	3,326.40
Contingency		Lumpsum	500.00
Total			6,476.40 **or 6,476**
Year 4			
Contingency			500.00
Watch and ward for 12 months (average 12 hrs sunrise to sunset, everyday, for 10 ha)	12 months	10.80 mds yr^{-1}	3,326.40
Total			3,826.40 **or 3,826**
Year 5			**3,326**

Table 7.44. Cost summary for YM/MP/UL/02

Year	Rs. ha^{-1}
Year 1 (Advance work)	986
Year 2 (Planting and establishment)	20,073
Year 3 (1st maintenance)	6,476
Year 4 (2nd maintenance)	3,826
Year 5 (3rd maintenance)	3,326
Total	**34,687**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

7.17. CONSERVATION INTERVENTIONS

YM/MP/CI/01: Water storage bodies/structures

Katcha pond, dabradabri, pitched pond, percolation tank and similar traditional water storage bodies or structures will be created in forest areas where sites have been proposed by the forest department. The stored water will increase ground water recharge, reduce problem of soil erosion, provide drinking water for animals and improve the site quality. Planting work will not be done on these structures.

YM/MP/CI/01/A: *Kachcha* pond, *dabradabri*

YM/MP/CI/01/B: Pitched pond

YM/MP/CI/01/C: Percolation tank

Table 7.45. Budget norm for YM/MP/CI/01/A to YM/MP/CI/01/C

Model code	Model name	Estt. cost (Rs. m^{-3})	Maint.cost (Rs. m^{-3})	Total cost (Rs. m^{-3})
YM/MP/CI/01/A	*Kachha* pond, *dabra dabri*	100(manual digging) (1 m^3=1,000 L)	25 (5 yr^{-1} x 5 yrs)	**Rs. 125 m^{-3}**
YM/MP/CI/01/B*	Pitched pond	Site-specific requirement	Site-specific requirement	**Site-specific cost**
YM/MP/CI/01/C	Percolation tank	100 (manual digging) (1 m^3=1,000 L)	25 (5 yr^{-1} x 5 yrs)	**Rs. 125 m^{-3}**

*Requirement was given by SFD in monetary terms as rates vary widely with site and specifications

Table 7.46. Cost summary for YM/MP/CI/01/A to YM/MP/CI/01/C (Rs./m^3)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/MP/CI/01/A						
100	5	5	5	5	5	**125**
YM/MP/CI/01/B						
80% of amount demanded	-	-	10% of amount demanded	-	10% of amount demanded	**Site-specific cost**
YM/MP/CI/01/C						
100	5	5	5	5	5	**125**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 7.24. Percolation tank
(*Source:* ICAR-IISWC, Dehradun)

YM/MP/CI/02: Managing water flow, soil moisture and sedimentation

There are several sites where problem of soil erosion is present. The loose soil shows incidence of erosion of the upper soil layer and/or gully formation. Loose boulder check dam, anicut, stopdam, *kharanja*, wall etc. will be created where they are expected to be effective. Planting of trees will not be done on these structures. The remaining forest area surrounding the structures will not be treated. These interventions will be carried out as per rates existing at the site, some of which are too complex to be generalised as they depend on location and detailed specifications of the structure.

An anicut is like a check dam but it is a masonry structure constructed across a stream to collect water for regulating its flow (Fig. 7.25.). A *kharanja* is a path made of brick or stone joined by cement and supported on *murrum* (local name of laterite soil) at the base (Fig. 7.26.). A *rapta* is a path made of reinforced cement (Fig. 7.27.). Both these structure are constructed in the forest to facilitate movement of vehicles and personnel on soft wet soil.

Table 7.47. Budget norm for YM/MP/CI/02

Model	Estt. cost (Rs. m^{-3})	Maint. cost (Rs. m^{-3})	Total cost (Rs. m^{-3})
YM/MP/CI/02/A Loose boulder check dam/structure 3m x 0.60 m x 0.45 m size; quantity as per requirement of particular site (200 no. or 162 m^3 earthen check dams will be equivalent to 1 ha)	308	15.40 x 5 yrs= 77	**385**
YM/MP/CI/02/B* SMC - Anicut	Site-specific requirement	Site-specific requirement	**Site-specific cost**
YM/MP/CI/02/C* SMC - Stopdam	Site-specific requirement	Site-specific requirement	**Site-specific cost**
YM/MP/CI/02/D* SMC - *Kharanja* (brick/stone passage)	Site-specific requirement	Site-specific requirement	**Site-specific cost**
YM/MP/CI/02/E* SMC – *Rapta* (causeway)	Site-specific requirement	Site-specific requirement	**Site-specific cost**
YM/MP/CI/02/F* Protection wall	Site-specific requirement	Site-specific requirement	**Site-specific cost**
YM/MP/CI/02/G* Mixed soil and moisture conservation (*mrida jal sanrakshan*)	Site-specific requirement	Site-specific requirement	**Site-specific cost**

*Requirement was given by SFD in monetary terms as rates vary widely with site and specifications

Table 7.48. Cost summary for YM/MP/CI/02 (Rs. m^{-3})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
YM/MP/CI/02/A						
308	15.40	15.40	15.40	15.40	15.40	**385**
YM/MP/CI/02/B to YM/MP/CI/02/G						
80% of amount demanded	-	-	10% of amount demanded	-	10% of amount demanded	**Site-specific cost**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.



Fig. 7.25. Conservation intervention through anicut
(***Source:*** Project Team**)**



Fig. 7.26. View of a *kharanja*
(***Source:*** Madhya Pradesh Forest Department**)**



Fig. 7.27. View of a *rapta*
(***Source:*** Madhya Pradesh Forest Department**)**

YM/MP/CI/03: Rehabilitation of soil and moisture conservation structures

This model will be deployed in all such sites in forest areas in the riverscape where no other model is proposed to be used. Soil and moisture conservation is crucial to river rejuvenation as it increases percolation of water in the soil and reduces surface runoff and soil erosion thereby prolonging retention of water in the catchment area, improvement of environmental flow and improvement of quality of water. This indirectly ameliorates site quality which in turn results in improvement of natural regeneration, plant survival and growth, and enhancement of forest productivity and biodiversity conservation. Soil and moisture conservation structures have direct, definite and immediate effect on water quality and quantity. The soil and moisture structures in several forest areas are quite old or inadequate and need repair /strengthening. This model aims to strengthen the soil and water conservation measures in different areas in the riverscape at a modest scale through need-based repair/ development of low-cost structures such as contour trenches, contour bunds, loose boulder check dams, earthen check dams, brushwood check dams, ponds, gully plugs, percolation tanks, etc. The forest area in the riverscape in the state (2 km wide strip of land beyond maximum flood zone along the Chambal, Betwa, Ken and Sind on both sides) which is not proposed to be treated by any other treatment model, is about 2,30,000 ha. This extent of area is proposed to be treated under this model (this model will serve as a default model) with a tentative amount of Rs. 6,600/ha, or other suitable rate to be suggested by the state. Different rates can be prescribed for different site conditions, if deemed appropriate.

Table 7.49. Budget norm for YM/MP/CI/03

Model	**Year 1 (Rs. ha^{-1})**	**Year 2 to 6 (Rs. ha^{-1})**	**Total cost (Rs. ha^{-1})**
YM/MP/CI/03: Rehabilitation of soil and water conservation structures	4,600	2,000 (400 yr^{-1} for 5 yrs)	**6,600**

Table 7.50. Cost summary for YM/MP/CI/03(Rs.ha^{-1})

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
4,600	400	400	400	400	400	**6,600**

Note: The activities and quantities prescribed in the model may be altered as per the site availability and site conditions, if required but within the given cost.

7.18. SUPPORTING ACTIVITIES

Other activities such as awareness generation, capacity building, monitoring, research, nursery development, development of value chain, protection against fire, etc. are essential to facilitate the forestry interventions and are considered vital for successful and effective execution of proposed forestry interventions.

The strategies and specific interventions for these important supporting activities are provided in Volume 1 of the DPR.

A multi-tiered mechanism has been suggested for monitoring of the project (Fig. 7.28.).

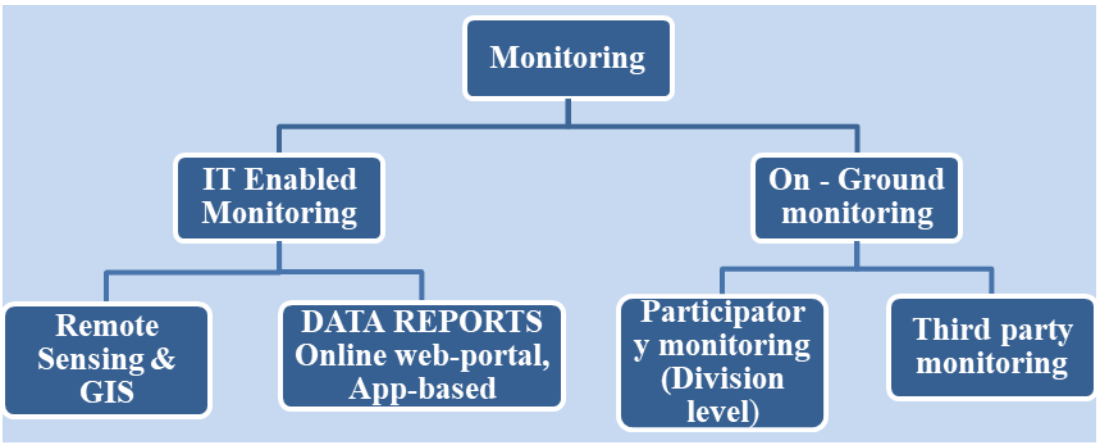


Fig. 7.28. A multi -tiered monitoring mechanism for forestry interventions for Rejuvenation of Yamuna River

7.19. BUDGET ESTIMATE

The physical and financial projections for all the interventions, supporting activities to be undertaken for the cost, duration as well as various divisions in Madhya Pradesh are given in Table 7.51. to 7.68. The total budget proposed for the Implementing Agency in the state of Madhya Pradesh is Rs. 59,309.33 lakh for the project.

Indexing of cost

The budget for the project has been prepared on the basis of rates applicable during April 2020. The cost of the project may be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI).

Table 7.51. Component/Activity-wise Budget Allocation for Madhya Pradesh

S. no.	Component and /or Activity	Amount (Rs. in lakh)	Allocation (%)
Implementation of forestry interventions in riverscape area in Madhya Pradesh		**59,309.33**	**100.00**
A.	**Plantations and treatment models in three categories of landscape**	**36,078.70**	**60.83**
A.1	Natural Landscapes	19,423.32	
A.2	Agriculture Landscapes	16,443.40	
A.3	Urban and Peri-Urban Landscapes	211.98	
B.	**Conservation interventions**	18,144.23	**30.59**
	Total	**54,222.93**	
C.	**Supporting activities**	**5,086.40**	**8.58**
C.1	Awareness generation, research activities, capacity building, value-chain development, nursery establishment/Improvement, fire protection, monitoring and evaluation, etc.	**3,504.40**	
C.2	Field activities, contingency and miscellaneous expenses	**725.00**	
C.3	Cost of PMU in Madhya Pradesh	**857.00**	

Perusal of Table 7.51. reveals that Rs. 36,078.70 lakh which is 60.83% of the total budget has been allocated for plantations and treatment models in three landscapes while Rs. 18,144.23 lakh is provisioned for Conservation interventions. For supporting activities like awareness generation, research activities, capacity building, nursery establishment/improvement, fire protection, monitoring and evaluation, etc. an amount of Rs. 5,086.40 lakh is allocated. A sum of Rs. 725 lakh is provided for field activities, contingency, etc. while Rs. 857 lakh is earmarked for Project Management Unit in the state (Table 7.52.).

Forestry interventions in the three landscapes will cover an area of 38,238.87 ha and Conservation interventions would be carried out on 9,515.73 ha area in Madhya Pradesh (Table 7.53).

Table 7.52. Year-wise cost summary for supporting activities (cost Rs. in lakh)

S. no.	Particular	1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	Total
	Supporting Activity						
1	Awareness generation, research activities, capacity building, value-chain development, nursery establishment/ Improvement, fire protection, monitoring and evaluation, etc.	**1,080.00**	**760.00**	**720.00**	**540.00**	**404.40**	**3,504.40**
2	Field activities, contingency and miscellaneous expenses	160.00	160.00	160.00	130.00	115.00	**725.00**
3	Cost of PMU in Madhya Pradesh	240.00	235.00	154.00	114.00	114.00	**857.00**
	Total	**1,480.00**	**1,155.00**	**1,034.00**	**784.00**	**633.40**	**5,086.40**

Table 7.53. Plantation/treatment area summary for Forestry interventions (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II	No. of
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**sites**
Natural	15,814.30	6,778.37	15,814.30	815.20	22,592.67	23,407.87	23,119.87	23,407.87	17,233.87	281
Agriculture	4,000.00	6,000.00	4,000.00	5,000.00	10,000.00	15,000.00	15,000.00	15,000.00	11,000.00	2
Urban	125.00	0.00	125.00	0.00	125.00	125.00	125.00	125.00	5.00	2
Conservation	8,887.69	694.54	8,887.69	0.00	9,515.73	9,515.73	9,515.73	9,515.73	9,515.73	243
Total	**28,826.99**	**13,472.91**	**28,826.99**	**5,815.20**	**42,233.40**	**48,048.60**	**47,760.60**	**48,048.60**	**37,754.60**	**528**

Table 7.54. Cost summary for Forestry interventions (Rs. in lakh)

	Year1	Year 2		Year 3		Year 4	Year 5	Phase I			Phase II	Grand
Landscape	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Est.**	**Maint.**	**Total**		**total**
Natural	7,029.83	2,551.93	1,489.55	573.76	2,548.81	2,022.51	1,642.06	10,155.52	7,702.92	17,858.45	1,564.87	19,423.32
Agriculture	2,250.00	3,543.75	525.00	3,100.78	1,323.00	1,967.92	1,838.44	8,894.53	5,654.36	14,548.90	1,894.50	16,443.40
Urban	126.18	0.00	32.85	0.00	16.51	13.65	13.60	126.18	76.61	202.79	9.19	211.98
Conservation	12,028.73	263.78	991.64	0.00	1,041.68	1,232.71	1,185.34	12,292.51	4,451.38	16,743.88	1,400.35	18,144.23
Total	**21,434.74**	**6,359.46**	**3,039.04**	**3,674.54**	**4,930.00**	**5,236.79**	**4,679.45**	**31,468.74**	**17,885.27**	**49,354.02**	**4,868.91**	**54,222.93**

Table 7.55. Year-wise cost summary for C.1 supporting activities (Cost Rs.in Lakhs)

S. no.	Supporting Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Awareness generation	100.00	120.00	100.00	50.00	40.00	**410.00**
2	Capacity building and value-chain development	120.00	140.00	120.00	50.00	40.00	**470.00**
3	Entry point activities	500.00	0.00	0.00	0.00	0.00	**500.00**
4	Nursery improvement and fire protection	100.00	120.00	120.00	120.00	80.00	**540.00**
5	Research	100.00	120.00	120.00	100.00	60.00	**500.00**
6	Monitoring and evaluation	160.00	260.00	260.00	220.00	184.40	**1,084.40**
	Total	**1,080.00**	**760.00**	**720.00**	**540.00**	**404.40**	**3,504.40**

Table 7.56. Year-wise details of C.2 Field activities, contingency and miscellaneous expenses (Cost Rs. in lakh)

S. no.	Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Field activities, contingency and miscellaneous costs	160.00	160.00	160.00	130.00	115.00	**725.00**

Table 7.57. Year-wise details of C.3 PMU (Cost Rs. in lakh)

S. no.	Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Recurring	200.00	225.00	150.00	110.00	110.00	**795.00**
2	Non-recurring	40.00	10.00	4.00	4.00	4.00	**62.00**
	Total	**240.00**	**235.00**	**154.00**	**114.00**	**114.00**	**857.00**

Table 7.58. Area in Natural Landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Phase II**
Ashoknagar	43.00	0.00	43.00	0.00	43.00	43.00	15.00	43.00	15.00
Chhattarpur	640.00	278.00	640.00	0.00	918.00	918.00	918.00	918.00	475.00
Damoh	415.00	280.00	415.00	220.00	695.00	915.00	915.00	915.00	915.00
Datia	2,125.00	1,025.00	2,125.00	0.00	3,150.00	3,150.00	3,150.00	3,150.00	2,850.00
Eco Task Force	800.00	0.00	800.00	0.00	800.00	800.00	800.00	800.00	800.00
Guna	20.00	86.00	20.00	0.00	106.00	106.00	106.00	106.00	106.00
Gwalior	448.00	134.00	448.00	0.00	582.00	582.00	582.00	582.00	582.00
Indore	207.00	200.00	207.00	0.00	407.00	407.00	407.00	407.00	407.00
Madhav National Park	1,215.95	293.19	1,215.95	0.00	1,509.14	1,509.14	1,409.14	1,509.14	384.14
Mandsaur	1,652.95	615.98	1,652.95	0.00	2,268.93	2,268.93	2,153.93	2,268.93	1,143.93
Morena	374.00	162.00	374.00	0.00	536.00	536.00	536.00	536.00	536.00
Neemuch	2,078.00	186.00	2,078.00	0.00	2,264.00	2,264.00	2,264.00	2,264.00	186.00
North Panna	100.00	0.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00
Raisen	20.00	0.00	20.00	0.00	20.00	20.00	20.00	20.00	20.00
Ratlam	195.00	0.00	195.00	0.00	195.00	195.00	150.00	195.00	150.00
Sheopur (T)	3,644.40	2,280.20	3,644.40	595.20	5,924.60	6,519.80	6,519.80	6,519.80	6,519.80
Shivpuri (Terr.)	801.00	270.00	801.00	0.00	1,071.00	1,071.00	1,071.00	1,071.00	936.00
South Panna	955.00	968.00	955.00	0.00	1,923.00	1,923.00	1,923.00	1,923.00	1,108.00
Tikamgarh	80.00	0.00	80.00	0.00	80.00	80.00	80.00	80.00	0.00
Total	**15,814.30**	**6,778.37**	**15,814.30**	**815.20**	**22,592.67**	**23,407.87**	**23,119.87**	**23,407.87**	**17,233.87**

Table 7.59. Area in Agriculture Landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Agri. Lands	4,000.00	6,000.00	4,000.00	5,000.00	10,000.00	15,000.00	15,000.00	15,000.00	11,000.00
Total	**4,000.00**	**6,000.00**	**4,000.00**	**5,000.00**	**10,000.00**	**15,000.00**	**15,000.00**	**15,000.00**	**11,000.00**

Table 7.60. Area in Urban/peri-urban Landscape (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	Phase II
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Maint.**
Chhattarpur	5.00	0.00	5.00	0.00	5.00	5.00	5.00	5.00	5.00
Morena	120.00	0.00	120.00	0.00	120.00	120.00	120.00	120.00	0.00
Total	**125.00**	**0.00**	**125.00**	**0.00**	**125.00**	**125.00**	**125.00**	**125.00**	**5.00**

Table 7.61. Area in Conservation intervention (ha)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I	
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Phase II**
Chhattarpur	43.66	0.00	43.66	0.00	43.66	43.66	43.66	43.66	43.66
Default areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Indore	376.00	0.00	376.00	0.00	376.00	376.00	376.00	376.00	376.00
Madhav National Park	4,609.83	205.50	4,609.83	0.00	4,786.83	4,786.83	4,786.83	4,786.83	4,786.83
Mandsaur	2,068.45	0.00	2,068.45	0.00	2,068.45	2,068.45	2,068.45	2,068.45	2,068.45
Neemuch	104.00	113.00	104.00	0.00	179.00	179.00	179.00	179.00	179.00
Obedullaganj	77.91	0.00	77.91	0.00	77.91	77.91	77.91	77.91	77.91
Ratlam	90.32	91.04	90.32	0.00	181.36	181.36	181.36	181.36	181.36
Sheopur (T)	1,037.60	0.00	1,037.60	0.00	1,037.60	1,037.60	1,037.60	1,037.60	1,037.60
Shivpuri(Terr.)	479.93	285.00	479.93	0.00	764.93	764.93	764.93	764.93	764.93
Total	**8,887.69**	**694.54**	**8,887.69**	**0.00**	**9,515.73**	**9,515.73**	**9,515.73**	**9,515.73**	**9,515.73**

Table 7.62. Cost for natural landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**totalMaint.**	**Maint.**	
Ashoknagar	23.24	0.00	8.91	0.00	8.85	2.76	2.97	23.24	23.49	1.32	48.05
Chhattarpur	214.86	76.98	69.47	0.00	111.55	62.45	51.15	291.84	294.61	35.10	621.55
Damoh	354.16	261.07	142.29	215.38	291.11	295.99	241.42	830.61	970.81	229.57	2,030.99
Datia	1,118.19	557.29	265.69	0.00	428.77	362.80	309.77	1,675.48	1,367.03	333.26	3,375.78
Eco Task Force	1,840.00	0.00	0.00	0.00	0.00	0.00	0.00	1,840.00	0.00	0.00	1,840.00
Guna	17.76	80.18	7.43	0.00	43.13	46.54	18.61	97.94	115.70	27.62	241.27
Gwalior	282.08	89.75	68.73	0.00	96.29	77.41	67.76	371.83	310.18	67.20	749.22
Indore	84.00	75.09	20.47	0.00	47.84	51.63	42.54	159.09	162.49	55.51	377.10
Madhav National Park	159.51	34.41	55.05	0.00	70.22	38.99	11.83	193.93	176.08	3.44	373.45
Mandsaur	379.27	133.11	94.89	0.00	139.34	84.51	69.09	512.38	387.83	52.58	952.79
Morena	238.93	108.10	58.71	0.00	89.45	73.37	62.88	347.03	284.41	66.66	698.10
Neemuch	249.51	23.45	15.93	0.00	18.22	19.13	20.09	272.96	73.37	1.73	348.06
North Panna	64.51	0.00	15.87	0.00	17.27	12.01	11.35	64.51	56.51	8.70	129.72
Raisen	17.76	0.00	7.43	0.00	9.59	3.24	3.96	17.76	24.22	1.77	43.75
Ratlam	36.35	0.00	7.52	0.00	4.91	2.88	2.48	36.35	17.79	2.61	56.75
Sheopur (T)	1,110.31	738.71	343.89	358.38	664.49	605.23	502.80	2,207.40	2,116.41	516.42	4,840.23
Shivpuri (Terr.)	607.60	251.74	248.41	0.00	425.68	245.10	179.10	859.35	1,098.29	139.99	2,097.62
South Panna	222.17	122.04	58.25	0.00	81.47	37.78	43.55	344.21	221.04	21.38	586.64
Tikamgarh	9.61	0.00	0.61	0.00	0.64	0.68	0.71	9.61	2.64	0.00	12.25
Total	**7,029.83**	**2,551.93**	**1,489.55**	**573.76**	**2,548.81**	**2,022.51**	**1,642.06**	**10,155.52**	**7,702.92**	**1,564.87**	**19,423.32**

Table 7.63. Cost for Agriculture landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Total Maint.**	**Maint.**	
Agri. Lands	2,250.00	3,543.75	525.00	3,100.78	1,323.00	1,967.92	1,838.44	8,894.53	5,654.36	1,894.50	16,443.40
Grand Total	**2,250.00**	**3,543.75**	**525.00**	**3,100.78**	**1,323.00**	**1,967.92**	**1,838.44**	**8,894.53**	**5,654.36**	**1,894.50**	**16,443.40**

Table 7.64. Cost for Urban/peri-urban landscape (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**totalMaint.**	**Maint.**	
Chhattarpur	125.00	0.00	7.56	0.00	7.94	8.33	8.75	125.00	32.58	9.19	166.77
Morena	1.18	0.00	25.29	0.00	8.57	5.31	4.85	1.18	44.03	0.00	45.21
Total	**126.18**	**0.00**	**32.85**	**0.00**	**16.51**	**13.65**	**13.60**	**126.18**	**76.61**	**9.19**	**211.98**

Table 7.65. Cost for Conservation intervention (Rs. in lakh)

	Year 1	Year 2		Year 3		Year 4	Year 5	Phase I		Phase II	Grand total
Division	**Est.**	**Est.**	**Maint.**	**Est.**	**Maint.**	**Maint.**	**Maint.**	**Total Est.**	**Total Maint.**	**Maint.**	
Chhattarpur	17.46	0.00	0.92	0.00	0.96	1.01	1.06	17.46	3.95	1.11	22.53
Default areas	10,580.00	0.00	966.00	0.00	1,014.30	1,064.99	1,118.26	10,580.00	4,163.55	1,174.20	15,917.75
Indore	18.80	0.00	0.99	0.00	1.04	1.09	1.14	18.80	4.25	1.20	24.25
Madhav National Park	507.87	74.34	13.16	0.00	14.02	51.93	25.66	582.21	104.77	68.76	755.74
Mandsaur	188.70	0.00	8.23	0.00	8.64	13.70	9.52	188.70	40.09	15.10	243.89
Neemuch	41.60	31.50	0.46	0.00	0.75	5.53	4.66	73.10	11.40	10.64	95.14
Obedullaganj	31.16	0.00	1.64	0.00	1.72	1.80	1.89	31.16	7.05	1.99	40.20
Ratlam	36.13	38.24	0.21	0.00	0.22	4.88	5.78	74.36	11.09	11.48	96.93
Sheopur (T)	415.04	0.00	0.00	0.00	0.00	60.06	0.00	415.04	60.06	66.21	541.31
Shivpuri (Terr.)	191.97	119.70	0.04	0.00	0.04	27.71	17.37	311.67	45.16	49.65	406.48
Grand Total	**1,2028.73**	**263.78**	**991.64**	**0.00**	**1,041.68**	**1,232.71**	**1,185.34**	**12,292.51**	**4,451.38**	**1,400.35**	**18,144.23**

Table 7.66. Division-wise area and cost summary for different landscapes (Area in ha and cost in lakh rupees)

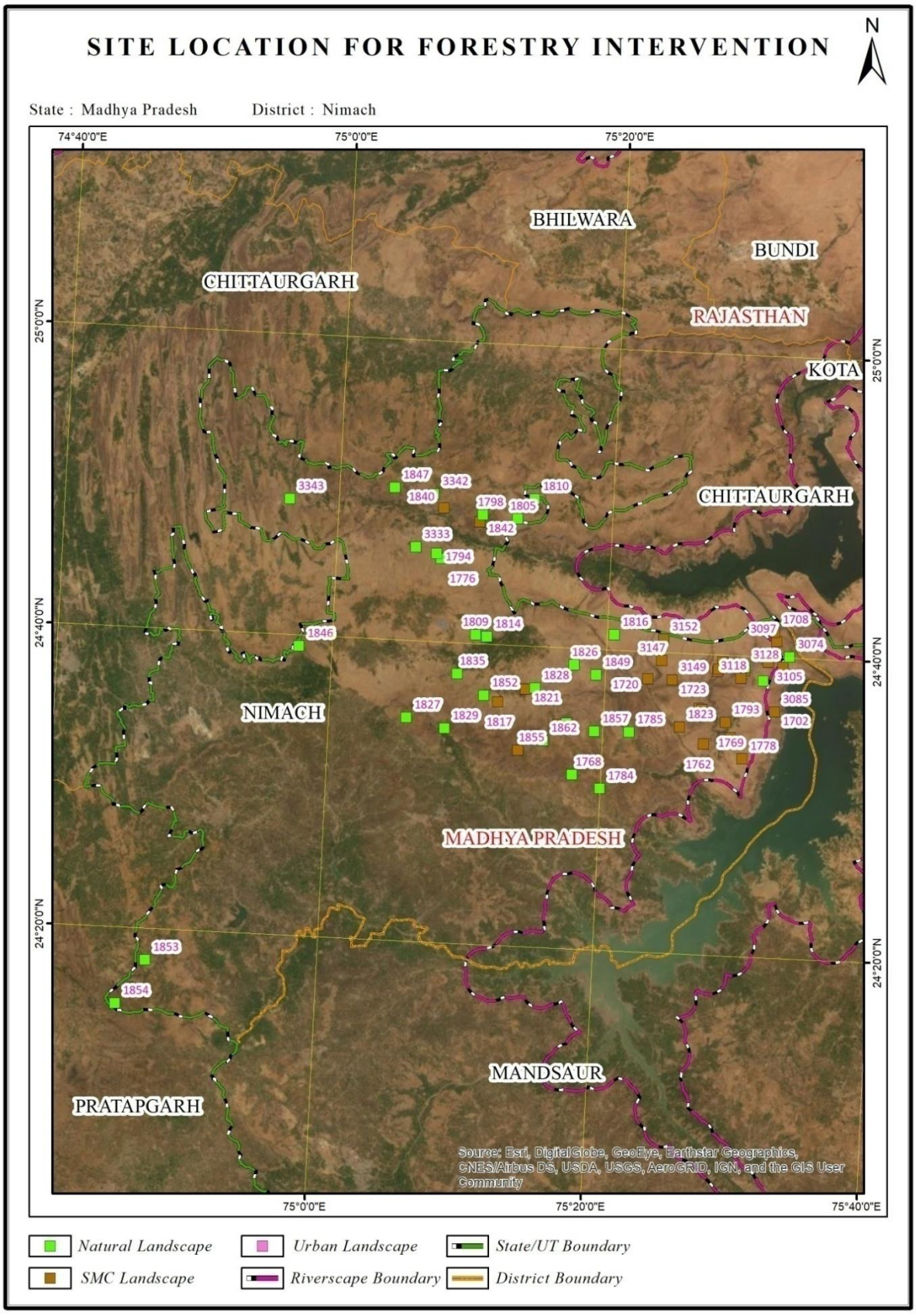
	Natural			Agriculture			Urban/peri-urban			Conservation			Total		
Division	**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**		**Area**	**Cost**	
	Est.	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**	**Est.**	**Est.**	**Maint.**
Agri. Lands	0.00	0.00	0.00	15,000.00	8,894.53	5,654.36	0.00	0.00	0.00	0.00	0.00	0.00	15,000.00	8,894.53	5,654.36
Ashoknagar	43.00	23.24	23.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.00	23.24	23.49
Chhattarpur	918.00	291.84	294.61	0.00	0.00	0.00	5.00	125.00	32.58	43.66	17.46	3.95	966.66	434.30	331.14
Damoh	915.00	830.61	970.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	915.00	830.61	970.81
Datia	3,150.00	1,675.48	1,367.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,150.00	1,675.48	1,367.03
Default areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,580.00	4,163.55	0.00	10,580.00	4,163.55
Eco Task Force	800.00	1,840.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	800.00	1,840.00	0.00
Guna	106.00	97.94	115.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	106.00	97.94	115.70
Gwalior	582.00	371.83	310.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	582.00	371.83	310.18
Indore	407.00	159.09	162.49	0.00	0.00	0.00	0.00	0.00	0.00	376.00	18.80	4.25	783.00	177.89	166.75
Madhav National Park	1,509.14	193.93	176.08	0.00	0.00	0.00	0.00	0.00	0.00	4,786.83	582.21	104.77	6,295.97	776.13	280.86
Mandsaur	2,268.93	512.38	387.83	0.00	0.00	0.00	0.00	0.00	0.00	2,068.45	188.70	40.09	4,337.37	701.08	427.92
Morena	536.00	347.03	284.41	0.00	0.00	0.00	120.00	1.18	44.03	0.00	0.00	0.00	656.00	348.21	328.44
Neemuch	2,264.00	272.96	73.37	0.00	0.00	0.00	0.00	0.00	0.00	179.00	73.10	11.40	2,443.00	346.06	84.77
North Panna	100.00	64.51	56.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	64.51	56.51
Obedullaganj	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.91	31.16	7.05	77.91	31.16	7.05
Raisen	20.00	17.76	24.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	17.76	24.22
Ratlam	195.00	36.35	17.79	0.00	0.00	0.00	0.00	0.00	0.00	181.36	74.36	11.09	376.36	110.72	28.88
Sheopur (T)	6,519.80	2,207.40	2,116.41	0.00	0.00	0.00	0.00	0.00	0.00	1,037.60	415.04	60.06	7,557.40	2,622.44	2,176.47
Shivpuri (Terr.)	1,071.00	859.35	1,098.29	0.00	0.00	0.00	0.00	0.00	0.00	764.93	311.67	45.16	1,835.93	1,171.02	1,143.45
South Panna	1,923.00	344.21	221.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1923.00	344.21	221.04
Tikamgarh	80.00	9.61	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00	9.61	2.64
Total	**23,407.87**	**10,155.52**	**7,702.92**	**15,000.00**	**8,894.53**	**5,654.36**	**125.00**	**126.18**	**76.61**	**9,515.73**	**12,292.51**	**4,451.38**	**48,048.60**	**31,468.74**	**17,885.27**

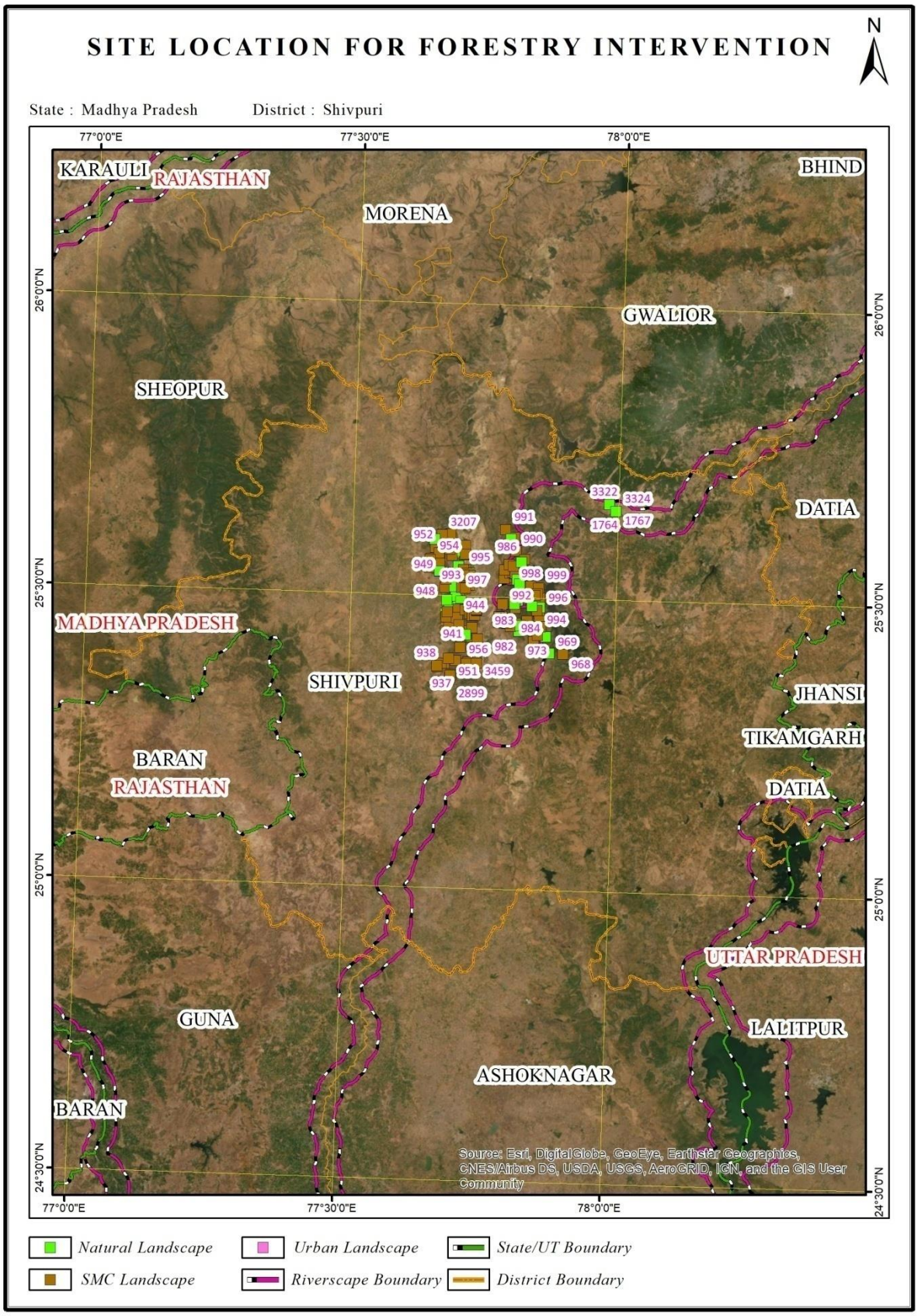
Table 7.67. Division and phase-wise area and cost summary (Area in ha and Cost in lakh rupees)

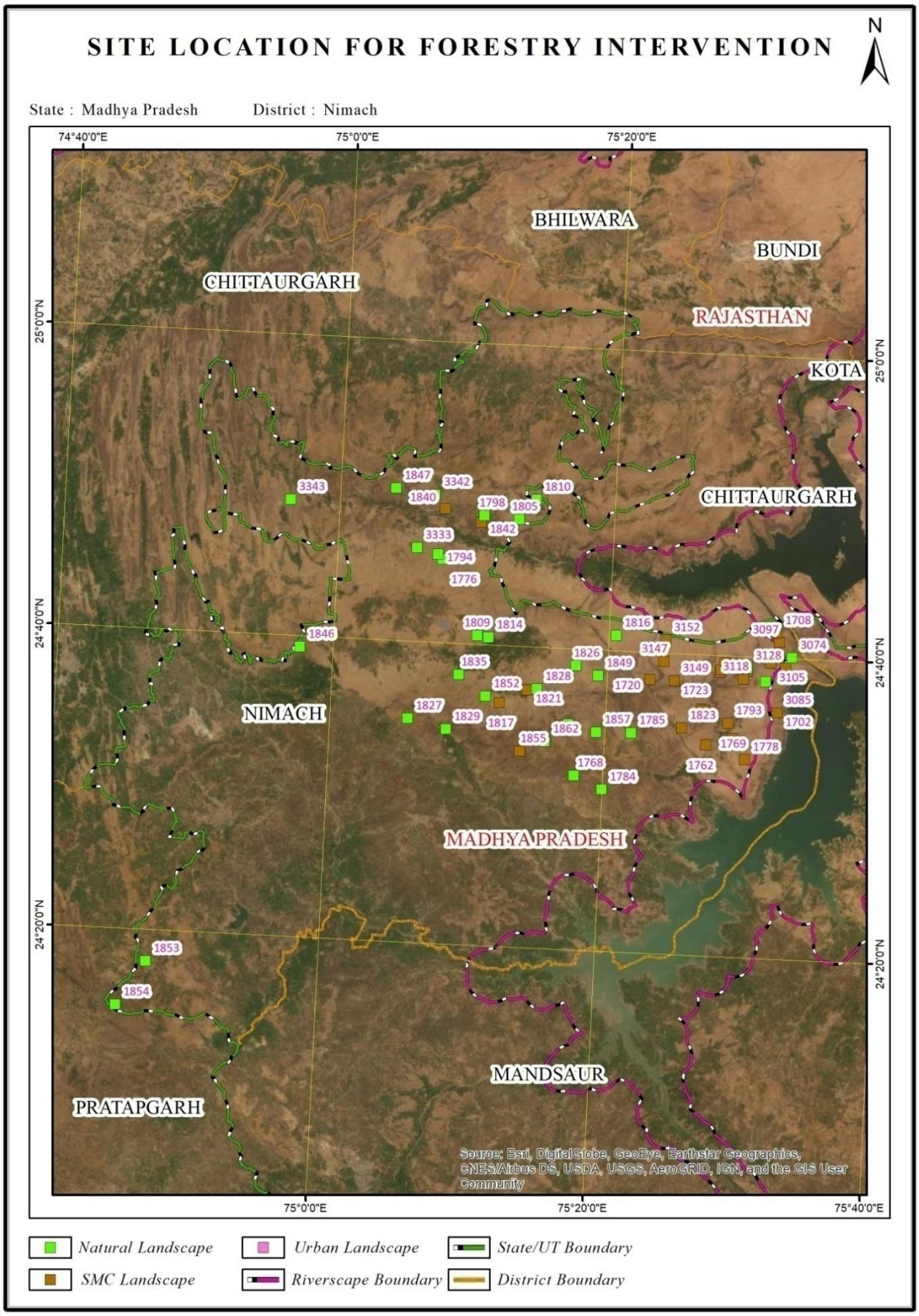
	Phase I			Phase II	Grand total
Division	Area	Cost		cost	
	Est.	Est.	Maint.	Maint	cost
Agri. Lands	15,000.00	8,894.53	5,654.36	1,894.50	16,443.40
Ashoknagar	43.00	23.24	23.49	1.32	48.05
Chhattarpur	966.66	434.30	331.14	45.41	810.85
Damoh	915.00	830.61	970.81	229.57	2,030.99
Datia	3,150.00	1,675.48	1,367.03	333.26	3,375.78
Default areas		10,580.00	4,163.55	1,174.20	1,5917.75
Eco Task Force	800.00	1,840.00	0.00	0.00	1,840.00
Guna	106.00	97.94	115.70	27.62	241.27
Gwalior	582.00	371.83	310.18	67.20	749.22
Indore	783.00	177.89	166.75	56.71	401.35
Madhav National Park	6,295.97	776.13	280.86	72.20	1,129.19
Mandsaur	4,337.37	701.08	427.92	67.68	1,196.68
Morena	656.00	348.21	328.44	66.66	743.31
Neemuch	2,443.00	346.06	84.77	12.38	443.20
North Panna	100.00	64.51	56.51	8.70	129.72
Obedullaganj	77.91	31.16	7.05	1.99	40.20
Raisen	20.00	17.76	24.22	1.77	43.75
Ratlam	376.36	110.72	28.88	14.09	153.68
Sheopur (T)	7,557.40	2,622.44	2,176.47	582.64	5,381.54
Shivpuri (Terr.)	1,835.93	1,171.02	1,143.45	189.64	2,504.10
South Panna	1,923.00	344.21	221.04	21.38	586.64
Tikamgarh	80.00	9.61	2.64	0.00	12.25
Total	**48,048.60**	**31,468.74**	**17,885.27**	**4,868.91**	**54,222.93**

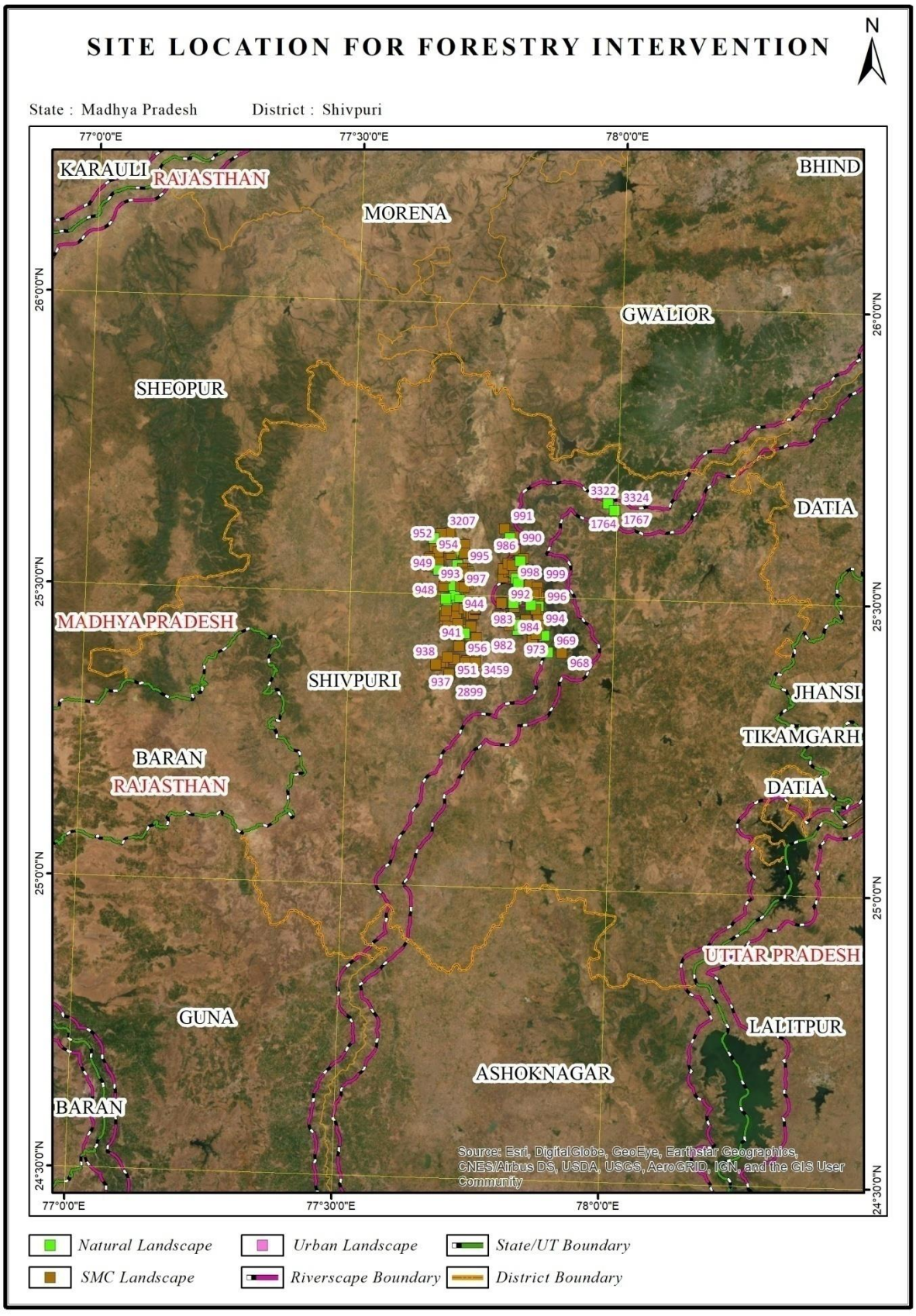
Table 7.68. Model-wise area and cost summary (Area in ha and cost in lakh rupees)

	Phase I		Phase II	Grand total
Landscape	**Area**	**Cost**	**Cost**	**Cost**
Natural	**23,407.87**	**17,858.45**	**1,564.87**	**19,423.32**
YM/MP/NL/01	4,212.70	8,612.37	864.22	9,476.59
YM/MP/NL/02	687.50	523.29	84.94	608.24
YM/MP/NL/03	1,583.50	1,908.56	198.59	2,107.16
YM/MP/NL/04	50.00	59.29	4.35	63.64
YM/MP/NL/05	2,034.00	2,315.84	248.55	2,564.38
YM/MP/NL/06	1,200.00	273.74	1.04	274.78
YM/MP/NL/07	100.00	18.74	0.00	18.74
YM/MP/NL/08	288.00	156.78	0.00	156.78
YM/MP/NL/09	6,811.00	1,039.57	18.17	1,057.74
YM/MP/NL/10/A	44.44	21.13	1.84	22.97
YM/MP/NL/10/B	5,487.58	1,066.04	140.77	1,206.81
YM/MP/NL/10/C	109.14	23.09	2.40	25.49
YM/MP/NL/11	800.00	1,840.00	0.00	1,840.00
Agriculture	**15,000.00**	**14,548.90**	**1,894.50**	**16443.40**
YM/MP/AL/01	7,500.00	7,419.43	598.26	8,017.69
YM/MP/AL/02	7,500.00	7,129.47	1,296.24	8,425.71
Urban	**125.00**	**202.79**	**9.19**	**211.98**
YM/MP/UL/01	5.00	157.58	9.19	166.77
YM/MP/UL/02	120.00	45.21	0.00	45.21
Conservation Interventions	**9,515.73**	**16,743.88**	**1,400.35**	**18144.23**
YM/MP/CI/01/A	6,018.13	369.00	19.20	388.20
YM/MP/CI/01/B	80.00	36.63	5.11	41.74
YM/MP/CI/01/C	1,164.45	540.03	66.26	606.30
YM/MP/CI/02/A	363.11	175.36	13.03	188.40
YM/MP/CI/02/B	304.00	140.39	19.57	159.95
YM/MP/CI/02/C	345.00	159.87	22.28	182.15
YM/MP/CI/02/D	11.00	5.17	0.72	5.90
YM/MP/CI/02/E	21.00	9.62	1.34	10.96
YM/MP/CI/02/F	270.00	125.69	17.52	143.21
YM/MP/CI/02/G	939.04	438.58	61.12	499.70
YM/MP/CI/03	0.00	14,743.55	1,174.20	15,917.75
Total	**48,048.60**	**49,354.02**	**4,868.91**	**54,222.93**


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Madhya Pradesh
District : Nimach
74°40'0"E
75°0'0"E
75°20'0"E
25°0'0"N
24°40'0"N
24°20'0"N
BHILWARA
BUNDI
CHITTAURGARH
RAJASTHAN
KOTA
CHITTAURGARH
NIMACH
MADHYA PRADESH
MANDSAUR
PRATAPGARH
3343
1847
3342
1840
1810
1798
1805
1842
3333
1794
1776
1809
1814
1816
3152
3097
1708
1846
3147
3074
1826
3128
1835
1849
3149
3118
1828
1852
1720
3105
1723
1821
3085
1827
1829
1817
1857
1785
1823
1793
1702
1855
1862
1769
1778
1768
1762
1784
1853
1854
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Natural Landscape
Urban Landscape
State/UT Boundary
SMC Landscape
Riverscape Boundary
District Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Madhya Pradesh
District : Shivpuri
77°0'0"E
77°30'0"E
78°0'0"E
26°0'0"N
25°30'0"N
25°0'0"N
24°30'0"N
KARAULI
RAJASTHAN
MORENA
BHIND
GWALIOR
SHEOPUR
DATIA
MADHYA PRADESH
SHIVPURI
JHANSI
TIKAMGARH
BARAN
RAJASTHAN
DATIA
UTTAR PRADESH
GUNA
LALITPUR
ASHOKNAGAR
BARAN
3322
3324
1764
1767
991
3207
990
952
954
986
995
949
993
997
998
999
948
992
996
944
983
994
941
984
969
938
956
982
973
968
951
3459
937
2899
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Natural Landscape
Urban Landscape
State/UT Boundary
SMC Landscape
Riverscape Boundary
District Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Madhya Pradesh
District : Nimach
74°40'0"E
75°0'0"E
75°20'0"E
25°0'0"N
24°40'0"N
24°20'0"N
BHILWARA
BUNDI
CHITTAURGARH
RAJASTHAN
KOTA
CHITTAURGARH
NIMACH
MADHYA PRADESH
MANDSAUR
PRATAPGARH
3343
1847
3342
1840
1810
1798
1805
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3333
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1768
1762
1784
1853
1854
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Natural Landscape
Urban Landscape
State/UT Boundary
SMC Landscape
Riverscape Boundary
District Boundary


SITE LOCATION FOR FORESTRY INTERVENTION
N
State : Madhya Pradesh
District : Shivpuri
77°0'0"E
77°30'0"E
78°0'0"E
26°0'0"N
25°30'0"N
25°0'0"N
24°30'0"N
KARAULI
RAJASTHAN
BHIND
MORENA
GWALIOR
SHEOPUR
DATIA
MADHYA PRADESH
SHIVPURI
JHANSI
TIKAMGARH
BARAN
RAJASTHAN
DATIA
UTTAR PRADESH
GUNA
LALITPUR
ASHOKNAGAR
BARAN
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991
3207
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990
954
986
995
949
993
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998
999
948
992
996
944
983
994
941
984
969
938
956
982
973
968
951
3459
937
2899
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Natural Landscape
Urban Landscape
State/UT Boundary
SMC Landscape
Riverscape Boundary
District Boundary

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GPS COORDINATES OF SITES FOR VARIOUS FORESTRY INTERVENTIONS IN UTTARAKHAND

The following table gives GPS coordinates of the sites proposed by the state SFD at time of DPR formulation. The sites may be finalised, with suitable changes wherever required, and georeferenced at time of implementation of the DPR.

Site ID	State	Division	Geo-coordinates (Format: degree-minute-second ºN Lat., degree-minute-second ºE Long.)
80	Uttarakhand	Gorkhadi, Naraya	(30-42-27,77-50-31.26); (30-42-13.68,77-50-34.02)
85	Uttarakhand	Dirnaad village	(30-53-53, 77-55-30)
86	Uttarakhand	Fanaar	30-52-26, 77-53-36
88	Uttarakhand	Bangur Village	(30-46-57.3,78-07-11.7)
90	Uttarakhand	Chilhaad	(30-51-32, 77-49-57)
91	Uttarakhand	Chaunjai Village	(30-39-32, 77-48-3.45)
94	Uttarakhand	Dimich	(30-49-30, 77-49-28)
96	Uttarakhand	Bhandoli	(30-52-12,77-50-37)
98	Uttarakhand	Silwada	(30-52-52,77-50-45)
100	Uttarakhand	Chausaal	(30-54-8, 77-54-39)
102	Uttarakhand	Ataal	(30-49-35.60,77-45-42.30)
104	Uttarakhand	Bhaatgadi	(30-48-31, 77-55-52)
105	Uttarakhand	Raigi	(30-48-31, 77-55-52)
106	Uttarakhand	Putaad	(30-56-53, 77-58-9)
107	Uttarakhand	Kaanda	(30-57-57.50,77-49-28.80)
109	Uttarakhand	Dersa	(30-56-14, 77-50-56)
126	Uttarakhand	Mashak Binsaun	(30-46-58, 77-48-45)
371	Uttarakhand	Dedikhad	(30-39-14.76,77-51-22.2) (31-7-13.2,78-4-50); (31-7-49.14,78-4-44.22)
372	Uttarakhand	Datnu village	(30-35-26.16,77-53-0.06); (30-35.584-00,77-53.594-00) (,)
381	Uttarakhand	Chatra Village	
1	Uttarakhand	Chakrata	(30-31-59.7,77-49-22.74); (30-31-00, 77-49-21.06)
2	Uttarakhand	Chakrata	(30-32-27.54,77-50-0.18); (30-32-26.4,77-50-12.3); (30-30-23.58,77-49-20.1); (30-30-58.2, 77-49-21.3)
3	Uttarakhand	Chakrata	(30- 18-43.884,77-29-51.612); (30- 18-52.5672,77- 29-40.4376)
4	Uttarakhand	Chakrata	(30-31-7.44,77-51-27.42); (30-31-1.116,77-51-33.54)
5	Uttarakhand	Chakrata	(30-57-29.20,77-56-34.90); (30-57-37.80,77-56-26.40); (30-31-6.12,77-51-31.2); (30-31-3.66,77-51-36.84); (30-31-7.98,77-51-28.98)
6	Uttarakhand	Tons Forest Division	(31-04-9.48,77-53-22.74); (31-4-12.42,77-53-22.68); (30-57-37.10,77-56-46.40); (30-57-45.00,77-56-45.90)
7	Uttarakhand	Chakrata	(30-53-38.5,77-56-52.0); (30-53-28.8, 77-57-18.9); (31-04-

			10.08,77-53-22.92)
8	Uttarakhand	Tons Forest Division	(31-3-15.24,77-51-49.2); (31-03-43.62,77-51-48.06); (30-53-29.6,77-57-25.2); (30-53-29.6, 77-57-25.2)
9	Uttarakhand	Chakrata	(30-56-37.8,77-56-44.4); (30-56-39,77-56-40.2); (31-3-14.80,77-51-50.52); (31-3-15.84,77-51-48.06); (31-03-13.62,77-51-54.84)
10	Uttarakhand	Tons Forest Division	(30-58-49.86,77-50-55.32); (30-58-43.62,77-50-58.44); (30-56-45.6,77-56-43.8); (30-56-48.6,77-56-40.2)
11	Uttarakhand	Chakrata	(30-54-51.1, 77-56-00); (30-54-42.0, 77-56-04.9); (30-58-46.2,77-51-1.26); (30-58-46.98,77-50-54.12)
12	Uttarakhand	Chakrata	(30-57-45.40,77-50-33.20); (30-57-54.50,77-49-30.30); (30-54-41.4, 77-56-07.3); (30-54-48.4, 77-56-09.7)
13	Uttarakhand	Tons Forest Division	(30.58-49.86,77-50-55.32); (30-58-43.62,77-50-58.44); (30-58-11.20,77-50-17.80)
14	Uttarakhand	Tons Forest Division	(30-58-32.88,77-56-58.8); (30-58-33.96,77-56-36.84); (30-58-46.2,77-51-1.26); (30-58-46.98,77-50-54.12)
15	Uttarakhand	Chakrata	(30-57-58.8,77-58-54.6); (30-58-00,77-58-56.4); (30-58-37.74,77-56-53.28); (30-58-37.56,77-56-54.6); (30-58-41.28,77-56-56.94); (30-58-38.52,77-56-56.14); (30-58-33.48,77-57-0.18); (30-58-32.28,77-56-58.86)
16	Uttarakhand	Chakrata	(30-56-32.069,77-53-49.813); (30-56-45.693,77-53-39.465); (30-58-00,77-58-59.4); (30-58-00,77-58-59.4)
17	Uttarakhand	Chakrata	(30-33-36, 78-0-10.44); (30-33-52.128,78-0-24.12); (30-30-35.984,77-53-54.062); (30-56-48.363,77-53-42.463)
18	Uttarakhand	Tons Forest Division	(30-58-32.88,77-56-53.88); (30-58-33.96,77-56-54.84)
19	Uttarakhand	Tons Forest Division	(30-57-44.4,77-54-26.76); (30-57-37.08,77-54-28.92); (30-58-55.74,77-56-53.28); (30-58-37.56,77-56-54.6); (30-58-41.28,77-56-56.94); (30-58-38.52,77-56-56.16)
20	Uttarakhand	Chakrata	(30-56-19.6,77-46-12.9); (30-56-42.3,77-45-30.1); (30-57-37.08,77-54-23.76); (30-57-38.46,77-44-16.68); (30-57-26.7,77-54-16.5); (30-57-20.4,77-54-22.2)
21	Uttarakhand	Chakrata	(30-56-47.4, 77-56-49.2); (30-56-46.2, 77-56-46.2); (30-56-35.6,77-45-26.3); (30-57-12.6,77-44-21.3)
22	Uttarakhand	Tons Forest Division	(30-58-32.58,77-58-54.66); (30-58-29.58,77-58-55.86); (30-56-50.4,77-56-53.4); (30-56-51.6, 77-5652.8)
24	Uttarakhand	Tons Forest Division	(30-58-45.36,77-59-17.34); (30-58-44.46,77-59-22.32); (30-58-27.66,77-58-59.21); (30-58-29.76,77-59-36.42); (30-58-29.46,77-58-28.02); (30-58-36.42,77-59-12.06); (30-58-40.86,77-59-4.86); (30-58-42.18,77-59-31.8)
25	Uttarakhand	Chakrata	(30-54-49.73,77-51-37.46); (30-54-47.02, 77-51-50.74); (30-58-43.08,77-59-25.92); (30-58-40.5,77-59-28.56); (30-58-38.82,77-59-27.18); (30-58-39.3,77-59-25.74); (30-58-43.5,77-59-47.82);
26	Uttarakhand	Tons Forest Division	(30-58.885-00,77-58-33.84); (30-58-53.4,77-58-46.26); (30-54-34.57,77-51-42.31); (30-54-38.85,77-51-48.19)
27	Uttarakhand	Chakrata	(30-55-5.371,77-54-35.112); (30-55-6.038,77-54-29.624); (30-58-52.8,77-58-41.46); (30-58-54,77-58-35.52); (30-58-53.42,77-58-32.34); (30-58-53.34,77-58-40.26); (30-58-49.2,77-58-46.2); (30-58-53.22,77-58-34.02)
28	Uttarakhand	Chakrata	(30-55-37.727,77-54-28.324); (30-55-24.792,77-54-23.187);

			(30-55-13.63,77-54-29.343); (30-55-10.506,77-54-39.663)
29	Uttarakhand	Soil Conservation Kalsi	(30-27-01.8,77-48-07.5); (30-27-11.5,77-48-12.7); (30-55-31.708,77-54-18.643)
30	Uttarakhand	Chakrata	(30-53-56.012, 77-55-06.760); (30-53-55.754, 77-55-03.875); (30-27-12.8,77-48-21.4)
31	Uttarakhand	Soil Conservation Kalsi	(30-26-33.7,77-49-14.6); (30-26-35.2,77-48-55.3)
32	Uttarakhand	Tons Forest Division	(30-49-19.8,78-05-19.2); (30-49-22.8,78-05-21); (30-26-38.6,77-48-41.9); (30-26-40.3,77-49-07.2)
33	Uttarakhand	Chakrata	(30-50-45,77-49-22); (30-50-40,77-49-20); (30-49-18,78-05-19.8); (30-49-13.2,78-05-22.8)
34	Uttarakhand	Chakrata	(30-45-46.11,77-52-20.4); (30-45-44.2,77-52-31.1); (30-50-35,77-49-15); (30-50-33,77-49-13)
35	Uttarakhand	Chakrata	(30-51-04, 77-45-21); (30-51-46, 77-49-25); (30-45-40.6,77-52-30.1); (30-45-40.8,77-52-27.5)
36	Uttarakhand	Tons Forest Division	(30-54-28.26,78-05-0.72); (30-54-17.16,78-05-0.72); (30-51-46, 77-49-23); (30-51-16,77-49-29)
37	Uttarakhand	Chakrata	(30-50-40.5,77-49-10); (30-50-13,77-49-21); (30-54-14.22,78-05-55.8); (30-54-17.16,78-05-6.72)
38	Uttarakhand	Tons Forest Division	(30-58-48.6,78-07-36.6); (30-58-29.16,78-07-47.28); (30-50-19,77-49-22); (30-50-15,77-49-25)
39	Uttarakhand	Chakrata	(30-46-20.73,77-50-30.8); (30-46-25.4,77-50-40.9); (30-58-33.36,78-07-14.04); (30-58-13.44,78-07-13.86); (30-58-23.94,78-07-28.02); (30-58-30.06,78-07-20.52); (30-58-13.26,78-27-21.96); (30-58-21.9,78-07-23.7)
40	Uttarakhand	Tons Forest Division	(30-58-6.48,78-05-28.02); (30-58-10.02,78-05-6.96); (30-40-50.5,77-51-24.8); (30-46-50.2,77-50-53.8)
41	Uttarakhand	Tons Forest Division	(31-01-21.54,78-03-8.52); (31-01-26.16,78-03-21.66); (30-58-15.24,78-05-25.56); (30-58-28.68,78-05-14.7); (30-58-9.36,78-05-10.56); (30-58-15.42,78-05-16.56); (30-58-11.64,78-05-31.26); (30-58-19.5,78-05-16.02)
42	Uttarakhand	Chakrata	(30-49-59.29,77-58-32.69); (30-49-58.90,77-58-34.716); (31-01-32.64,78-03-7.26); (31-01-25.38,78-03-15.36)
43	Uttarakhand	Tons Forest Division	(30-57-22.32,78-06-27.72); (30-57-24.37,78-06-31.02)
44	Uttarakhand	Chakrata	(30-49-44.49, 77-58-40.43); (30-49-47.15,77-58-37.996); (30-57-17.16,78-06-28.4); (30-57-13.44,78-06-6.9); (30-57-24.96,78-06-15.3); (30-57-16.02,78-06-27.06)
45	Uttarakhand	Chakrata	(30-56-4.0,77-49-21); (30-55-59,77-49-29)
46	Uttarakhand	Chakrata	(30-48-55.80,77-57-55.48); (30-48-51.06,77-58-6.762)
47	Uttarakhand	Tons Forest Division	(31-1-13.32,78-2-16.90); (31-1-16.68,78-2-8.58)
48	Uttarakhand	Chakrata	(30-45-51.4,78-00-52.6); (30-45-51.4,78-5-56.2); (31-1-23.04,78-2-23.64); (31-1-19.68,78-2-10.08); (31-1-22.2,78-2-10.08); (31-1-21.96,78-2-20.34)
49	Uttarakhand	Tons Forest Division	(31-00-50.4,78-2-13.5); (31-00-50.1,78-2-13)
50	Uttarakhand	Chakrata	(30-47-26.94,77-57-16.55); (30-47-34.75,77-57-13.29); (31-

			00-49.9,78-02-13.7); (31-00-50.8,78-02-13.3); (31-00-51.7,78-02-13.9); (31-00-50.6,78-02-13.2)
51	Uttarakhand	Chakrata	(30-56-19.0,77-46-12.4); (30-56-35.9,77-47-21.8)
52	Uttarakhand	Tons Forest Division	(31-00-38.1,78-1-47.94); (31-00-36.5,78-01-46.86)
53	Uttarakhand	Tons Forest Division	(31-1-12,77-59-58.5); (31-1-17.4,77-59-57.66); (31-00-38.6,78-1-47.52); (31-00-37.00,78-1-47.76); (31-00-38.8,78-1-47.58); (31-00-37.7,78-1-46.8)
54	Uttarakhand	Tons Forest Division	(31-1-46.44,78-1-20.64); (31-1-43.68,78-1-17.58); (31-1-12.42,77-59-58.32); (31-01-12.66,77-59-58.14); (31-01-12.3,77-59-58.74); (31-01-12.6,77-59-58.2)
55	Uttarakhand	Tons Forest Division	(31-2-19.86,78-00-37.92); (31-2-20.64,78-00-38.88); (31-1-47.22,78-2-18.06); (31-01-47.22,78-1-16.8); (31-1-47.58,78-1-15.6); (31-1-50.52,78-1-15.36); (31-1-52.32,78-1-14.16); (31-1-52.26,78-2-18.06)
56	Uttarakhand	Tons Forest Division	(31-03-39.96,77-56-42.54); (31-03-39.42,77-56-42.66); (31-2-21.42,78-00-38.94); (31-2-22.92,78-00-37.32); (31-2-37.76,78-00-37.02); (31-2-27.3,78-00-34.8); (31-2-27.72,78-00-32.58); (31-02-26.28,78-00-31.2)
57	Uttarakhand	Tons Forest Division	(31-04-37.8,77-68-3.96); (31-04-16.8,78-68-6.6); (31-03-37.14,77-56-38.94); (31-03-39.6,77-56-43.14); (31-03-39.48,77-56-42.6); (31-03-39.78,77-56-39.48); (31-03-38.82,77-56-43.74); (31-03-39.72,77-56-42.78)
81	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-47-22.74,78-07-32.34); (30-48-13.14,78-09-10.38); (30-42-13.44,77-50-34.02)
87	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-46-45.36,78-06-52.68); (30-48-33.96,78-07-9.06)
93	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-46-32.64,78-95-18.14)
99	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-46-32.64,78-95-10.14)
120	Uttarakhand	Chakrata	(30-48-30.4,77-54-44.9); (30-48-12.78,77-54-37.5)
123	Uttarakhand	Chakrata	(30-44-18.6,77-51-42.1); (30-44-32.28,77-51-41.54)
139	Uttarakhand	Tons Forest Division	(30-58-45.6,77-56-32.46); (30-58-45.9,77-56-32.8); (30-15-55.9,77-28-40.8); (30-15-56.3,77-28-45); (30-15-55.9,77-28-43.1)
140	Uttarakhand	Tons Forest Division	(30-56-11.1,78-6-21); (30-54-19,78-3-5.5)
143	Uttarakhand	Tons Forest Division	(30-58-41.16,77-56-57.96); (30-58-34.92,77-56-4.62); (21-15-7,77-6-17); (29-15-9,77-6-51)
144	Uttarakhand	Tons Forest Division	(30-58-17.58,77-55-11.82); (30-57-12.9,77-55-16.32); (30-58-44.94,77-56-42.54)
145	Uttarakhand	Tons Forest Division	(30-50-51.48,78-04-42.36); (30-50-52.86,78-04-44.28)
148	Uttarakhand	Tons Forest Division	(30-57-31.56,77-54-24.84); (30-57-30.72,77-54-11.58)
149	Uttarakhand	Tons Forest	(30-57-21.275,77-53-44.610) (30-57-44.4,77-54-26.76)

		Division	
150	Uttarakhand	Tons Forest Division	(30-52-16.56,78-4-27.7); (30-52-17,78-4-24.8)
152	Uttarakhand	Tons Forest Division	(30-57-22.5,77-53--37.2); (30-57-20.1,77-53-39.36); (30-52-15.9,78-4-23.5); (30-52-13.2,78-3-53.7)
155	Uttarakhand	Tons Forest Division	(30-58-28.98,77-59-8.22); (30-58-27.96,77-59-10.98); (30-18-34.8,77-33-35.6); (30-18-35.9,77-33-35.3); (30-18-34.1,77-33-35.3)
156	Uttarakhand	Tons Forest Division	(30-52-36.9,78-2-16.25); (30-52-36.36,78-2-14.14); (30-58-27.66,77-59-17.58); (30-58-26.52,77-59-22.74)
158	Uttarakhand	Tons Forest Division	(30-58-30.72,77-59-8.22); (30-58-27.66,77-59-17.58); (77-7-42,)
159	Uttarakhand	Tons Forest Division	(30-52-22.86,78-5-12); (30-52-20.1,78-5-9.72); (30-58-29.1,77-59-26.82); (30-58-44.46,77-59-22.32)
160	Uttarakhand	Tons Forest Division	(30-58-46.14,77-59-35.82); (30-58-47.34,77-59-35.1); (30-52-15.84,78-5-10.86); (30-52-11.64,78-5-15.66)
162	Uttarakhand	Tons Forest Division	(30-58-1.38,78-00-5.7); (30-59-2.94,78-00-22.38); (29-17-55,77-8-33); (29-17-30,77-7-48)
163	Uttarakhand	Chakrata	(30-35-29.76,77-53-25.02); (30-35-29.34,77-53-24.96); (30-59-2.28,78-00-20.82); (30-59-2.58,78-00-5.4)
164	Uttarakhand	Tons Forest Division	(30-58-44.58,78-00-50.7); (30-58-43.74,78-00-50.4)
165	Uttarakhand	Tons Forest Division	(30-54-47,78-2-36.6); (30-53-54.6,78-4-18.2); (30-59-45.6,78-00-30.6); (30-59-2.82,78-00-30.36)
166	Uttarakhand	Tons Forest Division	(30-58-43.02,77-57-28.38); (30-58-40.62,77-57-23.4); (30-54-7.8,78-2-11.2); (30-54-11.2,78-1-49.7)
167	Uttarakhand	Chakrata	(30-35-35.22,77-53-36.36) (30-58-41.1,77-57-23.34); (30-58-43.14,77-57-29.4)
168	Uttarakhand	Tons Forest Division	(30-58-52.98,77-58-41.7); (30-58-46.08,77-58-47.52)
169	Uttarakhand	Tons Forest Division	(30-58.883-00,77-58-41.7); (30-58-46.08,77-58-47.52); (30-58-52.8,77-58-41.82); (30-58-52.74,77-58-42.12)
170	Uttarakhand	Tons Forest Division	(30-48-14,78-06-33); (30-48-15,78-06-30); (30-58-52.8,77-58-41.82); (30-58-52.74,77-58-42.12)
172	Uttarakhand	Tons Forest Division	(30-52-59.8,78-4-9.84); (30-53-75,78-4-62); (29-13-17,77-8-8); (29-13-6,77-8-13)
173	Uttarakhand	Chakrata	(30-42-16.98,77-50-25.62); (30-42-15.18,77-50-31.98); (30-53-81,78-4-7.5); (30-52-55.5,78-4-12.2)
174	Uttarakhand	Tons Forest Division	(30-55-35.38,78-6-8.9); (30-55-29.75,70-5-37.60)
175	Uttarakhand	Tons Forest Division	(31-01-55.2,78-06-59.3); (31-01-47.4,78-06-54.1); (30-55-40.49,78-5-48.10); (30-55-57.62,78-5-47.44)
176	Uttarakhand	Chakrata	(30-42-16.14,77-50-29.58); (30-42-16.98,77-5-27.3)
177	Uttarakhand	Tons Forest Division	(30-52-28.32,78-00-27.9); (30-53-29.1,78-00-30.96)
178	Uttarakhand	Tons Forest Division	(31-2-39.6,78-3.8-50.4); (31-2.4-28.5,78-3.69-41.4); (30-53-37.1,78-00-19.6); (30-53-25.6,78-00-20.1)
179	Uttarakhand	Chakrata	
180	Uttarakhand	Tons Forest Division	(30-52-12.4,78-02-45.8); (30-52-57.8,78-02-33.5)

181	Uttarakhand	Tons Forest Division	(30-59-52.3,78-4-34.8) (30-51-40.5,78-2-48.5); (30-51-40.9,78-2-43.5)
182	Uttarakhand	Tons Forest Division	(30-51-38.22,78-6-17.52); (30-51-34.8,78-6-36.24)
183	Uttarakhand	Tons Forest Division	(30-59-41.2,78-4-15.1) (30-51-33.36,78-6-38.94)
184	Uttarakhand	Tons Forest Division	(30-50-8,78-5-55); (30-50-4,78-5-55)
185	Uttarakhand	Tons Forest Division	(31-00-42.1,78-05-24.1); (31-00-23.94,78-3-47.28); (30-50-7,78-5-58); (30-50-2,78-5-56)
186	Uttarakhand	Tons Forest Division	(30-52-53.6,78-1-41); (30-52-38.8,78-4-38)
187	Uttarakhand	Tons Forest Division	(31-1-6.18,78-7-21.96); (31-1-8.4,78-7-23.1); (30-52-39.9,78-1-39.8); (30-52-41.1,78-1.064-00)
188	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1)
189	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1)
190	Uttarakhand	Tons Forest Division	(30-53-16.32,78-3-00); (30-53-29.7,78-2-48.4)
191	Uttarakhand	Tons Forest Division	(30-53-40.08,78-6-30.12); (30-53-37.98,78-6-33.54); (30-53-35.2,78-4-46.0); (30-53-59.3,78-2-41.4)
192	Uttarakhand	Tons Forest Division	(30-57-29.8,78-07-57.6); (30-57-30.4,78-7-21.5); (30-53-35.4,78-6-32.1); (30-53-39.12,78-6-37.86)
193	Uttarakhand	Chakrata	(30-31-23.04,77-49-44.64); (30-31-24.3,)
194	Uttarakhand	Tons Forest Division	(31-0-49.086,78-2-18.3); (31-0-46.74,78-2-19.14)
195	Uttarakhand	Tons Forest Division	(30-49-34,78-6-39); (30-49-36,78-6-36); (31-0-47.64,78-2-14.7); (31-0-49.32,78-2-18.72)
196	Uttarakhand	Tons Forest Division	(31-0-3.6,78-1-52.5); (31-0-3.72,78-1-52.14); (30-49-34.9,78-6-40.5); (30-49-39,78-6-41.6)
197	Uttarakhand	Tons Forest Division	(30-58-10.8,78-05-47.6); (30-58-41.2,78-05-24.5); (31-0-4.2,78-1-52.74); (31-0-3.66,78-1-52.2)
198	Uttarakhand	Chakrata	(30-31-9.3,77-51-24.84); (30-31-13.08,77-51-13.08)
199	Uttarakhand	Tons Forest Division	(31-00-34.2,78-05-8.20)
200	Uttarakhand	Chakrata	(30-31-17.1,77-51-29.1); (30-31-7.98,77-51-28.98)
201	Uttarakhand	Tons Forest Division	(31-2-39.06,78-2-25.44); (31-2-39.24,78-2-25.14)
202	Uttarakhand	Tons Forest Division	(30-57-58.86,78-5-41.4) (31-2-39.42,78-2-24.9); (31-2-39.6,78-2-24.72)
203	Uttarakhand	Tons Forest Division	(30-48-24,78-6-28); (30-48-25,78-6-24)
204	Uttarakhand	Tons Forest Division	(31-0-53.88,78-2-57.12) (30-48-23,78-6-26); (30-48-22,78-6-26)
205	Uttarakhand	Tons Forest Division	(30-55-21.2,78-4-46.1); (30-55-33,78-4-57.66)
206	Uttarakhand	Tons Forest Division	(30-57-0.5,78-6-6.32); (30-56-32.97,78-5-37.47); (30-55-43.1,78-4-36.1); (30-55-30.1,78-4-19.1)
207	Uttarakhand	Chakrata	(30-32-25.98,77-50-13.62) (30-56-36,78-6-10.44); (30-56-

			33.24,78-6-8.82)
208	Uttarakhand	Tons Forest Division	(30-51-27.7,78-3-22.3); (30-51-24.9,78-3-16)
209	Uttarakhand	Tons Forest Division	(30-59-22, 77-51-59); (31-59-12, 77-51-44); (30-51-25.02,78-2-16.9); (30-51-21.12,78-3-35.7)
210	Uttarakhand	Chakrata	(30-32-29.4,77-49-59.28); (30-32-27.12,77-49-57.9); (31-59-39.6,77-51-35.4); (30-59-43.38,77-50-3)
212	Uttarakhand	Chakrata	(30-56-32.069,77-53-49.813)
213	Uttarakhand	Tons Forest Division	(31-1-46,77-48-41); (31-1-49,77-49-55)
214	Uttarakhand	Tons Forest Division	(31-2-39.12,78-2-25.5); (31-2-39.3,78-2-24.78); (31-01-38.46,77-49.58-00); (31-01-37.62,77-49-21)
215	Uttarakhand	Chakrata	(30-47-37.44,77-55-28.98); (30-47-35.22,77-55-32.46); (31-2-39.48,78-2-24.9); (31-2-39.72,78-2-25.02)
216	Uttarakhand	Chakrata	(30-57-13.26,77-56-19.68) (30-47-36.36,77-55-30.78)
217	Uttarakhand	Tons Forest Division	(31-3-25.5,77-51-24.9); (31-3-42,77-52-3.92)
218	Uttarakhand	Chakrata	(30-44-52.6, 77-52-06.94); (30-44-51.02, 77-52-12.68); (31-3-22.4,77-52-27.6)
219	Uttarakhand	Tons Forest Division	(31-4-53.4,77-53-43.2); (31-5-3.4,77-53-38.6)
220	Uttarakhand	Chakrata	(30-55-50.6,77-55-11.3); (30-55-49.3,77-55-07.2); (31-5-4.8,77-53-32.6)
221	Uttarakhand	Chakrata	(30-48-50.4,77-54-47.4); (30-48-48.12,77-54-45.78)
222	Uttarakhand	Tons Forest Division	(31-0-2.52,78-1-51.18); (31-0-4.5,78-1-48.54)
223	Uttarakhand	Tons Forest Division	(30-59-16,77-51-31); (30-59-9,77-51-10); (31-0-1.92,78-1-51.42); (31-0-3.36,78-1-52.26)
224	Uttarakhand	Chakrata	
225	Uttarakhand	Chakrata	(30-47-38.04,77-54-31.5); (30-47-21.6,77-55-16.08)
226	Uttarakhand	Tons Forest Division	(31-03-51.7,77-53-37.4); (31-3-54,77-53-36.2)
227	Uttarakhand	Tons Forest Division	(31-00-50.1,78-2-13.5); (31-00-50.8,78-2-14.0); (31-3-55.2,77-28-20.3); (31-4-2.9,77-53-22.2)
228	Uttarakhand	Tons Forest Division	(31-3-18.9,77-51-31); (31-3-14.7,77-51-33.7); (31-00-51.0,78-02-12.9); (31-00-51.0,78-02-14.0)
229	Uttarakhand	Chakrata	(30-47-18.6,77-55-10.74); (30-47-20.88,77-55-13.2); (31-3-7.9,77-51-36.9)
230	Uttarakhand	Tons Forest Division	(31-00-35.3,78-01-44.0); (31-00-36.4,78-01-43.0)
231	Uttarakhand	Tons Forest Division	(31-1-53,77-30-39); (31-1-41,77-50-15); (31-00-35.7, 78-01-44.1)
232	Uttarakhand	Chakrata	(30-44-59.39,77-51-52.6); (30-45-01.7,77-51-47.2); (31-1-42.7,77-50-9); (31-1-41.4,77-50-15)
233	Uttarakhand	Tons Forest Division	(31-3-11.11,77-49-18.43); (31-3-9.6,77-49-10.74); (30-45-04,77-51-37.3); (30-45-07.13,77-51-42.6)
234	Uttarakhand	Tons Forest Division	(31-1-31.21,77-49-38.38); (31-1-18.08,77-49-45.6); (31-3-2.18,77-49-18.39); (31-3-56.12,77-49-14.28)
235	Uttarakhand	Chakrata	(30-43-46.7,77-51-12.7); (30-52-8.9,77-51-1.7); (31-1-10.30,77-49-45.88)

236	Uttarakhand	Tons Forest Division	(31-5-21.1,77-54-26.6); (31-5-9.9,77-54-26.9); (30-43-55.8,77-50-57.7); (30-43-50.8,77-51-4.52)
237	Uttarakhand	Soil Conservation Kalsi	(30-24-27,77-49-25) (31-5-7.0,77-54-27.9); (31-5-15.3,77-53-55.4)
238	Uttarakhand	Chakrata	(30-46-54.6,77-47-09.8); (30-47-4.6,77-47-16.1)
239	Uttarakhand	Chakrata	(30-47-6.83,77-54-25.5); (30-47-7.16,77-54-31.4); (30-47-7.32,77-47-18.2); (30-47-7.5,77-77-47-14.2)
240	Uttarakhand	Tons Forest Division	(31-2-58.38,78-0-6.54); (31-2-50.16,78-0-12.24)
241	Uttarakhand	Chakrata	(30-47-9.19,77-53-7.49) (31-2-54.06,78-0-7.02)
243	Uttarakhand	Soil Conservation Kalsi	(30-24-37.8,77-51-08.7); (30-24-36.5,77-51-4.5)
244	Uttarakhand	Chakrata	(30-45-46.3,77-48-22.9); (30-45-44.1,77-43-21.1); (30-24-34,77-50-59.02)
246	Uttarakhand	Soil Conservation Kalsi	(30-24-44.6,77-49-57.5); (30-24-54.0,77-50-08.9); (30-45-36.6,77-48-05.8)
247	Uttarakhand	Chakrata	(30-47-45.42,77-55-51.36) (30-24-39.6,77-49-45.5); (30-24-29.5,77-49-35.1)
248	Uttarakhand	Tons Forest Division	(31-2-36.66,78-0-23.16); (31-2-35.4,78-0-14.82)
249	Uttarakhand	Soil Conservation Kalsi	(30-28-51,77-49-52)
250	Uttarakhand	Soil Conservation Kalsi	(30-27-41,77-49-35)
251	Uttarakhand	Tons Forest Division	(31-2-24.18,78-0-42.66); (31-2-21.54,78-0-40.32)
252	Uttarakhand	Soil Conservation Kalsi	(30-28-18.5,77-48-26.3); (30-20-13.3,77-48-1.44); (31-2-20.28,78-0-39.3); (31-2-19.02,78-0-37.8)
253	Uttarakhand	Chakrata	(30-57-56.4,77-59-0) (30-28-20.3,77-49-0.3); (30-28-26.8,77-48-47.4)
254	Uttarakhand	Tons Forest Division	(31-1-51.48,78-1-30.36); (31-1-48.54,78-1-32.22)
255	Uttarakhand	Soil Conservation Kalsi	(30-27-06.1,77-53-38.4); (30-27-06.5,77-33-49.2); (31-1-52.02,78-1-30.72); (31-1-49.08,78-1-31.38)
256	Uttarakhand	Soil Conservation Kalsi	(30-27-11.6, 77-53-47.2); (30-27-09.1,77-53-36.2); (30-26-48.8,77-53-9.7); (30-26-52.8,77-53-57.8)
257	Uttarakhand	Chakrata	(30-56-51.48,77-59-1.8) (30-27-0.4,77-53-36.2); (30-27-03,77-53-55.8); (30-27-05.7, 77-54-02.1)
258	Uttarakhand	Tons Forest Division	(31-1-45.24,78-1-26.8); (31-1-45,78-1-28.02)
259	Uttarakhand	Soil Conservation Kalsi	(30-26-44.6,77-50-40.5); (30-26-44.7,77-50-36.9); (31-1-45.18,78-1-26.4); (31-1-45.18,78-1-25.5); (31-1-45.54,78-1-23.8)

260	Uttarakhand	Chakrata	(30-56-35.22,77-56-47.64); (30-57-58.70,77-56-52.60); (30-26-44.5,77-50-34.4); (30-26-44.5,77-50-31.0)
261	Uttarakhand	Soil Conservation Kalsi	(30-26-42.0,77-50-11.4); (30-26-43.4,77-50-2.9)
262	Uttarakhand	Chakrata	(30-53-28.8,77-56-27.6); (30-53-27.7,77-56-31.6); (30-26-44.2,77-49-55.6); (30-26-46.0,77-49-47.5)
263	Uttarakhand	Tons Forest Division	(31-4-37.8,77-68-3.96); (31-3-28.86,77-68-51.06)
264	Uttarakhand	Chakrata	(30-56-9.9,77-57-12.40) (31-4-38.1,77-68-4.14); (31-3-28.98,77-68-51)
265	Uttarakhand	Soil Conservation Kalsi	(30-26-11.1,77-56-39.7); (30-25-32.2,77-56-46.6)
266	Uttarakhand	Tons Forest Division	(31-3-40.86,77-59-51.12); (31-3-30.66,77-59-37.26); (30-25-21.5,77-56-47.5)
267	Uttarakhand	Chakrata	(30-57-28.80,77-57-04.20) (31-3-37.26,77-59-43.8); (31-3-38.4,77-59-48.72)
268	Uttarakhand	Tons Forest Division	(31-0-33.84,78-0-49.74); (31-0-33.9,78-1-35.52)
269	Uttarakhand	Soil Conservation Kalsi	(30-27-52.9,77-53-25.44); (30-27-51.6,77-53-21.12); (31-0-45.78,78-0.595-00); (31-0-34.14,78-0-49.44)
270	Uttarakhand	Soil Conservation Kalsi	(30-28-055.9,77-54-34.95); (30-27-59.29,77-54-23.91)
271	Uttarakhand	Soil Conservation Kalsi	(30-27-42.67,77-54-10.96)
272	Uttarakhand	Chakrata	(30-56-52.86,77-56-30.78)
273	Uttarakhand	Soil Conservation Kalsi	(30-26-09.8,77-59-20.1); (30-26-05.9,77-59-18.2)
274	Uttarakhand	Soil Conservation Kalsi	(30-25-24.0,77-55-56.7); (30-25-14.6,77-55-51.4); (30-25-51.8,77-59-15.8)
275	Uttarakhand	Chakrata	(30-56-51.48,78-59-1.8); (30-58-19.98,57-58-22.5); (30-24-57.3,77-55-42.0)
276	Uttarakhand	Soil Conservation Kalsi	(30-26-24.6,77-56-07.6); (30-26-15.5,77-51-56.6)
277	Uttarakhand	Soil Conservation Kalsi	(30-25-35.2,77-56-21.0); (30-25-41.4,77-56-18.4); (30-25-29.1,77-57-19.5)
278	Uttarakhand	Soil Conservation Kalsi	(30-26-48.3,77-56-30.1); (30-25-05.6,77-54-40.4); (30-24-46.7,77-56-01.8)
279	Uttarakhand	Soil Conservation Kalsi	(30-25-39.2,77-58-42.6); (30-25-38.6,77-58-23.8); (30-24-36.2,77-55-26.2)
280	Uttarakhand	Soil	(30-28-37.07,77-54-05.59); (30-28-46.54,77-53-22.82); (30-

		Conservation Kalsi	24-49.2,77-58-44.2)
281	Uttarakhand	Soil Conservation Kalsi	(30-19-35.2,77-44-15.1); (30-19-50.2,77-44-13.5)
282	Uttarakhand	Soil Conservation Kalsi	(30-19-14.8,77-44-49.7); (30-19-18.2,77-44-52.3); (30-22-44.6,77-44-07.5)
283	Uttarakhand	Soil Conservation Kalsi	(30-19-27.2,77-44-24.2); (30-19-35.1,77-44-26.8); (30-19-25.1,77-44-55.0); (30-19-35.7,77-44-56.6); (30-19-45.6,77-44-51.6)
284	Uttarakhand	Soil Conservation Kalsi	(30-19-20.3,77-44-38.8); (30-19-37.5,77-44-36.7); (30-19-46.2,77-44-26.0); (30-19-49.8,77-44-26.1); (30-20-07.5,77-44-29.5); (30-20-48.9,77-44-15.2)
285	Uttarakhand	Chakrata	(30-51-43,77-50-32) (30-19-48.8,77-44-39.3); (30-20-15.9,77-44-47.9)
286	Uttarakhand	Soil Conservation Kalsi	(30-19-46.5,77-43-43.0); (30-19-53.5,77-43-44.2)
287	Uttarakhand	Soil Conservation Kalsi	(30-19-14.9,77-55-08.1); (30-19-24,77-45-09.7); (30-20-0.7,77-43-42.8); (30-20-29.4,77-43-44.6)
288	Uttarakhand	Chakrata	(30-50-21.7,77-50-17.1) (30-19-35.2,77-45-15.0); (30-19-42.21,77-45-22)
289	Uttarakhand	Chakrata	(30-51-01.2,77-49-32.9)
290	Uttarakhand	Soil Conservation Kalsi	(30-21-39.42,77-41-58.32); (30-21-38.76,77-42-7.14)
291	Uttarakhand	Soil Conservation Kalsi	(30-19-13.1,77-46-4.8); (30-19-13.6,77-45-13.5); (30-21-40.32,77-42-11.64); (30-20-21.6,77-42-6)
292	Uttarakhand	Soil Conservation Kalsi	(30-20-56.34,77-42-31.38); (30-20-56.82,77-42-33.78); (30-20-29.1,77-46-30.7); (30-20-28.4,77-76-30.8)
293	Uttarakhand	Soil Conservation Kalsi	(30-22-28,77-46-45); (30-21-58.3,77-46-29.2); (30-20-54.84,77-42-39.84)
294	Uttarakhand	Soil Conservation Kalsi	(30-21-49.1,77-46-27.2)
295	Uttarakhand	Soil Conservation Kalsi	(30-23-31.56,77-41-22.5); (30-29-25.32,77-40-24.72)
296	Uttarakhand	Chakrata	(30-55-01.458,77-54-34.09); (30-55-06.838,77-54-29.624)
297	Uttarakhand	Soil Conservation Kalsi	(30-21-0.23,77-42-3.09); (30-21-2.60,77-42-6.39)
298	Uttarakhand	Soil Conservation Kalsi	(30-24-19.44,77-43-10.6); (30-23-55.2,77-42-28.38); (30-21-6.44,77-43-9.92)
299	Uttarakhand	Chakrata	(30-53-11.462,77-55-42.274) (30-22-28.02,77-42-6.9)

300	Uttarakhand	Soil Conservation Kalsi	(30-25-8.64,77-41-33.6); (30-24-18.72,77-41-13.08)
301	Uttarakhand	Chakrata	(30-55-36.053,77-54-17.886) (30-23-37.5,77-29-51.6)
302	Uttarakhand	Soil Conservation Kalsi	(30-21-20.04,77-42-8.88); (30-21-22.8,77-42-11.94)
303	Uttarakhand	Soil Conservation Kalsi	(30-24-18.7,77-37-11.9); (30-24-21.3,77-37-09.8); (30-21-25.32,77-42-17.28); (30-21-24.54,77-42-21.12)
304	Uttarakhand	Chakrata	(30-53-33.489,77-55-30.389)
305	Uttarakhand	Soil Conservation Kalsi	(30-25-39.1,77-37-06.5); (30-25-17.1,77-25-17.3)
306	Uttarakhand	Chakrata	(30-53-14.377,77-55-39.400)
307	Uttarakhand	Soil Conservation Kalsi	(30-25-18.7,77-35-34.0); (30-25-15.5,77-35-38.5)
308	Uttarakhand	Chakrata	(30-54-52.1,77-54-59.8); (30-54-53.425,77-54-39.303); (30-25-14.5,77-35-41.2); (30-25-13.8,77-35-46.8)
310	Uttarakhand	Chakrata	(30-47-42.906,77-56-8.70); (30-47-03.054,77-56-28.944)
311	Uttarakhand	Soil Conservation Kalsi	(30-22-06.4,77-44-1.1); (30-23-21.2,77-45-47.0)
312	Uttarakhand	Soil Conservation Kalsi	(30-21-52.86,77-43-28.8); (30-20-50.82,77-42-24.9); (30-23-21.2,77-45-47.0)
313	Uttarakhand	Soil Conservation Kalsi	(30-24-11.72,77-39-37.24); (30-24-17.86,77-39-40.81); (30-20-48.42,77-49-28.98)
314	Uttarakhand	Chakrata	(30-50-56.178,77-58-40.877); (30-40-45.159,77-47-35.442); (30-24-23,77-39-43); (30-24-34,77-39-51)
315	Uttarakhand	Soil Conservation Kalsi	(30-24-2.08,77-37-50.09); (30-24-04.538,77-37-48.415)
316	Uttarakhand	Soil Conservation Kalsi	(30-23-41.824,77-39-52.08); (30-25-13.933,77-40-50.65); (30-24-31.897,77-37-45.47)
317	Uttarakhand	Chakrata	(30-47-04.554,77-56-52.498); (30-47-23.550,77-56-37.620)
319	Uttarakhand	Chakrata	(30-45-51.4,78-50-56.2); (30-45-51.6,78-01-20.5)
320	Uttarakhand	Chakrata	(30-47-33,78-01-18) (30-46-51.4,78-01-56.2); (30-46-46.9,78-59-70.2)
321	Uttarakhand	Soil Conservation Kalsi	(30-21-41.94,77-41-54.66); (30-21-44.64,77-42-3.42)
322	Uttarakhand	Chakrata	(30-46-51.3,78-02-29.8); (30-46-51.2, 78-01-56.5); (30-21-48.48,77-42-10.98); (30-21-53.22,77-42-14.7); (30-21-57.36,77-42-21.66)
323	Uttarakhand	Soil Conservation Kalsi	(30-21-06.2,77-43-29.4); (30-21-22.4,77-43-36.7)

326	Uttarakhand	Soil Conservation Kalsi	(30-20-46.86,77-42-37.44); (30-20-42.42,77-42-39.66); (30-21-39.2,77-43-47.5); (30-21-45.7,77-43-56.9); (30-24-04.7,77-44-56.7)
327	Uttarakhand	Soil Conservation Kalsi	(30-21-56.34,77-41-42.06); (30-22-5.58,77-41-51.6); (30-20-42.72,77-42-45); (30-20-41.48,77-42-48.18)
328	Uttarakhand	Chakrata	(30-57-59.90,77-49-44.10) (30-22-7.32,77-41-59.16)
329	Uttarakhand	Soil Conservation Kalsi	(30-25-27.4,77-51-38.7); (30-25-11.7,77-51-48.9)
330	Uttarakhand	Soil Conservation Kalsi	(30-25-09.4,77-54-23.2); (30-24-54.1,77-53-36.4)
331	Uttarakhand	Chakrata	(30-49-35.60,77-45-42.30) (30-24-56.4,77-53-30.8); (30-24-57.2,77-53-28.9)
332	Uttarakhand	Soil Conservation Kalsi	(30-25-11,77-55-14)
333	Uttarakhand	Chakrata	(30-54-55.66,77-51-49.71)
334	Uttarakhand	Chakrata	(30-56-14.4,77-45-19.4)
335	Uttarakhand	Soil Conservation Kalsi	(30-26-15.2,77-55-12.9); (30-26-21.5,77-55-05.8)
339	Uttarakhand	Tons Forest Division	(30-58-37.2,77-58-55.9) (30-26-09, 77-54-44.5); (30-26-7.8,30-54-49.7)
341	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-54-20,78-21-30); (30-54-16,78-21-34)
342	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-56-03,78-14-48); (30-56-55,78-14-57); (30-54-21,78-21-42); (30-54-09,78-21-23)
343	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-57-11,78-14-47); (30-59-16,78-16-09)
345	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-57-11,78-14-47); (30-56-55,78-40-37)
348	Uttarakhand	Chakrata	(30-56-26.32,77-50-52.48); (30-56-25.5,77-50-51.90); (30-56-05,78-14-48); (30-56-37,78-40-60)
349	Uttarakhand	Chakrata	(30-43-56.00,78-04-27.00); (30-43-57.00,78-02-51.00); (30-56-24.16,77-50-51.28); (30-56-23.56,77-50-51.70)
350	Uttarakhand	Chakrata	(30-57-58.9,77-55-26.5); (30-57-57,77-55-27.42)
354	Uttarakhand	Chakrata	(30-31-17.88,77-49-42.6); (30-31-18.66,77-49-43.88); (30-57-57.6,77-55-25.86); (30-57-58.98,77-55-27.3)
355	Uttarakhand	Chakrata	(30-46-20.73,77-50-30.8); (30-46-25.39, 77-50-40.8984); (30-31-18.12,77-49-18.12)
356	Uttarakhand	Chakrata	(30-45-46,77-52-20.36); (30-45-44.20,77-52-31.10); (30-46-50.49, 77-51-24.8)
357	Uttarakhand	Chakrata	(30-44-18.6,77-51-42.09); (30-44-32.28, 77-51-41.54); (30-45-40.60,77-52-30.10); (30-45-40.7,77-52-27.50)

362	Uttarakhand	Soil Conservation Kalsi	(30-24-27,77-44-51.7); (30-24-14,77-44-51.3)
363	Uttarakhand	Govind Wildlife sanctuary	(31-06-22,78-5-33); (31-6-25,78-5-3); (30-23-52.2,77-44-44.7)
364	Uttarakhand	Soil Conservation Kalsi	(30-26-26.9, 77-56-22.6); (30-26-24.7, 77-56-26.5); (31-6-26,78-5-3); (31-6-28,78-5-3)
365	Uttarakhand	Govind Wildlife sanctuary	(31-07-10,78-4-59); (31-7-8,78-4-59); (30-26-25.1,77-56-23.9); (30-26-38.6, 77-56-48.6)
374	Uttarakhand	Govind Wildlife sanctuary	(31-7-56,78-07-44) (30-35.596-00,77-53.611-00) (,)
376	Uttarakhand	Govind Wildlife sanctuary	(31-3-25,78-8-29)
377	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-45-38,78-8-9)
383	Uttarakhand	Govind Wildlife sanctuary	(31-4-12,78-06-11); (31-06-48,78-04-53) (,)
386	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-40-53,78-9-6); (30-38-13,78-04-45); (31-5-47,78-04-38)
387	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-40-53,78-9-6)
388	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-40-53,78-9-6); (30-38-13,78-4-45)
389	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-40-53,78-9-6); (30-38-13,78-4-45)
390	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-40-53,78-9-6); (30-38-13,78-4-45)
391	Uttarakhand	Tons Forest Division	(30-58-46.14,77-59-35.82); (30-58-47.34,77-59-35.1)
392	Uttarakhand	Tons Forest Division	(31-0-49.086,78-2-18.3); (31-0-46.74,78-2-19.14); (30-58-45.96,77-59-37.26)
394	Uttarakhand	Tons Forest Division	(31-0-3.6,78-1-52.5); (31-0-3.72,78-1-52.14); (31-0-47.64,78-2-14.7); (31-0-49.32,78-2-18.72)
397	Uttarakhand	Tons Forest Division	(30-58-1.38,78-00-5.7); (30-59-2.94,78-00-22.38); (31-0-4.2,78-1-52.74); (31-0-3.66,78-1-52.2)
398	Uttarakhand	Chakrata	(30-45-51.4,78-50-56.2); (30-45-51.6,78-01-20.5); (30-59-2.28,78-00-20.82); (30-59-2.58,78-00-5.4)
399	Uttarakhand	Tons Forest Division	(30-58-44.58,78-00-50.7); (30-58-43.74,78-00-50.4); (30-46-51.4,78-01-56.2)
400	Uttarakhand	Tons Forest Division	(31-0-2.52,78-1-51.18); (31-0-4.5,78-1-48.54); (30-59-45.6,78-00-30.6); (30-59-2.82,78-00-30.36)
401	Uttarakhand	Tons Forest Division	(30-58-37.2,77-57-13.38); (30-58-37.8,77-57-14.46); (31-0-1.92,78-1-51.42); (31-0-3.36,78-1-52.26)
402	Uttarakhand	Tons Forest	(30-58-43.02,77-57-28.38); (30-58-40.62,77-57-23.4); (30-58-

		Division	40.62,77-57-23.82); (30-58-41.88,77-57-29.4)
403	Uttarakhand	Tons Forest Division	(31-00-50.1, 78-02-13.5); (31-00-50.8, 78-02-14.0); (30-58-41.1,77-57-23.34); (30-58-43.14,77-57-29.4)
404	Uttarakhand	Tons Forest Division	(30-58-52.98,77-58-41.7); (30-58-46.08,77-58-47.52); (31-00-51.0, 78-02-12.9)
405	Uttarakhand	Tons Forest Division	(30-58.885-00,77-58-33.84); (30-58-53.4,77-58-34.26); (30-58-52.8,77-58-41.82); (30-58-52.74,77-58-42.12)
406	Uttarakhand	Tons Forest Division	(30-58.883-00,77-58-41.7); (30-58-46.08,77-58-47.52); (30-58-52.98,77-58-41.7); (30-58-46.08,77-58-47.52)
407	Uttarakhand	Tons Forest Division	(31-00-36.4,78-01-43.0); (31-00-35.7,78-1-44.1); (30-58-52.8,77-58-41.82); (30-58-52.74,77-58-42.12)
408	Uttarakhand	Tons Forest Division	(31-00-35.3,78-01-44.0); (31-00-36.4,78-01-43.0); (31-00-35.8,78-1-44.7); (31-00-35.4,78-1-43.5)
409	Uttarakhand	Tons Forest Division	(30-58-45.6,77-56-32.46); (30-58-45.9,77-56-32.8); (31-00-35.7,78-01-44.1); (31-00-35.8,78-01-44.7)
410	Uttarakhand	Tons Forest Division	(30-58-45.6,77-56-32.46); (30-58-45.9,77-56-32.8)
411	Uttarakhand	Tons Forest Division	(30-58-41.16,77-56-57.96); (30-58-44.94,77-56-42.54)
412	Uttarakhand	Tons Forest Division	(30-58-41.16,77-56-57.96); (30-58-34.92,77-56-4.62); (30-58-18.54,77-56-13.62)
413	Uttarakhand	Tons Forest Division	(31-1-51.48,78-1-30.36); (31-1-48.36,78-1-32.22); (30-58-44.94,77-56-42.54)
414	Uttarakhand	Tons Forest Division	(31-01-55.2,78-06-59.3); (31-01-47.1,78-06-54.1); (31-1-52.02,78-1-30.72); (31-1-49.08,78-1-31.38)
415	Uttarakhand	Tons Forest Division	(31-1-51.48,78-1-30.36); (31-1-48.54,78-1-32.22)
416	Uttarakhand	Tons Forest Division	(30-58-17.58,77-55-11.82); (30-57-12.9,77-55-16.32); (31-1-52.02,78-1-30.72); (31-1-49.08,78-1-31.38)
417	Uttarakhand	Tons Forest Division	(30-58-17.58,77-55-11.82); (30-57-12.9,77-55-16.32)
418	Uttarakhand	Tons Forest Division	(30-57-31.56,77-54-24.84); (30-57-30.72,77-54-11.58)
419	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-54-29.46, 78-21-25.02) (30-57-44.4,77-54-26.76)
420	Uttarakhand	Tons Forest Division	(30-57-31.56,77-54-24.84); (30-57-30.72,77-54-11.58)
421	Uttarakhand	Tons Forest Division	(31-1-45.24,78-1-26.88); (31-1-45,78-1.467-00); (30-57-44.4,77-54-26.76)
422	Uttarakhand	Tons Forest Division	(31-1-45.24,78-1-26.88); (31-1-45,78-1-28.02); (31-1-45.18,78-1-26.4); (31-1.753-00,78-1-25.5); (31-1.759-00,78-1.398-00)
423	Uttarakhand	Tons Forest Division	(30-57-21.275,77-53-44.610) (31-1-45.18,78-1-26.4); (31-1-45.18,78-1-25.5); (31-1-45.54,78-1-23.88)
424	Uttarakhand	Tons Forest Division	(30-57-22.5,77-53-37.2); (30-57-20.1,77-53-39.36)
425	Uttarakhand	Tons Forest Division	(31-01-55.2,78-06-59.3); (31-01-47.4,78-06-54.1)
426	Uttarakhand	Tons Forest	(31-4-37.8,77-68-3.96); (31-3-28.86,77-68-51.06)

		Division	
428	Uttarakhand	Tons Forest Division	(30-58-28.98,77-59-8.22); (30-58-27.96,77-59-10.98); (31-4-38.1,77-68-4.14); (31-3-28.98,77-68-51)
429	Uttarakhand	Tons Forest Division	(30-58-44.76,77-59-12.24); (30-58-43.92,77-59-23.4); (30-58-27.66,77-59-17.58); (30-58-26.52,77-59-22.74)
430	Uttarakhand	Tons Forest Division	(30-58-42.48,77-58-58.08); (30-58-36,77-58-56.22)
431	Uttarakhand	Tons Forest Division	(30-58-28.98,77-59-8.22); (30-58-27.96,77-59-10.98)
432	Uttarakhand	Tons Forest Division	(30-58-30.72,77-59-8.22); (30-58-27.66,77-59-17.58); (30-58-27.66,77-59-17.58); (30-58-26.52,77-59-22.74)
433	Uttarakhand	Tons Forest Division	(30-58-30.72,77-59-8.22); (30-58-27.66,77-59-17.58); (30-58-29.1,77-59-26.82); (30-58-44.46,77-59-22.32)
482	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-59-51.36,78-28-3.84); (30-59-48.84,78-28-40.8)
488	Uttarakhand	Chakrata	
489	Uttarakhand	Chakrata	(30-30-50.91,77-49-33.66); (30-30-59.26,77-49-24.36)
490	Uttarakhand	Tons Forest Division	(30-59-22,77-51-29); (31-59-12,77-51-44); (30-30-58.66,77-49-18.77)
491	Uttarakhand	Tons Forest Division	(30-59-22,77-51-29); (31-59-12,77-51-44); (31-59-39.6,77-51.59-00); (30-59-43.38,77-50-3)
492	Uttarakhand	Soil Conservation Kalsi	(31-59-39.6,77-51.59-00); (30-59-43.38,77-50-3)
493	Uttarakhand	Chakrata	(30-49-35.60,77-45-42.30)
494	Uttarakhand	Tons Forest Division	(31-1-46,77-48-41); (31-1-49,77-49-55)
495	Uttarakhand	Tons Forest Division	(31-1-46,77-48-41); (31-1-49,77-49-55); (31-01-38.46,77-49.58-00); (31-1-37.62,77-49-21)
496	Uttarakhand	Chakrata	(30-45-51.4,78-50-56.2); (30-45-51.6,78-01-20.5); (31-1-38.46,77-49.58-00); (31-1-37.62,77-49.35-00)
497	Uttarakhand	Chakrata	(30-47-4.534,77-56-52.498); (30-47-23.550,77-56-37.620); (30-46-51.4,78-01-56.2)
498	Uttarakhand	Tons Forest Division	(31-3-25.5,77-51-24.9); (31-3-42.0,77-52-3.92)
499	Uttarakhand	Chakrata	(30-46-51.3,78-02-29.8); (30-46-51.2,78-01-56.5); (31-3-22.4,77-52-27.6)
500	Uttarakhand	Chakrata	(30-57-22.10,77-56-32.80)
501	Uttarakhand	Tons Forest Division	
502	Uttarakhand	Chakrata	(30-58-33.30,77-58-37.50)
503	Uttarakhand	Tons Forest Division	(31-4-53.4,77-53-43.2); (31-5-3.4,77-53-38.6)
504	Uttarakhand	Tons Forest Division	(31-4-53.4,77-53-43.2); (31-5-3.4,77-53-38.6); (31-5-4.8,77-53-32.6)
505	Uttarakhand	Chakrata	(30-56-52.86,77-56-30.78) (31-5-4.8,77-53-32.6)
506	Uttarakhand	Tons Forest Division	(30-59-16,77-51-31); (30-59-9,77-51-10)
507	Uttarakhand	Chakrata	(30-57-28.80,77-57-04.20)

508	Uttarakhand	Tons Forest Division	(30-59-16,77-51-31); (30-59-9,77-51-10)
509	Uttarakhand	Chakrata	(30-53-28.8,77-56-27.6); (30-53-27.7,77-56-31.6)
510	Uttarakhand	Chakrata	(30-56-34.8,77-56-47.64); (30-57-58.70,77-56-52.60)
512	Uttarakhand	Chakrata	(30-54-52.1,77-54-59.8); (30-54-53.425,77-54-39.303)
513	Uttarakhand	Tons Forest Division	(31-3-51.7,77-53-37.4); (31-3-54.0,77-53-36.2)
514	Uttarakhand	Chakrata	(30-57-9.4,77-59-00) (31-3-55.2,77-28-20.3); (31-4-2.9,77-53-22.2)
515	Uttarakhand	Tons Forest Division	(31-3-51.7,77-53-37.4); (31-3-54.0,77-53-36.2)
516	Uttarakhand	Chakrata	(31-3-55.2,77-28-20.3); (31-4-2.9,77-53-22.2)
517	Uttarakhand	Chakrata	(30-51-43,77-50-32)
518	Uttarakhand	Chakrata	(30-55-50.6,77-55-11.3); (30-55-49.3,77-55-07.2)
519	Uttarakhand	Tons Forest Division	(31-3-18.9,77-51-31); (31-3-14.7,77-51-33.7)
520	Uttarakhand	Tons Forest Division	(31-3-18.9,77-51-31); (31-3-14.7,77-51-33.7); (31-3-7.9,77-51-36.9)
521	Uttarakhand	Chakrata	(30-56-51.48,78-59-18) (31-3-7.9,77-51-36.9)
522	Uttarakhand	Chakrata	(30-51-01.24,77-49-32.9)
523	Uttarakhand	Tons Forest Division	(31-1-53,77-50-39); (31-1-41,77-50-15)
524	Uttarakhand	Chakrata	(30-56-9.9,77-57-12.40) (31-1-42.7,77-50-9); (31-1-41.4,77-50-15)
525	Uttarakhand	Chakrata	(30-53-11.462,77-55-42.274)
526	Uttarakhand	Chakrata	(30-53-11.462,77-55-39.400)
527	Uttarakhand	Chakrata	(30-53-33.489,77-55-36.389)
528	Uttarakhand	Tons Forest Division	(31-1-53,77-50-39); (31-1-41,77-50-15)
529	Uttarakhand	Tons Forest Division	(31-3-11.11,77-49-18.43); (31-3-9.6,77-49-10.74); (31-1-42.7,77-50-9); (31-1-41.4,77-50-15)
530	Uttarakhand	Tons Forest Division	(31-3-11.11,77-49-18.43); (31-3-9.6,77-49-10.74); (31-3-2.18,77-49-18.39); (31-3-56.12,77-49-14.28)
531	Uttarakhand	Tons Forest Division	(31-1-31.21,77-49-38.38); (31-1-18.08,77-49-45.6); (31-3-2.18,77-49-18.39); (31-3-56.12,77-49-14.28)
532	Uttarakhand	Tons Forest Division	(31-1-31.21,77-49-38.38); (31-1-18.08,77-49-45.6); (31-1-10.30,77-49-45.88)
533	Uttarakhand	Tons Forest Division	(31-5-21.1,77-54-26.6); (31-5-9.9,77-54-26.9); (31-1-10.30,77-49-45.88)
534	Uttarakhand	Tons Forest Division	(31-5-21.1,77-54-26.6); (31-5-9.9,77-54-26.9); (31-5-7.0,77-54-27.9); (31-5-15.3,77-53-55.4)
535	Uttarakhand	Tons Forest Division	(31-02-39.8,78-03-52.6); (31-02-28.5,78-03-41.4); (31-5-7.0,77-54-27.9); (31-5-15.3,77-53-55.4)
536	Uttarakhand	Tons Forest Division	(31-02-39.8,78-03-52.6); (31-02-28.5,78-03-41.4)
537	Uttarakhand	Tons Forest Division	(31-02-39.8,78-03-52.6); (31-02-28.5,78-03-41.4)
538	Uttarakhand	Tons Forest Division	(31-02-39.8,78-03-52.6); (31-02-28.5,78-03-41.4)
539	Uttarakhand	Tons Forest	(30-52-12.4,78-2-45.8); (30-52-57.8,78-02-33.5)

		Division	
540	Uttarakhand	Tons Forest Division	(30-59-52.3,78-4-34.8) (30-51-40.5,78-2-48.5); (30-51-40.9,78-2-43.5)
541	Uttarakhand	Tons Forest Division	(30-59-52.3,78-4-34.8)
542	Uttarakhand	Tons Forest Division	
543	Uttarakhand	Tons Forest Division	
544	Uttarakhand	Tons Forest Division	(30-53-40.08,78-6-30.12); (30-53-37.98,78-6-33.54)
545	Uttarakhand	Tons Forest Division	(30-59-41.2,78-4-15.1) (30-53-35.4,78-6-32.1); (30-53-39.12,78-6-37.86)
546	Uttarakhand	Tons Forest Division	(30-59-41.2,78-4-15.1)
547	Uttarakhand	Tons Forest Division	
548	Uttarakhand	Tons Forest Division	(30-53-40.08,78-6-30.12); (30-53-37.98,78-6-33.54)
549	Uttarakhand	Tons Forest Division	(31-00-42.1,78-05-24.1); (31-00-23.94,78-3-47.28); (30-53-35.4,78-6-32.1); (30-53-39.12,78-6-37.86)
550	Uttarakhand	Tons Forest Division	(31-00-42.1,78-05-24.1); (31-00-23.94,78-3-47.28)
551	Uttarakhand	Tons Forest Division	(31-00-42.1,78-05-24.1); (31-00-39.9,78-03-7.88)
552	Uttarakhand	Chakrata	(30-47-38.04,77-54-31.5); (30-47-21.6,77-55-16.08)
553	Uttarakhand	Tons Forest Division	(31-00-42.1,78-05-24.1); (31-00-39.9,78-03-7.88)
554	Uttarakhand	Tons Forest Division	(31-1-6.18,78-7-21.96); (31-1-8.4,78-7-23.1)
555	Uttarakhand	Tons Forest Division	(31-1-6.18,78-7-21.96); (31-1-8.4,78-7-23.1)
556	Uttarakhand	Tons Forest Division	(30-49-34,78-6-39); (30-49-36,78-6-36)
557	Uttarakhand	Chakrata	(30-32-29.4,77-49-59.28); (30-32-27.12,77-49-57.9); (30-49-34.9,78-6-40.5); (30-49-39,78-6-41.6)
558	Uttarakhand	Tons Forest Division	(30-49-34,78-6-39); (30-49-36,78-6-36)
559	Uttarakhand	Chakrata	(30-31-23.04,77-49-44.64); (30-31-24.3,); (30-49-34.9,78-6-40.5); (30-49-39,78-6-41.6)
560	Uttarakhand	Tons Forest Division	(30-48-24,78-6-28); (30-48-25,78-6-24)
561	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1); (30-48-23,78-6-26); (30-48-22,78-6-26)
562	Uttarakhand	Tons Forest Division	(30-48-24,78-06-28); (30-48-25,78-6-24)
563	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1); (30-48-23,78-6-26); (30-48-22,78-6-26)
564	Uttarakhand	Tons Forest Division	(30-55-21.2,78-4-46.1); (30-55-33,78-4-57.66)

565	Uttarakhand	Tons Forest Division	(30-55-21.2,78-4-46.1); (30-55-33,78-4-57.66); (30-55-43.1,78-4-36.1); (30-55-30.1,78-4-19.1)
566	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1); (30-55-43.1,78-4-36.1); (30-55-30.1,78-4-19.1)
567	Uttarakhand	Chakrata	(30-44-59.39,77-51-52.6); (30-45-01.6,77-51-47.2)
568	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1); (30-45-07,77-51-37.3); (30-45-07.30,77-51-42.6)
569	Uttarakhand	Chakrata	(30-43-46.7,77-51-12.7); (30-52-8.9,77-51-01.7)
570	Uttarakhand	Tons Forest Division	(30-57-0.5,78-6-6.32); (30-56-32.97,78-5-37.47); (30-43-55.8,77-50-57.7)
571	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1); (30-56-36,78-6-10.44); (30-56-33.24,78-6-8.82)
572	Uttarakhand	Tons Forest Division	(30-57-0.5,70-6-6.32); (30-56-32.97,78-5-37.47)
573	Uttarakhand	Tons Forest Division	(30-57-35.4,78-07-29.3); (30-57-26.4,78-07-42.1); (30-56-36,78-6-10.44); (30-56-33.24,78-6-8.82)
574	Uttarakhand	Chakrata	(30-45-46.3,77-48-22.9); (30-45-44.1,77-43-21.1)
575	Uttarakhand	Chakrata	(30-47-6.83,77-54-25.5); (30-47-7.16,77-54-31.7); (30-45-36.6,77-48-05.8)
576	Uttarakhand	Tons Forest Division	(30-57-29.8,78-07-57.6); (30-57-30.4,78-07-21.5)
577	Uttarakhand	Soil Conservation Kalsi	(30-25-35.2,77-56-21.0); (30-25-41.4,77-56-18.4)
578	Uttarakhand	Tons Forest Division	(30-57-29.8,78-07-57.6); (30-57-30.4,78-07-21.5); (30-24-46.7,77-56-01.8)
579	Uttarakhand	Soil Conservation Kalsi	(30-28-37.07,77-54-05.59); (30-28-40.78,77-53-82.64)
580	Uttarakhand	Tons Forest Division	(30-57-29.8,78-07-29.3); (30-57-30.4,78-07-21.5); (30-28-46.54,77-53-22.82)
581	Uttarakhand	Tons Forest Division	(30-57-29.8,78-07-57.6); (30-57-30.4,78-07-21.5)
582	Uttarakhand	Soil Conservation Kalsi	(30-26-11.1,77-56-39.7); (30-25-32.2,77-56-46.6)
583	Uttarakhand	Soil Conservation Kalsi	(30-26-48.3,77-56-30.1); (30-25-05.6,77-55-40.4); (30-25-21.5,77-56-47.5)
584	Uttarakhand	Tons Forest Division	(30-58-10.8,78-05-47.6); (30-58-41.2,78-05-24.5); (30-24-36.2,77-55-26.2)
585	Uttarakhand	Tons Forest Division	(30-58-10.8,78-05-47.6); (30-58-41.2,78-05-24.5)
586	Uttarakhand	Soil Conservation Kalsi	(30-26-24.6,77-58-07.6); (30-26-15.5,77-51-56.6)
587	Uttarakhand	Tons Forest Division	(30-51-27.7,78-3-22.3); (30-51-24.9,78-3-16); (30-25-29.1,77-57-19.5)
588	Uttarakhand	Tons Forest Division	(30-51-27.7,78-3-22.3); (30-51-24.9,78-3-16); (30-51-25.02,78-2-16.9); (30-51-21.12,78-3-35.7)

589	Uttarakhand	Tons Forest Division	(31-00-34.2,78-05-8.20) (30-51-25.02,78-2-16.9); (30-51-21.12,78-3-35.7)
590	Uttarakhand	Tons Forest Division	(30-56-11.1,78-6-21); (30-54-19,78-3-5.5)
591	Uttarakhand	Soil Conservation Kalsi	(30-26-09.8,77-59-20.1); (30-26-05.9,77-59-18.2); (30-55-52.8,78-5-45.45); (30-56-0.14,78-5-37.13)
592	Uttarakhand	Tons Forest Division	(30-56-11.1,78-6-21); (30-54-19,78-3-5.5); (30-25-51.8,77-59-15.8)
593	Uttarakhand	Tons Forest Division	(30-57-58.86,78-05-41.4) (30-55-52.8,78-5-45.45); (30-56-0.14,78-5-37.13)
594	Uttarakhand	Tons Forest Division	(30-57-58.86,78-5-41.4)
595	Uttarakhand	Tons Forest Division	(30-57-58.86,78-5-41.4)
596	Uttarakhand	Soil Conservation Kalsi	(30-25-24.0,77-55-56.7); (30-25-14.6,77-55-51.4)
597	Uttarakhand	Tons Forest Division	(31-0-53.88,78-2-57.12) (30-24-57.3,77-55-42.0)
598	Uttarakhand	Tons Forest Division	(31-0-53.88,78-2-57.12)
599	Uttarakhand	Soil Conservation Kalsi	(30-28-055.9,77-54-34.95); (30-27-59.29,77-54-23.91)
600	Uttarakhand	Tons Forest Division	(30-50-51.48,78-4-42.36); (30-50-52.86,78-4-44.28); (30-27-42.67,77-54-10.96)
601	Uttarakhand	Tons Forest Division	(30-50-51.48,78-4-42.36); (30-50-52.86,78-4-44.28); (30-50-48,78-4-21); (30-50-28.2,78-4-18)
602	Uttarakhand	Soil Conservation Kalsi	(30-27-52.9,77-53-25.44); (30-27-51.6,77-53-21.12); (30-50-48,78-4-21); (30-50-28.2,78-4-18)
603	Uttarakhand	Soil Conservation Kalsi	(30-23-16.6,77-43-14.0); (30-24-28.1,77-43-34.0)
604	Uttarakhand	Soil Conservation Kalsi	(30-19-27.2,77-44-24.2); (30-19-35.1,77-44-26.8); (30-24-14.9,77-44-23.7)
605	Uttarakhand	Soil Conservation Kalsi	(30-19-27.2,77-44-24.2); (30-19-35.1,77-44-26.8); (30-19-46.2,77-44-26.0); (30-19-49.8,77-44-26.1); (30-20-07.5,77-44-29.5); (30-20-48.9,77-44-15.2)
606	Uttarakhand	Tons Forest Division	(30-52-16.56,78-4-27.7); (30-52-17,78-4-24.8); (30-19-46.2,77-44-26.0); (30-19-49.8,77-44-26.1); (30-20-07.5,77-44-29.5); (30-20-48.9,77-44-15.2)
607	Uttarakhand	Tons Forest Division	(30-52-16.56,78-4-27.7); (30-52-17,78-4-24.8); (30-52-15.9,78-4-23.5); (30-52.13.2,78-3-53.7)
608	Uttarakhand	Soil Conservation Kalsi	(30-19-14.8,77-44-49.7); (30-19-18.2,77-44-52.3); (30-52-15.9,78-4-23.5); (30-52-13.2,78-3-53.7)
609	Uttarakhand	Tons Forest Division	(30-52-36.9,78-2-16.25); (30-52-36.36,78-2-14.14); (30-19-25.1,77-44-55.0); (30-19-35.7,77-44-56.6); (30-19-45.6,77-44-

			51.6)
610	Uttarakhand	Soil Conservation Kalsi	(30-19-14.8,77-44-49.7); (30-19-18.2,77-44-52.3); (30-52-33.36,78-2-18.03); (30-52-36.27,78-2-18.22)
611	Uttarakhand	Tons Forest Division	(30-52-36.9,78-2-16.25); (30-52-36.36,78-2-14.14); (30-19-25.1,77-44-55.0); (30-19-35.7,77-44-56.6); (30-19-45.6,77-44-51.6)
612	Uttarakhand	Tons Forest Division	(30-52-22.86,78-5-12); (30-52-20.1,78-5-9.72); (30-52-33.36,78-2-18.03); (30-52-36.27,78-2-18.22)
613	Uttarakhand	Soil Conservation Kalsi	(30-23-16.6,77-43-14.0); (30-24-28.1,77-43-34.0); (30-52-15.84,78-5-10.86); (30-52-11.64,78-5-15.66)
614	Uttarakhand	Tons Forest Division	(30-52-22.86,78-5-12); (30-52-20.1,78-5-9.72); (30-24-14.9,77-44-23.7)
615	Uttarakhand	Tons Forest Division	(30-54-47,78-2-36.6); (30-53-54.6,78-4-18.2); (30-52-15.84,78-5-10.86); (30-52-11.64,78-5-15.66)
616	Uttarakhand	Tons Forest Division	(30-54-47,78-02-36.6); (30-53-54.6,78-04-18.2); (30-54-7.8,78-2-11.2); (30-54-11.2,78-1-49.7)
617	Uttarakhand	Soil Conservation Kalsi	(30-25-11,77-55-14) (30-54-7.8,78-2-11.2); (30-54-11.2,78-1-49.7)
618	Uttarakhand	Tons Forest Division	(30-48-14,78-06-33); (30-48-15,78-06-30)
619	Uttarakhand	Tons Forest Division	(30-52-59.8,78-4-9.84); (30-53-7.5,78-4-6.2); (30-48-19,78-06-29); (30-48-18,78-06-29)
620	Uttarakhand	Tons Forest Division	(30-52-59.8,78-4-9.84); (30-53-7.5,78-4-6.2); (30-53-81,78-4-7.5); (30-52-55.5,78-4-12.2)
621	Uttarakhand	Tons Forest Division	(30-55-35.38,78-06-8.98); (30-55-29.75,78-05-37.60); (30-53-81,78-4-7.5); (30-52-55.5,78-4-12.2)
622	Uttarakhand	Tons Forest Division	(30-55-35.38,78-6-8.98); (30-55-29.75,78-5-37.60); (30-55-40.49,78-5-48.10); (30-55-57.62,78-5-47.44)
623	Uttarakhand	Tons Forest Division	(30-52-28.32,78-00-27.9); (30-53-29.1,78-00-30.96); (30-55-40.49,78-5-48.10); (30-55-57.62,78-5-47.44)
624	Uttarakhand	Soil Conservation Kalsi	(30-24-18.7,77-37-11.9); (30-24-21.3,77-37-09.8); (30-53-37.1,78-00-19.6); (30-53-25.6,78-00-20.1)
625	Uttarakhand	Tons Forest Division	(30-52-28.32,78-00-27.9); (30-53-29.1,78-00-30.96); (30-24-50.6,77-37-0.98); (30-25-19.1,77-36-14.6); (30-25-13.7,77-36-15.3); (30-25-10.7,77-36-16.6)
626	Uttarakhand	Soil Conservation Kalsi	(30-25-39.1,77-37-06.5); (30-25-17.1,77-25-17.3); (30-53-37.1,78-00-19.6); (30-53-25.6,78-00-20.1)
627	Uttarakhand	Tons Forest Division	(30-51-38.22,78-6-17.52); (30-51-34.8,78-06-36.24); (30-24-50.4,77-37-22.1); (30-24-50.4,77-37-22.1)
628	Uttarakhand	Tons Forest Division	(30-50-8,78-5-55); (30-50-4,78-5-55); (30-51-33.36,78-6-38.94); (30-52-41.1,78-1-3.84)
629	Uttarakhand	Tons Forest Division	(30-50-8,78-5-55); (30-50-4,78-5-55); (30-50-7,78-5-58); (30-50-2,78-5-56)
630	Uttarakhand	Soil Conservation Kalsi	(30-25-18.7,77-35-34.0); (30-25-15.5,77-35-38.5); (30-50-7,78-5-58); (30-50-2,78-5-56)

631	Uttarakhand	Tons Forest Division	(30-52-53.6,78-1-41); (30-52-38.8,78-4-38); (30-25-14.5,77-35-41.2); (30-25-13.8,77-35-46.8)
632	Uttarakhand	Tons Forest Division	(30-52-53.6,78-1-41); (30-52-38.8,78-4-38); (30-52-39.9,78-1-39.8); (30-52-41.1,78-1-64)
633	Uttarakhand	Tons Forest Division	(30-53-16.32,78-3-00); (30-53-29.7,78-2-48.4); (30-52-39.9,78-1-39.8); (30-52-41.1,78-1-3.84)
634	Uttarakhand	Tons Forest Division	(30-53-16.32,78-3-00); (30-53-29.7,78-2-48.4); (30-53-35.2,78-4-46.0); (30-53-59.3,78-2-41.4)
635	Uttarakhand	Soil Conservation Kalsi	(30-22-06.4,77-44-1.1); (30-23-21.2,77-45-47.0); (30-53-35.2,78-4-46.0); (30-53-59.3,78-2.69-00)
636	Uttarakhand	Soil Conservation Kalsi	(30-24-19.44,77-43-10.6); (30-23-55.2,77-42-28.38); (30-23-21.2,77-45-47.0)
637	Uttarakhand	Soil Conservation Kalsi	(30-19-46.5,77-43-43.0); (30-19-53.5,77-43-44.2); (30-22-27.6,77-42-6.9)
638	Uttarakhand	Soil Conservation Kalsi	(30-24-44.6,77-49-57.5); (30-24-54.1,77-50-0.59); (30-20-0.7,77-43-42.8); (30-20-29.4,77-43-44.6)
639	Uttarakhand	Soil Conservation Kalsi	(30-25-09.4,77-54-23.2); (30-24-54.1,77-53-36.4); (30-24-39.6,77-49-45.5); (30-24-29.5,77-49-35.1)
640	Uttarakhand	Soil Conservation Kalsi	(30-19-20.3,77-44-38.8); (30-19-37.5,77-44-36.7); (30-24-56.4,77-53-30.8); (30-24-57.2,77-53-28.9)
641	Uttarakhand	Soil Conservation Kalsi	(30-27-06.1,77-53-38.4); (30-27-06.5,77-33-49.2); (30-19-48.8,77-44-39.3); (30-20-15.9,77-44-47.9)
642	Uttarakhand	Soil Conservation Kalsi	(30-27-41,77-49-35) (30-26-48.8,77-53-9.7); (30-26-52.8,77-53-57.8)
643	Uttarakhand	Soil Conservation Kalsi	(30-19-13.1,77-46-4.8); (30-19-13.6,77-45-13.5)
644	Uttarakhand	Soil Conservation Kalsi	(30-20-29.1,77-46-30.7); (30-20-28.4,77-76-30.8)
645	Uttarakhand	Soil Conservation Kalsi	(30-20-46.86,77-42-37.44); (30-20-42.42,77-42-39.66)
646	Uttarakhand	Soil Conservation Kalsi	(30-21-56.34,77-41-42.06); (30-22-5.58,77-41-51.6); (30-20-42.72,77-42-45); (30-20-41.48,77-42-48.18)
647	Uttarakhand	Govind Wildlife sanctuary	(31-6-22,78-5-33); (31-6-25,78-5-3); (30-22-7.32,77-41-59.16)
648	Uttarakhand	Soil Conservation Kalsi	(30-20-56.34,77-42-31.38); (30-20-56.82,77-42-33.78); (31-6-26,78-5-3); (31-6-28,78-5-3)
649	Uttarakhand	Govind Wildlife sanctuary	(31-7-10,78-4-59); (31-7-8,78-4-59); (30-20-54.84,77-42-39.84)

650	Uttarakhand	Soil Conservation Kalsi	(30-21-0.23,77-42-3.09); (30-21-2.60,77-42-6.79); (31-7-13.2,78-4-50); (31-7-49.14,78-4-44.22)
651	Uttarakhand	Soil Conservation Kalsi	(30-21-20.04,77-42-8.88); (30-21-22.8,77-42-11.94); (30-21-6.49,77-43-9.92)
652	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-45-48.2,78-05-10.2); (30-47-35.5,78-03-04.7); (30-21-25.32,77-42-17.28); (30-21-24.54,77-42-21.12); (30-21-25.5,77-42-25.5); (30-21-29.52,77-42-28.92)
653	Uttarakhand	Soil Conservation Kalsi	(30-21-52.86,77-43-28.8); (30-20-50.82,77-42-24.9)
654	Uttarakhand	Soil Conservation Kalsi	(30-21-41.94,77-41-54.66); (30-21-44.64,77-42-6.39); (30-20-48.42,77-49-28.98)
655	Uttarakhand	Soil Conservation Kalsi	(30-21-39.42,77-41-58.32); (30-21-38.76,77-42-7.14); (30-21-48.48,77-42-10.98); (30-21-53.22,77-42-14.7)
656	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-21-40.32,77-42-11.64); (30-20-21.6,77-42-6)
657	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-56-03,78-14-48); (30-56-55,78-14-57)
658	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-56-03,78-14-78); (30-56-55,78-14-37); (30-57-11,78-14-47); (30-59-16,78-16-09)
659	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-56-03,78-14-48); (30-56-55,78-14-37); (30-57-11,78-14-47); (30-59-16,78-16-09)
660	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-56-03,78-14-48); (30-56-55,78-14-37); (30-57-11,78-14-47); (30-59-16,78-16-09)
661	Uttarakhand	Tons Forest Division	(30-57-11,78-14-47); (30-59-16,78-16-09)
662	Uttarakhand	Tons Forest Division	
663	Uttarakhand	Upper Yamuna Barkot Forest Division	
664	Uttarakhand	Upper Yamuna Barkot Forest Division	
665	Uttarakhand	Upper Yamuna Barkot Forest Division	
666	Uttarakhand	Upper Yamuna Barkot Forest Division	
789	Uttarakhand	Tons Forest Division	(31-0-49.086,78-2-18.3); (31-0-46.74,78-2-19.14); (31-09-35.5,78-06-29); (31-09-47,78-06-21.5)

1108	Uttarakhand	Mussoorie Forest Division	(30-33-53.2,78-04-00.1);(30-40-28.23,77-37-36.45); (30-40-21.33,77-37-36.10)
1112	Uttarakhand	Mussoorie Forest Division	(30-32-26.8,078-06-10.1);(31-13-40.45,78-04-38.53); (31-13-23.17,78-05-32.59)
1115	Uttarakhand	Mussoorie Forest Division	(30-32-19.8,78-07-49.7);(31-13-23.41,78-02-16.76); (31-12-59.06,78-02-53.41)
1117	Uttarakhand	Mussoorie Forest Division	(30-32-36.1,78-06-10.1);(31-13-54.57,78-4-47.49); (31-12-19.98,78-14-44); (31-12-26.57,78-38-37); (31-12-43.88,78-39-80); (31-13-14.57,78-2-4.88);
1118	Uttarakhand	Mussoorie Forest Division	(30-36-55.2,78-06-43.9)
1119	Uttarakhand	Mussoorie Forest Division	(30-33-18.10,78-08-30.87)
1120	Uttarakhand	Mussoorie Forest Division	(30-32-2.96,78-08-24.02)
1121	Uttarakhand	Mussoorie Forest Division	(30-32-43.7,78-07-22.0)
1125	Uttarakhand	Mussoorie Forest Division	(30-32-43.7,78-07-22.0);(31-11-11.27,77-45-58.25); (31-11-17.50,77-45-12.08); (31-11-52.66,77-44-55.10)
1127	Uttarakhand	Mussoorie Forest Division	(30-34-24.2,78-00-28.0);(30-39-14,77-45-47); (30-39-20,77-45-52)
1131	Uttarakhand	Mussoorie Forest Division	(30-37-06.9,78-01-13.3);(30-48-10,77-37-16)
1133	Uttarakhand	Mussoorie Forest Division	(30-32-15.8,78-1-38.6);(31-10-22.61,77-48-7.06); (31-10-41.03,77-48-12.04); (31-09-58.1015,77-47-15.18); (31-09-53.43,77-47-8.89); (31-10-4.30,77-47-10.13); (31-09-55.84,77-47-17.22)
1135	Uttarakhand	Mussoorie Forest Division	(30-33-43.8,78-03-58.9)
1138	Uttarakhand	Mussoorie Forest Division	(30-33-34.9,78-00-32.4)
1139	Uttarakhand	Mussoorie Forest Division	(30-32-58.7,78-12-21.7); (30-33-03.1,78-12-24.0)
1140	Uttarakhand	Mussoorie Forest Division	(30-34-0.05,78-02-10.4)
1142	Uttarakhand	Mussoorie Forest Division	(30-33-0.679,78-00-0.416); (30-33-0.677,78-00-0.447); (31-05-26.22,77-45-54.55)
1147	Uttarakhand	Mussoorie Forest Division	(30-37-02.0,78-06-56.4)
1148	Uttarakhand	Mussoorie Forest Division	(30-32-16.6,78-11-07.6)
1152	Uttarakhand	Mussoorie Forest Division	(30-32-30.91,78-11-02.12);(30-37-37,77-35-13); (30-37-38,77-35-12)
1153	Uttarakhand	Mussoorie Forest Division	(30-36-04.3,78-05-19.3)
1154	Uttarakhand	Mussoorie Forest Division	(30-33-56.5,78-03-01.4)
1157	Uttarakhand	Mussoorie Forest Division	(30-34-24.4,78-04-49.5);(30-37-45,77-34-36); (30-37-46,77-35-02)
1158	Uttarakhand	Mussoorie	(30-32-43.2,78-11-39.4); (30-32-28.8,78-11-55.2)

		Forest Division	
1159	Uttarakhand	Mussoorie Forest Division	(30-34-51.9,78-06-26.5)
1163	Uttarakhand	Mussoorie Forest Division	(30-32-33.8,78-11-49.0);(30-37-36,77-34-16); (30-37-47,77-34-20)
1164	Uttarakhand	Mussoorie Forest Division	(30-34-48.9,78-06-27.6)
1165	Uttarakhand	Mussoorie Forest Division	(30-33-10.5,78-10-35.8)
1168	Uttarakhand	Mussoorie Forest Division	(30-36-41.0,78-08-09.3);(30-46-39.20,77-24-16.09); (30-46-45,77-24-30.72); (30-46-44.74,77-23-50.00); (30-46-47.00,77-23-26.03); (30-48-48.09,77-24-14.10); (30-46-50.06,77-23-57.05)
1169	Uttarakhand	Mussoorie Forest Division	(30-37-15.3,78-05-19.3)
1171	Uttarakhand	Mussoorie Forest Division	(30-32-46.87,78-10-29.5);(30-38-21,77-33-29)
1172	Uttarakhand	Mussoorie Forest Division	(30-36-30.6,78-04-11.1)
1173	Uttarakhand	Mussoorie Forest Division	(30-36-40.7,78-09-55.2)
1174	Uttarakhand	Mussoorie Forest Division	(30-36-50.4,78-04-36.3)
1175	Uttarakhand	Mussoorie Forest Division	(30-36-40.7,78-09-55.2)
1176	Uttarakhand	Mussoorie Forest Division	(30-33-45.17,78-11-53.32)
1179	Uttarakhand	Mussoorie Forest Division	(30-33-10.5,78-10-45.1);(30-44-44.03,77-24-26.05); (30-44-38.07,77-41-41.06); (30-44-42.08,77-24-41.70); (30-44-42.12,77-24-36); (30-44-41.03,77-24-27.00); (30-44-52.07,77-24-13.01)
1182	Uttarakhand	Mussoorie Forest Division	(30-33-37.5,78-10-15.1);(30-44-19.09,77-25-10.03); (30-43-42.05,77-24-47.00); (30-44-05.00,77-24-58.07)
1183	Uttarakhand	Mussoorie Forest Division	(30-34-18.6,78-10-41.7)
1186	Uttarakhand	Mussoorie Forest Division	(30-33-16.6,78-10-13.3);(30-44-56.18,77-22-44.89); (30-45-17.34,77-23-03.43); (30-45-13.78,77-22-43.05)
1187	Uttarakhand	Mussoorie Forest Division	(30-31-19.4,78-09-56.44)
1189	Uttarakhand	Mussoorie Forest Division	(30-33-10.2,78-10-10.3);(30-45-13.78,77-21-47.84); (30-45-21.51,77-21-34.68); (30-45-14.95,77-21-44.52); (30-45-41.11,77-21-34.05);
1190	Uttarakhand	Mussoorie Forest Division	(30-33-13.20,78-09-27.62)
1191	Uttarakhand	Mussoorie Forest Division	(30-33-13.20,78-09-27.62)
1194	Uttarakhand	Mussoorie Forest Division	(30-32-14.9,78-08-45.1);(30-43-31.6,77-20-33.1)
1196	Uttarakhand	Mussoorie Forest Division	(30-33-18.10,78-08-30.87)

1198	Uttarakhand	Mussoorie Forest Division	(30-33-06.4,78-08-31.90);(30-44-18.01,77-20-59.7); (30-44-02,77-21-24.9); (30-44-12.4,77-21-9.8)
1200	Uttarakhand	Mussoorie Forest Division	(30-32-50.57,78-08-53.69);(30-38-48.87,77-33-16.49); (30-38-22.30,77-33-15.96); (30-38-19.97,77-32-59.29); (30-38-3.40,77-33-30.31);
1202	Uttarakhand	Mussoorie Forest Division	(30-29-25.64,78-14-56.99); (30-29-24.67,78-15-00.5); (30-44-36.9,77-21-43.3)
1204	Uttarakhand	Mussoorie Forest Division	(30-31-20.1,78-07-28.8);(30-38-48.87,77-33-16.49); (30-38-22.30,77-33-15.96); (30-38-19.97,77-32-59.29); (30-38-3.40,77-33-30.31);
1205	Uttarakhand	Mussoorie Forest Division	(30-29-25.64,78-14-56.99)
1206	Uttarakhand	Mussoorie Forest Division	
1207	Uttarakhand	Mussoorie Forest Division	(30-29-25.64,78-14-56.99)
1208	Uttarakhand	Mussoorie Forest Division	(30-32-09.8,78-07-33.8)
1209	Uttarakhand	Mussoorie Forest Division	(30-32-17.8,78-09-57.7)
1210	Uttarakhand	Mussoorie Forest Division	(30-29-08.64,78-50-13.51)
1212	Uttarakhand	Mussoorie Forest Division	(30-32-36.0,78-06-14.5);(30-42-22.12,77-23-28.88); (30-42-22.81,77-23-19.26); (30-42-19.34,77-23-13.45); (30-42-13,77-23-00); (30-42-05,77-23-21);
1213	Uttarakhand	Mussoorie Forest Division	(30-29-08.64,78-15-13.5)
1214	Uttarakhand	Mussoorie Forest Division	(30-29-08.64,78-15-13.5)
1215	Uttarakhand	Mussoorie Forest Division	(30-32-43.7,78-07-22.0)
1218	Uttarakhand	Mussoorie Forest Division	(30-32-36.0,78-06-14.5);(30-38-44.61,77-31-56.21); (30-38-30.63,77-31-48.45); (30-38-31.19,77-31-59.79); (30-38-33.71,77-32-12.73);
1219	Uttarakhand	Mussoorie Forest Division	(30-29-08.64,78-15-13.5)
1221	Uttarakhand	Mussoorie Forest Division	(30-32-36.0,78-06-14.5);(30-43-53,77-22-15); (30-43-56,77-22-02); (30-43-37,77-21-56)
1223	Uttarakhand	Mussoorie Forest Division	(30-29-08.64,78-15-13.5)
1227	Uttarakhand	Mussoorie Forest Division	(30-29-27.30,78-14-52.68);(30-37-28.0,77-28-21.7); (30-37-24.2,77-27-51.4); (30-36-58.8,77-28-2.4); (30-36-53.6,77-27-29.2);
1229	Uttarakhand	Mussoorie Forest Division	(30-43-16.1,77-22-38.6)
1230	Uttarakhand	Mussoorie Forest Division	
1231	Uttarakhand	Mussoorie Forest Division	
1233	Uttarakhand	Mussoorie	(30-38-18.12,77-21-31.19)

		Forest Division	
1234	Uttarakhand	Mussoorie Forest Division	(30-28-36.8,077-57-42.3)
1235	Uttarakhand	Mussoorie Forest Division	
1238	Uttarakhand	Mussoorie Forest Division	(30-38-1.4,77-32-49.4); (30-38-4.8,77-33-2.9)
1239	Uttarakhand	Mussoorie Forest Division	
1241	Uttarakhand	Mussoorie Forest Division	(30-27-0.40,78-07-9.54);(30-42-39.1,77-21-41.2)
1245	Uttarakhand	Mussoorie Forest Division	(30-27-0.40,78-27-9.54);(30-35-51.5,77-30-57.6); (30-35-35.4,77-30-54.2); (30-35-18.4,77-30-54.3)
1246	Uttarakhand	Mussoorie Forest Division	
1247	Uttarakhand	Mussoorie Forest Division	
1249	Uttarakhand	Mussoorie Forest Division	(30-40-49.40,77-18-13.63)
1253	Uttarakhand	Mussoorie Forest Division	(30-49-23.00,77-24-16.75); (30-49-27.35,77-24-01.33)
1254	Uttarakhand	Mussoorie Forest Division	
1256	Uttarakhand	Mussoorie Forest Division	(30-40-2.64,77-20-17.40)
1257	Uttarakhand	Mussoorie Forest Division	(30-27-8.00,78-8-3.21)
1258	Uttarakhand	Mussoorie Forest Division	
1260	Uttarakhand	Mussoorie Forest Division	(30-49-00.62,77-26-24.60); (30-48-56.55,77-26-29.93); (30-49-09.16,77-26-20.10); (30-49-12.73,77-26-27.43); (30-49-02.82,77-26-73.31);
1261	Uttarakhand	Mussoorie Forest Division	(30-28-00,78-14-00)
1262	Uttarakhand	Mussoorie Forest Division	
1263	Uttarakhand	Mussoorie Forest Division	
1266	Uttarakhand	Mussoorie Forest Division	(30-28-9.0,78-14-12.8); (30-28-8.98,78-14-07.6); (30-48-08.98,77-28-12.32)
1267	Uttarakhand	Mussoorie Forest Division	
1268	Uttarakhand	Mussoorie Forest Division	(30-28-9.0,78-14-12.8); (30-28-8.98,78-14-07.6)
1270	Uttarakhand	Mussoorie Forest Division	
1272	Uttarakhand	Mussoorie Forest Division	(30-48-42.33,77-28-40.47); (30-48-53.38,77-28-11.94)
1275	Uttarakhand	Mussoorie Forest Division	

1277	Uttarakhand	Mussoorie Forest Division	(30-36-1.05,77-30-56.3); (30-36-10.3,77-30-37.3)
1279	Uttarakhand	Mussoorie Forest Division	(30-29-25.64,78-14-56.99);(30-37-42.02,77-21-57.20)
1281	Uttarakhand	Mussoorie Forest Division	(30-47-48.3,77-24-21.4); (30-47-56.1,77-24-16.3); (30-47-51.9,77-24-17.8); (30-47-49.6,77-24-21.5);
1282	Uttarakhand	Mussoorie Forest Division	
1283	Uttarakhand	Mussoorie Forest Division	
1284	Uttarakhand	Mussoorie Forest Division	(30-29-25.64,78-14-56.99)
1289	Uttarakhand	Mussoorie Forest Division	(30-31- 19.5,77-59-7.26); (30-31-19.2,77-59-6.18); (30-35-49.8,77-29-14.1); (30-35-27.1,77-29-1.4)
1291	Uttarakhand	Mussoorie Forest Division	(30-30-05.0,77-59-47.5); (30-30-05.8,77-59-47.9); (30-39-8.79,77-20-14.39)
1292	Uttarakhand	Mussoorie Forest Division	(30-31-0.559,77-59-.374);(30-30-08.8,77-59-49.7)
1293	Uttarakhand	Mussoorie Forest Division	(30-30-42.2,77-59-30.3)
1296	Uttarakhand	Mussoorie Forest Division	(30-31-0.815,77-59-0.290); (30-31-0.815,77-59-02.74); (30-39-8.04,77-29-46.13); (30-39-31.99,77-29-33.50)
1298	Uttarakhand	Mussoorie Forest Division	(30-38-23.93,77-21-11.20)
1300	Uttarakhand	Mussoorie Forest Division	(30-30-25.14,77-59-1.86); (30-30-25.2,77-59-1.14)
1666	Uttarakhand	Mussoorie Forest Division	(30-27-5.25,78-11-6.02);(31-4-19.11,77-31-42.59); (31-4-33.04,77-31-35.40)
1668	Uttarakhand	Mussoorie Forest Division	(30-27-5.19,78-11-4.14)
1672	Uttarakhand	Mussoorie Forest Division	(30-27-5.83,78-11-9.96);(30-51-27.9,77-00-16.26)
1673	Uttarakhand	Mussoorie Forest Division	(30-27-5.35,78-11-8.10)
1674	Uttarakhand	Mussoorie Forest Division	(30-27-6.37,78-11-9.13)
1675	Uttarakhand	Mussoorie Forest Division	(30-27-7.50,78-11-9.28)
1677	Uttarakhand	Mussoorie Forest Division	(30-27-6.28,78-11-7.24)
1678	Uttarakhand	Mussoorie Forest Division	(30-28-48.122,78-11-14.324); (30-28-47.776,78-11-14.322)
1679	Uttarakhand	Mussoorie Forest Division	(30-28-33.359,78-12-2.703)
1680	Uttarakhand	Mussoorie Forest Division	(30-28-50.747,78-11-16.825)
1682	Uttarakhand	Mussoorie Forest Division	(30-28-56.644,78-11-23.836);(30-51-32.58,77-01-0.12)
1683	Uttarakhand	Mussoorie Forest Division	(30-28-56.719,78-11-23.151)

1684	Uttarakhand	Mussoorie Forest Division	(30-28-55.250,78-11-22.756)
1686	Uttarakhand	Mussoorie Forest Division	(30-27-7.10,78-11-2.77)
1687	Uttarakhand	Mussoorie Forest Division	(30-28-48.577,78-11-19.879); (30-28-44.059,78-11-14.006)
1688	Uttarakhand	Mussoorie Forest Division	(30-26-40.743,78-13-43.128);(30-28-50.436,78-11-18.934); (30-28-48.607,78-11-13.883)
1690	Uttarakhand	Mussoorie Forest Division	(30-27-24.614,78-13-53.233); (30-27-22.792,78-13-51.097)
1691	Uttarakhand	Mussoorie Forest Division	(30-27-22.922,78-13-57.346)
2290	Uttarakhand	Chakrata	(30-56-04.0,77-79-21)
2295	Uttarakhand	Chakrata	(30-46-20.73,77-50-30.08); (30-46-25.04,77-50-40.09)
2297	Uttarakhand	Chakrata	(30-57-45.40,77-50-33.20); (30-58-11.20,77-50-17.80)
2298	Uttarakhand	Chakrata	(30-56-19.08,77-46-12.04); (30-56-35.09,77-47-21.08); (30-57-54.50,77-49-30.30)
2299	Uttarakhand	Chakrata	(30-56-32.069,77-53-49.813); (30-56-45.693,77-53-39.465)
2300	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-46-32.64,78-95-10.14); (30-47-10.02,78-91-44.7); (30-46-35.984,77-53-54.062); (30-56-48.36,77-53-42.46)
2301	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-48-33.9,78-07-9.06); (30-46-57.3,78-07-11.7)
2302	Uttarakhand	Upper Yamuna Barkot Forest Division	(30-47-29.76,78-10-51.9); (30-47-12.3,78-10-49.9)
2303	Uttarakhand	Upper Yamuna Barkot Forest Division	
2305	Uttarakhand	Uttarakhand	(30-23-11,77-52-15); (30-23-12,77-52-27)
2308	Uttarakhand	Uttarakhand	(30-23-13,77-52-19); (30-23-14,77-52-26)
2321	Uttarakhand	Uttarakhand	(30-21-58.68,77-53-10.5); (30-21-48,77-53-2.4)
2322	Uttarakhand	Uttarakhand	(30-22-42.36,77-58-24.84); (30-20-36.54,77-57-6.24)
2326	Uttarakhand	Uttarakhand	(30-22-18.06,77-59-14.34)
2327	Uttarakhand	Uttarakhand	(30-22-33.72,78-0-21.72); (30-22-20.76,77-0-29.58)
2329	Uttarakhand	Uttarakhand	(30-21-37.68,77-59-29.22)
2358	Uttarakhand	Uttarakhand	(30-22-27.96,77-59-8.76)
2360	Uttarakhand	Uttarakhand	(30-22-27.96,77-59-8.7)
2363	Uttarakhand	Uttarakhand	(30-23-48.66,77-58-42.72); (30-23-48.78,77-58-47.7)
2368	Uttarakhand	Uttarakhand	(30-23-40.56,77-58-52.14); (30-23-12.72,77-58-56.76)
2369	Uttarakhand	Uttarakhand	(30-23-40.56,77-58-52.14); (30-23-12.7,77-58-56.76)
2371	Uttarakhand	Uttarakhand	(30-23-15.84,77-58-59.34); (30-23-13.68,77-58-59.22)
2373	Uttarakhand	Uttarakhand	(30-23-48.42,77-57-35.88); (30-23-36.72,77-57-28.08)
2374	Uttarakhand	Uttarakhand	(30-23-48.42,77-57-35.8); (30-23-36.72,77-57-28.08)
2375	Uttarakhand	Uttarakhand	(30-22-44.1,77-55-53.7); (30-20-53.0,77-53-59.0)
2376	Uttarakhand	Uttarakhand	(30-22-44.1,77-55-53.7); (30-20-53.0,77-53-59.0)
2384	Uttarakhand	Uttarakhand	(30-18-18.84,77-52-1.74); (30-18-16.68,77-52-1.2)
2394	Uttarakhand	Uttarakhand	(30-18-30.24,77-52-45.66); (30-18-31.98,77-52-46.7)
2396	Uttarakhand	Uttarakhand	(30-18-36.48,77-52-40.9); (30-18-38.34,77-52-40.62)

2397	Uttarakhand	Uttarakhand	(30-18-39.54,77-51-17.52); (30-19-37.02,77-51-15.42)
2398	Uttarakhand	Uttarakhand	(30-19-53.64,77-50-47.16); (30-19-52.2,77-50-45.54)
2401	Uttarakhand	Uttarakhand	(30-20-0.3,77-50-28.9); (30-19-58.8,77-50-27.9)
2404	Uttarakhand	Uttarakhand	(30-20-10.32,77-50-5.73); (30-20-9.96,77-50-10.2)
2406	Uttarakhand	Uttarakhand	(30-20-34.44,77-49-48.54); (30-20-32.1,77-49-47.7)
2407	Uttarakhand	Uttarakhand	(30-20-41.58,77-49-25.74); (30-30-41.1,77-49-24.3)
2423	Uttarakhand	Uttarakhand	(30-21-37.68,77-59-29.22)
2432	Uttarakhand	Uttarakhand	(30-23-10,77-52-20)
2438	Uttarakhand	Uttarakhand	(30-20-53.88,77-48-58.2); (30-20-52.38,77-48-56.88)
2439	Uttarakhand	Uttarakhand	(30-21-3,77-48-43.26); (30-21-0.78,77-48-42.18)
2441	Uttarakhand	Uttarakhand	(30-20-23.82,77-48-9.84); (30-21-22.8,77-48-26.94)
2443	Uttarakhand	Uttarakhand	(30-21-36.6,77-45-43.26); (30-21-34.02,77-45-42.66)
2445	Uttarakhand	Uttarakhand	(30-19-51.6,77-47-4.44); (30-19-50.58,77-47-3.9)
2447	Uttarakhand	Uttarakhand	(30-20-6.24,77-46-18.6); (30-20-4.8,77-46-18.6)
2449	Uttarakhand	Uttarakhand	(30-14-52.433,77-58-30.167)
2593	Uttarakhand	Uttarakhand	(30-21-39.72,77-47-37.8)
2656	Uttarakhand	Uttarakhand	(30-23-10.05,78-02-48.00); (30-23-11.07,78-02-41.01)
2659	Uttarakhand	Uttarakhand	(30-23-17.07,78-02-49.08); (30-23-19.02,78-02-44.08)
2662	Uttarakhand	Uttarakhand	(30-22-51.05,78-02-42.06); (30-22-56.04,78-02-38.06)
2663	Uttarakhand	Uttarakhand	(30-22-53.07,78-01-23.03); (30-22-53.08,78-01-09.07)
2664	Uttarakhand	Uttarakhand	(30-22-59.04,78-01-33.05); (30-23-04.01,78-01-13.02)
2665	Uttarakhand	Uttarakhand	(30-23-01.07,78-01-39.00); (30-23-19.03,78-01-29.00)
2667	Uttarakhand	Uttarakhand	(30-23-26.01,78-01-47.05); (30-23-28.02,78-01-34.09)
2668	Uttarakhand	Uttarakhand	(30-22-57.18,78-01-45.66); (30-23-48.01,78-01-38.00)
79	Uttarakhand	Salra	
83	Uttarakhand	Mautad	(30-48-26.04,78-10-58.68); (30-49-17.52,78-12-28.14)
84	Uttarakhand	Salla/Petadi	
89	Uttarakhand	Nanai	
92	Uttarakhand	Dobhalgaon	
95	Uttarakhand	Devjani	
97	Uttarakhand	Kharsadi	
101	Uttarakhand	Pasa	
103	Uttarakhand	Ludrala	
108	Uttarakhand	Dagoli	
112	Uttarakhand	Maijani	
113	Uttarakhand	Bhutanu	
114	Uttarakhand	Kiroli	
115	Uttarakhand	Kaleech	
116	Uttarakhand	Jaagta	
117	Uttarakhand	Cheewa	
118	Uttarakhand	Gram Ishali (Thunara)	
119	Uttarakhand	Gram Banpur (Kashta)	
121	Uttarakhand	Nakot	(30-48-15.3,77-54-6.3); (30-48-4,77-54-52.4)
122	Uttarakhand	Arakot	
124	Uttarakhand	Gram Bhankwad	(30-44-35.7,77-51-33.42); (30-44-29.14,77-51-28.88)
125	Uttarakhand	Gram Bamsu	
129	Uttarakhand	Gram Kukreda	(29-33-48.69,77-05-45.12)

131	Uttarakhand	Devti	(29-30-16.22,77-05-45.30); (29-30-14.96,77-05-22.04)
667	Uttarakhand	Pujeli	(31-06-16.57,78-05-06.14)
668	Uttarakhand	Parbat beat	(31-09-52.2,78-06-45.8); (31-09-59.1,78-07-23.4)
426	Gothihari Nala	Mussoorie Forest Division	(30-28-17.1, 77-57-43.1)
5427	Devkui Nala	Mussoorie Forest Division	(30-29-3.5, 77-58-14.8)
5428	Sambagaad Nala	Mussoorie Forest Division	(30-28-12.8, 77-58-10.9)
5429	C.N. 9	Mussoorie Forest Division	(30-27-35.2, 78-7-95.5)
5430	Nala pani Nala	Mussoorie Forest Division	(30-28-36.8, 77-57-42.3)
5431	Padai Nala	Mussoorie Forest Division	(30-29-11.1, 77-57-51.4)
5432	Paniyar Nala	Mussoorie Forest Division	(30-28-37.2, 78-1-00.65)

Annexure-2

GPS COORDINATES OF SITES FOR VARIOUS FORESTRY INTERVENTIONS IN HIMACHAL PRADESH

The following table gives GPS coordinates of the sites proposed by the state SFD at time of DPR formulation. The sites may be finalised, with suitable changes wherever required, and georeferenced at time of implementation of the DPR.

Site ID	State	Division	Geo-coordinates (Format: degree-minute-second ºN Lat., degree-minute-second ºE Long.)
790	Himachal Pradesh	Paonta Sahib	(30-30-34.90,77-45-56.96); (30-30-29.32,77-46-02.49); (31-0-47.64,78-2-14.7); (31-0-49.32,78-2-18.72)
791	Himachal Pradesh	Paonta Sahib	(30-31-02.22,77-46-41.28); (30-30-45.50,77-46-33.09); (30-30-24.12,77-46-09.02)
792	Himachal Pradesh	Paonta Sahib	(30-30-59.99,77-47-36.02); (30-30-44.93,77-47-31.49); (30-30-26.94,77-46-31.94)
793	Himachal Pradesh	Paonta Sahib	(30-31-29.97,77-48-27.93); (30-31-30.56,77-48-32.70); (30-30-36.20,77-47-32.65)
794	Himachal Pradesh	Paonta Sahib	(30-33-18.14,77-46-09.54); (30-33-26.11,77.46-14.62); (30-31-31.50,77-48-35.85)
795	Himachal Pradesh	Paonta Sahib	(30-31-69.39,77-79-26.23); (30-32-45.97,77-79-07.58); (30-33-30.92,77-46-18.25)
796	Himachal Pradesh	Paonta Sahib	(30-29-56.1,77-46-35.76); (30-30-1.14,77-46-40.92)
797	Himachal Pradesh	Paonta Sahib	(30-29-35.76,77-45-26.1); (30-29-19.5,77-45-21.12); (30-29-58.98,77-46-29.46)
798	Himachal Pradesh	Paonta Sahib	(30-30-14.4,77-45-28.8); (30-30-14.04,77-45-27.36); (30-29-35.76,77-45-26.94)
799	Himachal Pradesh	Paonta Sahib	(30-30-42.66,77-43-30.42); (30-30-37.86,77-43-30.42); (30-30-13.32,77-45-32.52)
800	Himachal Pradesh	Paonta Sahib	(30-30-8.46,77-43-42.9); (30-30-12.96,77-43-41.28)
801	Himachal Pradesh	Paonta Sahib	(30-26-37.62,77-39-9.24) (30-30-23.34,77-43-9.84)
802	Himachal Pradesh	Paonta Sahib	(30-26-45.48,77-40-20.4)
803	Himachal Pradesh	Rohru	(31-11-33.50, 77-41-19.57)
804	Himachal Pradesh	Rohru	(31-11-34.48, 77-41-26.11)
805	Himachal Pradesh	Rohru	(31-11-35.28, 77-41-31.27)
806	Himachal Pradesh	Rohru	(31-11-41.75, 77-41-28.84)
807	Himachal	Rohru	(31-11-43.38, 77-41-34.99)

	Pradesh		
1062	Himachal Pradesh	Renuka ji	(30-46-28,72-38-59); (30-45-56,77-38-44); (24-49-27.69,79-20); (24-49-2.91,79-20-29.57)
1064	Himachal Pradesh	Renuka ji	(30-41-42.58,77-44-39.61); (30-41-44.20,77-44-36.54); (30-46-05,77-38-36); (30-46-22,77-38-36)
1068	Himachal Pradesh	Renuka ji	(30-42-17.87,77-42-01.67); (30-42-8.74,77-42-7.32); (30-41-7.55,77-44-39.06); (30-41-6.61,77-44-37.19); (30-43-50.60,77-43-12.50); (30-43-39.26,77-43-14.40); (30-43-35.75,77-43-16.24); (30-43-33.58,77-43-15.11)
1069	Himachal Pradesh	Renuka ji	(30-46-19,77-34-19); (30-46-19,77-34-30); (30-42-06,77-41-41); (30-42-02,77-41-41); (30-41-59,77-41-41); (30-41-57,77-41-41); (30-41-54,77-41-40);
1070	Himachal Pradesh	Rohru	(31-05-01.96,77-38-01.21); (31-05-2.89,77-38-3.36); (30-46-20,77-34-19); (30-46-24,77-34-25)
1071	Himachal Pradesh	Renuka ji	(30-46-27,77-35-31); (30-46-26,77-35-38); (31-05-4.59,77-38-03.51); (31-05-05.42,77-38-02.13); (31-05-6.25,77-38-00.68); (31-05-05.73,77-37-59.92); (31-05-04.50,77-37-58.97); (31-05-02.92,77-37-59.37)
1073	Himachal Pradesh	Renuka ji	(30-42-49.11,77-41-44.97); (30-42-49.45,77-41-43.16); (30-46-26,77-35-32)
1075	Himachal Pradesh	Renuka ji	(30-46-07,77-37-23); (30-46-08,77-37-23); (30-42-35.98,77-41-42.37); (30-42-33.22,77-41-41.06); (30-42-47.17,77-42-07.87); (30-42-49.08,77-42-08.07); (30-42-51.76,77-42-07.76); (30-42-56.71,77-42-06.36)
1078	Himachal Pradesh	Renuka ji	(30-44-08,77-40-38); (30-44-08,77-40-41); (30-46-21,77-37-18)
1079	Himachal Pradesh	Renuka ji	(30-46-30,77-35-49); (30-46-26,77-35-51); (30-44-10,77-40-44); (30-44-12,77-40-41); (30-44-13,77-40-42); (30-44-14,77-40-47); (30-44-28,77-41-08); (30-44-44,77-41-16)
1081	Himachal Pradesh	Renuka ji	(30-44-02,77-41-00); (30-44-04,77-41-03); (30-45-58,77-36-24)
1083	Himachal Pradesh	Rohru	(31-13-39.41,77-51-16.88); (31-11-5.44,77-53-46.36); (30-44-05,77-41-10); (30-44-12,77-41-19); (30-44-18,77-41-27); (30-44-26,77-41-41); (30-44-32,77-41-47); (30-44-37,77-41-54)
1089	Himachal Pradesh	Renuka ji	(30-42-16.31,77-39-20.10); (30-42-2.7,77-39-6.00); (31-10-10.67,77-56-10.15)
1090	Himachal Pradesh	Rohru	(31-13-27.51,77-50-40.86); (31-13-17.20,77-50-32.65); (30-41-46.39,77-38-42.82); (30-42-17.71,77-39-26.08)
1091	Himachal Pradesh	Renuka ji	(30-42-6.00,77-39-27.07); (30-42-2.22,77-39-13.97); (31-13-12.54,77-50-32.57)
1092	Himachal Pradesh	Renuka ji	(30-41-01.13,77-39-02.00); (30-41-03.00,77-38-52.43); (30-41-59.72,77-39-5.02); (30-42-13.22,77-39-36.84)
1094	Himachal Pradesh	Renuka ji	(30-42-21.75,77-38-31.36); (30-42-18.83,77-38-22.01); (30-41-05.36,77-38-45.9); (30-40-53.84,77-38-52.11)
1096	Himachal Pradesh	Renuka ji	(30-42-29.04,77-37-25.52); (30-42-20.78,77-37-25.85); (30-42-12.28,77-38-15.63); (30-42-23.21,77-38-34.29)
1098	Himachal Pradesh	Renuka ji	(30-42-22.29,77-37-07.56); (30-42-13.58,77-37-11.91); (30-42-11.05,77-37-32.67); (30-42-33.21,77-37-22.57)
1099	Himachal Pradesh	Rohru	(31-12-50.27,78-01-52.58); (31-12-41.65,78-02-11.14); (30-41-56.16,77-37-27.78); (30-42-22.35,77-36-56.71)
1100	Himachal	Renuka ji	(30-42-11.34,77-36-44.40); (30-41-56.24,77-36-48.38); (31-

	Pradesh		12-49.18,78-02-31.60); (31-12-56.66,78-02-24.89); (31-12-56.60,78-01-57.33)
1101	Himachal Pradesh	Renuka ji	(30-39-21,77-46-52); (30-39-24,77-46-42); (30-41-34.47,77-37-17.34); (30-42-10.11,77-36-64.20)
1102	Himachal Pradesh	Renuka ji	(30-41-45.32,77-35-58.25); (30-41-81.73,77-36-11.46); (30-39-21,77-46-28); (30-39-18,77-46-34); (30-39-18,77-46-43)
1103	Himachal Pradesh	Renuka ji	(30-41-21.77,77-36-5.11); (30-41-25.90,77-36-35.23); (30-41-25.23,77-36-20.44); (30-41-49.00,77-35-43.99)
1104	Himachal Pradesh	Renuka ji	(30-40-52.48,77-37-29.70); (30-40-59.56,77-37-01.94); (30-41-35.9,77-36-59.45); (30-41-15.57,77-36-59.10)
1106	Himachal Pradesh	Renuka ji	(30-40-21.26,77-37-41.82); (30-40-25.90,77-37-39.49)
1109	Himachal Pradesh	Rohru	(31-12-41.36,77-59-59.30); (31-12-29.32,78-00-45.12)
1110	Himachal Pradesh	Rohru	(31-12-36.53,78-01-57.27); (31-12-52.10,78-02-51.03)
1111	Himachal Pradesh	Rohru	(31-13-49.64,78-03-59.89); (31-13-55.79,78-04-28.69)
1113	Himachal Pradesh	Rohru	(31-13-35.30,78-01-33.95); (31-13-23.41,78-02-07.78)
1116	Himachal Pradesh	Rohru	(31-13-46.86,78-4-59.25); (31-12-34.99,78-0-59.57)
1122	Himachal Pradesh	Rohru	(31-10-3.64,77-47-10.27); (31-09-58.99,77-47-7.71)
1123	Himachal Pradesh	Nahan	(30-35-53.28,77-23-8.09); (30-36-1.66,77-23-10.95); (31-09-51.22,77-47-13.81); (31-01-52.32,77-47-17.13); (31-09-57.25,77-47-14.71)
1124	Himachal Pradesh	Rohru	(31-10-06.07,77-47-30.74); (31-10-47.20,77-47-7.85); (30-36-8.72,77-23-7.88); (30-26-15.88,77-23-3.76)
1126	Himachal Pradesh	Renuka ji	(30-39-5,77-45-34); (30-39-6,77-45-42)
1128	Himachal Pradesh	Rohru	(31-09-59.49,77-47-43.06); (31-11-06.84,77-48-25.07)
1129	Himachal Pradesh	Nahan	(30-35-45.36,77-22-12.09); (30-35-47.13,77-22-12.72); (31-11-31.94,77-48-55.04); (31-12-28.86,77-48-24.35); (31-13-2.07,77-48-34.77)
1130	Himachal Pradesh	Renuka ji	(30-48-15,77-37-12); (30-48-30,77-37-20); (30-35-51.33,77-22-6.21); (30-35-52.97,77-22-10.52); (30-35-58.99,77-22-21.58); (30-36-2.04,77-22-39.28); (30-35-54.86,77-22-30.74);
1132	Himachal Pradesh	Rohru	(31-10-3.43,77-47-42.13); (31-10-10.51,77-47-52.59)
1136	Himachal Pradesh	Rohru	(31-03-38.56,77-45-43.26); (31-03-45.98,77-45-37.14)
1137	Himachal Pradesh	Renuka ji	(30-48-11,77-37-03); (30-47-50,77-37-11); (31-03-53.56,77-45-31.89); (31-03-59.81,77-45-22.67)
1141	Himachal Pradesh	Rohru	(31-05-10.88,77-45-53.01); (31-05-14.94,77-45-52.80)
1143	Himachal Pradesh	Nahan	(30-36-2.32,77-22-39.48); (30-36-7.09,77-22-38.87); (30-33-0.572,78-00-0.461)
1144	Himachal	Renuka ji	(30-38-51,77-33-25); (30-38-48,77-33-29); (30-36-16.18,77-

	Pradesh		23-4.32); (30-36-18.94,77-23-4.12); (30 -36-20.58,77-22-58.31); (30-36-28.62,77-22-53.61);
1145	Himachal Pradesh	Renuka ji	(30-43-24,77-37-49); (30-43-45,77-38-01); (30-38-43,77-33-36); (30-38-38,77-33-41)
1146	Himachal Pradesh	Rohru	(31-03-38.74,77-45-43.27); (31-04-00,77-45-22.35); (30-43-45,77-38-03); (30-42-12,77-35-34); (30-43-45,77-37-37)
1149	Himachal Pradesh	Renuka ji	(30-44-41,77-32-41); (30-44-37,77-33-36)
1150	Himachal Pradesh	Renuka ji	(30-37-24,77-34-57); (30-37-29,77-35-2); (30-44-23,77-36-09); (30-44-43,77-37-03)
1155	Himachal Pradesh	Renuka ji	(30-37-43,77-34-36); (30-37-44,77-34-36)
1160	Himachal Pradesh	Renuka ji	(30-37-38,77-34-26); (30-37-37,77-34-18)
1166	Himachal Pradesh	Nahan	(30-35-16.25,77-22-14.97); (30-35-9.73,77-22-24.50)
1167	Himachal Pradesh	Renuka ji	(30-46-50.07,77-23-41.18); (30-46-41.30,77-23-47.20); (30-35-10.13,77-22-32.87); (30-35-9.22,77-22-38.36); (30-35-15.63,77-22-42.15)
1170	Himachal Pradesh	Renuka ji	(30-38-13.78,77-33-39.78); (30-38-19.78,77-33-34.92)
1177	Himachal Pradesh	Renuka ji	(30-37-58.41,77-33-47.15); (30-37-48.54,77-34-6.78)
1178	Himachal Pradesh	Renuka ji	(30.44-58.08,77-23-57.09); (30-44-40.07,77-24-09.00); (30-37-56.31,77-34-16.87); (30-38-8.47,77-34-7.5)
1181	Himachal Pradesh	Renuka ji	(30-44-12.06,77-24-41.05); (30-44-00.03,77-25-02.00); (30-33-28.8,77-59-15.6)
1184	Himachal Pradesh	Renuka ji	(30-38-3.64,77-33-28.80); (30-38-15.56,77-33-13.85)
1185	Himachal Pradesh	Renuka ji	(30-45-32.71,77-22-28.19); (30-45-23.44,77-22-5.62); (30-38-19.95,77-32-51.44); (30-38-6.09,77-32-35.99); (30-37-59.55,77-32-39.54); (30-38-5.83,77-32-53.22);
1188	Himachal Pradesh	Renuka ji	(30-45-37.54,77-21-24.43); (30-45-40.37,77-21-42.17)
1193	Himachal Pradesh	Renuka ji	(30-43-36.0,77-20-39.5); (30-43-33.5,77-20-35.0)
1197	Himachal Pradesh	Renuka ji	(30-44-16.5,77-21-01.3); (30-44-18.0,77-20-59.8)
1199	Himachal Pradesh	Renuka ji	(30-38-56.37,77-33-22.26); (30-38-43.31,77-32-44.37)
1201	Himachal Pradesh	Renuka ji	(30-44-52.3,77-21-02); (30-44-50.3,77-22-02.1)
1203	Himachal Pradesh	Renuka ji	(30-38-56.37,77-33-22.26); (30-38-43.31,77-32-44.37)
1211	Himachal Pradesh	Renuka ji	(30-42-35.97,77-23-14.66); (30-42-22.05,77-23-20.24)
1216	Himachal Pradesh	Renuka ji	(30-42-28.09,77-22-52.08); (30-42-24.42,77-23-08.26)
1217	Himachal Pradesh	Renuka ji	(30-38-47.19,77-32-45.62); (30-38-49.04,77-32-21.16); (30-42-20.69,77-23-01.43); (30-42-19.34,77-23-03.03); (30-42-

			24.63,77-23-08.35); (30-42-36,77-22-48); (30-42-17,77-23-08);
1220	Himachal Pradesh	Renuka ji	(30-43-44.72,77-22-16.81); (30-43-42.37,77-22-18.13)
1224	Himachal Pradesh	Renuka ji	(30-40-46.80,77-20-6.32); (30-40-27.38,77-19-58.50)
1225	Himachal Pradesh	Renuka ji	(30-42-18.6,77-22-13.5); (30-42-14.1,77-22-05.2); (30-40-13.87,77-19-10.12)
1226	Himachal Pradesh	Renuka ji	(30-37-37.2,77-28-2.8); (30-37-32.6,77-28-29.6); (30-42-12.5,77-22-01.0)
1228	Himachal Pradesh	Renuka ji	(30-43-31.6,77-21-10.5); (30-43-23.0,77-20-55.2)
1232	Himachal Pradesh	Renuka ji	(30-37-58.04,77-21-13.03); (30-38-8.02,77-21-20.55)
1236	Himachal Pradesh	Renuka ji	(30-42-57.9,77-20-50.3); (30-43-06.7,77-21-12.9)
1237	Himachal Pradesh	Renuka ji	(30-37-59.3,77-33-10.8); (30-37-56.7,77-33-0.1)
1240	Himachal Pradesh	Renuka ji	(30-42-56.7,77-22-07.7); (30-42-39.1,77-21-56.2)
1242	Himachal Pradesh	Renuka ji	(30-38-21.22,77-20-38..6); (30-39-6.75,77-20-50.47)
1243	Himachal Pradesh	Renuka ji	(30-43-02.3,77-21-11.3); (30-42-54.0,77-21-09.8); (30-39-53.86,77-21-3.62)
1244	Himachal Pradesh	Renuka ji	(30-35-32.7,77-30-43.2); (30-35-52.1,77-30-45.2); (30-42-55.2,77-21-09.2)
1248	Himachal Pradesh	Renuka ji	(30-40-32.24,77-17-42.44); (30-40-34.84,77-17-48.688)
1252	Himachal Pradesh	Renuka ji	(30-49-36.89,77-24-30.06); (30-49-33.83,77-23-59.53)
1255	Himachal Pradesh	Renuka ji	(30-38-43.68,77-19-56.81); (30-39-10.82,77-19-56.81)
1259	Himachal Pradesh	Renuka ji	(30-49-06.16,77-26-46.58); (30-48-48.95,77-26-34.36)
1264	Himachal Pradesh	Renuka ji	(30-40-33.28,77-17-40.57); (30-40-39.07,77-17-49.68)
1265	Himachal Pradesh	Renuka ji	(30-48-16.35,77-28-26.43); (30-48-77.00,77-28-07.33); (30-40-52.42,77-18-1.32)
1271	Himachal Pradesh	Renuka ji	(30-49-02.04,77-28-32.69); (30-49-00.32,77-28-44.32)
1276	Himachal Pradesh	Renuka ji	(30-36-39.7,77-30-37.11); (30-36-21.1,77-30-50.4)
1278	Himachal Pradesh	Renuka ji	(30-37-45.03,77-21-27.14); (30-37-49.43,77-21-40.97)
1280	Himachal Pradesh	Renuka ji	(30-47-48.4,77-24-16.9); (30-47-48.3,77-24-19.5)
1285	Himachal Pradesh	Renuka ji	(30-37-46.07,77-21-25.76); (30-38-6.72,77-21-44.95)
1286	Himachal Pradesh	Renuka ji	(30-47-29.8,77-25-10.3); (30-47-28,77-25-10); (30-38-26.49,77-22-16.48)

1287	Himachal Pradesh	Renuka ji	(30-36-2.3,77-29-54.4); (30-36-12.1,77-29-26.9); (30-47-01,77-25-15)
1290	Himachal Pradesh	Renuka ji	(30-38-23.19,77-20-22.07); (30-38-52.89,77-20-12.23); (30-31-.317,77-59-5.7); (30-31-28.32,77-59-14.22)
1294	Himachal Pradesh	Renuka ji	(30-40-48.29,77-20-6.71); (30-40-35.61,77-19-31.36)
1295	Himachal Pradesh	Renuka ji	(30-39-22.82,77-29-34.27); (30-39-14.79,77-29-38.72); (30-39-28.04,77-18-51.07)
1297	Himachal Pradesh	Renuka ji	(30-37-58.04,77-21-13.03); (30-38-6.8-,77-21-9.83); (30-31-0.800,77-59-0.241); (30-31-0.848,77-59-0.320); (30-31-0.863,77-59-0.321)
1304	Himachal Pradesh	Renuka ji	(30-37-56.31,77-25-38.48); (30-37-31.65,77-25-32.11); (30-30-25.02,77-58-59.52); (30-30-24.72,77-58-57.96)
1306	Himachal Pradesh	Renuka ji	(30-42-25.04,77-31-55.57); (30-42-8.19,77-31-35.84); (30-37-23.99,77-25-33.73)
1307	Himachal Pradesh	Renuka ji	(30-46-51.14,77-25-20.51); (30-46-55.4,77-25-18.00); (30-41-56.73,77-31-8.67); (30-41-44.71,77-31-23.62); (30-41-52.21,77-31-48.61); (30-41-56.85,77-31-55.59); (30-42-4.47,77-32-1.76); (30-41-47.90,77-31-42.04)
1308	Himachal Pradesh	Renuka ji	(30-39-22.59,77-28-42.28); (30-39-19.07,77-28-32.95); (30-47-07.00,77-25-15.00)
1309	Himachal Pradesh	Renuka ji	(30-47-46.2,77-23-8.76); (30-47-1.34,77-23-43.75); (30-39-12.72,77-28-26.53); (30-39-6.75,77-28-23.38); (30-39-2.08,77-28-18.89); (30-38-50.26,77-28-20.93);
1310	Himachal Pradesh	Renuka ji	(30-37-14.91,77-40-21.01);(30-48-1.55,77-23-54.84); (30-48-06.00,77-24-0.6)
1311	Himachal Pradesh	Renuka ji	(30-42-8.19,77-32-14.21); (30-41-53.7,70-41-53.7)
1313	Himachal Pradesh	Renuka ji	(30-47-1.46,77-23-8.76); (30-47-1.34,77-23-43.75); (30-41-39.98,77-32-37.28); (30-41-17.66,77-32-47.86); (30-41-43.39,77-32-16.68); (30-41-44.22,77-32-6.36); (30-41-39.55,77-31-56.81); (30-41-37.64,77-31-39.76)
1314	Himachal Pradesh	Renuka ji	(30-38-37.08,77-42-38.46); (30-38-33.47,77-42-46.63); (30-48-17.00,77-23-48.01)
1315	Himachal Pradesh	Renuka ji	(30-38-02.98,77-42-35.76); (30-38-06.73,77-42-39.44); (30-38-36.27,77-42-55.60)
1316	Himachal Pradesh	Renuka ji	(30-37-54.53,77-42-01.71); (30-37-52.06,77-41-57.87)
1317	Himachal Pradesh	Renuka ji	(30-46-54.4,77-31-35.4); (30-46-45.2,77-31-17.3); (30-37-50.54,77-41-54.0)
1318	Himachal Pradesh	Renuka ji	(30-38-39.10,77-41-32.21);(30-47-17.2,77-31-11.1); (30-47-05.1,77-30-55.9)
1319	Himachal Pradesh	Renuka ji	(30-40-54.33,77-32-40.31); (30-40-53.18,77-32-21.33)
1320	Himachal Pradesh	Renuka ji	(30-40-57.61,77-31-56.30); (30-41-5.66,77-31-46.57); (30-41-25.35,77-32-5.76); (30-41-14.25,77-32-13.47); (30-41-8.38,77-32-21.39); (30-41-1.35,77-32-28.09)
1321	Himachal Pradesh	Renuka ji	(30-38-49.46,77-41-41.88); (30-38-46.16,77-41-51.29)
1322	Himachal Pradesh	Renuka ji	(30-38-01.78,77-42-19.25); (30-38-11.38,77-42-22.81); (30-38-37.51,77-41-58.94)

1323	Himachal Pradesh	Renuka ji	(30-47-27.6,77-30-36.8); (30-47-05.8,77-30-25.5); (30-38-17.20,77-42-25.75)
1324	Himachal Pradesh	Renuka ji	(30-43-12.40,77-19-48.17); (30-42-25.84,77-20-0.91); (30-47-25.9,77-30-29.6); (30-46-51.0,77-30-25.4)
1325	Himachal Pradesh	Renuka ji	(30-37-14.06,77-41-03.16); (30-37-20.43,77-41-5.46); (30-41-14.84,77-19-50.19)
1326	Himachal Pradesh	Renuka ji	(30-37-10.82,77-40-57.33); (30-37-13.43,77-40-48.19); (30-37-24.54,77-41-8.37)
1327	Himachal Pradesh	Renuka ji	(30-37-28.53,77-40-10.94); (30-37-37.86,77-39-55.52); (30-37-11.43,77-40-39.75)
1328	Himachal Pradesh	Renuka ji	(30-40-51.67,77-30-51.27); (30-40-53.87,77-31-7.02); (30-37-51.02,77-39-52.43)
1329	Himachal Pradesh	Renuka ji	(30-38-26.42,77-24-53.62); (30-38-34.73,77-24-35.66); (30-40-48.70,77-31-13.79); (30-40-26.36,77-31-23.97); (30-40-1.81,77-31-17.97); (30-40-6.17,77-31-10.72); (30-40-21.90,77-30-48.61); (30-40-36.98,77-30-59.27)
1330	Himachal Pradesh	Renuka ji	(30-41-10.41,77-22-23.89); (30-40-3.12,77-21-51.57); (30-38-42.80,77-23-43.66)
1331	Himachal Pradesh	Renuka ji	(30-38-14,77-39-58.67); (30-37-15.54,77-39-59.49); (30-39-49.81,77-21-58.15)
1332	Himachal Pradesh	Renuka ji	(30-37-15.68,77-39-37.29); (30-37-18.28,77-39-42.82); (30-37-18.68,77-40-01.95)
1333	Himachal Pradesh	Renuka ji	(30-34-29.34,77-34-36.88); (30-34-24.54,77-34-36.36); (30-37-22.60,77-39-44.32); (30-37-3.98,77-39-40.95)
1334	Himachal Pradesh	Renuka ji	(30-41-10.41,77-22-23.89); (30-40-18.21,77-20-57.97); (30-34-21.33,77-34-34.76)
1335	Himachal Pradesh	Renuka ji	(30-37-57.41,77-25-23.78); (30-37-51.91,77-24-59.73); (30-37-48.59,77-21-46.29)
1336	Himachal Pradesh	Renuka ji	(30-42-29.34,77-35-23.21); (30-34-23.83,77-35-17.64); (30-37-37.88,77-24-42.72)
1337	Himachal Pradesh	Renuka ji	(30-42-06.81,77-21-38.61); (30-41-58.57,77-21-2.81); (30-34-20.42,77-35-11.53)
1338	Himachal Pradesh	Renuka ji	(30-38-3.64,77-33-28.80); (30-38-15.56,77-33-13.85); (30-41-53.52,77-20-50.84)
1339	Himachal Pradesh	Renuka ji	(30-35-09.69,77-35-56.61); (30-35-02.03,77-35-33.41); (30-38-19.95,77-32-51.44); (30-38-6.09,77-32-35.99); (30-37-59.55,77-32-39.54); (30-38-5.83,77-32-53.22); (30-38-5030,77-33-5.57); (30-38-3.35,77-33-24.12)
1340	Himachal Pradesh	Renuka ji	(30-36-24.91,77-25-00.37); (30-36-1.56,77-25-38); (30-34-58.63,77-35-46.64)
1341	Himachal Pradesh	Renuka ji	(30-34-25.63,77-36-17.79); (30-34-22.47,77-36-16.17); (30-35-56.54,77-24-56.01)
1342	Himachal Pradesh	Renuka ji	(30-41-10.45,77-30-43.00); (30-41-45.15,77-30-29.86); (30-34-12.55,77-36-19.87)
1343	Himachal Pradesh	Renuka ji	(30-34-32.78,77-36-38.11); (30-34-41.44,77-36-39.44); (30-41-50.26,77-30-4.77); (30-41-44.23,77-29-43.30); (30-41-55.26,77-29-32.47)
1344	Himachal Pradesh	Renuka ji	(30-36-3.35,77-33-22.85); (30-36-30.40,77-40-42.88); (30-34-36.22,77-36-48.76)
1345	Himachal	Renuka ji	(30-41-58.47,77-21-48.43); (30-41-21.97,77-21-1.19); (30-36-

	Pradesh		36.66,77-33-56.29)
1346	Himachal Pradesh	Renuka ji	(30-36-17.45,77-33-30.94); (30-36-15.22,77-33-35.66); (30-40-54.02,77-20-7.90)
1347	Himachal Pradesh	Renuka ji	(30-37-16.82,77-36-09.82); (30-37-11.85,77-36-02.60); (30-36-13.71,77-33-38.64)
1348	Himachal Pradesh	Renuka ji	(30-36-37.57,77-24-30.24); (30-36-7.60,77-24-22.05); (30-37-04.51,77-36-01.89); (30-37-15.94,77-35-52.63); (30-37-04.14,77-36-01.37); (30-36-52.72,77-36-09.97);
1349	Himachal Pradesh	Renuka ji	(30-35-08.40,77-32-50.17); (30-35-04.93,77-32-56.32); (30-36-4.28,77-24.-21.70)
1350	Himachal Pradesh	Renuka ji	(30-37-46.08,77-44-23.80); (30-37-35.95,77-44-18.74); (30-34-59.05,77-33-02.77)
1351	Himachal Pradesh	Renuka ji	(30-35-34.19,77-33-25.11);(30-37-27.10,77-44-18.08); (30-37-19.78,77-44-39.40)
1352	Himachal Pradesh	Renuka ji	(30-37-12.30,77-34-18.82); (30-37-04.45,77-34-17.68)
1353	Himachal Pradesh	Renuka ji	(30-37-22.67,77-43-43.48); (38-37-16.91,77-43-58.71); (30-37-58.55,77-34-17.55)
1354	Himachal Pradesh	Renuka ji	(30-42-28.66,77-20-44.16); (30-41-57.35,77-20-32.01); (30-37-17.86,77-43-46.50); (30-37-22.15,77-44-12.77)
1355	Himachal Pradesh	Renuka ji	(30-35-3.67,77-33-06.60); (30-34-55.80,77-33-00.88); (30-41-40.72,77-20-21.42)
1356	Himachal Pradesh	Renuka ji	(30-36-04.81,77-35-06.29); (30-36-04.49,77-35-09.81); (30-34-46.60,77-33-01.14); (30-34-36.68,77-33-01.90)
1357	Himachal Pradesh	Renuka ji	(30-36-7.18,77-45-35.76); (30-36-15.04,77-45-43.36); (30-36-03.60,77-35-13.08)
1358	Himachal Pradesh	Renuka ji	(30-34-29.17,77-34-21.07); (30-34-32.55,77-33-46.99); (30-36-17.64,77-45-19.99); (30-36-34.84,77-45-15.38); (30-36-35.41,77-45-05.57)
1359	Himachal Pradesh	Renuka ji	(30-41-20.51,77-22-50.45); (30-40-59.94,77-21-26.64); (30-34-29.66,77-33-46.66); (30-34-18.73,77-33-38.38)
1360	Himachal Pradesh	Renuka ji	(30-3612.12,77-44-56.33); (30-36-29.18,77-44-53.73); (30-40-58.26,77-21-23.66)
1361	Himachal Pradesh	Renuka ji	(30-36-41.00,77-23-8.05); (30-37-42.09,77-23-14.60); (30-36-33.53,77-44-57.56); (30-36-45.94,77-44-53.71); (30-36-45.86,77-44-43.53)
1362	Himachal Pradesh	Renuka ji	(30-36-31.48,77-44-12.19); (30-36-26.65,77-44-08.07); (30-38-15.65,77-23-14)
1363	Himachal Pradesh	Renuka ji	(30-37-09.92,77-37-43.76); (30-37-02.57,77-37-37.38); (30-35-52.28,77-44-36.99); (30-35-43.66,77-44-29.38); (30-35-52.97,77-44-09.56)
1364	Himachal Pradesh	Renuka ji	(30-36-41.00,77-43-53.68); (30-36-12.67,77-43-58.91); (30-37-11.89,77-37-53.14)
1365	Himachal Pradesh	Renuka ji	(30-35-18.66,77-37-01.12); (30-35-02.08,77-37-11.19); (30-36-28.52,77-43-54.34); (30-36-09.21,77-43-40.30); (30-36-26.05,77-43-38.62)
1366	Himachal Pradesh	Renuka ji	(30-36-33.95,77-33-20.30);(30-35-14.77,77-37-23.49)
1367	Himachal Pradesh	Renuka ji	(30-41-16.71,77-26-10.4); (30-41-29.9,77-25-56.2)

1368	Himachal Pradesh	Renuka ji	(30-36-08.18,77-32-31.88); (30-36-06.35,77-32-22.15); (30-41-20.2,77-25-40.20)
1369	Himachal Pradesh	Renuka ji	(30-38-42.27,77-45-37.79); (30-38-49.17,77-45-32.34); (30-36-03.57,77-32-21.94)
1370	Himachal Pradesh	Renuka ji	(30-34-59.77,77-32-61.14); (30-34-52.54,77-31-56.29); (30-38-46.68,77-48-78.97); (30-38-37.91,77-45-26.25); (30-38-39.72,77-45-14.29); (30-38-37.66,77-45-00.57);
1371	Himachal Pradesh	Renuka ji	(30-41-11,77-26-00); (30-41-13.5,77-25-56.5); (30-34-49.40,77-31-51.18)
1372	Himachal Pradesh	Renuka ji	(30-35-21.85,77-37-00.72); (30-35-16.84,77-37-08.45); (30-41-17.5,77-25-42.2)
1373	Himachal Pradesh	Renuka ji	(30-37-18.78,77-38-42.22);(30-35-14.21,77-37-02.38); (30-35-23.56,77-36-53.64)
1374	Himachal Pradesh	Renuka ji	(30-40-49.3,77-23-53.24); (30-40-41.26,77-23-40.36)
1375	Himachal Pradesh	Renuka ji	(30-36-37.96,77-23-52.97); (30-36-19.88,77-23-42.86); (30-40-40.37,77-23-29.07)
1376	Himachal Pradesh	Renuka ji	(30-37-08.74,77-37-46.59);(30-36-16.37,77-23-41.15)
1378	Himachal Pradesh	Renuka ji	(30-37-43.44,77-45-15.76); (30-37-46.92,77-45-15.43)
1379	Himachal Pradesh	Renuka ji	(30-33-96.7,77-38-15.29); (30-33-30.75,77-38-47.75); (30-37-49.95,77-45-15.27); (30-37-35.21,77-45-21.50); (30-37-40.31,77-45-28.04)
1380	Himachal Pradesh	Renuka ji	(30-37-2.48,77-23-45.43); (30-36-46.46,77-23-24.62); (30-34-25.46,77-38-11.8); (30-34-19.95,77-38-42.05)
1381	Himachal Pradesh	Renuka ji	(30-36-13.82,77-36-46.95); (30-36-10.58,77-36-28.98); (30-36-34.55,77-23-21.32)
1382	Himachal Pradesh	Renuka ji	(30-37-44.35,77-44-55.61); (30-37-49.70,77-44-57.94); (30-36-10.21,77-36.37.52)
1383	Himachal Pradesh	Renuka ji	(30-40-10.3,77-24-40.3); (30-40-0.8,77-24-35.7); (30-37-50.00,77-45-04.53); (30-37-44.29,77-45-05.32); (30-37-43.93,77-45-12.70)
1384	Himachal Pradesh	Renuka ji	(30-35-04.16,77-37-21.44); (30-35-01.98,77-37-11.41); (30-39-48.9,77-24-35.7)
1385	Himachal Pradesh	Renuka ji	(30-42-44.2,77-24-55.3); (30-42-44.4,77-24-50.4); (30-34-59.06,77-37-02.62)
1386	Himachal Pradesh	Renuka ji	(30-37-46.05,77-44-23.80); (30-37-35.95,77-44-18.74); (30-42-51.9,77-24-48.8)
1388	Himachal Pradesh	Renuka ji	(30-37-22.67,77-43-43.48); (30-37-16.91,77-43-88.71); (30-37-27.10,77-44-18.08); (30-37-19.75,77-44-39.40); (30-37-36.12,77-44-48.50)
1389	Himachal Pradesh	Renuka ji	(30-35-37.36,77-37-00.12);(30-37-17.86,77-43-46.50); (30-37-22.15,77-44-12.77); (30-37-35.29,77-44-02.00)
1390	Himachal Pradesh	Renuka ji	(30-42-51.5,77-31-19.0); (30-42-46,77-31-26.5)
1391	Himachal Pradesh	Renuka ji	(30-33-52.58,77-38-25.05); (30-33-45.57,77-38-17.97); (30-42-39.8,77-31-32.7)
1392	Himachal Pradesh	Renuka ji	(30-34-08.37,77-39-2.31); (30-34-04.06,77-39-07.28); (30-33-39.93,77-38-14.42)

1393	Himachal Pradesh	Renuka ji	(30-39-16.46,77-24-31.55); (30-38-55.70,77-23-49.66); (30-34-01.43,77-39-14.59)
1394	Himachal Pradesh	Renuka ji	(30-34-35.32,77-38-46.87);(30-38-56.19,77-23-42.45)
1396	Himachal Pradesh	Renuka ji	(30-42-53.20,77-31-38.2); (30-42-39.4,77-31-32.9)
1397	Himachal Pradesh	Renuka ji	(30-46-16.8,77-31-06.2); (30-46-07.7,77-30-57.7); (30-42-18.8,77-31-27.7)
1398	Himachal Pradesh	Renuka ji	(30-35-14.10,77-41-14.82); (30-35-59.15,77-41-14.55); (30-46-18.58,77-30-51.7); (30-46-13.9,77-30-49.7)
1399	Himachal Pradesh	Renuka ji	(30-42-37.3,77-31-49.5); (30-42-24.6,77-31-36.6); (30-35-34.13,77-41-08.07)
1400	Himachal Pradesh	Renuka ji	(30-35-59.45,77-25-03.64); (30-36-02.62,77-25-.6.34); (30-42-17.7,77-31-26.2)
1401	Himachal Pradesh	Renuka ji	(30-46-07.4,77-31-30.5); (30-46-04.1,77-31-13.00); (30-36-24.68,77-25-13.48)
1402	Himachal Pradesh	Renuka ji	(30-36-07.18,77-45-35.76); (30-36-15.04,77-45-43.36); (30-46-14.01,77-31-10.7); (30-46-03.02,77-31-08.3)
1403	Himachal Pradesh	Renuka ji	(30-42-28.2,77-31-15.8); (30-42-28.7,77-31-28.4); (30-36-17.64,77-45-19.99); (30-36-34.84,77-45-15.38); (30-36-35.41,77-45-05.51)
1404	Himachal Pradesh	Renuka ji	(30-35-47.51,77-41-36.00); (30-35-53.17,77-41-48.87); (30-42-0.2,77-31-17.5)
1405	Himachal Pradesh	Renuka ji	(30-36-12.12,77-44-56.33); (30-36-29.18,77-44-53.73)
1406	Himachal Pradesh	Renuka ji	(30-45-22.02,77-31-19.6); (30-45-29.10,77-31-07.7); (30-36-33.53,77-44-57.56); (30-36-45.94,77-44-53.71); (30-36-45.56,77-44-43.53)
1407	Himachal Pradesh	Renuka ji	(30-41-57.7,77-31-13.3); (30-41-54.0,77-30-50.3); (30-45-35.4,77-31-30.02); (30-45-40.30,77-31-17.3)
1408	Himachal Pradesh	Renuka ji	(30-34-52.05,77-38-30.09); (30-34-38.18,77-38-00.96); (30-41-59.6,77-30-37.3)
1409	Himachal Pradesh	Renuka ji	(30-36-41.00,77-43-53.68); (30-36-12.67,77-43-58.91); (30-34-32.59,77-37-50.46)
1410	Himachal Pradesh	Renuka ji	(30-36-28.52,77-43-54.34); (30-36-9.21,77-43-40.30)
1411	Himachal Pradesh	Renuka ji	(30-42-42.9,77-31-5.4); (30-42-30.5,77-30-52.3)
1412	Himachal Pradesh	Renuka ji	(30-39-01.55,77-45-56.01); (30-38-57.81,77-45-54.00); (30-42-24.6,77-30-37.3)
1413	Himachal Pradesh	Renuka ji	(30-36-18.76,77-25-21.42); (30-36-02.62,77-25-.06.34); (30-38-55.75,77-45-48.86); (30-38-53.78,77-45-42.18)
1414	Himachal Pradesh	Renuka ji	(30-42-46.19,77-30-35.0); (30-42-33.4,77-30-34.7); (30-35-59.45,77-25-.3.64)
1415	Himachal Pradesh	Renuka ji	(30-38-42.27,77-45-37.79); (30-38-49.17,77-45-32.34); (30-42-12.8,77-30-28.3)
1416	Himachal Pradesh	Renuka ji	(30-32-07.90,77-40-19.16); (30-32-23.28,77-40-01.71); (30-38-46.63,77-45-78.97); (30-38-37.91,77-45-26.25)
1417	Himachal Pradesh	Renuka ji	(30-34-03.60,77-37-03.38); (30-34-01.43,77-37-02.34); (30-32-40.73,77-40-51.90); (30-32-18.54,77-46-33.39)

1418	Himachal Pradesh	Renuka ji	(30-36-30.30,77-26-08); (30-36-26.84,77-26-08.77); (30-34-00.31,77-37-01.28)
1419	Himachal Pradesh	Renuka ji	(30-32-33.78,77-40-37.56); (30-31-45.64,77-40-58.05); (30-36-29.68,77-26-03.76)
1420	Himachal Pradesh	Renuka ji	(30-42-35.1,77-26-35.9); (30-42-36.1,77-26-35.5); (30-31-55.67,77-40-10.92); (30-31-51.71,77-40-42.14); (30-31-43.86,77-40-19.72); (30-31-59.87,77-40-16.18);
1421	Himachal Pradesh	Renuka ji	(30-47-51.37,77-32-11.10); (30-48-00.00,77-32-30.56); (30-42-37.7,77-26-35)
1422	Himachal Pradesh	Renuka ji	(30-32-29.68,77-40-46.71); (30-32-21.63,77-40-39.91); (30-47-56.03,77-32-31.83); (30-48-00.70,77-32-09.62)
1423	Himachal Pradesh	Renuka ji	(30-47-05.76,77-32-57.15); (30-47-18.23,77-33-03.98); (30-32-18.20,77-40-09.18); (30-32-13.02,77-40-26.07); (30-31-54.01,77-40-22.47)
1424	Himachal Pradesh	Renuka ji	(30-44-4.8,77-25-53.5); (30-44-8.4,77-25-0.3); (30-47-36.30,77-33-8.91); (30-47-6.32,77-32-40.99)
1425	Himachal Pradesh	Renuka ji	(30-43-45.74,77-31-54.59); (30-43-38.80,77-32-05.15); (30-44-13.4,77-25-48.4)
1426	Himachal Pradesh	Renuka ji	(30-34-35.22,77-45-11.45); (30-34-32.99,77-45-44); (30-43-45.74,77-32-15.70)
1427	Himachal Pradesh	Renuka ji	(30-38-20.42,77-39-42.91); (30-38-19.03,77-39-21.24); (30-34-26.05,77-45-10.86)
1428	Himachal Pradesh	Renuka ji	(30-46-49.25,77-32-23.97); (30-46-53.76,77-32-29.85); (30-38-21.11,77-39-49.42)
1429	Himachal Pradesh	Renuka ji	(30-46-52.32,77-31-50.01); (30-46-59.4,77-31-58.5); (30-46-58.69,77-32-53.88); (30-46-38.25,77-32-18.63)
1430	Himachal Pradesh	Renuka ji	(30-46-54.26,77-31-42.38); (30-47-12.44,77-31-35.10); (30-47-14.46,77-32-12.09); (30-46-49.41,77-32-17.30)
1431	Himachal Pradesh	Renuka ji	(30-44-43.14,77-30-20.09); (30-44-19.27,77-30-27.74); (30-47-03.98,77-31-36.74); (30-46-55.84,77-31-34.60)
1432	Himachal Pradesh	Renuka ji	(30-38-6.84,77-39-2.22); (30-38-6.72,77-39-7.75); (30-44-11.71,77-30-23.36); (30-44-12.08,77-30-37.25); (30-44-16.39,77-30-46.29); (30-44-25.31,77-30-53.00);
1433	Himachal Pradesh	Renuka ji	(30-47-12.5,77-31-18.9); (30-47-24.3,77-31-30.1); (30-38-14.01,77-38-26.78)
1434	Himachal Pradesh	Renuka ji	(30-35-08.36,77-42-26.27); (30-35-09.07,77-42-45.32); (30-47-57.70,77-31-48.60); (30-47-13.9,77-31-13.7)
1435	Himachal Pradesh	Renuka ji	(30-47-15.76,77-31-45.20); (30-47-24.0,77-31-40.0); (30-35-09.94,77-42-57.39); (30-34-41.00,77-43-09.79); (30-34-33.45,77-42-57.24); (30-34-41.93,77-43-21.78); (30-34-17.67,77-43-05.66); (30-34-29.99,77-43-34.94)
1436	Himachal Pradesh	Renuka ji	(30-44-37.05,77-31-7.30); (30-44-21.86,77-30-50.18); (30-47-29.19,77-31-34.96); (30-47-25.76,77-31-38.89)
1437	Himachal Pradesh	Renuka ji	(30-47-14.93,77-32-12.30); (30-47-36.71,77-32-07.79); (30-44-15.69,77-30-47.18); (30-44-7.29,77-30-58.14); (30-44-8.37,77-31-12.61)
1438	Himachal Pradesh	Renuka ji	(30-37-17.97,77-36-33.28); (30-37-21.61,77-36-31.91); (30-48-00.03,77-32-04.54); (30-47-39.31,77-31-54.80)
1439	Himachal Pradesh	Renuka ji	(30-34-17.67,77-43-05.66); (30-34-29.99,77-43-34.94); (30-37-26.65,77-36-33.88)

1440	Himachal Pradesh	Renuka ji	(30-43-28.76,77-31-54.90); (30-43-26.99,77-32-11.50); (30-34-10.99,77-43-12.41); (30-34-24.74,77-43-39.73); (30-34-16.65,77-43-53.44); (30-34-00.80,77-43-35.51); (30-34-08.21,77-43-43.94); (30-34-13.38,77-43-49.89)
1441	Himachal Pradesh	Renuka ji	(30-44-6.98,77-31-11.73); (30-44-15.58,77-30-46.59); (30-43-15.30,77-31-50.80); (30-43-13.01,77-31-59.00)
1442	Himachal Pradesh	Renuka ji	(30-38-30.36,77-38-22.72); (30-38-34.23,77-38-10.5); (30-44-11.37,77-30-37.76); (30-44-10.93,77-30-22.77); (30-44-7.71,77-30-18.14)
1443	Himachal Pradesh	Renuka ji	(30-46-21.98,77-32-35.11); (30-46-16.3,77-32-29.6); (30-38-35.81,77-38-17.37)
1444	Himachal Pradesh	Renuka ji	(30-34-16.65,77-43-53.44); (30-34-00.80,77-43-35.51); (30-46-06.79,77-32-24.63); (30-46-29.8,77-33-07.29)
1445	Himachal Pradesh	Renuka ji	(30-46-41.25,77-33-29.29); (30-46-29.79,77-33-25.39); (30-34-08.21,77-43-35.51); (30-34-13.38,77-43-49.39); (30-33-50.85,77-43-45.07); (30-34-19.63,77-44-10.00); (30-34-06.50,77-44-14.49); (30-33-52.85,77-43-57.06)
1446	Himachal Pradesh	Renuka ji	(30-38-44.83,77-39-30.29); (30-38-32.15,77-39-14.25); (30-46-16.3,77-32-29.6); (30-46-37.11,77-33-57.83)
1447	Himachal Pradesh	Renuka ji	(30-44-8.71,77-31-21.24); (30-43-57.23,77-30-49.13); (30-38-43.99,77-39-25.91)
1448	Himachal Pradesh	Renuka ji	(30-42-55.50,77-32-00.92); (30-42-31.08,77-32-07.40); (30-43-46.08,77-30-26.58); (30-43-39.52,77-30-32.18); (30-43-41.16,77-30-44.44); (30-43-43.76,77-30-52.89);
1449	Himachal Pradesh	Renuka ji	(30-34-35.64,77-43-29.28); (30-34-48.62,77-43-29.90); (30-42-37.89,77-32-24.30); (30-42-50.18,77-32-48.20)
1450	Himachal Pradesh	Renuka ji	(30-45-42.71,77-31-48.05); (30-45-55.08,77-31-45.05); (30-35-07.10,77-43-12.95); (30-35-26.60,77-43-05.17); (30-34-56.22,77-43-70.71); (30-34-33.27,77-44-05.46); (30-34-19.34,77-44-02.65); (30-34-56.49,77-43-43.08)
1451	Himachal Pradesh	Renuka ji	(30-38-22.66,77-39-24.75); (30-38-27.40,77-39-32.25); (30-46-18.5,77-32-13.8); (30-46-15.8,77-32-11.1)
1452	Himachal Pradesh	Renuka ji	(30-37-22.67,77-38-42.16); (30-37-17.83,77-38-30.49)
1454	Himachal Pradesh	Renuka ji	(30-43-59.10,77-31-30.81); (30-43-53.65,77-31-33.87)
1455	Himachal Pradesh	Renuka ji	(30-43-21.33,77-32-47.10);(30-43-40.69,77-31-23.15); (30-43-35.15,77-31-8.00); (30-43-40.76,77-30-50.90)
1456	Himachal Pradesh	Renuka ji	(30-45-32.21,77-34-44.95); (30-45-29.89,77-34-57.14)
1457	Himachal Pradesh	Renuka ji	(30-37-55.13,77-39-48.44);(30-45-22.26,77-35-02.33); (30-45-18.12,77-34-43.24)
1458	Himachal Pradesh	Renuka ji	(30-34-38.69,77-44-26.08); (30-34-40.96,77-45-09.25)
1459	Himachal Pradesh	Renuka ji	(30-45-03.50,77-34-58.42); (30-04-59.21,77-35-14.97); (30-34-42.09,77-45-23.31); (30-34-43.26,77-45-34.79); (30-35-01.78,77-45-24.19); (30-34-55.74,77-45-11.32); (30-34-59.62,77-45-18.06); (30-34-50.32,77-44-49.16)
1460	Himachal Pradesh	Renuka ji	(30-33-01.78,77-45-24.19); (30-34-55.74,77-45-11.32); (30-44-57.99,77-35-27.70); (30-45-08.73,77-35-19.72)
1461	Himachal	Renuka ji	(30-45-15.57,77-34-31.57); (30-45-10.40,77-34-41.27); (30-

	Pradesh		34-59.02,77-45-18.06); (30-35-06.70,77-44-57.11); (30-35-12.91,77-45-12.58); (30-35-12.75,77-44-48.25); (30-35-21.30,77-45-02.92); (30-35-24.19,77-44-27.95)
1462	Himachal Pradesh	Renuka ji	(30-38-41.87,77-39-20.77); (30-38-30.91,77-38-56.46); (30-45-11.98,77-34-47.61); (30-45-05.89,77-34-42.25)
1463	Himachal Pradesh	Renuka ji	(30-33-58.19,77-45-59.39); (30-33-52.69,77-45-50.11)
1464	Himachal Pradesh	Nahan	(30-40-34.10,77-11-55.10); (30-40-35.00,77-12-03.31); (30-33-45.09,77-45-43.50); (30-33-49.01,77-45-51.02); (30-33-35.08,77-45-47.37); (30-33-25.76,77-45-46.82); (30-33-22.08,77-46-02.85); (30-33-30.38,77-46-20.15)
1468	Himachal Pradesh	Renuka ji	(30-43-54.81,77-31-36.45); (30-43-48.66,77-31-29.08); (30-40-39.80,77-11-57.92); (30-40-48.84,77-11-44.94)
1470	Himachal Pradesh	Nahan	(30-39-48.41,77-13-19.10); (30-39-43.42,77-13-11.84); (30-43-39.93,77-31-23.83); (30-43-40.10,77-31-31.58); (30-43-39.92,77-31-43.10)
1472	Himachal Pradesh	Renuka ji	(30-43-4.39,77-31-27.67); (30-43-22.64,77-31-16.24); (30-39-39.32,77-13-10.67); (30-39-32.44,77-13-22.22); (30-39-35.48,77-13-26.67); (30-39-41.39,77-13-35.09); (30-39-44.48,77-13-28.04); (30-39-35.56,77-13-16.06)
1474	Himachal Pradesh	Nahan	(30-39-57.54,77-12-42.83); (30-40-05.17,77-12-48.25); (30-43-34.82,77-31-11.05); (30-43-49.35,77-31-23.46); (30-43-38.35,77-31-52.86); (30-43-29.91,77-31-49.20);
1477	Himachal Pradesh	Renuka ji	(30-43-34.24,77-31-9.86); (30-43-40.43,77-30-46.31); (30-40-00.90,77-12-55.43); (30-39-53.57,13-09.73); (30-39-49.41,77-13-18.35); (30-39-43.58,77-13-11.51); (30-39-41.26,77-13-08.42); (30-39-48.93,77-12-55.22)
1479	Himachal Pradesh	Nahan	(30-40-06.42,77-12-44.49); (30-40-04.94,77-12-39.96); (30-43-27.72,77-30-39.39); (30-43-13.70,77-30-35.27); (30-42-52.17,77-30-46.51); (30-42-56.67,77-30-58.58); (30-42-59.83,77-31-7.34); (30-43-3.34,77-31-17.93)
1481	Himachal Pradesh	Renuka ji	(30-42-52.69,77-30-44.68); (30-43-13.27,77-30-34.40); (30-40-07.61,77-12-28.45); (30-40-02.23,77-12-25.35); (30-39-55.62,77-12-38.30); (30-39-58.85,77-12-43.76); (30-40-03.89,77-12-46.09); (30-40-04.44,77-12-53.77)
1484	Himachal Pradesh	Renuka ji	(30-43-4.78,77-30-3.49); (30-43-4.76,77-29-55.08); (30-43-20.33,77-30-24.85); (30-43-22.72,77-30-17.42); (30-43-15.18,77-30-15.18); (30-43-4.42,77-30-4.23); (30-42-59.66,77-30-16.08); (30-42-57.95,77-30-37.02)
1486	Himachal Pradesh	Nahan	(30-40-04.79,77-12-24.57); (30-40-04.20,77-12-12.10); (30-43-27.02,77-29-55.40); (30-43-42.25,77-29-53.40); (30-43-38.14,77-30-5.65); (30-43-24.51,77-30-17.15); (30-43-15.88,77-30-14.40); (30-43-4.72,77-30-3.55)
1488	Himachal Pradesh	Renuka ji	(30-33-44.15,77-44-08.78); (30-33-46.23,77-44-13.50); (30-40-08.82,77-12-13.40); (30-40-11.42,77-12-23.71); (30-40-26.13,77-12-29.11); (30-40-06.91,77-12-42.31); (30-40-04.23,77-12-38.24); (30-40-07.29,77-12-26.81)
1489	Himachal Pradesh	Renuka ji	(30-33-35.55,77-45-44.83); (30-33-18.59,77-45-40.63); (30-33-46.68,77-44-17.69); (30-33-47.71,77-44-19.95); (30-33-53.31,77-43-57.12); (30-33-56.56,77-44-03.17); (30-34-02.79,77-44-07.15); (30-34-05.77,77-44-14.13)

1491	Himachal Pradesh	Renuka ji	(30-43-20.6677-33-24.52); (30-43-22.58,77-33-29.49); (30-33-14.84,77-45-28.19); (30-33-12.56,77-45-03.32); (30-33-19.62,77-44-44.69); (30-33-21.05,77-45-04.22); (30-33-26.18,77-45-21.62); (30-33-29.92,77-45-32.16)
1494	Himachal Pradesh	Renuka ji	(30-43-20.66,77-33-24.52); (30-43-22.58,77-33-29.49); (30-43-25.04,77-33-34.36)
1499	Himachal Pradesh	Nahan	(30-39-34.52,77-13-26.40); (30-39-38.63,77-13-34.23); (30-43-24.04,77-33-34.36)
1500	Himachal Pradesh	Renuka ji	(30-44-55.40,77-33-03.88);(30-39-44.04,77-13-37.07); (30-39-46.82,77-13-42.34); (30-39-38.89,77-13-44.66); (30-39-35.68,77-13-39.29); (30-39-79.76,77-13-36.94); (30-39-31.84,77-13-23.03)
1501	Himachal Pradesh	Nahan	(30-37-46.27,77-19-10.00); (30-37-31.33,77-19-08.47)
1504	Himachal Pradesh	Nahan	(30-38-03.19,77-18-48.87); (30-37-59.27,77-18-57.15); (30-37-22.78,77-18-52.22); (30-37-55.41,77-19-00.03)
1505	Himachal Pradesh	Nahan	(30-39-16.86,77-17-29.85); (30-39-17.80,77-17-18.46); (30-37-52.65,77-18-59.28); (30-38-05.75,77-18-58.51)
1507	Himachal Pradesh	Nahan	(30-39-19.68,77-13-50.44); (30-39-25.10,77-13-53.35); (30-39-14.37,77-17-04.75); (30-39-12.55,77-16-56.62); (30-39-05.86,77-17-08.06); (30-39-09.86,77-17-22.84);
1516	Himachal Pradesh	Renuka ji	(30-44-27.80,77-32-30.17); (30-44-15.57,77-32-33.03); (30-39-31.37,77-13-58.67); (30-39-36.55,77-14-01.99); (30-31-35.05,77-14-05.68); (30-39-31.08,77-14-03.62); (30-39-20.09,77-14-03.54); (30-39-10.93,77-13-52.59)
1520	Himachal Pradesh	Renuka ji	(30-44-03.17,77-31-36.05); (30-44-34.05,77-31-47.04)
1522	Himachal Pradesh	Nahan	(30-39-00.85,77-14-32.22); (30-38-50.72,77-14-40.13); (30-44-00.03,77-31-47.04); (30-44-15.05,77-31-48.30)
1525	Himachal Pradesh	Nahan	(30-39-47.17,77-16-40.92); (30-38-39.28,77-16-35.63); (30-38-55.21,77-14-49.32); (30-39-08.79,77-14-32.62); (30-39-07.49,77-14-44.24); (30-39-08.41,77-14-50.29); (30-39-05.14,77-14-56.44); (30-38-58.50,77-14-50.83)
1526	Himachal Pradesh	Nahan	(30-39-11.04,77-14-06.54); (30-39-10.44,77-14-19.72); (30-38-35.41,77-16-52.19); (30-38-33.39,77-17-12.35); (30-38-44.25,77-16-55.15)
1527	Himachal Pradesh	Renuka ji	(30-44-50.03,77-31-13.42); (30-44-31.58,77-31-33.40); (30-39-08.82,77-14-24.72); (30-39-00.42,77-14-31.44); (30-38-57.97,77-14-12.44); (30-38-57.13,77-14-04.93); (30-39-00.51,77-13-57.17); (30-39-06.14,77-14-01.85)
1528	Himachal Pradesh	Nahan	(30-37-37.36,77-17-57.57); (30-37-47.74,77-17-51.74); (30-44-42.59,77-31-44.38); (30-44-48.05,77-31-56.08)
1529	Himachal Pradesh	Nahan	(30-39-30.18,77-14-24.22); (30-39-25.60,77-14-21.98); (30-37-59.71,77-17-54.61); (30-38-10.14,77-17-51.73); (30-38-14.66,77-17-58.18); (30-38-11.77,77-18-07.83); (30-38-1.90,77-18-6.35); (30-38-1.90,77-18-1.66)
1530	Himachal Pradesh	Renuka ji	(30-45-22.03,77-31-36.07); (30-45-05.09,77-31-33.03); (30-39-18.34,77-14-16.85); (30-39-12.45,77-14-08.53); (30-39-10.30,77-19-19.08); (30-39-12.05,77-14-26.32); (30-39-09.68,77-14-30.94); (30-39-18.69,77-14-36.65)
1531	Himachal	Nahan	(30-38-34.06,77-16-52); (30-38-33.94,77-17-15.46); (30-45-

	Pradesh		10.74,77-31-44.08); (30-45-01.07,77-31-56.04)
1532	Himachal Pradesh	Nahan	(30-37-35.16,77-17-49.24); (30-37-44.03,77-17-53.13); (30-38-33.07,77-17-23.03); (30-38-29,77-17-24.60); (30-38-28.70,77-16-56.29); (30-38-32,77-16-39.58);
1533	Himachal Pradesh	Renuka ji	(30-45-38.18,77-31-53.02); (30-45-30.05,77-32-08.59); (30-37-53.89,77-17-44.4); (30-37-42.50,77-17-41.68)
1535	Himachal Pradesh	Renuka ji	(30-44-08.02,77-32-56.07);(30-45-35.64,77-32-20.53); (30-45-39.94,77-32-30.36)
1536	Himachal Pradesh	Nahan	(30-38-29.28,77-16-18.46); (30-38-14.29,77-16-36.09)
1542	Himachal Pradesh	Nahan	(30-38-25.97,77-16-15.14); (30-38-31.90,77-16-25.35); (30-38-02.19,77-16-27.45); (30-38-03,77-16-41.7); (30-38-22.09,77-16-46.29); (30-38-31.36,77-16-38.70); (30-38-33.51,77-16-20.05); (30-38-29.60,77-16-31.6)
1543	Himachal Pradesh	Nahan	(30-38-56.40,77-16-91.43); (30-38-37.04,77-16-17.54); (30-38-39.27,77-16-39.67); (30-38-38.84,77-16-21.31)
1554	Himachal Pradesh	Nahan	(30-36-02.12,77-20-13.76); (30-36-08.44,77-20-33.69); (30-38-44.36,77-16-29.72); (30-38-57.60,77-16-35.05); (30-39-05.70,77-16-26.5); (30-39-06.02,77-16-23.46);
1560	Himachal Pradesh	Solan	(30-54-30,77-07-06); (30-54-34,77-07-02); (30-36-12.33,77-20-37.36); (30-36-28.42,77-20-44.53)
1562	Himachal Pradesh	Solan	(30-54-39,77-07-10); (30-54-48,77-07-04); (30-54-37,77-06-59); (30-54-38,77-06-51)
1564	Himachal Pradesh	Nahan	(30-36-08.48,77-20-35.19); (30-36-12.58,77-20-38.29); (30-54-59,77-07-05); (31-54-57,77-07-18)
1565	Himachal Pradesh	Solan	(30-52-22.2,76-59-54.78); (31-01-28.82,77-00-6.72); (30-36-23.26,77-20-44.97); (30-36-28.05,77-24-47.99)
1567	Himachal Pradesh	Solan	(30-54-10,77-8-12); (30-54-5,77-08-07); (30-51-57.72,76-59-50.28); (30-52-16.8,77-59-55.26); (30-51-56.76,76-59-56.22)
1571	Himachal Pradesh	Solan	(30-52-7.26,77-00-18.54); (30-51-53.52,77-00-24.12); (30-54-12,77-8-13)
1572	Himachal Pradesh	Solan	(30-54-34,77-7-18); (30-54-48,77-7-29); (30-52-5.94,77-00-28.86); (30-52-3.6,77-00-26.88)
1574	Himachal Pradesh	Nahan	(30-36-01.24,77-21-04.15); (30-35-56.40,77-21-03.85); (30-54-59,77-7-36); (30-54-61,77-7-40)
1575	Himachal Pradesh	Solan	(30-56-24.3,77-08-11.9); (30-56-23.1,77-08-12.2); (30-35-48.93,77-21-07.28); (30-35-37.74,77-21-16.09)
1578	Himachal Pradesh	Solan	(30-58-4.15,77-07-9.38); (30-56-8.97,77-08-15.0); (30-56-20.34,77-08-19.5); (30-56-19.7,77-08-19.2)
1579	Himachal Pradesh	Nahan	(30-37-2.2,77-17-45.7); (30-37-6.7,77-17-43.0); (30-56-07.3,77-08-31.2); (30-56-8.16,77-08-21.5)
1580	Himachal Pradesh	Solan	(30-56-59,77-08-24); (30-56-43,77-08-31); (30-37-8.2,77-17-44.6); (30-37-8.5,77-17-44.9); (30-37-8.2,77-17-44.6)
1583	Himachal Pradesh	Solan	(30-57-05,77-07-38); (30-57-08,77-07-40); (30-57-11,77-07-54)
1585	Himachal Pradesh	Solan	(30-53-24.88,77-09-07.77); (30-53-36.88,77-09-28.52)
1586	Himachal Pradesh	Nahan	(30-36-39.2,77-18-41.5); (30-36-24.1,77-16-42.1); (30-54-04.78,77-09-38.92)
1588	Himachal	Solan	(30-53-20.8,77-09-41.05); (30-53-14.51,77-09-45.57); (30-36-

	Pradesh		43.9,77-18-42.0); (30-36-50.6,77-17-35.0)
1591	Himachal Pradesh	Solan	(30-53-10,77-09-03); (30-53-09,77-53-25); (30-53-12.02,77-09-51.19); (30-53-15.18,77-09-52.09)
1593	Himachal Pradesh	Solan	(30-52-26.16,77-11-18.78);(30-53-05,30-53-20); (30-53-05,77-09-20)
1595	Himachal Pradesh	Nahan	(30-36-48.3,77-17-31.0); (30-36-30.5,77-18-7.9)
1598	Himachal Pradesh	Solan	(30-54-38,77-03-57); (30-54-40,77-03-49); (30-36-57.7,77-17-34.0); (30-36-43.5,77-17-59.2)
1599	Himachal Pradesh	Solan	(30-55-20,77-03-21); (30-55-16,77-03-16); (30-54-53,77-03-44)
1602	Himachal Pradesh	Solan	(30-58-55.61,77-11-45.09); (30-58-54.53,77-50.87); (30-55-13,77-03-12)
1603	Himachal Pradesh	Solan	(30-55-05,77-03-12); (30-55-04,77-03-12); (30-58-54.48,77-11-53.57); (30-58-53.02,77-11-58.12)
1604	Himachal Pradesh	Solan	(30-56-36.5,77-06-44.3); (30-56-35.4,77-06-43.1); (30-55-05,77-03-34)
1605	Himachal Pradesh	Solan	(30-56-35.6,77-06-49.8); (30-57-13.5,77-06-23.5); (30-56-31.0,77-06-41.9)
1607	Himachal Pradesh	Solan	(30-54-19,77-03-57); (30-54-17,77-04-07); (30-56-34.4,77-06-44.5)
1609	Himachal Pradesh	Solan	(30-56-24.8,77-06-35.3); (30-56-24.2,77-06-35.1); (30-54-13,77-04-35); (30-54-00,77-04-46)
1614	Himachal Pradesh	Solan	(30-59-26.74,77-08-39.25); (31-01-25.88,77-06-53.95); (30-56-24.6,77-6-35.1); (30-56,77-06-35.2); (30-56-24.5,77-06-36.2); (30-56-24.2,77-06-36.6);
1615	Himachal Pradesh	Solan	(30-34-25.89,77-4-9.26); (30-57-18,77-6-57); (31-01-16.94,77-06-40.77); (31-01-27.31,77-06-52.32)
1617	Himachal Pradesh	Solan	(30-50-33.72,76-58-49.8); (30-50-37.98,76-58-47.58)
1619	Himachal Pradesh	Solan	(30-56-24.2,77-06-36.2); (30-56-24.6,77-06-54.3); (30-50-13.92,76-58-49.26); (30-50-36.78,76-58-46.92); (30-50-40.08,76-59-25.32); (30-50-39.24,76-59-28.68); (30-51-6.78,76-59-39.96);
1620	Himachal Pradesh	Solan	(30-56-33.72,77-13-39.9);(30-56-24.8,77-06-57.1)
1621	Himachal Pradesh	Solan	(31-00-27.03,77-07-54.50); (31-00-30.30,77-07-59.28)
1622	Himachal Pradesh	Solan	(30-56-27.88,77-14-17.61); (30-56-38.22,77-14-07.49); (31-00-33.09,77-07-56.82); (31-00-36.76,77-07-54.22)
1623	Himachal Pradesh	Solan	(30-56-26.3,77-6-44.0); (30-56-24.8,77-06-35.3); (30-56-19.97,77-14-28.16)
1625	Himachal Pradesh	Solan	(30-56-27.88,77-14-17.61); (30-56-38.22,77-56-07.49); (30-56-24.3,77-06-44.0)
1627	Himachal Pradesh	Solan	(30-57-0.60,77-7-13.32); (30-57-02.9,77-07-12.13)
1631	Himachal Pradesh	Solan	(30-56-35.8,77-06-49.7); (30-56-32.1,77-06-48.1); (30-57-3.7,77-7-10.3)
1632	Himachal Pradesh	Solan	(30-57-80,77-13-6.90); (30-51-57.91,77-13-05.49); (30-56-30.0,77-06-48.0)

1634	Himachal Pradesh	Solan	(30-56-36.77,77-11-20.51); (30-55-55.58,77-10-07.79)
1636	Himachal Pradesh	Solan	(30-56-50.89,77-10-17.39); (30-56-46.59,77-10-16.32); (30-56-31.98,77-11-13.39)
1638	Himachal Pradesh	Solan	(30-55-46.65,77-11-43.35); (30-55-43.36,77-11-41.69); (30-55-18.71,77-09-36.57)
1639	Himachal Pradesh	Solan	(30-55-59.66,77-11-06.51); (30-55-53.08,77-11-06.37)
1640	Himachal Pradesh	Solan	(30-55-15.10,77-14-29.58); (30-55-08.99,77-14-34.28); (30-55-45.73,77-11-04.99)
1641	Himachal Pradesh	Solan	(30-55-40.22,77-13-03.35); (30-54-57.64,77-13-02.13); (30-55-06.13,77-14-35.78)
1642	Himachal Pradesh	Theog	(31-02-32.4,77-29-3.12); (31-02-16.2,77-28-44.22); (30-54-47.12,77-13-53.57)
1643	Himachal Pradesh	Theog	(31-04-10.6,77-29-48.4); (31-02-58.1,77-29-57.4); (31-02-8.88,77-28-36.06)
1644	Himachal Pradesh	Theog	(31-04-39.2,77-25-13.6);(31-03-06.08,77-27-51.7)
1645	Himachal Pradesh	Theog	(31-8-53,77-34-34); (31-8-53,77-34-31)
1646	Himachal Pradesh	Theog	(31-01-37.4,77-31-53.6);(31-8-53,77-34-28)
1647	Himachal Pradesh	Solan	(30-51-17.58,77-01-23.4); (30-51-16.56,77-01-56.46)
1648	Himachal Pradesh	Theog	(31-4-9.29,77-30-34.56); (31-4-13.22,77-30-41.14); (30-51-18.9,77-01-56.52)
1649	Himachal Pradesh	Theog	(31-05-25.8,77-27-40.8);(31-4-20.78,77-30-19.56); (31-3-57.84,77-30-9.97); (31-4-21.33,77-31-11.25)
1651	Himachal Pradesh	Solan	(30-51-37.92,77-01-39.96)
1652	Himachal Pradesh	Theog	(31-5-34.66,77-34-13.14); (31-5-36.16,77-34-29)
1653	Himachal Pradesh	Solan	(30-53-04.6,30-53-04.6); (30-53-012,77-00-08.05); (31-5-36.48,77-34-1.15); (31-4.49-00,77-34-52); (31-4.52-00,77-34-29); (31-5-7.38,77-34-43);
1654	Himachal Pradesh	Solan	(30-53-58.62,76-59-16.2); (30-53-43.98,76-59-15.12)
1655	Himachal Pradesh	Solan	(30-47-11.64,77-01-8.16);(30-53-9.72,76-59-28.92)
1656	Himachal Pradesh	Solan	(30-48-54.72,77-00-52.38); (30-48-54.24,77-00-56.04)
1658	Himachal Pradesh	Theog	(31-6-37,77-4.77-00); (31-6-34.22,77-36-19); (30-48-51.9,77-00-57.12)
1660	Himachal Pradesh	Solan	(31-6-36,77-36-15); (31-6-39,77-37-5.4); (31-6-35.35,77-36-45)
1661	Himachal Pradesh	Solan	(30-50-8.34,77-15-04); (30-50-10.2,77-01-30.84)
1663	Himachal Pradesh	Theog	(31-6-36,77-30-57); (31-9-11,77-49-03); (30-50-14.1,77-01-31.2)
1665	Himachal	Theog	(31-4-15.43,77-31-44.38); (31-4-26.10,77-31-37.7); (31-09-

	Pradesh		56,77-49-05); (31-09-10,77-49-08)
1669	Himachal Pradesh	Solan	(30-48-46.5,77-00-5.46); (30-48-50.34,77-00-4.2)
1670	Himachal Pradesh	Solan	(30-52-22.2,76-59-54.78); (30-51-44.4,77-00-15.9)
1676	Himachal Pradesh	Solan	(30-52-5.34,77-00-27.18)
1681	Himachal Pradesh	Solan	(30-51-32.7,77-00-52.08); (30-51-32.7,77-01-2.94)
1692	Himachal Pradesh	Solan	(30-50-16.62,77-00-17.04); (30-50-18,77-00-17.04)
1894	Himachal Pradesh	Shimla	(30-48-38.7,77-38-25.5); (30-48-3.7,77-38-28.6); (28-53-35.30,77-10-58.83); (28-53-33.63,77-10-57.52)
1895	Himachal Pradesh	Shimla	(30-48-17,77-30-56); (30-48-50,77-40-25); (30-48-50.3,77-38-30.9)
1898	Himachal Pradesh	Shimla	(30-77-53.58,77-68-10.74); (30-78-1.86,77-72-4.26); (25-53-59.04,79-55-03.54)
1899	Himachal Pradesh	Shimla	(30-46-8.16,77-41-9.6); (30-46-29.46,77-43-8.7); (30-33-30.36,77-75-59.52); (30-51-12.3,77-41-10.2)
1901	Himachal Pradesh	Shimla	(30-46-49.11,77-43-14.55); (30-31-9.3,77-26-31.74); (25-57-29.80,80-06-11.06)
2749	Himachal Pradesh	Renukaji	(30-42-8.19,77-32-14.21); (30-41-53.07,77-41-53.07)
2754	Himachal Pradesh	Solan	(30-51-58.32,77-00-8.52); (30-51-29.1,77-00-10.32)
2755	Himachal Pradesh	Solan	(30-51-58.32,77-00-8.52); (30-51-29.1,77-00-10.32); (30-51-44.4,77-00-15.9); (30-51-22.92,77-00-18.6)
2758	Himachal Pradesh	Theog	(31-44-1.8,77-31-55.95); (31-44-3.56,77-31-56.45); (31-44-1.63,77-31-54.80); (31-44-2.79,77-31-55.59)
2777	Himachal Pradesh	Solan	(30-51-32.7,77-00-52.08); (30-51-32.7,77-01-2.94); (30-51-32.58,77-01-0.12)
2782	Himachal Pradesh	Solan	(30-51-32.7,77-00-52.08); (30-51-32.7,77-01-2.94); (30-51-32.58,77-01-0.12)
2784	Himachal Pradesh	Theog	(31-4-15.43,77-31-44.38); (31-4-26.10,77-31-37.7); (31-4-19.11,77-31-42.59); (31-4-33.04,77-31-35.40)
2786	Himachal Pradesh	Theog	(31-4-9.29,77-30-34.56); (31-4-13.22,77-30-41.14); (31-4-20.78,77-30-19.56); (31-3-57.84,77-30-9.97); (31-4-21.33,77-31-11.25)
2800	Himachal Pradesh	Theog	(31-12-3.364,77-32-17.22); (31-08-7.482,77-29-19.174)
2804	Himachal Pradesh	Theog	(31-06-23.71,77-30-39.17); (31-06-3.92,77-30-44.33)
2805	Himachal Pradesh	Theog	(31-06-36.89,77-30-57.23); (31-09-38.87,77-30-57.03)
2806	Himachal Pradesh	Nahan	(30-39-47.17,77-16-40.92); (30-38-39.28,77-16-35.63); (30-38-35.41,77-16-52.19); (30-38-33.39,77-17-12.35); (30-38-44.25,77-16-55.15)
2807	Himachal Pradesh	Nahan	(30-38-34.06,77-16-52); (30-38-33.94,77-17-15.46); (30-38-33.07,77-17-23.03); (30-38-29,77-17-24.60); (30-38-28.70,77-16-56.29); (30-38-32,77-16-39.58)

2808	Himachal Pradesh	Nahan	(30-38-29.28,77-16-18.46); (30-38-14.29,77-16-36.09); (30-38-02.19,77-16-27.45); (30-38-03,77-16-41.7); (30-38-22.09,77-16-46.29); (30-38-31.36,77-16-38.70); (30-38-33.5177-16-20.05); (30-38-29.6077-16-31.6)
2810	Himachal Pradesh	Nahan	(30-38-25.97,77-16-15.14); (30-38-31.90,77-16-25.35); (30-38-39.27,77-16-39.67); (30-38-38.84,77-16-21.31)
2812	Himachal Pradesh	Nahan	; (30-38-37.04,77-16-17.54); (30-38-44.36,77-16-29.72); (30-38-57.60,77-16-35.05); (30-39-05.70,77-16-26.5); (30-39-06.02,77-16-23.46)
2841	Himachal Pradesh	Solan	(31-00-27.03,77-07-54.50); (30-56-53.63,77-07-59.28); (31-00-33.09,77-07-56.82); (31-00-36.76,77-07-54.22)
2889	Himachal Pradesh	Solan	(30-50-33.72,76-58.83-00); (30-50-37.98,76-58-47.58); (30-50-13.92,76-58-49.26) (30-50-40.08,76-59-25.32); (30-50-39.24,76-59-28.68); (30-51-6.7876-59-39.96); (30-51-5.9476-59-40.2)
2903	Himachal Pradesh	Solan	(30-54-39,77-07-10); (30-54-48,77-07-04); (30-54-59,77-07-05); (31-54-57,77-07-18)
2913	Himachal Pradesh	Solan	(30-56-09,77-6-09); (30-56-15,77-6-34)
2944	Himachal Pradesh	Nahan	(30-37-55.17,77-18-11.93); (30-38-5.64,77-18-22.20); (30-38-17.56,77-18-29.58); (30-38-17.61,77-18-17.49); (30-38-12.62,77-18-6.37); (30-38-4.62,77-18-7.51)
2948	Himachal Pradesh	Nahan	(30-37-51.44,77-17-28.38); (30-37-38.64,77-17-30.90); (30-37-41.00,77-17-39.71); (30-37-53.91,77-17-44.08); (30-38-1.17,77-17-42.58); (30-35-3.66,77-17-45.59)
2953	Himachal Pradesh	Nahan	(30-39-08.53,77-16-56.33); (30-38-54.12,77-17-00.71); (30-38-40.38,77-17-15.89); (30-38-46.75,77-17-23.76); (30-38-44.59,77-17-36.19); (30-38-56.78,77-17-23.30); (30-39-04.5877-17-04.44); (30-38-59.3177-16-57.12)
2956	Himachal Pradesh	Nahan	(30-37-56.86,77-17-12.93); (30-37-55.58,77-16-57.56); (30-37-46.16,77-17-10.99); (30-37-47.01,77-17-25.66)
2958	Himachal Pradesh	Nahan	(30-37-55.28,77-16-21.40); (30-37-52.14,77-16-40.25); (30-37-59,77-16-57.91); (30-38-6.76,77-16-54.99); (30-37-59.58,77-16-36.11)
2966	Himachal Pradesh	Nahan	(30-37-57.10,77-17-08.74); (30-38-05.24,77-16-59.14)
2967	Himachal Pradesh	Nahan	(30-37-55.17,77-18-11.93); (30-38-5.64,77-18-22.20); (30-38-17.56,77-18-29.58); (30-38-17.61,77-18-17.49); (30-38-12.62,77-18-6.37); (30-38-4.62,77-18-7.51)
2968	Himachal Pradesh	Nahan	(30-37-48.14,77-18-36.19); (30-37-58.59,77-18-29.27); (30-38-3.76,77-18-26.72); (30-38-5.44,77-18-34.48); (30-38-14.00,77-18-41.17); (30-38-19.30,77-18-27.75); (30-38-8.1777-18-26.07); (30-37-58.3977-18-21.09)
2970	Himachal Pradesh	Nahan	(30-37-40.13,77-18-13.51); (30-37-36.46,77-17-58.42); (30-37-49.04,77-18-02.42); (30-37-58.23,77-18-5.25); (30-37-52.42,77-18-17.54); (30-37-52.42,77-18-31.29) (77-18-21.09)
2975	Himachal Pradesh	Nahan	(30-37-58.85,77-17-47.24); (30-37-51.42,77-17-47.76); (30-37-54.65,77-17-54.29); (30-78-3.82,77-17-56.23); (30-38-7.37,77-17-48.49)
2978	Himachal Pradesh	Nahan	(30-38-31.56,77-18-36.42); (30-38-45.94,77-18-52.00); (30-38-41.37,77-18-37.05); (30-38-37.75,77-18-19.37); (30-38-

			30.05,77-18-16.72)
2982	Himachal Pradesh	Nahan	(30-38-21.52,77-18-41.72); (30-38-31.69,77-18-52.17); (30-38-43.35,77-18-58.29); (30-38-35.15,77-18-46.77); (30-38-28.77,77-18-33.45)
2986	Himachal Pradesh	Nahan	(30-38-16.91,77-17-34.13); (30-38-12.77,77-17-44.17); (30-38-9.03,77-17-49.55); (30-38-14.03,77-18-11.63); (30-38-22.38,77-18-25.15); (30-38-20.61,77-17-58.32)
2990	Himachal Pradesh	Nahan	(30-39-01.77,77-17-52.79); (30-38-45.62,77-18-06.07)
2993	Himachal Pradesh	Nahan	(30-32-40.01,77-12-01.57); (30-38-39.17,77-12-23.54)
2998	Himachal Pradesh	Nahan	(30-39-08.53,77-16-56.33); (30-38-54.12,77-17-00.71)
3001	Himachal Pradesh	Nahan	(30-39-16.60,77-17-31.93); (30-39-05.79,77-17-41.37); (30-39-12.72,77-17-51.66); (30-39-1.29,77-17-52.04); (30-38-54.1,77-17-36.07); (30-38-57.2,77-17-19.18); (30-39-00.77,77-17-10.19); (30-39-09.26,77-17-22.8)
3003	Himachal Pradesh	Nahan	(30-39-17.68,77-16-35); (30-38-59.64,77-16-35.04); (30-38-56.39,77-16-53.81); (30-39-13.52,77-16-52.24); (30-39-20.86,77-16-43.70)
3005	Himachal Pradesh	Nahan	(30-38-53.4,77-16-52.69); (30-38-42.6,77-16-58.58); (30-38-38.20,77-17-14.01); (30-38-49.95,77-17-06.83)
3008	Himachal Pradesh	Nahan	(30-39-35.12,77-14-07.49); (30-39-30.72,77-14-04.23); (30-39-19.36,77-14-02.91); (30-39-09.86,77-13-55.50); (30-39-10.75,77-19-04.38); (30-39-19.11,77-19-08.16); (30-39-22.56,77-14-19.26); (30-39-32.08,77-14-23.69)
3011	Himachal Pradesh	Nahan	(30-39-10.23,77-14-02.61); (30-39-01.77,77-13-52.90); (30-39-06.17,77-13-49.17); (30-39-15.27,77-13-33.22); (30-39-26.64,77-13-20.20); (30-39-30.46,77-13-21.90); (30-39-22.35,77-13-33.43); (30-39-17.87,77-13-48.86)
3016	Himachal Pradesh	Nahan	(30-39-44.29,77-13-46.57); (30-39-40.96,77-13-43.85); (30-39-35.02,77-13-40.07); (30-39-20.37,77-13-35.53); (30-39-19.64,77-13-48.49); (30-39-25.38,77-13-52.99); (30-39-31.87,77-13-56.55); (30-39-36.95,77-14-01.68)
3024	Himachal Pradesh	Nahan	(30-38-21.64,77-19-11.01); (30-38-23.99,77-19-31.21); (30-38-22.20,77-19-35.71); (30-38-18.86,77-19-22.01)
3026	Himachal Pradesh	Nahan	(30-38-11.29,77-19-06.37); (30-38-04.00,77-19-11.42); (30-38-01.37,77-19-07.30); (30-37-51.20,77-19-08.78)
3031	Himachal Pradesh	Nahan	(30-37-35.90,77-18-03.45); (30-37-47.37,77-18-15.70); (30-37-52.2,77-18-22.2); (30-37-48.09,77-18-30.83)
3036	Himachal Pradesh	Nahan	(30-37-47.36,77-18-32.17); (30-37-38.86,77-18-25.27); (30-38-07.63,77-18-41.38); (30-37-58.98,77-18-53.86)
3041	Himachal Pradesh	Nahan	(30-38-26.96,77-18-48.09); (30-38-15.48,77-18-50.45); (30-38-28.69,77-19-00.09); (30-38-28.33,77-19-18.30)
3044	Himachal Pradesh	Nahan	(30-37-12.80,77-20-01.12); (30-36-58.01,77-20-3.81); (30-36-55.40,77-19-46.67); (30-37-05.24,77-19-39.84)
3046	Himachal Pradesh	Nahan	(30-37-06.90,77-19-27.30); (30-37-15.33,77-19-36.11); (30-37-05.78,77-19-39.22); (30-37-15.67,77-19-22.98)
3048	Himachal Pradesh	Nahan	(30-37-27.25,77-19-01.34); (30-37-29..41,77-19-16.90); (30-37-24.01,77-19-24.38); (30-37-15.01,77-19-27.72)
3050	Himachal	Nahan	(30-37-36.58,77-19-11.87); (30-37-29.53,787-19-16.17)

	Pradesh		
3051	Himachal Pradesh	Nahan	(30-38-02.73,77-19-25.14); (30-37-49.10,77-19-41.67)
3053	Himachal Pradesh	Nahan	(30-38-10.41,77-19-30.43); (30-38-06.77,77-19-48.12)
3056	Himachal Pradesh	Nahan	(30-37-49.15,77-19-57.07); (30-37-59-55,77-19-47.66)
3058	Himachal Pradesh	Nahan	(30-38-01.75,77-20-39.29); (30-37-56.73,77-20-46.20)
3060	Himachal Pradesh	Nahan	(30-37-36.45,77-20-15.78); (30-37-34.90,77-20-11.29)
3064	Himachal Pradesh	Nahan	(30-36-23.44,77-20-44.71); (30-36-28.07,77-20-46.88); (30-36-35.27,77-20-35.31); (30-36-52.31,77-19-56.15)
3065	Himachal Pradesh	Nahan	(30-35-57.01,77-19-12.57); (30-35-55.97,77-19-26.51); (30-36-00.75,77-19-45.98); (30-35-55.92,77-20-04.45)
3067	Himachal Pradesh	Nahan	(30-37-06.16,77-21-04.92); (30-37-20.30,77-21-26.48); (30-37-08.23,77-21-27.27); (30-36-57.58,77-21-26.70)
3070	Himachal Pradesh	Nahan	(30-36-57.18,77-21-26.93); (30-36-50.51,77-21-35.88); (30-36-42.69,77-21-37.34); (30-36-25.95,77-21-37.60)
3073	Himachal Pradesh	Nahan	(30-37-05.29,77-20-41.60); (30-37-02.93,77-20-54.98); (30-37-05.47,77-21-03.85); (30-36-52.19,77-21-08.61); (30-36-50.27,77-21-08.31)
3075	Himachal Pradesh	Nahan	(30-35-46.97,77-21-19.05); (30-35-46.51,77-21-22.16); (30-35-40.29,77-21-30.29); (30-35-36.09,77-21-27.82); (30-35-36.81,77-21-24.23)
3080	Himachal Pradesh	Nahan	(30-36-52.0,77-19-54); (30-37-11.6,77-19-5.1); (30-37-9.0,77-19-3.5); (30-37-10.2,77-19-5.2)
3083	Himachal Pradesh	Nahan	(30-36-45.5,77-19-3.2); (30-36-45.5,77-19-3.2); (30-36-50.7,77-19-5.4); (30-36-53.1,77-19-20.7); (30-36-45.5,77-19-3.2)
3087	Himachal Pradesh	Nahan	(30-36-37.7,77-19-37.6); (30-36-35.5,77-19-34.4); (30-36-34.4,77-19-32.2); (30-36-34.4,77-19-32.2); (30-36-37.8,77-19-46.7)
3088	Himachal Pradesh	Nahan	(30-36-31.6,77-19-27.9); (30-36-31.6,77-19-27.9); (30-36-20.4,77-18-59.4); (30-36-26.7,77-19-2.9); (30-36-22,77-19-27.9)
3091	Himachal Pradesh	Nahan	(30-36-26.2,77-18-45.1); (30-36-26.4,77-19-2.7); (30-36-22.1,77-19-14.4); (30-36-35.2,77-18-41.5)
3093	Himachal Pradesh	Nahan	(30-36-23.7,77-18-24.9); (30-36-29.2,77-18-9.7); (30-36-30.1,77-18-7.9); (30-36-26.2,77-18-45.2); (30-36-21.4,77-18-40.1); (30-36-14,77-18-32.7)
3098	Himachal Pradesh	Nahan	(30-36-15.1,77-18-10.9); (30-36-22.6,77-18-12.8); (30-36-4,77-18-26.8); (30-36-22.6,77-18-12.8)
3104	Himachal Pradesh	Nahan	(30-38-32.65,77-17-23.78); (30-38-15.73,77-17-32.67); (30-38-30.22,77-17-31.54); (30-38-44.90,77-17-21.58)
3107	Himachal Pradesh	Nahan	(30-38-34.54,77-18-06.65); (30-38-44.53,77-17-52.06); (30-38-44.50,77-17-32.33)
3109	Himachal Pradesh	Nahan	(30-38-35.30,77-17-44.3); (30-38-33.05,77-17-31.36); (30-38-30.13,77-17-40.58); (30-38-35.5,77-18-06.6)
3113	Himachal	Nahan	(30-38-21.21,77-17-55.32); (30-38-30.55,77-18-16.04); (30-

	Pradesh		38-31.80,77-17-53.61); (30-38-24.80,77-17-32.50)
3115	Himachal Pradesh	Nahan	(30-38-36.50,77-16-17.70); (30-38-40.52,77-15-53.08); (30-38-33.49,77-15-51.36); (30-38-25.74,77-15-45.01); (30-38-19.66,77-15-46.67)
3117	Himachal Pradesh	Nahan	(30-38-31.15,77-16-05.67); (30-38-17.31,77-16-09.53); (30-38-08.36,77-16-23.27); (30-38-03.76,77-16-31.57); (30-38-19.66,77-15-46.67)
3119	Himachal Pradesh	Nahan	(30-39-07.51,77-16-20.67); (30-38-54.36,77-16-07.51); (30-38-38.68,77-16-13.09); (30-38-36.40,77-16-18.18); (30-38-19.66,77-15-46.67)
3121	Himachal Pradesh	Nahan	(30-39-11.37,77-15-58.48); (30-39-12.52,77-16-08.4); (30-39-09.40,77-16-17.12); (30-38-59.39,77-16-14.13)
3124	Himachal Pradesh	Nahan	(30-38-56.90,77-14-51.80); (30-38-43.04,77-15-21.22); (30-38-53.77,77-15-20.95); (30-39-04.13,77-15-11.36)
3125	Himachal Pradesh	Nahan	(30-38-46.66,77-15-25.92); (30-38-37.22,77-15-30.64); (30-38-26.45,77-15-37.86); (30-38-19.46,77-15-45.75)
3127	Himachal Pradesh	Nahan	(30-38-55.25,77-15-37.05); (30-38-39.00,77-15-37.45); (30-38-32.98,77-15-50.78); (30-38-40.41,77-15-51.95)
3132	Himachal Pradesh	Nahan	(30-39-11.99,77-15-29.05); (30-38-58.44,77-15-30.53); (30-38-57.54,77-15-09.70); (30-38-51.84,77-15-14.14); (30-38-51.32,77-15-31.54)
3144	Himachal Pradesh	Nahan	(30-35-33.17,77-26-21.52); (30-35-37.56,77-26-25.29); (30-35-43.55,77-26-29.45); (30-35-33.79,77-26-44.12); (30-35-32.50,77-27-12.50); (30-35-27.22,77-27-13.45); (30-35-25.28,77-26-41.49); (30-35-25.32,77-26-32.61)
3145	Himachal Pradesh	Nahan	(30-35-44.14,77-26-23.68); (30-35-35.87,77-26-20.75); (30-35-30.79,77-26-15.97); (30-35-34.63,77-26-10.36); (30-35-35.93,77-26-49.53); (30-35-43.0,77-26-49.51); (30-35-41.40,77-26-00.56); (30-35-39.54,77-26-12.09)
3146	Himachal Pradesh	Nahan	(30-36-03.97,77-24-10.90); (30-35-54.37,77-24-10.76); (30-35-47.35,77-24-12.11); (30-35-46.16,77-24-04.20); (30-35-48.49,77-23-50.15); (30-35-49.02,77-23-38.39); (30-35-55.74,77-23-35.35); (30-35-56.03,77-23-42.50)
3148	Himachal Pradesh	Nahan	(30-35-03.99,77-24-07.20); (30-35-04.14,77-23-58.55); (30-35-08.48,77-23-51.94); (30-35-12.15,77-23-53.39); (30-35-17.12,77-23-55.91); (30-35-12.89,77-24-02.83); (30-35-10.93,77-24-09.05); (30-35-07.49,77-24-07.01)
3151	Himachal Pradesh	Nahan	(30-34-31.43,77-26-37.40); (30-34-35.03,77-26-40.56); (30-34-41.46,77-26-39.23); (30-34-52.17,77-26-42.62); (30-34-52.61,77-26-51.03); (30-34-50.10,77-27-00.20); (30-34-46.79,77-27-04.81); (30-34-26.44,77-26-52.30)
3153	Himachal Pradesh	Nahan	(30-34-31.43,77-26-35.40); (30-34-35.03,77-26-40.56); (30-34-39.20,77-26-38.14); (30-34-40.35,77-26-32.04); (30-34-46.08,77-26-30.2); (30-34-36.49,77-26-45.59); (30-34-25.21,77-26-48.79); (30-34-25.21,77-26-35.49)
3154	Himachal Pradesh	Nahan	(30-34-11.40,77-25-53.89); (30-34-16.20,77-25-58.17); (30-34-21.70,77-26-00.19); (30-34-31.99,77-26-02.91); (30-34-46.49,77-26-12.01); (30-34-41.96,77-26-12.89); (30-34-13.97,77-26-17.04); (30-34-12.03,77-26-08.64)
3156	Himachal Pradesh	Nahan	(30-34-20.10,77-26-37.10); (30-34-15.52,77-26-38.64); (30-34-06.26,77-26-38.39); (30-34-04.05,77-26-32.46); (30-34-

			03.42,77-26-30.72); (30-34-10.30,77-26-28.92); (30-34-15.65,77-26-27.71); (30-34-20.73,77-26-34.49)
3160	Himachal Pradesh	Nahan	(30-35-53.05,77-24-34.29); (30-35-21.18,77-24-43.70); (30-35-43.26,77-24-44.85); (30-35-39.54,77-24-37.09); (30-35-37.86,77-24-27.12); (30-35-39.63,77-24-18.93); (30-35-40.65,77-24-12.77); (30-36-02.04,77-24-12.30)
3181	Himachal Pradesh	Renuka ji	(30-34-29.64,77-45-34.31); (30-34-08.35,77-45-42.28); (30-34-20.33,77-45-57.38); (30-34-08.13,77-46-00.45); (30-33-58.19,77-45-59.89); (30-33-52.69,77-45-50.11); (30-33-45.09,77-45-43.50); (30-33-49.01,77-45-51.02)
3184	Himachal Pradesh	Renuka ji	(30-47-06,77-37-23); (30-40-39,77-36-24)
3185	Himachal Pradesh	Renuka ji	(30-46-48,77-36-24); (30-45-42,77-35-14)
3186	Himachal Pradesh	Renuka ji	(30-46-40,77-35-28); (30-46-33,77-35-29); (30-46-27,77-35-42); (30-46-37,77-35-42)
3190	Himachal Pradesh	Renuka ji	(30-44-02,77-41-07); (30-44-03,77-41-08); (30-44-05,77-41-08); (30-44-06,77-41-09); (30-44-03,77-41-11); (30-44-03,77-41-13); (30-44-02,77-41-13); (30-44-07,77-41-12)
3191	Himachal Pradesh	Renuka ji	(30-44-25.11,77-40-21.8); (30-44-30,77-40-21.08); (30-44-27.64,77-40-11.56)
3204	Himachal Pradesh	Renuka ji	(30-42-03,77-40-35); (30-42-10,77-40-17); (30-42-13,77-40-17); (30-42-12,77-39-47)
3205	Himachal Pradesh	Renuka ji	(30-42-07,77-39-55); (30-42-07,77-40-05); (30-42-04,77-40-14); (30-41-57,77-40-21)
3206	Himachal Pradesh	Renuka ji	(30-42-48,77-39-42); (30-42-54,77-39-52); (30-42-59,77-40-04); (30-42-54,77-40-15)
3208	Himachal Pradesh	Renuka ji	(30-41-48.80,77-40-5.77); (30-41-49.09,77-40-0.28); (30-40-53.62,77-39-56.66); (30-40-53.81,77-39-45.68)
3209	Himachal Pradesh	Renuka ji	(30-41-19,77-40-16); (30-41-34,77-40-12); (30-41-41,77-40-05); (30-41-32,77-39-52)
3211	Himachal Pradesh	Renuka ji	(30-40-22,77-39-49); (30-40-47,77-39-40); (30-41-01,77-39-41); (30-41-01,77-39-46); (30-40-52,77-39-55)
3213	Himachal Pradesh	Renuka ji	(30-41-32,77-41-45); (30-41-29,77-41-41); (30-41-31,77-41-39); (30-41-29,77-41-37)
3215	Himachal Pradesh	Renuka ji	(30-41-10,77-40-48); (30-41-04,77-40-49); (30-40-58,77-40-48); (30-40-58,77-40-40)
3217	Himachal Pradesh	Renuka ji	(30-39-0.15,77-42-5.94); (30-39-0.54,77-42-11.38); (30-39-9.98,77-42-11.72); (30-39-19.58,77-42-17.26); (30-39-24.54,77-42-17.49)
3220	Himachal Pradesh	Renuka ji	(30-39-0.15,77-42-5.94); (30-39-0.54,77-42-11.38); (30-39-9.98,77-42-11.72); (30-39-19.58,77-42-17.26); (30-39-24.54,77-42-17.49)
3225	Himachal Pradesh	Renuka ji	(30-39-33,77-44-49); (30-39-33,77-44-41); (30-39-26,77-44-35); (30-39-16,77-44-33); (30-39-23,77-44-41)
3226	Himachal Pradesh	Renuka ji	(30-39-21,77-46-52); (30-39-24,77-46-42); (30-39-21,77-46-28); (30-39-18,77-46-34); (30-39-18,77-46-43)
3229	Himachal Pradesh	Renuka ji	(30-38-31,77-44-54); (30-38-44,77-44-48); (30-38-53,77-45-2); (30-38-58,77-45-17)
3233	Himachal Pradesh	Nahan	(30-35-22.85,77-22-22.35); (30-35-29.62,77-22-29.94); (30-35-21.56,77-22-44.43); (30-35-17.29,77-22-42.46); (30-35-

			31.69,77-22-27.82)
3234	Himachal Pradesh	Nahan	(30-35-15.44,77-22-42.37); (30-35-8.04,77-22-41.89); (30-35-12.04,77-22-58.74); (30-35-6.51,77-23-17.92); (30-35-12.88,77-23-36.33)
3236	Himachal Pradesh	Renuka ji	(30-34-25.46,77-38-2.03); (30-34-16.29,77-38-17.01); (30-34-07.18,77-38-21.51)
3239	Himachal Pradesh	Solan	(30-57-55.44,77-08-21.66); (30-56-66.11,77-08-2.13); (30-56-54.89,77-12-04.54); (30-57.94-00,77-08.32-00)
3242	Himachal Pradesh	Solan	(30-56-7.89,77-12-2.41); (30-57-55.62,77-12-18.78)
3247	Himachal Pradesh	Solan	(30-57-01.87,77-12-03.12); (30-57-13.5,77-12-04.01); (30-56-34.4,77-06-44.5)
3250	Himachal Pradesh	Renuka ji	(30-37-33.00,77-26-57.19); (30-37-32.60,77-27-5.81); (30-37-20.41,77-27-5.54); (30-37-15.18,77-27-11.63); (30-37-13.30,77-27-3.36); (30-37-13.30,77-26-51.45); (30-37-11.49,77-26-43.76); (30-37-25.65,77-26-49.49)
3251	Himachal Pradesh	Renuka ji	(30-38-2,78,77-26-11.01); (30-38-9.60,77-26-7.64); (30-38-21.49,77-26-11.71); (30-38-17.87,77-26-15.98); (30-38-22.42,77-26-24.05); (30-38-9.22,77-26-20.22)
3254	Himachal Pradesh	Renuka ji	(30-37-27.90,77-27-20.83); (30-37-23.57,77-27-30.20); (30-37-13.34,77-27-35.34); (30-37-10.13,77-27-28.78)
3256	Himachal Pradesh	Renuka ji	(30-37-33.38,77-26-55.73); (30-37-11.58,77-26-42.14); (30-37-32.46,77-26-23.66); (30-37-54.81,77-26-3.85); (30-37-58.14,77-26-12.54)
3283	Himachal Pradesh	Shimla	(31-3-24.15,77-6-37.36); (31-6-6.28,77-1-20.64); (31-05-30.66,77-6-34.45)
3284	Himachal Pradesh	Shimla	(31-3-9.82,77-6-15.15); (31-3-9.97,31-3-9.97); (31-3-9.97,77-6-15.40)
3285	Himachal Pradesh	Shimla	(31-6-3.6,77-10-17.72); (31-5-26.16,31-5-26.16); (31-5-53.48,77-9-40.19)
3286	Himachal Pradesh	Shimla	(31-5-59.02,77-8-33.46); (31-59-0.6,77-8-42.72)
3287	Himachal Pradesh	Shimla	(31-5-51.57,77-8-23.49); (31-58-10.56,77-8-27.56); (31-5-44.05,77-8-34)
3297	Himachal Pradesh	Solan	(30-47.194-00,77-01.136-00)
3307	Himachal Pradesh	Rohru	(31-05-10.88,77-45-53.01); (31-05-14.94,77-45-52.80); (31-05-26.22,77-45-54.55)
3308	Himachal Pradesh	Renuka ji	(30-35-14.2,77-30-5.2); (30-35-42.4,77-30-56.7); (30-35-59.3,77-31-10.4); (30-35-40.6,77-31-21.1)
3340	Himachal Pradesh	Shimla	(30-48-38.7,77-38-25.5); (30-48-3.7,77-38-28.6); (30-48-50.3,77-38-30.9)
3344	Himachal Pradesh	Solan	(31-00-36.85,77-07-10.09); (31-01-20.27,77-07-07.69); (30-00-48.97,77-07-07.48); (31-00-40.18,77-07-05.18)
3346	Himachal Pradesh	Solan	(31-00-53.96,77-07-08.56); (31-00-30.32,77-07-07.35); (31-00-47.93,77-07-03.75); (30-00-52.30,77-07-10.12)
3347	Himachal Pradesh	Renuka ji	(30-37-50.86,77-44-30.27); (30-37-45.31,77-44-36.40); (30-37-47.46,77-44-43.16); (30-37-50.09,77-44-49.89); (30-37-54.72,77-44-55.89)
3447	Himachal	Chaupal	(30-50-29,77-32-36); (30-50-28,77-32-39); (30-51-56,77-31-

	Pradesh		56); (30-50-56,77-50-46); (30-50-46,77-32-06); (30-51-09,77-32-06)
3448	Himachal Pradesh	Chaupal	(30-51-05,77-32-06); (30-50-52,77-31-40); (30-50-46,77-32-00); (30-51-02,77-32-17); (30-51-07,77-32-20); (30-51-32,77-32-32); (30-51-22,77-32-04); (30-51-33,77-31-23)
3451	Himachal Pradesh	Chaupal	(30-50-27,77-32-42); (30-50-24,77-32-32); (30-50-55,77-31-57); (30-50-52,77-31-54); (30-50-58,77-32-00); (30-51-04,77-32-04)
3453	Himachal Pradesh	Chaupal	(30-50-27,77-32-42); (30-50-24,77-32-32); (30-50-55,77-31-57); (30-50-52,77-31-54); (30-50-58,77-32-00)
3460	Himachal Pradesh	Chaupal	(30-51-05,77-32-06); (30-50-52,77-31-40); (30-50-46,77-32-00); (30-51-02,77-32-17); (30-51-07,77-32-20); (30-51-32,77-32-32); (30-51-22,77-32-04); (30-51-33,77-31-23)
3510	Himachal Pradesh	Rajgarh	(30-52-35.17,77-22-22.87); (30-52-23.12,77-22-33.46); (30-51-52.27,77-22-12.88)
3511	Himachal Pradesh	Rajgarh	(30-52-35.17,77-22-22.87); (30-52-23.12,77-22-33.46); (30-51-52.27,77-22-12.88)
3512	Himachal Pradesh	Rajgarh	(30-51-14.83,77-21-36.44); (30-51-27.91,77-23-19.16); (30-51-59.72,77-22-42.69)
3513	Himachal Pradesh	Rajgarh	(30-49-9.79,77-20-19.02); (30-48-37.14,77-20-11.58); (30-48-59.79,77-21-19.93)
3514	Himachal Pradesh	Rajgarh	(30-55-24.64,77-19-22.48)
3515	Himachal Pradesh	Rajgarh	(30-55-10.12,77-19-59.32); (30-55-57.08,77-21-42.24); (30-54-34.66,77-19-27.47)
3516	Himachal Pradesh	Rajgarh	(30-53-51.36,77-19-15.95); (30-54-32.18,77-19-23.87); (30-54-46.00,77-18-52.19); (30-55-08.28,77-16-48.10); (30-55-50.76,77-18-46.96); (30-55-23.28,77-20-05.91); (30-54-50.78,77-20-19.17); (30-55-22.13,77-22-46.72)
3674	Himachal Pradesh	Nahan	
3675	Himachal Pradesh	Renuka ji	
4542	Himachal Pradesh	Nahan	
4543	Himachal Pradesh	Nahan	
4547	Himachal Pradesh	Nahan	(30-37-06.16,77-21-04.92); (30-37-20.30,77-21-25.48); (30-37-8.28,77-21-27.27); (30-36-50.15,77-21-8.40); (30-36-50.15,77-21-12.07)
4549	Himachal Pradesh	Nahan	(30-37-49.72,77-20-34.83); (30-37-49.65,77-20-34.8)
4550	Himachal Pradesh	Nahan	(30-37-57,77-20-33); (30-38-0.96,77-20-42.46)
4551	Himachal Pradesh	Nahan	(30-35-33.17,77-26-21.52); (30-35-37.56,77-26-25.27); (30-35-43.55,77-26-29.45); (30-35-33.79,77-26-44.12); (30-35-32.50,77-27-12.50)
4552	Himachal Pradesh	Nahan	(30-35-44.14,77-26-23.68); (30-35-35.87,77-26-20.75); (30-35-30.79,77-26-15.97); (30-35-34.63,77-26-10.36); (30-35-35.93,77-26-49.53)
4553	Himachal	Nahan	(30-35-53.05,77-24-34.29); (30-35-51.98,77-24-43.70); (30-

	Pradesh		35-43.26,77-24-44.95); (30-35-39.54,77-24-37.09)
4554	Himachal Pradesh	Nahan	(30-37-59,77-21-03); (30-37-55,77-21-03); (30-37-51,77-20-56); (30-37-48,77-20-58); (30-37-44,77-21-20); (30-37-45,77-21-21)
4555	Himachal Pradesh	Nahan	(30-36-3.97,77-24-10.90); (30-35-54.37,77-24-10.76); (30-35-47.35,77-24-12.11); (30-35-46.16,77-24-04.20); (30-35-43.49,77-23-50.15)
4556	Himachal Pradesh	Nahan	(30-38-01.75,77-20-39.29); (30-38-3.67,77-20-27.7); (30-38-1.74,77-20-19.84); (30-37-52.9,77-20-24.80)
4557	Himachal Pradesh	Van Mandal Rajgadh	
4558	Himachal Pradesh	Van Mandal Rajgadh	
4559	Himachal Pradesh	Van Mandal Rajgadh	
4560	Himachal Pradesh	Van Mandal Rajgadh	
4561	Himachal Pradesh	Van Mandal Rajgadh	
4563	Himachal Pradesh	Van Mandal Rajgadh	(30-41-4.12,77-16-51.13); (30-41-6.26,77-16-57.52); (30-41-06.02,77-16-58.01); (30-41-7.04,77-16-58.25); (30-41-08.47,77-16-57.25)
5433	Himachal Pradesh	Chopal forest division	(30-48-38.4,77-48-1.6); (30-48-46.9,77-37-4.7); (30-48-58.8,77-37-6.9);
5434	Himachal Pradesh	Chopal forest division	(30-48-38.7,77-38-25.5); (30-48-43.7,77-38-28.6); (30-48-50.3,77-38-30.9)
5435	Himachal Pradesh	Chopal forest division	(30-48-17,77-39-56); (30-48-50,77-40-25); (30-48-59,77-40-47)
5436	Himachal Pradesh	Chopal forest division	(30- 46-44.148, 77-41-16.044); (30-46-49.116, 77- 43-14.556); (30-27-53.676, 77-25-53.22); (30-51-12.528, 77-44-22.956)
5437	Himachal Pradesh	Chopal forest division	(30-46-49.116, 77-43-14.556); (30-53' 7.584, 77-43-33.024); (30-51-20.556, 77-44-17.016)
5438	Himachal Pradesh	Chopal forest division	(30-46-49.116, 77-43-14.556); (30-53-13.884, 77- 43-11.352)
5439	Himachal Pradesh	Chopal forest division	(30-55-21.21312,77-41-30.90156); (30-55-19.32852,77-41-38.32908)
5440	Himachal Pradesh	Chopal forest division	(31-14-55.62,77-40-48.63); (31-14-51.71,77-40-53.30); (31-14-50.54,77-40-51.67); (31-14-54.04,77-40-47.07); (31-14-52.81,77-40-50.3)
5441	Himachal Pradesh	Chopal forest division	(31-11-49.17,77-44-48.03); (31-11-53.71,77-44-54.54); (31-11-56.18,77-45-00.55); (31-12-7.75,77-45-00.19); (31-12-18.40,77-44-56.83)
5442	Himachal Pradesh	Chopal forest division	(31-12-11.58,77-46-15.32); (31-12-42.21,77-47-19.09); (31-13-7.05,77-48-18.71); (31-12-46.14,77-49-41.10); (31-13-28.27,77-50-51.81)

Annexure-3

GPS COORDINATES OF SITES FOR VARIOUS FORESTRY INTERVENTIONS IN HARYANA

The following table gives GPS coordinates of the sites proposed by the state SFD at time of DPR formulation. The sites may be finalised, with suitable changes wherever required, and georeferenced at time of implementation of the DPR.

Site ID	State	Division	Geo-coordinates (Format: degree-minute-second ºN Lat., degree-minute-second ºE Long.)
77	Haryana	Yamunanagar	(30-21-34,77-31-27.5); (30-21-34.07,77-31-29.5)
127	Haryana	Yamunanagar	(30-22-44.6,77-30-23.5); (30-22-50.9,77-30-23)
128	Haryana	Karnal	(29-33-53.35,77-05-53.38); (29-05-46.82,77-05-46.82); (30-22-53.2,77-30-28.9)
130	Haryana	Karnal	(29-29-43.50,77-05-39.12); (29-29-45.12,77-05-25.50)
132	Haryana	Yamunanagar	(30-21-29.2,77-32-01.6); (30-21-29.7,77-32-02.1)
133	Haryana	Karnal	(29-32-9.89,77-05-41.86); (29-32-7.65,77-05-22.34); (30-21-28.5,77-32-0.9)
134	Haryana	Yamunanagar	(30-20-52,77-31-29.4); (30-20-50.7,77-31-30.4); (29-31-00,77-5-45.06); (29-31-33.06,77-05-29.01)
135	Haryana	Yamunanagar	(30-21-29.9,77-30-13.4); (30-22-34.4,77-30-17.1)
136	Haryana	Panipat	(29-27-50,77-7-15); (29-24-42,77-7-40); (30-22-39.3,77-30-22.4)
137	Haryana	Yamunanagar	(30-16-23.4,77-31-18.2); (30-16-26.5,77-31-19.2); (29-23-21,77-7-40); (29-19-22,77-8-3)
138	Haryana	Yamunanagar	(30-15-55.6,77-28-35.5); (30-15-56,77-28-38.8); (30-16-26.1,77-31-18.5); (30-16-26.9,77-31-20.1)
141	Haryana	Panipat	(29-13-46,77-04-56); (29-14-50,77-5-48); (30-55-52.8,78-5-45.45); (30-56-0.14,78-5-37.13)
146	Haryana	Panipat	(29-23-57,77-7-52); (29-23-13,77-8-37); (30-50-48,78-04-21); (30-50-28.2,78-04-18)
147	Haryana	Yamunanagar	(29-22-50,77-8-56); (29-22-40,77-8-38)
153	Haryana	Panipat	(29-27-45,77-7-30); (29-27-6,77-7-54)
154	Haryana	Yamunanagar	(30-18-35.9,77-33-35.2); (30-18-35.6,77-33-33.8); (29-26-32,77-8-10); (29-25-38,77-7-54)
157	Haryana	Panipat	(29-11-03,77-7-52); (29-10-56,77-7-42); (30-52-33.36,78-2-18.03); (30-52-36.27,78-2-18.22)
161	Haryana	Panipat	(29-18-51,77-8-31); (29-18-7,77-7-53); (30-58-45.96,77-59-37.26)
171	Haryana	Panipat	(29-13-37,77-7-44); (29-13-20,77-7-59); (30-48-19,78-06-29); (30-48-18,78-06-29)
435	Haryana	Palwal	(28-12-19,77-26-9); (28-12-6.0,77-26-15); (30-58-29.1,77-59-26.82); (30-58-44.46,77-59-22.32)
437	Haryana	Panipat	(29-25-23,77-7-54); (29-24-44,77-7-27); (28-12-8.0,77-26-15)
439	Haryana	Panipat	(29-22-17,77-7-3); (29-22-4,77-6-58); (29-24-20,77-7-36);

			(29-24-00,77-7-56)
440	Haryana	Panipat	(29-13-46,77-4-56) (29-22-24,77-8-15); (29-21-50,77-7-53)
441	Haryana	Palwal	(28-05-38,77-28-19); (28-53-8,77-28-19)
442	Haryana	Palwal	(27-58-5,77-30-49); (27-57-51,77-30-1); (28-4-58,77-28-54); (28-4-56,77-29-65)
443	Haryana	Palwal	(28-5-38,77-28-19); (28-4-58.96, 77-28-46.96); (27-59-5,77-30-49)
444	Haryana	Yamunanagar	(30- 59-37.9572,77- 13-12.7344); (30-11- 37.1724,77-12-41.202); (28-05-3.46,77-28-44.37)
445	Haryana	Yamunanagar	(30-25-31,77-21-18)
446	Haryana	Yamunanagar	(30-19-26.6, 77-33-4.8); (30-19-26.6, 77-3-0.6)
447	Haryana	Yamunanagar	(30-24-31,77-22-38); (30-24-31,); (30-19-23.3,77-33-4); (30-19-27.5, 77-33-7.7)
448	Haryana	Yamunanagar	(30-22-07.1,77-29-50.7); (31-21-34.2,77-29-14.6)
449	Haryana	Yamunanagar	(30-15-30.1,77-31-39.4); (30-15-25.3,77-31-35.9)
450	Haryana	Yamunanagar	(30-18-51.7,77-33-53.9); (30-18-51.0,77-33-52.0); (30-15-22.5,77-31-33.7); (30-15-20.4,77-32-2)
451	Haryana	Yamunanagar	(30-14-43.53, 77-30-53.55); (30-14-40.95, 77-30-53.22); (30-18-51.4,77-33-52.7); (30-18-33.6,77-34-3.6)
452	Haryana	Yamunanagar	(30-18-44.6,77-33-11.1); (30-18-43.4,77-33-8.8); (30-14-56.52, 77-30-31.52); (30-15-0.42, 77-30-24.31); (30-14-39.85, 77-30-24.75); (30-14-52.40, 77-30-15.37); (30-14-22.32, 77-30-30.73); (30-14-20.20, 77-30-25.37)
453	Haryana	Yamunanagar	(30-19-39.6,77-32-48.6); (30-19-47.6,77-32-46.7); (30-18-44.4,77-33-0.6); (30-18-49.5,77-32-51.6)
454	Haryana	Yamunanagar	(30-25-21.2,77-21-18.1); (30-25-22.8,77-21-18.1); (30-19-44.8,77-32-48.9); (30-19-43.1,77-32-49.6); (30-19-36.9,77-32-48.8); (30-19-40.1,77-30-48.4)
455	Haryana	Yamunanagar	(30-19-15.1, 77-32-35.9); (30-19-14.9, 77-32-35.4); (30-25-23.9,77-21-18.3); (30-25-26.1 ,77-21-18.9)
456	Haryana	Yamunanagar	(30-26-41.11,77-27-24.1); (30-25-01.5,77-22-30); (30-19-16.5, 77-32-36.5); (30-19-19.5, 77-32-42.1); (30-19-43.1, 77-33-9.4)
457	Haryana	Yamunanagar	(30-17-10.34,77-25-1.78); (30-17-9.49,77-25-2.92); (30-26-41.3,77-27-16.1); (30-26-14.8, 77-27-1.5); (30-25-59.7,77-26-49.7); (30-24-2.5, 77-24-21.7); (30-26-17.3,77-26-59); (30-25-57.2, 77-26-37.2)
459	Haryana	Yamunanagar	(30-23-57.6,77-28-0.96); (30-23-59.28,77-28-1.98); (30-17-8.23,77-25-4.12); (30-17-5.185, 77-25-5.70)
460	Haryana	Yamunanagar	(30-24-56.3,77-22-43.6); (30-24-54.6,77-22-44.1); (30-23-32.1,77-27-22.56); (30-23-22.32,77-27-22.56)
461	Haryana	Yamunanagar	(30-21-50.8,77-31-34.5); (30-21-45.8,77-31-33.9); (30-24-47.4,77-22-50.7); (30-24-46.9,77-22-50.0)
462	Haryana	Yamunanagar	(30-20-19.5, 77-29-42.7); (30-20-18.4, 77-29-41.00); (30-21-42.8,77-31-32.3); (30-21-42.3,77-31-43.3)
463	Haryana	Yamunanagar	(30-23-17.4,77-24-07.1); (30-23-15.4,77-24-4.2); (30-20-18, 77-29-41); (30-20-17.9, 77-29-39.08)
464	Haryana	Yamunanagar	(30-25-08.0, 77-30-14.0); (30-24-40.0, 77-30-20.9); (30-23-13.2,77-24-1.2); (30-23-9.8,77-23-56.9); (30-20-7.5, 77-23-53.8); (30-23-5.9,77-23-50.9); (30-23-12,77-24-04.2); (30-23-

			8.8,77-24-0.7)
465	Haryana	Yamunanagar	(30-20-20.4,77-29-45.2); (30-20-20,77-29-44.5); (30-24-55.2, 77-30-20.8); (30-25-6.8, 77-30-15.4)
466	Haryana	Yamunanagar	(30-24-33.5, 77-30-36.8); (30-24-39.1, 77-30-39.1); (30-20-19.2,77-29-43.8); (30-20-18.3,77-29-42.9)
467	Haryana	Yamunanagar	(30-26-54.1,77-21-37.4); (30-26-58.5,77-21-34.3); (30-20-48.6, 77-30-43.3)
468	Haryana	Yamunanagar	(30-15-2,77-22-6); (30-15-2, 77-22-6); (30-26-41.1,77-21-22.8)
469	Haryana	Yamunanagar	(30-21-28.3,77-32-6.7); (30-21-5.6,77-31-42.9); (30-15-1, 77-22-7); (30-14-60, 77-22-7); (30-14-59, 77-22-7); (30-13-52, 77-22-47); (30-13-55, 77-22-48); (30-13-55, 77-22-49)
470	Haryana	Yamunanagar	(30-23-55.7, 77-31-25.3)
471	Haryana	Yamunanagar	(30-90-10.9,77-31-29.9); (30-20-11.5,77-31-30.4)
472	Haryana	Yamunanagar	(30-24-36,77-23-54); (30-24-32,77-23-51); (30-20-10.4,77-31-29.3); (30-20-11.9,77-31-29.8)
473	Haryana	Yamunanagar	(30-23-24.3, 77-32-22.7); (30-23-28.8, 77-32-22.9); (30-24-41,77-48-30); (30-24-38,77-23-49)
474	Haryana	Yamunanagar	(30-24-17.7, 77-30-35.1); (30-24-16.9, 77-30-36.4); (30-23-33.5, 77-32-22.5)
475	Haryana	Yamunanagar	(30-21-8.4, 77-32-16.9); (30-21-7.2, 77-32-20.6); (30-24-16.2, 77-30-36.7); (30-24-01.7, 77-31-12.9)
476	Haryana	Yamunanagar	(30-24-56.3, 77-22-43.6); (30-24-54.6, 77-22-44.1); (30-21-28.7, 77-32-20.5)
477	Haryana	Yamunanagar	(30-22-0.9,77-31-23.02); (30-22-1.5,77-31-23.6); (30-24-47.4, 77-22-50.7); (30-24-46.9, 77-22-50); (30-24-51.2,77-22-46); (30-24-48.3, 77-22-47.8); (30-24-32.3, 77-22-15.4); (30-24-29.9,77-22-14.7)
478	Haryana	Yamunanagar	(30-26- 54.1,77-21-37.4); (30-26-58.5,77-21-34.3)
479	Haryana	Yamunanagar	(30-23-23.00, 77-31-27.00); (30-23-19.00, 77-31-32.00); (30-26-41.1,77 21-22.8)
480	Haryana	Yamunanagar	(30-23-14.0, 77-32-20.0)
481	Haryana	Yamunanagar	(30-23-5.00, 77-32-18.0)
483	Haryana	Yamunanagar	(30-22-56.00, 77-32-34.0) (30-56-57.9,78-24-50.58); (30-56-54.36,78-24-53.82); (30-59-50.1,78-27-58.8)
484	Haryana	Yamunanagar	(30-22-11.00, 77-33-46.00)
485	Haryana	Yamunanagar	(30-22-46.0, 77-32-52.00); (30-22-32.00, 77-32-26.00)
487	Haryana	Yamunanagar	(30-22-5.00, 77-36.7)
928	Haryana	Karnal	(29-52-0.13,77-8-49.58); (29-52-0.2,77-8-49.69)
1041	Haryana	Karnal	(29-46-58.15,77-8-47.93);(24-08-47.11,79-57-41.08); (24-10-01.89,79-57-11.22)
1042	Haryana	Karnal	(29- 35- 8.5236,77- 45- 33.48); (29-30- 20.16,77- 47-22.452)
1043	Haryana	Karnal	(29-51-40.05,77-8-40.04); (29-51-39.93,77-8-40.2)
1044	Haryana	Karnal	(29-32-9.89,77-5-41.86); (29-32-7.65,77-5-22.34)
1046	Haryana	Karnal	(29-46-58.15,77-8-47.93);(29-31-25.23,77-5-45.66); (29-31-33.06,77-5-29.01)
1047	Haryana	Karnal	(29-33-53.35,77-05-53.38); (29-33-29,77-06-1.11)
1048	Haryana	Karnal	(29-29-43.50,77-5-39.12); (29-29-55.10,77-5-25.50); (29-05-46.82,77-05-46.82); (29-33-48.69,77-05-48.12)
1049	Haryana	Karnal	(29-52-20.73,77-9-15.9); (29-51-2.07,77-9-34.68); (29-30-

			16.22,77-5-45.30); (29-30-14.96,77-5-22.04)
1863	Haryana	Sonipat	(28-54-30.53,77-10-48.37); (28-54-27.94,77-10-59.37); (24-33-22.00,75-15-52.0); (24-33-32.0,75-15-22.0)
1864	Haryana	Sonipat	(29-06-22.28,77-07-14.50); (29-06-25.12,77-07-24.53); (28-54-32.51,77-10-54.66); (28-54-39.46,77-10-49.20)
1865	Haryana	Sonipat	(29-4-20.06,77-7-27.0); (29-4-20.20,77-7-38.7); (29-06-27.74,77-07-18.59); (29-06-19.07,77-07-17.84)
1867	Haryana	Sonipat	(29-04-36.57,77-06-31.29); (29-04-51.47,77-06-13.933); (29-4-11.2,77-7-25.16); (21-42-49.88,77-7-34.27)
1869	Haryana	Sonipat	(29-44-39.6,77-47-50.6); (29-35-06.65,77-31-03.68); (29-04-34.67,77-06-11.96); (29-04-55.46,77-06-32.30)
1870	Haryana	Sonipat	(28-55-50.83,77-10-28.68); (28-55-53.76,77-10-25.39); (29-4-10.29,77-7-38.91); (29-4-3.95,77-7-31.63)
1873	Haryana	Sonipat	(29-30-55.66,29- 30- 55.66); (29-31-44.70,77-20-9.24); (28-55-51.39,77-10-24.43); (28-55-48.49,77-10-26.018)
1874	Haryana	Sonipat	(28-58-48.39,77-10-26.49); (28-58-58.77,77-8-10.69)
1875	Haryana	Sonipat	(29-06-44.63,77-06-26.47); (29-06-48.31,77-06-40.24); (28-59-15.91,77-8-32.0064); (28-59-13.10,77-7-42.87)
1876	Haryana	Sonipat	(29-07-59.45,77-06-00.68); (29-08-06.09,77-06-25.17); (29-06-53.71,77-06-31.22); (29-06-40.87,77-06-38.44)
1879	Haryana	Sonipat	(28-56-53.55,77-10-28.60); (28-57-14.01,77-09-49.02); (29-08-10.05,77-06-10.63); (29-07-52.95,77-06-14.86)
1881	Haryana	Sonipat	(29-08-19.39,77-07-18.41); (29-08-07.86,77-07-22.36); (28-59-26.24,77-09-53.22); (28-57-26.35,77-10-9.40)
1883	Haryana	Sonipat	(29-09-26.76,77-04-36.54); (29-04-36.51,77-04-52.96); (77-07-06.14,29-08-10.53); (2-08-19.99,77-07-19.25)
1884	Haryana	Sonipat	(28-53-42.71,77-10-51.78); (28-53-44.41,77-10-53.37); (29-09-43.99,77-04-37.58); (29-09-26.63,77-04-55.92)
1886	Haryana	Sonipat	(29- 21- 16.86,77- 39- 0.83); (29-19-4.33,77-39- 0.14); (28-53-41.77,77-10-52.30); (28-53-39.81,77-10-52.78)
1890	Haryana	Sonipat	(28-58-32.080,77-8-31.60); (28-58-31.47,77-8-29.10); (29-18-47.62,77- 43-57)
1891	Haryana	Sonipat	(28-56-5.84,77-9-47.92); (28-50-45.92,77-9-44.22); (28-58-30.85,77-8-28.86)
1892	Haryana	Sonipat	(28-53-37.57,77-10-59.46); (28-55-36.38,77-10-58.92); (28-56-47.00,77-9-49.11)
2567	Haryana	Yamunanagar	(30-19-38,77-22-0); (30-19-36,77-22-1); (30-22-54,77-21-2); (30-22-43,77-20-52)
2568	Haryana	Yamunanagar	(30-19-38,77-22-0); (30-19-36,77-22-1); (30-22-54,77-21-2); (30-22-43,77-20-52)
2571	Haryana	Yamunanagar	(30-14-43.53,77-30-53.55); (30-14-40.95,77-30-53.22); (30-14-56.52,77-30-31.52); (30-15-0.42,77-30-24.31)
2573	Haryana	Yamunanagar	(30-15-42.7,77-29-09.1); (30-15-39.1,77-28-48.1); (30-15-38.7,77-28-53.2); (30-15-37.5,77-28-42.1)
2574	Haryana	Yamunanagar	(30-20-10.9,77-31-29.9); (30-20-11.5,77-31-30.4); (30-20-10.4,77-31-29.3); (30-20-11.9,77-31-29.8)
2576	Haryana	Yamunanagar	(30-10-47.892,77- 20-2.004); (30- 10-48.252,77- 20- 3.012); (30- 10- 54.156,77- 20- 10.68)
2578	Haryana	Yamunanagar	(30-20-10.9,77-31-29.9); (30-20-11.5,77-31-30.4); (30-20-10.4,77-31-29.3); (30-20-11.9,77-31-29.8)

2579	Haryana	Yamunanagar	(30-21-08.4,77-32-16.9); (30-21-17.2,77-32-20.6); (30-21-28.7,77-32-20.5)
2580	Haryana	Yamunanagar	(30-22-07.1,77-29-50.7); (31-21-34.2,77-29-14.6)
2581	Haryana	Yamunanagar	(30-22-07.1,77-29-50.7); (31-21-34.2,77-29-14.6)
2582	Haryana	Yamunanagar	(30-22-07.1,77-29-50.7); (31-21-34.2,77-29-14.6)
2583	Haryana	Yamunanagar	(30-19-26.6,77-33-04.8); (30-19-26.6,77-03-06.0); (30-19-23,77-33-04.0); (30-19-27.5,77-33-07.7)
2584	Haryana	Yamunanagar	(30-19-26.6,77-33-04.8); (30-19-26.6,77-03-06.0); (30-19-23,77-33-04.0); (30-19-27.5,77-33-07.7)
2585	Haryana	Yamunanagar	(30-23-1.00,77-31-57.1)
2586	Haryana	Yamunanagar	(30-21-50.8,77-31-34.5); (30-21-45.8,77-31-33.9); (30-21-42.8,77-31-32.3); (30-21-42.3,77-31-43.3); (30-21-31.7,77-31-33.8); (30-20-31.5,77-30-08.9)
2587	Haryana	Yamunanagar	(30-22-5.00,77-36-7.00)
2588	Haryana	Yamunanagar	(30-23-25.00,77-31-27.00); (31-23-19.00,77-31-32.00)
2589	Haryana	Yamunanagar	(30-19-15.1,77-32-35.9); (30-19-14.9,77-32-35.4); (30-19-16.5,77-32-36.5); (30-19-19.5,77-32-42.1)
2590	Haryana	Yamunanagar	(30-19-39.6,77-32-48.6); (30-19-47.6,77-32-46.7); (30-18-44.8,77-32-48.9)
2591	Haryana	Yamunanagar	(30-19-39.6,77-32-48.6); (30-19-47.6,77-32-46.7); (30-18-44.8,77-32-48.9)
2592	Haryana	Yamunanagar	(30-15-2,77-22-6); (30-15-2,77-22-6); (30-15-1,77-22-7); (30-14-60,77-22-7); (30-14-59,77-22-7)
2594	Haryana	Yamunanagar	(30-23-57.6,77-28-0.96); (30-23-59.28,77-28-1.98); (30-23-32.1,77-27-22.5); (30-23-22.32,77-27-22.56)
2595	Haryana	Yamunanagar	(30-23-57.6,77-28-0.96); (30-23-59.28,77-28-1.98); (30-23-32.1,77-27-22.56); (30-23-22.32,77-27-22.56)
2596	Haryana	Yamunanagar	(30-26-41.11,77-27-24.1); (30-25-01.5,77-22-30.0); (30-26-41.3,77-27-16.1); (30-26-14.8,77-27-1.5)
2597	Haryana	Yamunanagar	(30-26-41.11,77-27-24.1); (30-25-01.5,77-22-30.0); (30-26-41.3,77-27-16.1); (30-26-14.8,77-27-1.5)
2598	Haryana	Yamunanagar	(30-20-20.4,77-29-45.2); (30-20-20.0,77-29-44.5); (30-20-19.2,77-29-43.8); (30-20-18.3,77-29-42.9); (30-20-17.5,77-29-42.2); (30-20-16.3,77-29-41.7)
2599	Haryana	Sonipat	(29-4-20.06,77-7-27.01); (29-4-20.20,77-7-38.73); (29-4-10.49,77-7-34.29); (29-4-11.352,77-7-25.16)
2600	Haryana	Sonipat	(28-54-25.56,77-10-41.29); (28-54-29.72,77-10-44.26); (28-54-28.42,77-10-53.40)
2601	Haryana	Yamunanagar	(30-12- 46.188,77-19- 14.412); (30-12-38.016,77-18- 51.444); (30- 12- 26.064,77-19- 0.228)
2602	Haryana	Yamunanagar	(30-21-28.3,77-32-06.7); (30-21-05.6,77-31-42.9); (30-21-29.3,77-32-02.0)
2603	Haryana	Yamunanagar	(30-12-46.188,77-19-14.412); (30-12-38.016,77-18-51.444); (30- 12- 26.064,77-19-0.228)
2604	Haryana	Sonipat	(28-54-42.93,77-10-22.54); (28-55-38.72,77-10-25.57); (28-55-34.97,77-10-30.49); (28-55-38.65,77-10-37.06)
2605	Haryana	Sonipat	(29-06-22.28,77-07-14.50); (29-06-25.12,77-07-24.53); (29-06-27.74,77-07-18.59); (29-06-19.07,77-07-17.84)
2606	Haryana	Yamunanagar	(30-22-0.9,77-31-23.0); (30-22-1.5,77-31-23.6)
2607	Haryana	Yamunanagar	(30-22-0.9,77-31-23.0); (30-22-1.5,77-31-23.6)

2608	Haryana	Yamunanagar	(30-22-0.9,77-31-23.0); (30-22-1.5,77-31-23.6)
2609	Haryana	Sonipat	(24-06-44.63,77-06-26.47); (29-06-48.31,77-06-40.24); (29-06-31.22,77-06-31.22); (29-06-40.87,77-06-38.44)
2610	Haryana	Sonipat	(29-09-26.76,77-04-36.64); (29-09-36.51,77-04-52.96); (29-09-43.99,77-04-37.58); (29-09-26.63,77-04-55.92)
2611	Haryana	Sonipat	(29-04-36.57,77-06-31); (29-04-51.47,77-06-13.93); (29-04-34.67,77-06-11.96); (29-04-55.46,77-06-32.30)
2612	Haryana	Sonipat	(29-07-59.45,77-06-0.68); (29-08-06.09,77-06-25.17); (29-08-10.05,77-06-10.63); (29-07-52.95,77-06-14.86)
2613	Haryana	Sonipat	(29-08-19.39,77-07-18.41); (29-08-07.86,77-07-22.36); (29-08-10.53,77-07-6.4); (29-08-19.99,77-07-19.25)
2614	Haryana	Sonipat	(29-4-4.39,77-7-47.50); (29-3-58.85,77-7-31.36); (29-4-10.29,77-7-38.913); (29-4-3.95,77-7-31.63)
2616	Haryana	Sonipat	(28-18-56.61,77-27-45.14)
2618	Haryana	Sonipat	(29- 21-16.848,77-39-21.672); (29-18-46.008,77- 39-0.144)
3288	Haryana	Faridabad	(28-19-29.50,77-25-22.14); (28-19-20.28,77-25-20.01); (28-19-26.65,77-27-44.14); (28-19-28.29,77-25-14.49); (28-18-28.78,77-25-19.52)
3289	Haryana	Faridabad	(28-41-12.30,77-45-42.77); (28-41-61.94,77-46-07.61); (28-42-30.01,77-46-13.81); (28-42-34.28,77-45-28.16); (28-41-78.84,77-45-24.33); (28-41-57.00,77-44-97.87)
3290	Haryana	Faridabad	(28-24- 40.428,77- 27- 15.3972); (28-24- 58.2984,77- 27-38.7396); (28-25-22.8036,77- 27-40.9716); (28-25-24.3408,77- 27- 10.1376); (28- 24- 56.52,77- 26- 59.2332)
3291	Haryana	Palwal	(27-57-17,77-21-29); (27-37-17,77-31-35); (27-57-11,77-31-22)
3292	Haryana	Faridabad	(28-23-33.56,77-25-06.06); (28-23-11.58,77-25-44.12); (28-19-25.14,77-27-7.43)
3293	Haryana	Faridabad	(28-25- 0.99,77-24- 40.50); (28-24- 49.53,77- 24- 47.26); (28-24- 49.53,77- 24-40.22)
3294	Haryana	Palwal	(28-5-38,77-28-19); (28-04-58.96,77-28-45.69); (28-05-3.46,77-28-44.37); (28-04-54.87,77-28-44.52); (28-04-51.12,77-28-44.48); (28-04-46.95,77-28-45.75); (28-04-40.68,77-28-46.41);
3295	Haryana	Faridabad	(28-21-14.12,77-27-14.55); (28-21-5.97,77-27-23.56); (28-19-37.85,77-27-52.99); (28-20-46.97,77-28-14.17)
3296	Haryana	Faridabad	(28-19-1.97,77-27-38.26); (28-18-55.63,77-27-43.28); (28-18-47.96,77-27-43.33); (28-18-5.22,77-27-50.69)
3298	Haryana	Faridabad	(28-21-7.23,27-27-23.63)
3299	Haryana	Faridabad	(28-21-7.23,77-27-23.63)
3300	Haryana	Faridabad	(28-18-52.17,77-27-37.11)
3301	Haryana	Faridabad	(28- 22- 7.29,77- 28- 52.35); (28- 22- 27.41,77- 28- 57.36); (28-22-11.56,77-28-36.54)
3302	Haryana	Faridabad	(28-19-33.40,77-27-56.00)
3303	Haryana	Faridabad	(28-18-56.61,77-27-45.14)
3304	Haryana	Faridabad	(28-40-02.14,77-44-39.13); (28-40-36.91,77-44-08.85)
3305	Haryana	Faridabad	(28-24-39.90,77-25-32.99); (28-25-3.36,77-25-51.09)
3306	Haryana	Faridabad	(28-23-39.25,77-27-4.42); (28-23-41.80,77-26-53.54)
3309	Haryana	Faridabad	(28-20-44.57,77-25-16.08)
3310	Haryana	Faridabad	(28-19-33.40,77-27-56.00)

3311	Haryana	Faridabad	(28-25-22.3068,77-25-40.3896); (28-25-25.068,77- 25-53.2092)
3312	Haryana	Faridabad	(28-25-22.3068,77- 25-40.3896); (28- 25-25.068,77-25-53.2092); (28-25- 33.9456,77-26- 0.204); (28- 25-38.8128,77- 25- 44.6736)
3313	Haryana	Faridabad	(28-25- 40.3392,77-24-22.2624); (28- 22-26.7708,77-29-16.71); (28-24- 10.1736,77-25- 42.78)
3315	Haryana	Faridabad	(28-26- 17.106,77- 24- 55.0692); (28- 25- 48.3672,77-25-6.8664); (28- 25-35.0508,77- 25- 48.1476); (28-26-9.0456,77-26- 44.1168); (28-25-52.7268,77- 27- 33.5628)
3329	Haryana	Yamunanagar	(30-22-07.1,77-29-50.7); (31-21-34.2,77-29-14.6)
3331	Haryana	Yamunanagar	
3332	Haryana	Yamunanagar	(30-18-35.9,77-33-35.2); (30-18-35.6,77-33-33.8); (30-18-34.8,77-33-35.6); (30-18-35.9,77-33-35.3); (30-18-34.1,77-33-35.3)
3334	Haryana	Yamunanagar	(30-15-30.1,77-31-39.4); (30-15-25.3,77-31-35.9); (30-15-22.5,77-31-33.7); (30-15-20.4,77-32-2)
3335	Haryana	Yamunanagar	(30-18-51.7,77-33-53.9); (30-18-51.0,77-33-52.0); (30-18-51.4,77-33-52.7); (30-18-33.6,77-34-3.6)
3336	Haryana	Yamunanagar	(30-17-10.34,77-25-1.78); (30-17-9.492,77-25-2.923); (30-17-8.23,77-25-4.12); (30-17-5.185, 77-25-5.70)
3337	Haryana	Yamunanagar	(30-21-50.8,77-31-34.5); (30-21-45.8,77-31-33.9); (30-21-42.8,77-31-32.3); (30-21-42.3,77-31-43.3); (30-21-31.7,77-31-33.8); (30-20-31.5,77-30-08.9)
3338	Haryana	Yamunanagar	(30-22-44.6,77-30-23.5); (30-22-50.9,77-30-23); (30-22-53.2,77-30-28.9)
3339	Haryana	Yamunanagar	(30-23-01,77-31-57)
3341	Haryana	Panipat	(29-19-36,77-07-49); (29-19-29,77-08-05); (29-19-29,77-08-06); (29-19-23,77-08-09)

Annexure-4

GPS COORDINATES OF SITES FOR VARIOUS FORESTRY INTERVENTIONS IN UTTAR PRADESH

The following table gives GPS coordinates of the sites proposed by the state SFD at time of DPR formulation. The sites may be finalised, with suitable changes wherever required, and georeferenced at time of implementation of the DPR.

Site ID	State	Division	Geo-coordinates (Format: degree-minute-second ºN Lat., degree-minute-second ºE Long.)
58	Uttar Pradesh	Jhansi	(25-36-18.1,78-54-25); (25-36-19,78-54-33.7); (31-04-28.86,77-48-12.9); (71-04-37.5,77-68-13.14); (31-04-38.94,77-68-12.78); (31-04-33.42,77-68-18.06); (31-04-32.58,77-68-18.6); (31-04-38.22,77-68-8.52)
59	Uttar Pradesh	Jhansi	(25-38-8,78-59-27.5); (25-38-57.9,78-59-38.2); (25-36-14,78-54-22.3); (25-36-12.8,78-54-31.7)
60	Uttar Pradesh	Jhansi	(25-33-10.9,78-52-18.0); (25-33-08.3,78-52-22.1); (25-38-45.2,78-59-35.1); (28-38-46.9,78-59-26.2)
61	Uttar Pradesh	Sankargarh	(25-33-09.1,78-52-30.2); (25-33-05.0,78-52-16.2)
62	Uttar Pradesh	Jhansi	(25-12-43.8,78-32-38.9); (25-12-24.5,78-32-33.7)
63	Uttar Pradesh	Jhansi	(25-08-11.62,78-27-47.6); (25-08-12.17,78-27-47.6); (25-12-22.2,78-33-01.6); (25-12-41.9,78-3 3-6.5)
64	Uttar Pradesh	Jhansi	(25-10-41.6,78-30-13.7); (25-10-42.9,78-30-27); (25-08-18.4,78-28-00); (25-08-29.8,78-28-10.6)
65	Uttar Pradesh	Banda	(25-50-2.2,80-22-29.9); (25-50-2.0,80-22-27.4); (25-10-27.4,78-29-58.0); (25-10-25.8,78-30-6.9)
66	Uttar Pradesh	Kaushambi	(25-50-5.4,80-22-32.5)
69	Uttar Pradesh	Banda	(25-17-27.2,80-18-48.0);(25-17-26.9,80-18-51.6);(25-17-36.0,80-19-02.6);(25-17-27.7,80-18-48.9);(25-17-28.4.2,80-18-51.6);(25-17-26.9,80-18-15.6);(25-17-20.1,80-18-51.0);(25-17-27.6,80-18-57.6);(25-17-18.3,80-18-53);(25-17-36,80-19-03.0)
72	Uttar Pradesh	Banda	(25-40-15.5,80-38-38.8);(25-40-12.7,80-38-36.2);(25-40-17.3,80-38-37.2);(25-40-0.10,80-38-42.7)
1896	Uttar Pradesh	Hamirpur	(25-58-30.90,80-06-39.38); (25-58-30.80,80-06-39.15); (30-48-59,77-40-47)
1897	Uttar Pradesh	Hamirpur	(25-53-08.64,79-54-42.12); (25-53-40.14,79-54-49.08); (25-58-31.18,80-06-39.22)
1900	Uttar Pradesh	Hamirpur	(25-57-29.10,80-06-11.07); (25-57-29.45,80-06-11.09); (30-50-37.32,77-45-21.42); (30-85-20.88,77-73-58.26)
1902	Uttar Pradesh	Social Forestry Division, Agra	(27-12-56.33,78-04-32.35);(30-30-40.5,77-26-31.74)
1903	Uttar Pradesh	Hamirpur	(25-53-31.62,79-55-03.54); (25-53-43.38,79-55-27.18)

1904	Uttar Pradesh	Hamirpur	(25-57-05.14,80-05-47.50); (25-57-05.18,80-05-47.93); (25-53-43.56,79-59-16.98)
1905	Uttar Pradesh	Hamirpur	
1906	Uttar Pradesh	Hamirpur	(25-53-46.32,79-59-20.04); (25-53-46.02,79-59-20.28)
1907	Uttar Pradesh	Social Forestry Division, Agra	(27-17-27.57,77-52-16.5); (27-17-21.84,77-52-19.91); (25-53-46.05,79-59-19,68)
1908	Uttar Pradesh	Hamirpur	(25-58-32.09,80-06-38.48); (25-58-32.20,80-06-38.04); (27-17-22.65,77-52-27.16); (27-17-28.85,77-52-38.99); (27-17-34.4,77-52-32.47); (27-17-30.78,77-52-24.39); (27-174-30.84,77-52-21.66); (27-17-29.82,77-52-22.30)
1909	Uttar Pradesh	Hamirpur	(25-58-32.27,80-06-37.82)
1910	Uttar Pradesh	Hamirpur	(25-55-21.12,79-58-10.56); (25-55-21.24,79-58-10.38)
1912	Uttar Pradesh	Hamirpur	(25-58-30.90,80-06-39.38); (25-58-30.80,80-06-39.15); (25-55-21.18,79-58-10.68)
1913	Uttar Pradesh	Hamirpur	(25-53-08.64,79-54-42.12); (25-53.40.14,79-54-49.08); (25-58-31.18,80-06-39.22)
1914	Uttar Pradesh	Hamirpur	(25-57-29.10,80-06-11.07); (25-57-29.45,80-06-11.09); (25-53-59.4,79-55-03.54)
1915	Uttar Pradesh	Hamirpur	(25-5-31.62,79-55-03.54); (25-53-43.38,79-55-27.18); (25-57-29.80,80-06-11.06)
1916	Uttar Pradesh	Hamirpur	(25-57-05.14,80-05-47.81); (25-57-05.81,80-05-47.81); (25-53-43.56,79-59-16.98)
1917	Uttar Pradesh	Hamirpur	(25-53-46.32,79-59-20.04); (25-53-46.2,79-59-20.28); (25-57-05.38,80-05-47.93)
1918	Uttar Pradesh	Hamirpur	(25-58-32.09,80-06-39.48); (25-58-32.20,80-06-38.04); (25-53-46.5,79-59-19.68)
1919	Uttar Pradesh	Hamirpur	(26-04-06.24,79-56-06.16);(25-58-32.27,80-06-37.82)
1920	Uttar Pradesh	Hamirpur	(25-55-21.12,79-58-10.56); (25-55-21.24,79-58-10.38)
1923	Uttar Pradesh	Hamirpur	(25-55-21.18,79-58-10.68)
1924	Uttar Pradesh	Hamirpur	(25-53-17.11,80-17-47.51)
1925	Uttar Pradesh	Hamirpur	(25-54-44.18,80-12-23.72)
1928	Uttar Pradesh	Kanpur Dehat	(26-19-32,79-33-16.4); (26-19-34.7,79-33-43.1)
1929	Uttar Pradesh	Hamirpur	(26-19-17.8,79-34-04); (26-19-01,79-33-44.3)
1930	Uttar Pradesh	Muzaffarnagar	(29-21-40.5,77-29-32.5)
1932	Uttar Pradesh	Hamirpur	(25-52-29.69,80-00-45.31)
1933	Uttar	Muzaffarnagar	(29-18-16.6,77-29-25.2)

	Pradesh		
1934	Uttar Pradesh	Hamirpur	(25-52-19.25,79-56-13.15)
1936	Uttar Pradesh	Muzaffarnagar	(29-12-56.9,77-31-39.2)
1937	Uttar Pradesh	Hamirpur	(25-49-48.17,79-52-06.80)
1938	Uttar Pradesh	Muzaffarnagar	(29-15-41.2,77-30-10.0)
1939	Uttar Pradesh	Hamirpur	(25-54-08.96,79-39-06.67)
1941	Uttar Pradesh	Muzaffarnagar	(29-16-09,77-29-28)
1942	Uttar Pradesh	Hamirpur	(25-53-23.65,79-36-43.10)
1944	Uttar Pradesh	Muzaffarnagar	(29-17-29.6,77-28-40.6)
1945	Uttar Pradesh	Hamirpur	(25-48-24.83,79-28-02.72)
1946	Uttar Pradesh	Hamirpur	(25-51-49.58,79-46-11.67)
1953	Uttar Pradesh	Social Forestry Division, Agra	(27-13-33.4,77-59-43.4)
1954	Uttar Pradesh	Social Forestry Division, Agra	(27-03-3.0888,78-18-35.55)
1955	Uttar Pradesh	Social Forestry Division, Agra	(26-53-16.02,78-36-57.72)
1956	Uttar Pradesh	Sankargarh	(25-20-51.17,81-41-23.50)
1957	Uttar Pradesh	Sankargarh	(25-19-33.14,81-37-36.64)
1958	Uttar Pradesh	Social Forestry Division, Agra	(27-13-38.12,78-64-12.06)
1959	Uttar Pradesh	Sankargarh	(25-16-15.67,81-45-05.14)
1960	Uttar Pradesh	Social Forestry Division, Agra	(26-58-40.68,78-27-04.36)
1961	Uttar Pradesh	Sankargarh	(25-16-32.40,81-44-09.11)
1963	Uttar Pradesh	Social Forestry Division, Agra	(27-14-22.49,78-05-14.58)
1964	Uttar Pradesh	Social Forestry Division, Agra	(26-27-16.20,78-26-37.55)
1965	Uttar Pradesh	Sankargarh	(25-13-35.08,81-45-24.33)
1966	Uttar Pradesh	Prayagraj	(25-24-17.4,81-51-24.4)
1967	Uttar Pradesh	Social Forestry Division, Agra	(27-15-51.69,77-58-28.15);(25-24-52,81-51-07); (25-24-49,81-51-08)
1968	Uttar	Social Forestry	(26-59-51.15,78-26-34.2060)

	Pradesh	Division, Agra	
1969	Uttar Pradesh	Sankargarh	(25-19-02.10,81-36-26.75)
1970	Uttar Pradesh	Social Forestry Division, Agra	(27-03-01.01,78-23-31.36)
1971	Uttar Pradesh	Prayagraj	(25-25-19.20,81-51-4.32)
1972	Uttar Pradesh	Social Forestry Division, Agra	(27-03-40.59,78-22-35.10)
1973	Uttar Pradesh	Sankargarh	(25-19-14,81-48-13.47)
1974	Uttar Pradesh	Sankargarh	(25-20-43.30,81-38-35.31)
1975	Uttar Pradesh	Social Forestry Division, Agra	(27-17-30.84,77-52-21.66); (27-14-16.91,77-52-26.63)
1976	Uttar Pradesh	Prayagraj	(25-25-18.6,81-51-34.56)
1977	Uttar Pradesh	Social Forestry Division, Agra	(27-13-41,77-56-47); (27-15-28,77-56-18);(27-13-45,77-54-38)
1978	Uttar Pradesh	Social Forestry Division, Agra	(26-57-25.60,78-33-04.50)
1979	Uttar Pradesh	Prayagraj	(25-17-46.92,81-34-01.90)
1980	Uttar Pradesh	Sankargarh	(25-20-13.43,81-40-06.13)
1981	Uttar Pradesh	Social Forestry Division, Agra	(27-02-17.15,78-18-11.39);(27-03-59.75,78-18-14.30);(27-02-13.43,78-18-46.17);(27-02-38.37,78-19-37.47);(27-03-15.41,78-20-01.08)
1982	Uttar Pradesh	Sankargarh	(25-18-22.72,81-41-50.10)
1983	Uttar Pradesh	Prayagraj	(25-25-28.78,81-50-19.97)
1984	Uttar Pradesh	Prayagraj	(25-25-19.14,81-51-12.18)
1985	Uttar Pradesh	Kanpur Dehat	(26-22-07.5,79-33-23.6); (26-22-16.1,79-33-20.8)
1986	Uttar Pradesh	Social Forestry Division, Agra	(26-52-03.30,78-44-05.70)
1987	Uttar Pradesh	Prayagraj	(25-25-12.48,81-51-0.39)
1988	Uttar Pradesh	Prayagraj	(25-21-31.9,81-49-49.3)
1989	Uttar Pradesh	Social Forestry Division, Agra	(26-52-18.30,78-45-40.20)
1990	Uttar Pradesh	Kanpur Dehat	(26-21-39.6,79-36-34.72)
1992	Uttar Pradesh	Social Forestry Division, Agra	(26-58-05.63,78-28-34.68)
1993	Uttar Pradesh	Kanpur Dehat	(26-06-57.0,79-55-07); (26-06-54.0,79-55-03)

1994	Uttar Pradesh	Kanpur Dehat	(26-26-25.08,79-65-35.4);(26-06-58.0,79-54-57); (26-07-20.0,79-55-05)
1995	Uttar Pradesh	Social Forestry Division, Agra	(27-10-42.66,78-02-56.52)
1996	Uttar Pradesh	Social Forestry Division, Agra	(26-57-16.82,78-30-01.30)
1997	Uttar Pradesh	Kanpur Dehat	(26-19-32,79-33-16.4); (26-19-20.82,79-33-43.1); (25-24-52,81-51-07); (25-24-49,81-51-08)
1998	Uttar Pradesh	Social Forestry Division, Agra	(27-14-01.11,77-55-13.74)
2000	Uttar Pradesh	Kanpur Dehat	(26-20-45,77-34-17); (26-21-14,79-34-30)
2002	Uttar Pradesh	Shivalik	(30-22-06.35,77-36-14.19); (30-22-05.15,77-36-15.91); (26-21-11.4,79-34-55.1); (26-20-55.5,79-34-50.9)
2003	Uttar Pradesh	Social Forestry Division, Agra	(27-13-26.39,77-57-38.59)
2004	Uttar Pradesh	Kanpur Dehat	(26-10-11.61,79-46-15); (26-10-11.62,79-46-07)
2005	Uttar Pradesh	Kanpur Dehat	(26-16-24.16,79-40-57.75) (26-10-11.58,79-46-04); (26-10-12.15,79-46-13)
2006	Uttar Pradesh	Shivalik	(30-22-05.04,77-36-16.13); (30-22-03.72,77-36-17.71)
2007	Uttar Pradesh	Kanpur Dehat	(26-08-12.17,79-45-22)
2008	Uttar Pradesh	Shivalik	(30-22-18.55,77-37-46.60); (30-22-11.61,77-37-43.54)
2009	Uttar Pradesh	Social Forestry Division, Agra	
2010	Uttar Pradesh	Kanpur Dehat	(26-07-12.11,79-57-55)
2011	Uttar Pradesh	Kanpur Dehat	(26-34-60,79-57-15); (26-34-47,79-54-74)
2012	Uttar Pradesh	Shivalik	(30-22-31.77,77-37-30.57); (30-22-31.25,77-37-28.38); (26-35-22,79-58-22.8); (26-35-21.6,79-56-36.6)
2013	Uttar Pradesh	Kanpur Dehat	(26-12-24.00,79-43-00); (26-12-23.00,79-43-04)
2014	Uttar Pradesh	Kanpur Dehat	(26-10-11.61,79-46-15); (27-10-11.62,79-46-07); (26-12-27.0,79-43-06); (26-12-31.0,79-43-02)
2015	Uttar Pradesh	Shivalik	(30-22-19.82,77-37-48.46); (30-22-18.63,77-37-46.70); (26-10-11.58,79-46-04); (26-10-12.14,79-46-13)
2016	Uttar Pradesh	Shivalik	(30-22-30.13,77-37-01.65); (30-22-29.64,77-37-04.51)
2017	Uttar Pradesh	Kanpur Dehat	(26-36-38.4,79-56-58.02); (26-36-15.6,79-57-40.08)
2018	Uttar Pradesh	Kanpur Dehat	(26-22-22,79-31-39.7); (26-22-36,79-31-44); (26-35-55.8,79-57-07.2); (26-36.-25.02,79-57-42.6)
2019	Uttar	Shivalik	(30-22-40.90,77-36-50.42); (30-22-29.64,77-36-

	Pradesh		48.56); (26-22-34.9,79-31-54); (26-22-16.3,79-31-50.7)
2020	Uttar Pradesh	Kanpur Dehat	(26-06-12.16,79-54-37)
2021	Uttar Pradesh	Kanpur Dehat	(26-41-56.50,79-35-47.15)
2022	Uttar Pradesh	Shivalik	(30-22-41.91,77-36-48.26); (30-22-43.12,77-36-45.16)
2023	Uttar Pradesh	Kanpur Dehat	(26-20-45,79-34-17); (26-21-14,79-34-30)
2024	Uttar Pradesh	Kanpur Dehat	(26-16-33.59,79-34-54.95) (26-21-11.4,79-34-55.1); (26-20-55.5,79-24-50.9)
2025	Uttar Pradesh	Kanpur Dehat	(26-09-12.06,79-58-37); (26-09-12.02,79-58-15)
2026	Uttar Pradesh	Kanpur Dehat	(26-22-12.09,79-33-47.58); (26-22-30.20,79-33-47.50); (26-08-11.73,79-58-55.1); (26-09-12.08,79-58-23)
2027	Uttar Pradesh	Kanpur Dehat	(26-17-09,79-33-01); (26-16-34.68,79-33-01); (26-22-33.56,79-33-17.90); (26-22-28.41,79-33-25.17)
2028	Uttar Pradesh	Shivalik	(30-22-24.67,77-36-16.60); (30-22-25.17,77-36-14.35); (26-17-04.68,79-32-44.5); (26-17-20.6,79-32.540-00)
2029	Uttar Pradesh	Shivalik	(30-22-25.23,77-36-14.21); (30-22-25.71,77-36-12.03)
2030	Uttar Pradesh	Shivalik	(30-22-25.79,77-36-11.77); (30-22-26.38,77-36-9.67)
2031	Uttar Pradesh	Shivalik	(30-22-26.48,77-36-9.45); (30-22-27.43,77-36-7.53)
2032	Uttar Pradesh	Shivalik	(30-22-27.52,77-36-7.39); (30-22-28.5,77-36-6.46)
2033	Uttar Pradesh	Shivalik	(30-22-30.52,77-36-25.75); (30-22-33.95,77-36-25.75)
2034	Uttar Pradesh	Shivalik	(30-22-31.54,77-36-25.10); (30-22-29.52,77-36-24.40)
2035	Uttar Pradesh	Lalitpur	(25-11-36.1,78-33-36.6); (25-11-36.6,78-33-36.0)
2036	Uttar Pradesh	Shivalik	(30-22-33.52,77-36-25.10); (30-22-31.63,77-36-25.22); (25-11-36.8,78-33-35.4)
2037	Uttar Pradesh	Shivalik	(30-20-33.22,77-40-34.08); (30-20-31.44,77-40-33.39)
2038	Uttar Pradesh	Shivalik	(30-20-31.44,77-40-33.39); (30-20-30.17,77-40-32.98)
2039	Uttar Pradesh	Shivalik	(30-20-30.71,77-40-32.98); (30-20-30.38,77-40-31.89)
2040	Uttar Pradesh	Shivalik	(30-20-30.26,77-40-31.05); (30-20-27.67,77-40-29.95)
2041	Uttar Pradesh	Lalitpur	(25-09-39.2,78-31-50.5); (25-09-25.1,78-31-37.8)
2042	Uttar Pradesh	Shivalik	(30-20-27.68,77-40-29.94); (30-20-25.9,77-40-29.08); (25-09-35.9,78-31-50.7); (25-09-32.4,78-31-51.9);

			(25-09-22.4,78-31-41.2)
2043	Uttar Pradesh	Shivalik	(30-20-25.98,77-40-29.10); (30-20-24.20,77-40-28.49)
2044	Uttar Pradesh	Shivalik	(30-20-28.93,77-40-28.18); (30-20-21.23,77-40-27.11)
2045	Uttar Pradesh	Lalitpur	(24-57-25.2,78-17-29.0); (24-57-18.3,78-17-19.1)
2046	Uttar Pradesh	Shivalik	(30-20-39.61,77-40-34.53); (30-20-38.06,77-40-34.96); (24-57-06.2,78-17-11.5); (24-56-58.3,78-17-13.3)
2047	Uttar Pradesh	Shivalik	(30-20-38.04,77-40-34.97); (30-20-33.09,77-40-34.62)
2048	Uttar Pradesh	Lalitpur	(24-57-05.3,78-17-11.4); (24-57-02.5,78-17-17.6)
2049	Uttar Pradesh	Lalitpur	(24-57-41.2,78-19-19.3); (24-57-49.6,78-19-11.4); (24-57-00.3,78-17-16.7); (24-57-01.8,78-17-11.2)
2050	Uttar Pradesh	Shivalik	(30-20-37.1,77-40-34.59); (30-20-35.68,77-40-33.01); (24-57-53.4,78-19-15.2); (24-57-56.6,78-19-04.2)
2051	Uttar Pradesh	Shivalik	(30-19-58.08,77-37-45.62); (30-20-00.29,77-37-47.80)
2052	Uttar Pradesh	Shivalik	(30-20-10.24,77-37-44.25); (30-20-9.41,77-37-44.66)
2053	Uttar Pradesh	Shivalik	(30-20-5.01,77-37-46.59); (30-20-7.82,77-37-45.73)
2054	Uttar Pradesh	Shivalik	(30-10-40.14,77-54-2.34); (30-10-40.57,77-54-22.24)
2055	Uttar Pradesh	Shivalik	(30-10-25.81,77-50-20.86); (30-10-32.42,77-50-26.72)
2056	Uttar Pradesh	Shivalik	(30-12-50.10,77-37-46.77); (30-13-8.19,77-44-32.42)
2057	Uttar Pradesh	Lalitpur	(84-47-26.2,78-14-58.4); (24-47-16.2,78-14-59.2)
2058	Uttar Pradesh	Shivalik	(30-10-56.75,77-53-33.58); (30-10-57.43,77-54-32.29); (24-47-03.0,78-14-52.6)
2059	Uttar Pradesh	Shivalik	(30-9-6.21,77-51-55.42); (30-09-25.79,77-52-11.04)
2060	Uttar Pradesh	Lalitpur	(24-32-35.9,78-17-05.6); (24-32-20.2,78-16-41.8)
2061	Uttar Pradesh	Shivalik	(30-09-45.15,77-40-49.14); (30-9-46.23,77-46-48.10); (24-32-43.9,78-17-08.1); (24-32-25.9,78-17-07.1)
2062	Uttar Pradesh	Lalitpur	(24-26-29.9,78-19-05.7)
2063	Uttar Pradesh	Lalitpur	(25-07-05.70,78-30-47.40)
2064	Uttar Pradesh	Shivalik	(30-14-36.86,77-45-17.42); (30-15-12.89,77-45-41.19)
2065	Uttar Pradesh	Shivalik	(30-13-40.12,77-45-57.72); (30-13-42.50,77-45-57.72)
2066	Uttar Pradesh	Kanpur Dehat	(26-16-11.70,79-35-38.06); (26-16-17.53,79-35-40.39)

2067	Uttar Pradesh	Lalitpur	(25-06-26.51,25-06-11.8); (78-30-32.24,); (26-16-13.96,79-35-48.36); (26-16-10.08,79-35-46.51)
2068	Uttar Pradesh	Shivalik	(30-13-42.50,77-45-57.72); (30-13-45.19,77-45-59.40)
2069	Uttar Pradesh	Shivalik	(30-13-45.19,77-45-59.40); (30-13-47.84,77-46-1.38)
2070	Uttar Pradesh	Shivalik	(30-13-47.84,77-46-1.38); (30-13-49.84,77-46-3.98)
2071	Uttar Pradesh	Shivalik	(30-13-49.84,77-46-3.98); (30-13-50.74,77-46-5.97)
2072	Uttar Pradesh	Lalitpur	(25-07-26.2,78-29-57.4); (25-07-33.2,78-29-59.9)
2073	Uttar Pradesh	Lalitpur	(24-27-28.8,78-16-43.3); (24-27-09.7,78-17-11.6); (25-07-14.69,78-29-24.67)
2074	Uttar Pradesh	Shivalik	(30-14-42.11,77-43-55.03); (30-14-42.71,77-43-58.60); (24-27-07.5,78-17-12.3)
2075	Uttar Pradesh	Kanpur Dehat	(26-19-4.35,79-33-53.06); (26-19-23.21,79-35-16.94)
2076	Uttar Pradesh	Shivalik	(30-14-42.71,77-43-58.60); (30-14-44.11,77-44-1.96); (26-19-23.72,79-32-45.96)
2077	Uttar Pradesh	Lalitpur	(25-07-58.2,78-28-16.9)
2078	Uttar Pradesh	Shivalik	(30-14-44.11,77-44-1.96); (30-14-46.02,77-44-4.83)
2079	Uttar Pradesh	Shivalik	(30-14-46.02,77-44-4.83); (30-14-47.69,77-44-7.96)
2080	Uttar Pradesh	Lalitpur	(25-06-51.3,78-27-26.2); (25-06-45.5,78-27-18.8)
2082	Uttar Pradesh	Shivalik	(30-14-47.69,77-44-7.96); (30-14-49.91,77-44-10.23)
2083	Uttar Pradesh	Shivalik	(30-14-49.91,77-44-10.23); (30-14-51.82,77-44-13.55)
2084	Uttar Pradesh	Shivalik	(30-15-50.14,77-42-24.83); (30-15-51.08,77-42-29.31)
2085	Uttar Pradesh	Lalitpur	(25-06-51.4,78-27-00.03)
2086	Uttar Pradesh	Lalitpur	(25-07-29.0,78-28-02.05)
2087	Uttar Pradesh	Lalitpur	(24-57-68.21,78-17-40.66)
2088	Uttar Pradesh	Shivalik	(30-15-51.08,77-42-29.31); (30-15-53.48,77-42-31.67)
2089	Uttar Pradesh	Shivalik	(30-15-53.48,77-42-31.67); (30-15-56.64,77-42-33.56)
2090	Uttar Pradesh	Lalitpur	(27-07-12.17,78-28-2); (25-06-11.70,78-27-0)
2091	Uttar Pradesh	Shivalik	(30-15-56.64,77-42-33.56); (30-15-59.35,77-42-35.19); (25-06-11.67,78-27-19); (25-06-11.71,78-27-26)
2092	Uttar	Lalitpur	(24-57-49.76,78-21-21.05)

	Pradesh		
2093	Uttar Pradesh	Shivalik	(30-15-59.35,77-42-35.19); (30-15-2.10,77-42-37.59)
2094	Uttar Pradesh	Lalitpur	(24-51-11.2,78-10-40.3); (24-51-26.1,78-10-34.2)
2095	Uttar Pradesh	Shivalik	(30-15-2.10,77-42-37.59); (30-15-5.81,77-42-38.77); (24-51-34.6,78-10-41.3); (24-51-39.0,78-10-47.2)
2096	Uttar Pradesh	Shivalik	(30-15-5.81,77-42-38.77); (30-15-9.65,77-42-39.50)
2097	Uttar Pradesh	Shivalik	(30-15-9.65,77-42-39.50); (30-16-12.70,77-42-39.50)
2098	Uttar Pradesh	Shivalik	(30-15-12.70,77-42-39.05); (30-16-16.54,77-42-38.41)
2099	Uttar Pradesh	Lalitpur	(24-51-28,78-11-38.1); (24-51-13.4,78-11-30.0)
2100	Uttar Pradesh	Lalitpur	(24-56-02.3,78-15-25.4); (24-56-17.1,78-15-43.4); (24-51-06.5,78-11-28.3); (24-51-07.3,78-11-09.8)
2101	Uttar Pradesh	Lalitpur	(24-57-38.2,78-17-44.3); (24-57-34.3,78-17-51.2); (24-56-21.5,78-16-20.2); (24-56-11.3,78-16-17.2); (24-56-05.6,78-16-09.6)
2102	Uttar Pradesh	Shivalik	(30-14-14.53,77-44-53.98); (30-14-11.26,77-44-52.69); (24-57-39.2,78-17-51.4); (24-57-37.2,78-18-01.2); (24-57-23.2,78-17-52.3)
2103	Uttar Pradesh	Lalitpur	(24-58-18.2,78-18-24.3); (24-58-09.3,78-18-33.2)
2104	Uttar Pradesh	Shivalik	(30-14-11.16,77-44-52.20); (30-14-8.36,77-44-50.60); (24-58-13.2,78-18-37.4); (24-58-22.1,78-18-47.3); (24-58-29.2,78-18-51.5)
2105	Uttar Pradesh	Shivalik	(30-14-8.36,77-44-50.60); (30-14-5.26,77-44-50.29)
2106	Uttar Pradesh	Shivalik	(30-14-5.26,77-44-50.29); (30-14-2.50,77-44-49.31)
2107	Uttar Pradesh	Shivalik	(30-14-2.50,77-44-49.31); (30-14-00.00,77-44-46.92)
2109	Uttar Pradesh	Shivalik	(30-14-00.00,77-44-46.92); (30-13-56.86,77-44-44.97)
2110	Uttar Pradesh	Shivalik	(30-14-56.86,77-44-44.97); (30-13-54.14,77-44-42.96)
2111	Uttar Pradesh	Shivalik	(30-13-53.45,77-44-43.22); (30-13-50.27,77-44-41.54)
2112	Uttar Pradesh	Shivalik	(30-13-50.22,77-44-41.54); (30-13-48.40,77-44-38.32)
2113	Uttar Pradesh	Shivalik	(30-13-48.40,77-44-38.32); (30-13-45.13,77-44-36.72)
2114	Uttar Pradesh	Shivalik	(30-13-45.13,77-44-36.72); (30-13-42.27,77-44-35.11)
2115	Uttar Pradesh	Shivalik	(30-13-42.27,77-44-35.11); (30-13-39.44,77-44-33.20)
2116	Uttar Pradesh	Jhansi	(25-46-28.15,79-17-16.20); (25-46-35.65,79-17-11.82)

2117	Uttar Pradesh	Jhansi	(25-46-26.80,79-02-51.40); (25-46-34.58,79-02-59.55); (25-46-24.88,79-17-06.59); (25-46-21.91,79-17-13.41)
2118	Uttar Pradesh	Baghpat	(28-59-35,77-12-11); (28-59-40,77-12-17); (25-46-23.03,79-03-06.50); (25-46-18.00,79-02-52.22)
2119	Uttar Pradesh	Kanpur Dehat	(26-22-22,79-31-39.7); (26-22-36,79-31-44)
2120	Uttar Pradesh	Jhansi	(25-45-12.68,79-14-47.97); (25-45-10.89,79-02-05.93); (26-22-34.9,79-31-54); (26-22-16.3,79-31-50.7)
2121	Uttar Pradesh	Baghpat	(28-56-40,77-12-24); (28-56-39,77-12-26); (25-45-04.87,79-01-59.47); (25-45-04.31,79-01-45.19)
2122	Uttar Pradesh	Jhansi	(25-23-53.34,78-40-54.48); (25-23-53.7,78-40-51.78)
2123	Uttar Pradesh	Jhansi	(25-36-15.24,78-59-28.44)
2124	Uttar Pradesh	Jhansi	(25-50-02.10,79-05-30.29); (25-50-01.32,79-05-37.84)
2125	Uttar Pradesh	Jhansi	(25-45-22.98,79-16-51.36) (25-49-58.00,79-05-36.24); (25-49-59.01,79-05-32.16)
2126	Uttar Pradesh	Jhansi	(25-46-23.73,79-17-34.34); (25-46-16.85,79-17-31.23)
2129	Uttar Pradesh	Jhansi	(25-08-37.0,78-27-55.8); (25-08-31.1,78-28-02.9); (29-02-25,77-11-32); (29-03-12.14,77-11-11); (29-01-11.73,77-11-51)
2130	Uttar Pradesh	Jhansi	(25-08-26.7,78-27-51.0); (25-08-23.5,78-27-53.6); (25-08-29.5,78-27-47.6); (25-08-23.5,78-27-53.6)
2131	Uttar Pradesh	Jhansi	(25-08-36.06,78-28-10.44) (25-08-18.4,78-28-0.00); (25-08-23.1,78-28-11.20); (25-08-29.8,78-28-10.6); (25-08-31.1,78-28-02.1)
2132	Uttar Pradesh	Jhansi	(25-39-10.62,78-59-35.28)
2133	Uttar Pradesh	Jhansi	(25-12-22.2,78-33-0.16); (25-12-31.2,78-33-0.34)
2134	Uttar Pradesh	Jhansi	(25-46-9.9,79-17-6.6) (25-12-34.9,78-33-0.48); (25-12-41.9,78-33-0.65)
2136	Uttar Pradesh	Jhansi	(25-45-23.64,79-16-43.34); (25-45-25.44,79-16-31.66)
2137	Uttar Pradesh	Jhansi	(25-09-30.92,78-29-10.8) (25-45-34.36,79-16-40.04); (25-45-36.13,79-16-48.72)
2138	Uttar Pradesh	Jhansi	(25-38-57.90,78-59-38.25); (25-38-58.79,78-58-26.88)
2139	Uttar Pradesh	Jhansi	(25-32-56.22,78-52-21.12) (25-38-40.10,79-59-33.22); (25-38-42.17,78-59-25.44)
2140	Uttar Pradesh	Jhansi	(25-32-57.18,78-52-16.98); (25-32-56.34,78-52-17.88)
2142	Uttar Pradesh	Jhansi	(25-32-49.0,78-52-10.3); (25-32-49.1,78-52-18.6); (28-56-35,77-12-27); (28-56-21,77-12-29); (28-56-09,77-12-47)
2143	Uttar	Jhansi	(25-12-50.6,78-32-11.5) (25-32-52.4,78-52-30.2)

	Pradesh		
2144	Uttar Pradesh	Jhansi	(25-11-41.22,78-31-46.32)
2145	Uttar Pradesh	Jhansi	(25-11-9.09,78-31-8.95); (25-12-20.9,78-32-29.6)
2146	Uttar Pradesh	Jhansi	(25-11-41.16,78-31-40.2) (25-12-38.7,78-32-06.6)
2147	Uttar Pradesh	Jhansi	(25-11-05.7,75-30-6.90)
2149	Uttar Pradesh	Jhansi	(25-11-56.04,78-31-15.66)
2150	Uttar Pradesh	Jhansi	(25-37-57.9,78-56-27.4); (25-38-14.8,78-56-40.8)
2151	Uttar Pradesh	Jhansi	(25-40-22.68,79-1-01.32); (25-40-21.78,79-1-0.48); (25-38-14.5,78-56-32.8); (25-38-09.1,78-56-26.9); (25-38-06.3,78-56-18.7); (25-38-00.6,78-55--55.8)
2152	Uttar Pradesh	Jhansi	(25-36-17.0,78-54-47.5); (25-36-10.7,78-54-26.2); (25-40-21.18,79-0-59.4)
2153	Uttar Pradesh	Jhansi	(25-36-17.0,78-54-47.5); (25-36-10.7,78-54-26.2); (25-36-18.1,78-54-25.0); (25-36-17.3,78-54-31.3)
2154	Uttar Pradesh	Jhansi	(25-19- 45.73,78-31-24.67); (25-19-29.64,78-31-18.69); (25-36-18.1,78-54-25.0); (25-36-17.3,78-54-31.3)
2156	Uttar Pradesh	Jhansi	(25-09-10.92,78-29-10.8) (25-19-30.86,78-31-22.87); (25-19-30.72,78-31-23.52)
2158	Uttar Pradesh	Jhansi	(25-37-57.9,78-56-27.4); (25-38-14.8,78-56-40.8)
2159	Uttar Pradesh	Fatehpur	(25-51-26,80-35-25)
2160	Uttar Pradesh	Jhansi	
2162	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-01-38.36,80-07-34.48)
2163	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-06-39.29,79-58-50.53)
2164	Uttar Pradesh	Jhansi	(25-14-34.3,78-46-64.2); (25-14-16.5,78-46-89.9)
2166	Uttar Pradesh	Forest and Wildlife Division	(25-04-26.85,80-52-10.77); (25-4-29.136,80-52-9.6)
2167	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-01-39.31,80-07-33.98); (26-01-38.69,80-07-33.83); (25-4-25.232,80-52-9.6); (25-4-26.232,80-52-9.306); (25-4-26.568,80-52-11.436)
2168	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-06-38.80,78-58-51.47) (26-01-38.36,80-07-34.48); (26-01-38.78,80-07-34.64)
2169	Uttar Pradesh	Forest and Wildlife Division	(25-01-1.03,80-55-13.6); (25-01-09.8,80-55-13.5)
2170	Uttar	Jhansi	(25-15-24.8,78-34-16.8); (25-15-29.7,78-15-29.7);

	Pradesh		(25-01-09.8,80-55-14.1); (25-01-10.3,80-55-14.1)
2171	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-06-31.21,79-59-06.5); (26-06-39.29,79-58-50.53); (25-15-29.2,78-34-08.0); (25-15-33.9,78-34-02.2)
2172	Uttar Pradesh	Jhansi	(25-11-54.4,78-31-52.6); (25-12-29.2,78-32-06.3); (26-06-38.80,79-58-51.47)
2174	Uttar Pradesh	Chitrakoot	(25-12-21.7,78-32-09.1)
2175	Uttar Pradesh	Jhansi	(25-11-40.8,78-31-35.8); (25-11-44.4,78-31-39.5)
2176	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-00-0.56,80-05-4.82); (26-00-1.07,80-05-14.42); (25-11-46.9,78-31-50.5)
2178	Uttar Pradesh	Jhansi	(25-18-37.5,78-51-03.6); (25-18-50.1,78-51-11.4); (26-00-25.43,80-05-18.04); (26-00-24.7,80-05-18.9)
2181	Uttar Pradesh	Jhansi	(25-11-48.3,78-31-25.4); (25-11-09.3,78-31-26.2)
2182	Uttar Pradesh	Jhansi	(25-40-04.34,79-20-56.08)
2183	Uttar Pradesh	Jhansi	(25-23-10.01,78-41-20.00)
2185	Uttar Pradesh	Baghpat	(28-58-45,77-12-11); (28-58-31,77-12-19)
2187	Uttar Pradesh	Baghpat	(29-11-12.12,77-30-5); (29-11-12.09,77-30-14)
2188	Uttar Pradesh	Baghpat	(29-6-33.69,77-25-41.20); (29-6-34.50,77-25-41.53); (29-11-12.10,77-30-16); (29-11-12.13,77-30-6)
2189	Uttar Pradesh	Social Forestry Division, Urai	(26-13-12,79-34-21) (29-6-33.84,77-25-39.54); (29-6-35.43,77-25-38.79); (29-6-33.74,77-25-45.19)
2190	Uttar Pradesh	Jhansi	(25-36-12.8,78-54-31.7)
2191	Uttar Pradesh	Social Forestry Division, Urai	(26-06-01.29,79-46-38.68); (26-05-25.97,79-47-29.88)
2193	Uttar Pradesh	Social Forestry Division, Urai	(25-49-53.32,79-26-35.60); (25-49-58.05,79-26-42.12); (26-05-20.94,79-47-26.52)
2194	Uttar Pradesh	Social Forestry Division, Urai	(26-05-20.93,79-46-26.50) (25-50-49.7,79-26-41.60); (25-50-28.6,79-24-31.4)
2195	Uttar Pradesh	Social Forestry Division, Urai	(26-28-83.08,79-51-21.73); (26-28-86.09,79-51-31.70)
2196	Uttar Pradesh	Social Forestry Division, Urai	(25-49-53.32,79-26-35.60) (26-28-83,79-51-31.65); (26-28-83.15,79-51-31.55)
2197	Uttar Pradesh	Social Forestry Division, Urai	(26-28-50.04,79-51-20.73)
2198	Uttar Pradesh	Social Forestry Division, Urai	(26-05-20.92,79-46-25.50)
2200	Uttar Pradesh	Social Forestry Division, Urai	(26-19-1.36,79-29-07.2); (26-19-1.58,79-29-01.1)
2201	Uttar Pradesh	Social Forestry Division, Urai	(26-28-83,79-51-31.65) (26-19-1.53,79-29-04.71)
2203	Uttar	Social Forestry	(26-32-46.2,79-52-12.65); (26-32-53.4,79-52-18.45)

	Pradesh	Division, Urai	
2204	Uttar Pradesh	Social Forestry Division, Urai	(26-19-08.16,79-29-072) (26-32-46.02,79-52-18.35); (26-32-46.02,79-52-18.55)
2206	Uttar Pradesh	Social Forestry Division, Urai	(25-54-41.22,79-30-44.92); (25-54-54.06 ,79-30-34.13)
2207	Uttar Pradesh	Social Forestry Division, Urai	(26-32-88.65,79-53-18.46) (25-54-44.04,79-30-29.31); (25-54-41.4,79-30-56.71)
2208	Uttar Pradesh	Social Forestry Division, Urai	(26-25-5.01,79-28-6.65); (26-25-4.25,79-28-5.88)
2209	Uttar Pradesh	Social Forestry Division, Urai	(25-49-18.06,79-09-34.56); (25-49-19.05,79-09-36.54); (26-25-7.29,79-28-03.3); (26-25-6.81,79-28-01.4)
2210	Uttar Pradesh	Social Forestry Division, Urai	(26-05-37.91,79-45-41.96); (26-05-38.24,79-45-40.15)
2211	Uttar Pradesh	Social Forestry Division, Urai	(26-25-4.87,79-28-6.24) (26-05-36.38,79-45-41.29)
2212	Uttar Pradesh	Social Forestry Division, Urai	(25-49-18.06,79-09-34.56)
2213	Uttar Pradesh	Social Forestry Division, Urai	(26-05-35.38,79-45-41.27)
2214	Uttar Pradesh	Social Forestry Division, Urai	(26-24-7.07,79-24-04.0); (26-24-6.34,79-24-2.11)
2215	Uttar Pradesh	Social Forestry Division, Urai	(26-24-6.98,79-24-03.2) (26-24-6.45,79-24-2.44); (26-24-6.65,79-24-1.62)
2216	Uttar Pradesh	Social Forestry Division, Urai	(25-59-27.99,79-50-46.96); (25-59-29.75,79-50-44.76)
2217	Uttar Pradesh	Social Forestry Division, Urai	(25-48-33.54,79-23-19.92); (25-48-33.54,79-23-18.03)
2218	Uttar Pradesh	Social Forestry Division, Urai	(25-54-41.22,79-30-44.92) (25-48-34.68,79-23-15.72); (25-48-35.04,79-23-13.08)
2219	Uttar Pradesh	Social Forestry Division, Urai	(26-23-3.02,79-20-7.77); (26-23-4.17,79-20-7.42)
2220	Uttar Pradesh	Social Forestry Division, Urai	(25-48-33.54,79-23-19.92) (26-23-3.05,79-20-6.85); (26-23-3.60,79-20-6.92)
2221	Uttar Pradesh	Social Forestry Division, Urai	(25-54-41.21,79-30-44.92)
2222	Uttar Pradesh	Social Forestry Division, Urai	(26-23-3.01,79-20-7.75)
2223	Uttar Pradesh	Social Forestry Division, Urai	(26-23-5.36,79-19-6.12); (26-23-6.03,79-19-6.37)
2224	Uttar Pradesh	Social Forestry Division, Urai	(25-48-10.14,79-22-10.74); (25-48-10.74,79-22-15.66); (26-23-6.10,79-19-6.55); (26-23-5.59,79-19-6.74)
2225	Uttar Pradesh	Social Forestry Division, Urai	(25-54-40.21,79-30-43.92) (25-48-17.34,79-22-14.16); (25-48-16.56,79-22-17.28)
2226	Uttar Pradesh	Social Forestry Division, Urai	(25-48-10.14,79-22-10.74)
2227	Uttar Pradesh	Social Forestry Division, Urai	(25-48-09.03,79-20-44.88); (25-48-10.02,79-20-43.02)
2228	Uttar	Social Forestry	(25-47-51.1,79-27-35.3); (25-47-35.1,79-27-12.2);

	Pradesh	Division, Urai	(25-48-10.32,79-20-40.8); (25-48-11.46,79-20-38.52)
2229	Uttar Pradesh	Social Forestry Division, Urai	(25-48-09.03,79-20-44.88) (25-47-54.9,79-27-34.9); (25-47-17.3,79-46-03.88)
2231	Uttar Pradesh	Social Forestry Division, Urai	(26-49-48.18,79-12-26.7); (26-49-49.38,79-12-21.78)
2232	Uttar Pradesh	Social Forestry Division, Urai	(26-05-24.94,79-47-30.54); (26-05-25.97,79-47-29.88); (26-49-37.68,26-49-37.68)
2233	Uttar Pradesh	Social Forestry Division, Urai	(26-49-48.18,79-12-27.3) (26-05-20.94,79-47-26.52)
2234	Uttar Pradesh	Social Forestry Division, Urai	(26-05-20.93,79-46-26.50)
2236	Uttar Pradesh	Social Forestry Division, Urai	(25-47-51.1,79-27-35.3)
2237	Uttar Pradesh	Social Forestry Division, Urai	(26-05-20.92,79-46-25.50)
2238	Uttar Pradesh	Social Forestry Division, Urai	(25-53-29.7,79-33-57.7); (25-53-28.9,79-33-56.1)
2239	Uttar Pradesh	Social Forestry Division, Urai	(25-53-1.00,79-33-56.01) (25-53-10.2,79-33-58.1); (25-53-1.00,79-33-56.01)
2240	Uttar Pradesh	Social Forestry Division, Urai	(25-55-30.1,79-34-42.8); (25-55-29.2,79-34-30.1)
2241	Uttar Pradesh	Social Forestry Division, Urai	(26-26-46.56,79-05-34.56); (26-26-02.76,79-10-11.28); (25-55-21.1,79-34-31.1); (25-55-28.9,79-34-28.1)
2243	Uttar Pradesh	Social Forestry Division, Urai	(26-26-28.2,79-10-11.28) (26-25-31.26,79-09-31.14)
2244	Uttar Pradesh	Social Forestry Division, Urai	(26-8-2.8,79-1-19.5); (26-8-9.4,79-1-00.2)
2245	Uttar Pradesh	Social Forestry Division, Urai	(26-04-22.53,79-54-25.92); (26-04-58.89,79-53-58.32); (26-8-1.6,79-01-00.3); (26-07-52.7,79-01-10.5)
2246	Uttar Pradesh	Social Forestry Division, Urai	(25-55-28.9,79-34-28.1) (26-06-40.58,79-55-57.98); (26-04-27.29,79-56-16.22)
2247	Uttar Pradesh	Social Forestry Division, Urai	(26-25-48.7,79-79-12.127); (26-25-45.66,79-12-30.84)
2248	Uttar Pradesh	Social Forestry Division, Urai	(26-04-22.53,79-54-25.92) (26-25-44.76,79-12-50.88); (26-25-18.36,79-12-57.72)
2249	Uttar Pradesh	Social Forestry Division, Urai	(26-08-49.6,79-01-11.5)
2250	Uttar Pradesh	Social Forestry Division, Urai	(26-25-44.76,79-12-50.88)
2251	Uttar Pradesh	Social Forestry Division, Urai	(25-50-55.02,79-32-51.6); (25-51-00.71,79-32-49.91)
2252	Uttar Pradesh	Social Forestry Division, Urai	(26-25-44.76,79-12-50.82) (25-51-55.67,79-32-51.92); (25-51-23.6,79-32-20.9)
2253	Uttar Pradesh	Social Forestry Division, Urai	(25-50-55.2,79-32-51.06)
2254	Uttar Pradesh	Social Forestry Division, Urai	(26-24-30.3,79-11-54.78); (26-24-52.92,79-12-14.46)
2255	Uttar Pradesh	Social Forestry Division, Urai	(25-50-55.05,79-32-21.06); (25-51-00.71,79-32-49.91); (26-25-07.56,79-12-05.82); (26-25-20.34,79-

			11.-45.51)
2256	Uttar Pradesh	Social Forestry Division, Urai	(26-04-58.89,79-53-58.32) (25-51-55.67,79-32-51.92); (25-51-23.6,79-32-20.9)
2258	Uttar Pradesh	Social Forestry Division, Urai	(25-52-63.62,79-29-82.109); (25-52-62.7,79-29-86.26) ( )
2259	Uttar Pradesh	Social Forestry Division, Urai	(26-25-07.5,79-11-05.82) (25-52-63.78,79-29-92.10); (25-51-14.7,79-31-24.1)
2260	Uttar Pradesh	Jalaun	(26-06-40.58,79-55-57.98)
2261	Uttar Pradesh	Social Forestry Division, Urai	(25-51-14.7,79-31-24.1)
2262	Uttar Pradesh	Social Forestry Division, Urai	(26-08-01.6,79-01-00.3);(26-07-52.7,79-01-10.5)
2264	Uttar Pradesh	Social Forestry Division, Urai	(26-06-59.1,79-40-57.2); (26-06-43.1,79-41-08.9)
2266	Uttar Pradesh	Social Forestry Division, Urai	(26-06-33.2,79-41-54.7) (26-06-59.1,79-40-57.2); (26-06-32.6,79-41-54.5)
2267	Uttar Pradesh	Social Forestry Division, Urai	(25-51-13.7,79-31-24.1)
2268	Uttar Pradesh	Social Forestry Division, Urai	(26-06-20.8,79-43-19.7); (26-06-19.9,79-43-08.8)
2269	Uttar Pradesh	Social Forestry Division, Urai	(26-13-11.3,79-34-20.1) (26-05-29.0,79-44-21.4); (26-05-46.0,79-44-04.6)
2270	Uttar Pradesh	Social Forestry Division, Urai	(26-05-16.7,79-43-35.3)
2271	Uttar Pradesh	Social Forestry Division, Urai	(26-07-15.5,79-00-30.7); (26-07-16.9,79-00-37.9)
2272	Uttar Pradesh	Social Forestry Division, Urai	(26-07-29.8,79-00-17.0); (26-07-41.4,79-00-21.0)
2273	Uttar Pradesh	Social Forestry Division, Urai	(26-06-28.9,79-43-29.2)
2274	Uttar Pradesh	Social Forestry Division, Urai	(26-07-49.2,79-00-31.2)
2276	Uttar Pradesh	Social Forestry Division, Urai	(26-08-37.1,79-41-25.00); (26-07-40.1,79-43-53.4)
2277	Uttar Pradesh	Social Forestry Division, Urai	(26-23.86-00,79-10.59-00); (26-24.22.00,79-10-26.88); (26-06-45.4,79-44-15.60); (26-08-26.3,79-42-27.9)
2279	Uttar Pradesh	Social Forestry Division, Urai	(26-05-44.8,79-01-3.3); (26-05-34.4,79-40-57.4)
2280	Uttar Pradesh	Social Forestry Division, Urai	(26-24-13.08,79-10-26.76) (26-05-24.3,79-00-54.7); (26-05-25.9,79-00-59.4)
2281	Uttar Pradesh	Social Forestry Division, Urai	(26-08-17.4,79-42-04.5)
2282	Uttar Pradesh	Social Forestry Division, Urai	(25-51-00.71,25-51-00.71); (25-51-55.67,25-51-55.67)
2283	Uttar Pradesh	Social Forestry Division, Urai	(26-05-26.8,79-00-43.4) (25-51-23.6,79-32-20.9)
2284	Uttar Pradesh	Social Forestry Division, Urai	(26-07-32.2,79-42-15.8); (26-07-31.7,79-42-16.6)

2285	Uttar Pradesh	Social Forestry Division, Urai	(26-06-14.2,79-00-34.2); (26-05-52.5,79-00-10.4); (26-07-12.6,79-40-34.00); (26-07-57.8,79-41-4.5)
2286	Uttar Pradesh	Social Forestry Division, Urai	(26-10-06.00,79-40.36-00); (26-10-12.09,79-14-24.15); (26-05-56.1,79-00-17.5); (26-06-11.5,79-00-27.5)
2287	Uttar Pradesh	Social Forestry Division, Urai	(26-07-36.6,79-31-07.43) (26-10-20.0,79-40-36)
2288	Uttar Pradesh	Social Forestry Division, Urai	(26-06-13.6,79-00-18.5)
2289	Uttar Pradesh	Social Forestry Division, Urai	(26-09-12.04,79-45-45)
2291	Uttar Pradesh	Social Forestry Division, Urai	(26-24-29.04,79-23-36.06); (26-24-27.54,79-23-36.18)
2292	Uttar Pradesh	Jalaun	(26-24-32.82,79-23-14.52); (26-24-31.02,79-23-13.02)
2293	Uttar Pradesh	Social Forestry Division, Urai	(26-05-50.9,79-00-10.1); (26-05-40.9,79-00-10.7)
2294	Uttar Pradesh	Social Forestry Division, Urai	(26-24-28.86,79-23-36.9) (26-05-38.2,79-00-17.4); (26-05-48.8,79-00-12.4)
2296	Uttar Pradesh	Social Forestry Division, Urai	(26-10-15.00,79-40-26) (30-46-50.05,77-51-02.48); (30-46-50.02,77-50-53.08)
2306	Uttar Pradesh	Social Forestry Division, Urai	(26-06-14.2,79-00-34.1);(26-05-56.1,79-00-17.5)
2309	Uttar Pradesh	Social Forestry Division, Urai	(26-05-50.2,79-00-14.5)
2310	Uttar Pradesh	Social Forestry Division, Urai	(26-13-48,79-45-44); (26-12-11.74,79-45-54); (26-13-55,79-45-52); (26-13-35,79-45-30)
2311	Uttar Pradesh	Social Forestry Division, Urai	(26-05-20.90,79-47-24.54)
2312	Uttar Pradesh	Social Forestry Division, Urai	(26-05-20.90,79-47-24.54)
2313	Uttar Pradesh	Social Forestry Division, Urai	(26-05-50.9,79-00-10);(26-05-40.9,79-00-10.7)
2315	Uttar Pradesh	Social Forestry Division, Urai	(26-05-38.2,79-00-14.4);(26-05-48.8,79-00-12.4)
2318	Uttar Pradesh	Social Forestry Division, Urai	(25-48-10.14,79-22-10.74); (25-48.10.74,79-22-15.66); (25-48-17.34,79-22-14.16); (25-48-16.56,79-22-17.28)
2319	Uttar Pradesh	Social Forestry Division, Urai	(26-14-48,79-45-44)
2320	Uttar Pradesh	Social Forestry Division, Urai	(26-08-44.8,79-00-35.4); (26-08-59.4,79-01-7.2); (26-09-04.4,79-01-4.6); (26-09-7.7,79-00-48.7)
2323	Uttar Pradesh	Social Forestry Division, Urai	(26-09-10.2,79-00-49.2)
2324	Uttar Pradesh	Lalitpur	(25-11-36.1,78-33-36.6); (25-11-36.6,78-33-36.0); (25-11-36.11,78-33-35.4)
2325	Uttar Pradesh	Lalitpur	(25-07-50.68,78-30-47.30)
2328	Uttar Pradesh	Lalitpur	(25-06-26.51,78-30-25.90); (25-06-11.8,78-30-32.24)

2330	Uttar Pradesh	Lalitpur	(25-07-26.2,78-29-57.4); (25-07-14.69,78-29-24.67); (25-07-33.2,78-29-59.9)
2331	Uttar Pradesh	Lalitpur	(25-06-51.3,78-27-26.2); (25-06-45.5,78-27-18.8)
2332	Uttar Pradesh	Social Forestry Division, Urai	(26-09-04.4,79-01-04.6);(26-09-7.7,79-00-48.7)
2334	Uttar Pradesh	Lalitpur	(25-06-51.4,78-27-00.03)
2335	Uttar Pradesh	Social Forestry Division, Urai	(26-13-48,79-45-46)
2336	Uttar Pradesh	Lalitpur	(25-07-29.0,78-28-2); (25-06-51.0,78-27-0)
2338	Uttar Pradesh	Lalitpur	(24-51-11.2,78-10-40.3); (24-51-26.1,78-10-34.2); (24-51-34.6,78-10-41.3); (24-51-39.0,78-10-47.2)
2339	Uttar Pradesh	Social Forestry Division, Urai	(26-16-55,79-36-43); (26-16-42.6,79-36.57-00); (26-16-60,79-36-35); (26-16.45-00,79-36.65-00)
2340	Uttar Pradesh	Lalitpur	(24-51-11.2,78-10-40.3); (24-51-26.1,78-10-34.2); (24-51-34.6,78-10-41.3); (24-51-39.0,78-10-47.2)
2341	Uttar Pradesh	Social Forestry Division, Urai	(26-13-28,79-34-18); (26-13-19,79-34-25); (26-13-12,79-34-20); (26-13-25,79-13-35)
2342	Uttar Pradesh	Lalitpur	(24-51-28.2,78-11-38.1); (24-51-13.4,78-11-30.0); (24-57-06.5,78-11-28.3); (24-57-07.3,78-11-09.8)
2343	Uttar Pradesh	Lalitpur	(24-56-02.3,78-15-25.4); (24-56-17.1,78-15-43.4); (24-56-21.5,78-16-20.2); (24-56-11.3,78-16-17.2)
2344	Uttar Pradesh	Lalitpur	(24-57-38.2,78-17-44.3); (24-57-34.3,78-17-51.2); (24-57-39.2,78-17-51.4); (24-57-37.2,78-18-01.2)
2345	Uttar Pradesh	Lalitpur	(24-58-18.2,78-18-24.3); (24-58-09.3,78-18-33.2); (24-58-13.2,78-18-37.4); (24-58-22.1,78-18-47.3)
2346	Uttar Pradesh	Saharanpur	(29-59-51.24,77-41-26.88); (29-59-52.56,77-41-25.02); (29-59-54.36,77-41-21.03)
2347	Uttar Pradesh	Social Forestry Division, Urai	(26-07-29.8,79-00-17.0);(26-07-41.4,79-00-21)
2350	Uttar Pradesh	Social Forestry Division, Urai	(26-05-24.3,79-00-54.7),(26-05-25.9,79-00-59.4)
2352	Uttar Pradesh	Shivalik	(30-12-42.54,77-47-27.78)
2355	Uttar Pradesh	Saharanpur	(29-57-58.56,77-39-4.56); (29-57-57.06,77-39-06.96); (29-57-56.16,77-39-09.42); (29-58-0.06,77-39-12.06)
2356	Uttar Pradesh	Saharanpur	(29-57.-33.96,77-38-36); (29-57-36.42,77-38-39.78); (29-57-36.84,77-38-41.7); (29-57-38.28,77-38-44.16)
2359	Uttar Pradesh	Fatehpur	(25-44-31,80-34-56)
2361	Uttar Pradesh	Shivalik	(30-14-33.24,77-48-41.7); (30-14-30.84,77-48-43.62); (30-11-28.44,77-48-43.47)
2362	Uttar Pradesh	Shivalik	(30-14-33.24,77-48-41.7); (30-14-30.84,77-48-43.62); (30-11-28.44,77-48-43.74)
2364	Uttar Pradesh	Kaushambi	(25-21-18,81-19-2)
2366	Uttar Pradesh	Kaushambi	(25-20-45,81-36-40)

2367	Uttar Pradesh	Shivalik	(30-13-17.82,77-47-45); (30-17-11.64,77-47-42); (30-13-04.74,77-47-38.7)
2370	Uttar Pradesh	Shivalik	(30-13-23.82,77-47-45); (30-17-11.64,77-47-42); (30-13-47.4,77-47-38.7)
2372	Uttar Pradesh	Shivalik	(30-15-24.96,77-49-25.74); (30-15-27.82,77-49-26.76)
2379	Uttar Pradesh	GautamBudhha Nagar	(28-12-0.47,77-32-57);(28-11-0.49,77-33-29);(28-11-0.30,77-32-58)
2380	Uttar Pradesh	Baghpat	(28-53-38,77-24-36); (28-53-44,77-24-33); (28-53-51,77-24-37); (28-53-47,77-24-47); (28-53-42,77-24-51)
2381	Uttar Pradesh	Shivalik	(30-09-45.25,77-46-49.24); (30-09-46.33,77-46-48.20); (30-09-50.59,77-46-45.90); (30-09-56.44,77-46-47.40)
2382	Uttar Pradesh	Shivalik	(30-10-56.85,77-53-33.58); (30-10-57.43,77-53-32.37); (30-10-57.15,77-53-32.02); (30-11-30.98,77-53-00.04); (30-11-32.46,77-52-59.04); (30-11-27.86,77-53-07.37)
2383	Uttar Pradesh	Baghpat	(29-11-13.0,77-27-17); (29-11-11.0,77-27-19); (29-11-19.0,77-27-18); (29-11-11.0,77-27-16)
2385	Uttar Pradesh	Baghpat	(28-58-22,77-27-59); (28-58-16,77-28-01); (28-57-38,77-28-18); (28-57-34,77-28-14); (28-57-31,77-28-12)
2386	Uttar Pradesh	Meerut	(29-11-04.24,77-30-37.91)
2387	Uttar Pradesh	Shivalik	(30-10-40.24,77-54-21.44); (30-10-40.67,77-54-22.34); (30-10-41.15,77-54-22.99); (30-10-41.41,77-54-23.63); (30-10-41.91,77-54-24.39)
2388	Uttar Pradesh	Shamli	(29-35-40.77,77-6-40.75); (29-35-41.21,77-6-40.07); (29-33-45.44,77-7-51.46); (29-33-45.66,77-7-52.07); (29-38-12.62,77-8-13.06); (29-38-12.55,77-8-17.40)
2389	Uttar Pradesh	Baghpat	(28-57-31,77-28-14); (28-57-29,77-28-15); (28-57-27,77-28-14); (28-57-28,77-28-12)
2391	Uttar Pradesh	Saharanpur	(30-10-41.91,77-54-24.39); (30-10-42.13,77-54-25.37); (30-10-42.16,77-54-26.58); (30-10-42.96,77-54-28.03)
2392	Uttar Pradesh	Baghpat	(28-50-44,77-24-39); (28-50-37,77-24-18); (28-50-29,77-24-21); (28-50-31,77-24-36); (28-50-28,77-24-43); (28-50-24,77-24-45); (28-50-1977-24-49);
2395	Uttar Pradesh	Baghpat	(28-55-13,77-26-44); (28-55-06,77-26-01); (28-54-43,77-25-49); (28-54-34,77-25-40); (28-54-30,77-25-38)
2399	Uttar Pradesh	Baghpat	(28-47-57,77-23-49); (28-47-57,77-23-29); (28-47-55,77-23-25); (28-47-50,77-23-22); (28-47-46,77-23-26)
2400	Uttar Pradesh	Shivalik	(30-10-25.91,77-50-20.96); (30-10-32.52,77-50-26.82); (30-10-07.99,77-50-19.28); (30-10-34.60,77-52-53.13)
2402	Uttar Pradesh	Shamli	(29-22-35.58,77-09-20.68); (29-37-39.31,77-8-5.03); (29-35-20.53,77-6-34)
2403	Uttar	Baghpat	(28-59-28,77-27-31); (28-59-19,77-27-44); (28-59-

	Pradesh		13,77-27-54); (28-59-23,77-27-44); (28-59-28,77-27-38); (28-59-05,77-27-49)
2405	Uttar Pradesh	Jhansi	(25-36-17.00,78-54-47.50)
2408	Uttar Pradesh	Shivalik	(30-22-06.35,77-36-14.19); (30-22-05.15,77-36-15.91)
2409	Uttar Pradesh	Shivalik	(30-10-34.50,77-52-32.34); (30-10-34.19,77-52-31.53); (30-10-33.78,77-52-24.72)
2410	Uttar Pradesh	Shivalik	(30-22-05.04,77-36-16.13); (30-22-03.72,77-36-17.71)
2411	Uttar Pradesh	Shivalik	(30-22-19.82,77-37-48.46); (30-22-18.63,77-37-46.70)
2412	Uttar Pradesh	Jhansi	(25-40-22.68,79-01-1.32); (25-40-21.78,79-01-0.48); (25-40-21.18,79-00-59.4)
2413	Uttar Pradesh	Lalitpur	(24-51-11.2,78-10-40.3); (24-51-26.1,78-10-34.2); (24-51-34.6,78-10-41.3); (24-51-39.0,78-10-47.2)
2414	Uttar Pradesh	Lalitpur	(24-51-11.2,78-10-40.3); (24-51-26.1,78-10-34.2); (24-51-34.6,78-10-41.3); (24-51-39.0,78-10-47.2)
2415	Uttar Pradesh	Jhansi	(25-36-17.0,78-54-47.5); (25-36-10.7,78-54-26.2); (25-36-18.1,78-54-25.0); (25-36-17.3,78-54-31.3)
2416	Uttar Pradesh	Lalitpur	(24-51-28.2,78-11-38.1); (24-51-13.4,78-11-30.0); (24-51-06.5,78-11-28.3); (24-51-07.3,78-11-09.8); (24-51-05.3,78-10-44.3)
2418	Uttar Pradesh	Social Forestry Division, Urai	(25-49-18.6,79-09-34.56); (25-49-19.5,79-09-35.94); (25-49-20.52,79-09-36.54); (25-49-20.52,79-09-37.56)
2420	Uttar Pradesh	Jhansi	(26-36-17.0,78-54-26.3); (25-36-18.2,78-54-25.0); (25-36-18.1,78-54-25); (25-36-17.3,78-54-31.3); (25-36-10.3,78-54-45.0); (25-36-08.3,78-54-39.8); (25-36-14.978-54-32.8); (25-36-06.578-54-21.6)
2421	Uttar Pradesh	Lalitpur	(24-56-02.3,78-15-25.4); (24-56-17.1,78-15-43.4); (24-56-21.5,78-16-20.2); (24-56-11.3,78-16-17.2)
2422	Uttar Pradesh	Lalitpur	(24-56-02.3,78-15-25.4); (24-56-17.1,78-15-43.4); (24-56-21.5,78-16-20.2); (24-56-11.3,78-16-17.2); (24-56-05.6,78-16-09.6); (24-56-03.6,78-15-55.2)
2424	Uttar Pradesh	Jhansi	(25-23-48.30,78-40-55.70)
2425	Uttar Pradesh	Lalitpur	(24-57-38.2,78-17-44.3); (24-57-34.3,78-17-51.2); (24-57-39.2,78-17-51.4); (24-57-37.2,78-18-01.2)
2426	Uttar Pradesh	Lalitpur	(24-57-38.2,78-17-44.3); (24-57-34.3,78-17-51.2); (24-57-39.2,78-17-51.4); (24-57-37.2,78-18-01.2)
2428	Uttar Pradesh	Lalitpur	(24-57-38.2,78-17-44.3); (24-57-34.3,78-17-51.2); (24-57-39.2,78-17-51.4); (24-57-37.2,78-18-01.2)
2429	Uttar Pradesh	Jhansi	(25-24-04.50,78-40-55.80)
2430	Uttar Pradesh	Social Forestry Division, Urai	(25-48-33.54,79-23-19.92); (25-48-33.54,79-23-18.3); (25-48-34.68,79-23-15.72); (25-48-35.04,79-23-13.08)
2431	Uttar Pradesh	Jhansi	(25-23-56.70,78-40-53.80)
2433	Uttar Pradesh	Lalitpur	(24-57-38.2,78-17-44.3); (24-57-34.3,78-17-51.2); (24-57-39.2,78-17-51.4); (24-57-37.2,78-18-01.2);

			(24-57-23.2,78-17-52.3); (24-57-07.3,78-17-48.4)
2434	Uttar Pradesh	Jhansi	(25-46-11.38,79-17-08.19); (25-46-20.85,79-16-59.28); (25-46-29.406,79-17-05.274); (25-46-20.838,79-17-16.047)
2435	Uttar Pradesh	Lalitpur	(24-58-18.2,78-18-24.3); (24-58-09.3,78-18-33.2); (24-58-13.2,78-18-37.4); (24-58-22.1,78-18-47.3)
2436	Uttar Pradesh	Jhansi	(25-11-54.54,78-31-53.07); (25-12-12.54,78-32-17.76); (25-12-23.22,78-32-03.96)
2437	Uttar Pradesh	Jhansi	(25-14-34.3,78-46-38.04); (25-14-16.5,78-46-53.04)
2440	Uttar Pradesh	Shivalik	(30-22-30.13,77-37-01.65); (30-22-29.64,77-37-04.51)
2442	Uttar Pradesh	Social Forestry Division, Urai	(25-48-10.14,79-22-10.74); (25-48-10.74,79-22-15.66); (25-48-17.34,79-22-14.16); (25-48-16.56,79-22-17.28)
2444	Uttar Pradesh	Social Forestry Division, Urai	(25-48-10.14,79-22-10.74); (25-48-10.74,79-22-15.66); (25-48-17.34,79-22-14.16); (25-48-16.56,79-22-17.28)
2446	Uttar Pradesh	Shivalik	(30-22-40.90,77-36-50.42); (30-22-29.64,77-36-48.56)
2448	Uttar Pradesh	Shivalik	(30-22-41.91,77-36-48.26); (30-22-43.12,77-36-45.16)
2450	Uttar Pradesh	Jhansi	(25-11-54.54,78-31-53.07); (25-12-12.54,78-32-17.76); (25-12-23.22,78-32-03.96)
2451	Uttar Pradesh	Shivalik	(30-22-24.67,77-36-16.60); (30-22-25.17,77-36-14.35)
2453	Uttar Pradesh	Social Forestry Division, Urai	(25-48-9.3,79-20-44.88); (25-48-10.02,79-20-43.02); (25-48-10.32,79-20-40.8)
2454	Uttar Pradesh	Shivalik	(30-22-25.23,77-36-14.21); (30-22-25.71,77-36-12.03)
2456	Uttar Pradesh	Shivalik	(30-22-25.79,77-36-11.77); (30-22-26.38,77-36-9.67)
2458	Uttar Pradesh	Jhansi	(25-10-40.74,78-30-23.58)
2459	Uttar Pradesh	Shivalik	(30-22-26.48,77-36-9.45); (30-22-27.43,77-36-7.53)
2460	Uttar Pradesh	Shivalik	(30-22-27.52,77-36-7.39); (30-22-28.5,77-36-6.46)
2461	Uttar Pradesh	Shivalik	(30-22-31.54,77-36-25.10); (30-22-29.52,77-36-24.40)
2462	Uttar Pradesh	Shivalik	(30-22-33.52,77-36-25.10); (30-22-31.63,77-36-25.22)
2463	Uttar Pradesh	Shivalik	(30-20-33.22,77-40-34.08); (30-20-31.44,77-40-33.39)
2465	Uttar Pradesh	Social Forestry Division, Urai	(26-49-48.18,79-12-27.3); (26-49-49.38,79-12-21.78); (26-49-42.54,79-12-19.5)
2466	Uttar Pradesh	Shivalik	(30-20-30.71,77-40-32.98); (30-20-30.38,77-40-31.89)
2467	Uttar Pradesh	Shivalik	(30-20-25.98,77-40-29.10); (30-20-24.20,77-40-28.49)

2468	Uttar Pradesh	Shivalik	(30-20-10.24,77-37-44.25); (30-20-9.41,77-37-44.66)
2469	Uttar Pradesh	Shivalik	(30-20-5.01,77-37-46.59); (30-20-7.82,77-37-45.73)
2470	Uttar Pradesh	Shivalik	(30-10-40.14,77-54-2.34); (30-10-40.57,77-54-22.24)
2471	Uttar Pradesh	Shivalik	(30-10-25.81,77-50-20.86); (30-10-32.42,77-50-26.72)
2472	Uttar Pradesh	Shivalik	(30-12-50.10,77-37-46.77); (30-13-8.19,77-44-32.42)
2473	Uttar Pradesh	Shivalik	(30-10-56.75,77-53-33.58); (30-10-57.43,77-54-32.29)
2474	Uttar Pradesh	Shivalik	(30-9-6.21,77-51-55.42); (30-09-25.79,77-52-11.04)
2475	Uttar Pradesh	Shivalik	(30-09-45.15,77-40-49.14); (30-9-46.23,77-46-48.10)
2476	Uttar Pradesh	Shivalik	(30-14-42.11,77-43-55.03); (30-14-42.71,77-43-58.60)
2477	Uttar Pradesh	Shivalik	(30-14-42.71,77-43-58.60); (30-14-44.11,77-44-1.96)
2478	Uttar Pradesh	Saharanpur	(30-14-58.56,77-49-13.02)
2479	Uttar Pradesh	Shivalik	(30-14-44.11,77-44-1.96); (30-14-46.02,77-44-4.83)
2481	Uttar Pradesh	Shivalik	(30-14-46.02,77-44-4.83); (30-14-47.69,77-44-7.96)
2482	Uttar Pradesh	Shivalik	(30-14-47.69,77-44-7.96); (30-14-49.91,77-44-10.23)
2483	Uttar Pradesh	Shivalik	(30-14-49.91,77-44-10.23); (30-14-51.82,77-44-13.55)
2484	Uttar Pradesh	Shivalik	(30-15-50.14,77-42-24.83); (30-15-51.08,77-42-29.31)
2485	Uttar Pradesh	Shivalik	(30-09-06.31,77-51-55.52); (30-09-25.89,77-52-21.04); (30-09-34.32,77-52-28.80); (30-09-54.67,)
2486	Uttar Pradesh	Shivalik	(30-15-51.08,77-42-29.31); (30-15-53.48,77-42-31.67)
2487	Uttar Pradesh	Shivalik	(30-15-53.48,77-42-31.67); (30-15-56.64,77-42-33.56)
2488	Uttar Pradesh	Saharanpur	(29-57-58.56,77-39-4.56); (29-57-57.06,77-39-6.96); (29-57-56.16,77-39-9.42)
2489	Uttar Pradesh	Shivalik	(30-15-56.64,77-42-33.56); (30-15-59.35,77-42-35.19)
2490	Uttar Pradesh	Shivalik	(30-15-59.35,77-42-35.19); (30-15-2.10,77-42-37.59)
2491	Uttar Pradesh	Shivalik	(30-15-2.10,77-42-37.59); (30-15-5.81,77-42-38.77)
2492	Uttar Pradesh	Shivalik	(30-15-5.81,77-42-38.77); (30-15-9.65,77-42-39.50)
2493	Uttar Pradesh	Shivalik	(30-15-9.65,77-42-39.50); (30-16-12.70,77-42-39.50)

2494	Uttar Pradesh	Shivalik	(30-15-12.70,77-42-39.05); (30-16-16.54,77-42-38.41)
2495	Uttar Pradesh	Shivalik	(30-14-14.53,77-44-53.98); (30-14-11.26,77-44-52.69)
2496	Uttar Pradesh	Shivalik	(30-14-11.16,77-44-52.20); (30-14-8.36,77-44-50.60)
2497	Uttar Pradesh	Saharanpur	(29-57-33.96,77-38-36); (29-57-36.42,77-38-39.78); (29-57-36.84,77-38-41.7)
2498	Uttar Pradesh	Shivalik	(30-14-8.36,77-44-50.60); (30-14-5.26,77-44-50.29)
2499	Uttar Pradesh	Shivalik	(30-14-5.26,77-44-50.29); (30-14-2.50,77-44-49.31)
2500	Uttar Pradesh	Shivalik	(30-14-2.50,77-44-49.31); (30-14-00.00,77-44-46.92)
2501	Uttar Pradesh	Shivalik	(30-14-00.00,77-44-46.92); (30-13-56.86,77-44-44.97)
2502	Uttar Pradesh	Shivalik	(30-14-56.86,77-44-44.97); (30-13-54.14,77-44-42.96)
2504	Uttar Pradesh	Shivalik	(30-13-53.45,77-44-43.22); (30-13-50.27,77-44-41.54)
2505	Uttar Pradesh	Shivalik	(30-13-50.22,77-44-41.54); (30-13-48.40,77-44-38.32)
2506	Uttar Pradesh	Chitrakoot	(25-14-5.5,81-6-10.6); (25-14-2.3,81-5-57.3); (25-14-0.4,81-5-52.2); (25-14-14.4,81-6-3.0)
2507	Uttar Pradesh	Shivalik	(30-13-48.40,77-44-38.32); (30-13-45.13,77-44-36.72)
2508	Uttar Pradesh	Shivalik	(30-13-45.13,77-44-36.72); (30-13-42.27,77-44-35.11)
2509	Uttar Pradesh	Shivalik	(30-13-42.27,77-44-35.11); (30-13-39.44,77-44-33.20)
2510	Uttar Pradesh	Raipura	(25-14-5.5,81-6-10.6); (25-14-2,3,81-5-57.3); (25-14-0.4,81-5-52.2); (25-14-14.4,81-6-3); (25-14-26.9,81-5-43.9)
2511	Uttar Pradesh	Raipura	(25-14-5.5,81-6-10.6); (25-14-2.3,81-5-57.3); (25-14-0.4,81-5-52.2); (25-14-14.4,81-6-3.0)
2512	Uttar Pradesh	Raipura	(25-14-5.5,81-06-10.6); (25-14-2.3,81-5-57.3); (25-14-0.4,81-05-52.2); (25-14-14.4,81-06-3.0)
2513	Uttar Pradesh	Jhansi	(25-23-48.3,78-40-55.7); (25-23-54.3,78-40-46.1); (25-23-57.7,78-40-50.4); (25-24-04.5,78-40-55.8); (25-24-08.1,70-40-04.1); (25-23-58.1,78-41-00.2); (25-23-58.378-41-12.7); (25-23-55.078-41-04.8)
2514	Uttar Pradesh	Raipura	(25-14-5.5,81-6-10.6); (25-14-2.3,81-5-57.3); (25-14-0.4,81-5-52.2); (25-14-14.4,81-06-3.0)
2515	Uttar Pradesh	Muzaffarnagar	(29-14-06.7,77-31-14.0)
2516	Uttar Pradesh	Muzaffarnagar	
2517	Uttar Pradesh	Baghpat	(28-58-45,77-12-11); (28-58-21,77-12-11); (28-58-26,77-12-33); (28-58-47,77-12-13)
2518	Uttar	Shamli	(29-21-30,77-9-15); (29-22-15,77-10-0)

	Pradesh		
2519	Uttar Pradesh	Shamli	(29-26-32.34,77-09-6.54); (29-26-34.44,77-09-06.06)
2520	Uttar Pradesh	Muzaffarnagar	(29-34-49.792,77-42-43.77); (29-35-45.753,77-43-22.414)
2521	Uttar Pradesh	Forest and Wildlife Division Chitrakoot	(25-04-26.85,80-52-10.77); (25-4-29.136,80-52-9.6); (25-4-26.232,80-52-9.306); (25-4-26.664,80-52-6.792); (25-4-26.568,80-52-11.436); (25-4-24.594,80-52-10.434)
2522	Uttar Pradesh	Forest and Wildlife Division Chitrakoot	(25-04-26.85,80-52-10.77); (25-4-29.136,80-52-9.6); (25-4-26.232,080-52-9.306); (25-4-26.664,80-52-6.792); (25-4-26.568,80-52-11.436); (25-4-24.594,80-52-10.434)
2523	Uttar Pradesh	Shamli	(29-35-40.77,77-06-40.75); (29-35-41.21,77-06-40.07); (29-33-45.44,77-07-51.46); (29-34-30.04,77-07-13.92); (29-34-29.53,)
2525	Uttar Pradesh	Jhansi	(25-19- 45.73,78-31-24.67); (25-19-29.64,78-31-18.69); (25-19-30.86,78-31-22.87); (25-19-30.72,78-31-23.52)
2526	Uttar Pradesh	Muzaffarnagar	(29-34-49.792,77- 42-43.77-); (29-35-45.753,77-43-22.414)
2527	Uttar Pradesh	Shamli	(29-38-12.62,77-08-13.06); (29-38-12.55,77-08-17.40); (29-37-49.15,77-08-15.03); (29-38-4.98,77-08-16.61); (29-38-7.58,77-08-19.03)
2528	Uttar Pradesh	Jhansi	(25-32-93.7,78-52-35.2); (25-32-49.0,78-52-18.6); (25-32-52.4,78-52-30.2); (25-32-5.2,78-52-32.0); (25-33-02.8,78-52-34.4)
2529	Uttar Pradesh	Muzaffarnagar	(29-32-09.73,77-41-48.03); (29-30-13.08,77-40-14.22); (29-30-0.24,77-40-22.92); (29-28.16-00,77-40-06.6)
2530	Uttar Pradesh	Forest and Wildlife Division	(25-01-1.03,80-55-13.6); (25-01-09.8,80-55-13.5); (25-01-09.8,80-55-14.1); (25-01-10.3,80-55-14.1)
2531	Uttar Pradesh	Jhansi	(25-32-93.7,78-52-35.2); (25-32-49.0,78-52-18.6); (25-32-52.4,78-52-30.2); (25-32-55.2,78-52-32.0)
2532	Uttar Pradesh	Jhansi	(25-37-57.9,78-56-27.4); (25-38-14.8,78-56-40.8); (25-38-14.5,78-56-32.8); (25-38-01.1,78-56-26.9)
2533	Uttar Pradesh	Sankargarh	(25-10-20.13,81-19-50.68); (25-10-20.03,81-20-21.12)
2534	Uttar Pradesh	Forest and Wildlife Division Chitrakoot	(25-01-1.03,80-55-13.6); (25-01-9.8,80-55-13.5); (25-01-09.8,80-55-14.1); (25-01-10.3,80-55-14.1)
2535	Uttar Pradesh	Jhansi	(25-37-57.9,78-56-27.4); (25-38-14.8,78-56-40.8); (25-38-14.5,78-56-32.8); (25-38-01.1,78-56-26.9)
2536	Uttar Pradesh	Muzaffarnagar	(29-32-09.78,77-41-48.03); (29-30-13.08,77-40-14.22); (29-30-02.04,77-40-22.92); (29-28-09.06,77-40.11-00)
2537	Uttar Pradesh	Muzaffarnagar	
2538	Uttar Pradesh	Chitrakoot	(25-15-57.45,81-22-34.13); (25-16-28.455,81-31-46.278)
2539	Uttar Pradesh	Muzaffarnagar	(29-23-34.02,77-41-44.04)

2541	Uttar Pradesh	Jhansi	(25-15-31.2,78-48-04.2)
2542	Uttar Pradesh	Chitrakoot	(25-16-18.2,80-51-37.2); (25-15-56.4,80-51-40.2); (25-16-15.7,80-51-41.3); (25-16-15.1,80-51-38.7)
2543	Uttar Pradesh	Jhansi	(25-15-24.8,78-34-16.8); (25-15-29.7,78-15-29.7); (25-15-29.2,78-34-08.0); (25-15-33.9,78-34-02.2)
2544	Uttar Pradesh	Muzaffarnagar	(29-34-49.792,77-42-43.77); (29-35-45.733,77-43-22.414)
2545	Uttar Pradesh	Jhansi	(25-15-24.8,78-34-16.8); (25-15-29.7,78-15-29.7); (25-15-29.2,78-34-08.0); (25-15-33.9,78-34-02.2)
2546	Uttar Pradesh	Jhansi	(25-11-54.4,78-31-52.6); (25-12-29.2,78-32-06.3); (25-12-21.7,78-32-09.1)
2547	Uttar Pradesh	Jhansi	(25-11-40.8,78-31-35.8); (25-11-44.4,78-31-39.5); (25-11-46.9,78-31-50.5)
2548	Uttar Pradesh	Jhansi	(25-11-48.3,78-31-25.4); (25-11-09.3,78-31-26.2)
2549	Uttar Pradesh	Jhansi	(25-18-37.5,78-51-03.6); (25-18-50.1,78-51-11.4)
2550	Uttar Pradesh	Muzaffarnagar	
2551	Uttar Pradesh	Saharanpur	(30-12-50.010,77-50-01.81); (30-13-08.29,77-44-32.52); (30-12-44.46,77-50-04.85); (30-12-04.216,77-50-00.36)
2552	Uttar Pradesh	Lalitpur	(24-57-25.2,78-17-29.0); (24-57-18.3,78-17-19.1); (24-57-6.2,78-17-11.5); (24-56-58.3,78-17-13.3); (24-57-12.3,78-17-24.6); (24-57-20.4,78-17-29.2)
2553	Uttar Pradesh	Lalitpur	(25-17-12.59,81-23-12.50)
2554	Uttar Pradesh	Lalitpur	(24-57-41.2,78-19-19.3); (24-57-49.6,78-19-11.4); (24-57-53.4,78-19-15.2); (24-57-56.6,78-19-4.2); (24-58-3.4,78-18-58.2)
2555	Uttar Pradesh	Lalitpur	(24-47-26.2,78-14-58.4); (24-47-16.2,78-14-59.2); (24-47-3.0,78-14-52.6)
2556	Uttar Pradesh	Lalitpur	(24-47-26.2,78-14-58.4); (24-47-16.2,78-14-59.2); (24-47-3.0,78-14-52.6)
2557	Uttar Pradesh	Lalitpur	(24-32-35.9,78-17-05.6); (24-32-20.2,78-16-41.8); (24-32-43.9,78-17-08.1); (24-32-25.9,78-17-07.1)
2558	Uttar Pradesh	Fatehpur	(25-55-45.2,80-29-58.4)
2559	Uttar Pradesh	Lalitpur	(24-32-35.9,78-17-05.6); (24-32-20.2,78-16-41.8); (24-32-43.9,78-17-08.1); (24-32-25.9,78-17-07.1)
2560	Uttar Pradesh	Muzaffarnagar	(29-32-09.78,77-41-13.08); (29-30-13.08,77-40-14.22); (29-30-0.24,77-40-22.92); (29-28-09.06,77-40.11-00)
2561	Uttar Pradesh	Muzaffarnagar	(29-39-49,77-42-43); (29-35-45,77-43-22)
2562	Uttar Pradesh	Lalitpur	(24-27-28.8,78-16-43.3); (24-27-09.7,78-17-11.6); (24-27-07.5,78-17-12.3)
2563	Uttar Pradesh	Muzaffarnagar	(29-17.28.92,77-28-40.5); (29-16-09.09,77-2-29.04); (29-16-11.64,77-29-26.94); (29-16-15.3,77-29-21.09)

2564	Uttar Pradesh	Muzaffarnagar	(29-15-35.1,77-29-20.34); (29-15-02.46,77-29-24.72); (29-15-33.06,77-29-18.42)
2565	Uttar Pradesh	Lalitpur	(25-03-23.25,78-22-36.11)
2566	Uttar Pradesh	Lalitpur	(25-03-22.27,78-22-43.36)
2569	Uttar Pradesh	Lalitpur	(25-03-18.86,78-22-50.04)
2572	Uttar Pradesh	Lalitpur	(24-57-68.21,78-17-40.66)
2575	Uttar Pradesh	Lalitpur	(25-03-14.43,78-22-50.06)
2630	Uttar Pradesh	Meerut	(29-10-55.73,77-30-35.38)
2631	Uttar Pradesh	Meerut	(29-11-05.49,77-30-40.55)
2632	Uttar Pradesh	Meerut	(29-11-0.82,77-30-52.85)
2633	Uttar Pradesh	Meerut	(29-10-56.22,77-30-59.56)
2634	Uttar Pradesh	Meerut	(29-10-48.54,77-31-05.24)
2635	Uttar Pradesh	Meerut	(29-10-49.03,77-30-54.57)
2636	Uttar Pradesh	Meerut	(29-10-46.95,77-30-47.66)
2637	Uttar Pradesh	Meerut	(29-10-40.00,77-30-51.61)
2639	Uttar Pradesh	Meerut	(29-10-26.66,77-30-54.29)
2640	Uttar Pradesh	Meerut	(29-11-32.03,77-30-41.40)
2642	Uttar Pradesh	Meerut	(29-11-21.04,77-30-45.51)
2643	Uttar Pradesh	Meerut	(29-11-40.13,77-30-45.94)
2644	Uttar Pradesh	Meerut	(29-11-20.08,77-31-08.56)
2645	Uttar Pradesh	Meerut	(29-11-16.85,77-31-15.48)
2646	Uttar Pradesh	Meerut	(29-11-12.65,77-31-10.15)
2647	Uttar Pradesh	Meerut	(29-11-26.84,77-31-17.43)
2649	Uttar Pradesh	Meerut	(29-12-03.57,77-31-18.86)
2650	Uttar Pradesh	Meerut	(29-12-22.50,77-31-49.73)
2655	Uttar Pradesh	Meerut	(29-11-04.24,77-30-37.91)

2657	Uttar Pradesh	Meerut	(29-11-53.27,77-31-40.65)
2658	Uttar Pradesh	Meerut	(29-12-36.02,77-31-36.79)
2660	Uttar Pradesh	Meerut	(29-10-52.7,77-30-15.07)
2661	Uttar Pradesh	Meerut	(29-10-48.77,77-10-19.80)
3367	Uttar Pradesh	Chitrakoot	(25-14-05.5,81-01-10.6); (25-14-02.3,81-05-57.3); (25-14-00.4,81-05-52.2); (25-14-14.4,81-06-03.0)
3368	Uttar Pradesh	Raipura	(25-14-5.5,81-6-10.6); (25-14-2.03,81-5-57.3); (25-14-0.4,81-5-52.2); (25-14-14.4,81-6-3); (25-14-26.9,81-5-43.9)
3369	Uttar Pradesh	Baghpat	(28-58-34,77-12-12)
3370	Uttar Pradesh	Baghpat	(29-6-33.69,77-25-45.19); (29-6-34.50,77-25-41.53); (29-6-33.84,77-25-39.54); (29-6-35.43,77-25-38.79); (29-6-33.749,77-25-44.23); (29-6-34.13,77-25-44.23)
3373	Uttar Pradesh	Baghpat	(29-11-32.00,77-28-56); (29-11-34.00,77-28-40); (29-11-34-00,77-28-38); (29-11-33.00,78-28-31); (29-11-36.00,77-28-38); (29-11-42.00,77-28-43); (29-11-45.00,77-28-46);
3380	Uttar Pradesh	Shivalik	(30-10-56.85,77-53-33.58); (30-10-57.43,77-53-32.37); (30-10-57.15,77-53-32.02); (30-11-30.98,77-53-00.04); (30-11-32.46,77-52-59.04); (30-11-27.86,77-53-07.37)
3385	Uttar Pradesh	Saharanpur	(30-13-04.74,77-47-39.18); (30-12-54.0,77-47-38.7)
3387	Uttar Pradesh	Saharanpur	(30-13-4.74,77-47-39.18); (30-12-1954,77-47-38.7)
3391	Uttar Pradesh	Gautam Budhha Nagar	(28-11-51.9,77-31-54.1)
3392	Uttar Pradesh	Gautam Budhha Nagar	(28-11-55.6,77-31-51.5)
3393	Uttar Pradesh	Saharanpur	(30-2-18.27,77-18-38.27); (30-1-37.63,77-18-9.449)
3395	Uttar Pradesh	Saharanpur	(29-59-51.24,77-41-26.88); (29-59-52.56,77-41-25.2); (29-59-54.36,77-41-21.3); (29-59-57.66,77-41-23.52)
3397	Uttar Pradesh	Saharanpur	(29-57-11.34,77-38-11.16); (29-57-8.76,77-38-5.34); (29-57-12.24,77-38-12.78)
3399	Uttar Pradesh	Shivalik	(30-10-32.76,77-46-47.28); (30-10.35.94,77-46-47.88); (30-10-29.94,77-46-47.52)
3407	Uttar Pradesh	Jhansi	(25-10-41.60,78-30-13.70)
3464	Uttar Pradesh	Ghaziabad	(28-53-55.7,77-26-54.5)
3466	Uttar Pradesh	Mathura	(27-48-2.055,077-40-4.64); (27-48-3.02,77-47-7.85); (27-47-58.51,77-40-13.64); (27-47-58.72,77-40-12.71)
3467	Uttar Pradesh	Mathura	(27-41-50,077-48-39); (27-41-35,77-41-25)

3468	Uttar Pradesh	Mathura	(27-44-28,077-40-33); (27-44-27,77-40-33)
3469	Uttar Pradesh	Mathura	(27-41-23,077-40-8); (27-41-20,77-39-38)
3470	Uttar Pradesh	Mathura	(27-43-12,77-40-20)
3471	Uttar Pradesh	Mathura	(27-47-41.882,77-37-53.604)
3473	Uttar Pradesh	Mathura	(27-47-44.65,77-38-31.72)
3474	Uttar Pradesh	Mathura	(27-48-6.12,77-39-45.92)
3475	Uttar Pradesh	Mathura	(27-48-0.42,77-40-7.14); (27-48-2.21,77-40-4.41)
3476	Uttar Pradesh	Mathura	(27-47-37.55,77-41-39.61); (27-47-37.38,77-41-39.54)
3477	Uttar Pradesh	Mathura	(27-47-37.55,77-41-39.61); (27-47-37.38,77-41-39.54)
3478	Uttar Pradesh	Mathura	(27-50-17.30,77-41-11.60); (27-50-18.24,77-41-24.20); (27-50-4.10,77-41-24.20); (27-50-57.90,77-41-44.30)
3479	Uttar Pradesh	Mathura	(27-26-34.6,77-43-7.7); (27-26-33.3,77-43-11.4); (27-26-34.4,77-43-14.3); (27-26-35.5,77-43-16.6)
3480	Uttar Pradesh	Mathura	(27-30-38.8,77-39-12.3); (27-30-45.6,77-39-14.7); (27-30-53.2,77-39-17.5); (27-30-57.6,77-39-19.5)
3481	Uttar Pradesh	Lalitpur	(25-03-28.20,78-22-42.50)
3482	Uttar Pradesh	Lalitpur	(25-03-28.54,78-22-38.44)
3483	Uttar Pradesh	Lalitpur	(25-03-34.20,78-22-47.50)
3484	Uttar Pradesh	Mathura	(27-25-53.6,77-44-37.7); (27-25-54.4,77-44-40.3); (27-25-48.8,77-44-46.3); (27-25-46.2,77-44-50.3)
3485	Uttar Pradesh	Mathura	(27-27-49.15,77-41-21.40); (27-27-56.4,77-41-56.13)
3486	Uttar Pradesh	Mathura	(27-19-23.10,77-46-16.13); (27-19-26.03,77-46-39.41)
3487	Uttar Pradesh	Mathura	(27-19-23.10,77-41-24.42); (27-34-13.40,77-42-19.16)
3499	Uttar Pradesh	Social Forestry Division, Urai	(26-16-46,79-35-39)
3509	Uttar Pradesh	Social Forestry Division, Urai	(26-5-37.24,79-45-40.16)
3517	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-06-31.21,79-59-06.5)
3518	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-01-38.78,80-07-34.64)
3519	Uttar	Social Forestry	(26-06-31.21,79-59-06.5)

	Pradesh	Division, Kanpur Nagar	
3520	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-06-48.53,80-00-51.93)
3521	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-06-38.80,79-58-51.47)
3522	Uttar Pradesh	Social Forestry Division, Kanpur Nagar	(26-08-09.88,80-00-11.32)
3523	Uttar Pradesh	Mathura	(27-18-52.95,077-47-55.7); (27-18-60.1,77-47-47.6); (27-18-48.3,77-47-49.4); (27-18-50.2,77-47-57.3)
3524	Uttar Pradesh	Mathura	(27-33-27.95,077-42-20.74); (27-33-13.28,77-42-23.74)
3525	Uttar Pradesh	Mathura	(27-19-37.76,77-46-53.79); (27-19-40.01,77-46-56.92); (27-19-49.19,77-46-54.71); (27-19-32.81,77-46-58.69)
3526	Uttar Pradesh	Mathura	(27-41-33,077-40-56); (27-41-35,77-41-12); (27-41-35,77-41-14)
3527	Uttar Pradesh	Mathura	(27-18-59.69,77-47-32.56); (27-18-31.26,77-47-34.38); (27-18-28.39,77-47-35.21); (27-18-28.02,77-47-36.11)
3528	Uttar Pradesh	Mathura	(27-18-54.15,77-47-34.69); (27-18-58.78,77-47-30.17); (27-19-03.82,77-47-21.29); (27-19-10.21,77-45-14.35)
3529	Uttar Pradesh	Mathura	(27-23-01.50,77-49-04.50); (27-23-03.85,77-47-09.95); (27-23-07.15,77-47-10.73); (27-23-08.89,77-47-04.50)
3530	Uttar Pradesh	Mathura	(27-22-55.68,77-44-48.37); (27-22-55.77,77-44-43.82); (27-22-53.61,77-44-47.41); (27-22-51.44,77-44-47.24)
3531	Uttar Pradesh	Mathura	(27-17-40.62,77-50-08.51); (27-17-40.11,77-50-10.12); (27-17-40.34,77-50-10.92); (27-17-41.14,77-50-09.80)
3532	Uttar Pradesh	Mathura	(27-33-13.89,77-41-12.90); (27-33-13.20,77-41-42.08); (27-32-16.58,77-41-46.87); (27-32-46.59,77-41-05.21)
3533	Uttar Pradesh	Mathura	(27-30-58.57,77-42-42.90); (27-31-03.97,77-40-44.28); (27-30-59.60,77-40-.32.33); (27-31-03.70,77-40-31.55)
3534	Uttar Pradesh	Mathura	(27-47-4.366,77-40-5.708); (27-46-25.93,77-40-18.610)
3535	Uttar Pradesh	Mathura	(27-47-34.10,77-40-34.24); (27-47-31.15,77-40-34.54); (27-47-28.43,77-40-33.06); (27-47-30.89,77-40-28.01)
3536	Uttar Pradesh	Mathura	(27-48-6.83,77-37-35.88); (27-48-10.12,77-35-39.85); (27-47-45.92,77-36-46.56); (27-48-11.67,77-36-39.67)
3537	Uttar Pradesh	Mathura	(27-47-5.60,77-37-48.26); (27-47-5.90,77-37-46.48); (27-48-8.51,77-37-55.79); (27-47-17.63,77-37-55.08)
3538	Uttar	Mathura	(27-18-52.6,77-47-55.7); (27-18-59.5,77-47-47.6);

	Pradesh		(27-18-48.3,77-47-49.4); (27-18-50.2,77-47-55.73)
3539	Uttar Pradesh	Mathura	(27-23-05.4,77-45-02.3); (27-23-05.7,77-45-02.8); (27-23-06.3,77-45-03.7); (27-23-07.8,77-45-02.4)
3540	Uttar Pradesh	Mathura	(27-51-26.25,77-31-23.63); (27-51-39.37,77-32-41.45); (27-51-34.85,77-32-57.92)
3541	Uttar Pradesh	Mathura	(27-35-4.86,77-42-26.45); (27-35-6.81,77-42-29.35); (27-34-55.45,77-42-30.02); (27-35-1.14,77-42-36.20)
3542	Uttar Pradesh	Mathura	(27-36-32.70,77-39-25.69); (27-36-29.98,77-39-32.76); (27-36-32.72,77-39-33.87); (27-36-36.26,77-39-30.65)
3543	Uttar Pradesh	Mathura	(27-49-59.30,77-40-38.00); (27-49-55.20,77-40-39.50); (27-49-59.70,77-40-59.60); (27-49-52.80,77-17-41.02)
3544	Uttar Pradesh	Mathura	(27-44-52.94,77-40-43.74); (27-44-51.83,77-40-41.00)
3771	Uttar Pradesh	Etawah	(26-54-31.16, 78-45-59.35); (26-54-37.81, 78-46-06.52); (26-54-51.84, 78-45-43.33); (26-54-45.25, 78-45-41.16)
3773	Uttar Pradesh	Etawah	(26-53-37.42, 78-46-21.63); (26-53-51.27, 78-46-15.48); (26-53-55.00, 78-46-32.75); (26-53-38.74, 78-46-36.72)
3774	Uttar Pradesh	Etawah	(26-53-27.89, 78-47-15.44); (26-53-18.63, 78-47-25.55); (26-53-27.29, 78-47-30.45); (26-53-37.65, 78-47-29.68)
3776	Uttar Pradesh	Etawah	(26-52-22.56, 78-47-22.56); (26-52-32.34, 78-47-13.02); (26-52-43.38, 78-47-24.06); (26-52-33.36, 78-47-35.58)
3777	Uttar Pradesh	Etawah	(26-53-58.00, 78-46-37.36); (26-54-02.30, 78-46-31.36); (26-54-18.88, 78-46-59.58); (26-54-10.56, 78-47-02.16)
3779	Uttar Pradesh	Etawah	(26-52-14.7, 78-48-46.56); (26-52-1.74, 78-48-53.4); (26-52-4.38, 78-49-10.2); (26-52-18.12, 78-49-1.92)
3780	Uttar Pradesh	Etawah	
3783	Uttar Pradesh	Etawah	26-45-22.2, 78-59-9); (26-44-34.2, 78-59-12); (26-45-11.4, 79-00-1.8); (26-45-27.6, 79-00-1.8)
3784	Uttar Pradesh	Etawah	
3787	Uttar Pradesh	Etawah	(26-45-28.8, 79-01-3.24); (26-45-34.56, 79-01-18.9); (26-45-16.8, 79-01-35.4); (26-45-13.5, 79-01-23.22)
3788	Uttar Pradesh	Etawah	(26-36-20.76, 79-08-8.22); (26-36-17.64, 79-8-14.58); (26-36-32.88, 79-8-21.54); (26-36-34.26, 79-8-13.44); (26-36-33.66, 79-8-21.24); (26-36-35.64, 79-8-14.7); (26-36-49.56, 79-8-17.1); (26-36-48.18, 79-8-25.44)
3789	Uttar Pradesh	Etawah	(26-43-19.92, 79-00-58.98); (26-43-33.48, 79-0-54.42); (26-43-38.04, 79-01-7.32); (26-43-19.86, 79-01-36.78)
3790	Uttar Pradesh	Etawah	

3791	Uttar Pradesh	Etawah	(26-44-31.14, 79-01-24.24); (26-44-40.02, 79-01-10.56); (26-44-50.58, 79-01-16.56); (26-44-42.18, 79-01-34.38)
3792	Uttar Pradesh	Etawah	
3793	Uttar Pradesh	Etawah	(26-42-31.62, 79-01-55.74); (26-42-40.44, 79-01-48); (26-42-52.56, 79-01-56.62); (26-42-41.94, 79-02-10.32)
3794	Uttar Pradesh	Etawah	
3796	Uttar Pradesh	Etawah	(26-41-26.64, 79-02-0.42); (26-41-36.78, 79-02-12.12); (26-41-29.28, 79-02-25.86); (26-41-19.5, 79-02-18.66)
3797	Uttar Pradesh	Etawah	(26-42-18.42, 79-02-24.24); (26-42-30.6, 79-02-33.12); (26-42-42.96, 79-02-28.02); (26-42-18.42, 79-02-24.24)
3798	Uttar Pradesh	Etawah	(26-44-30.79, 79-58-40.91); (26-44-21.20, 79-58-31.17); (26-44-31.64, 79-58-13.87); (26-44-41.62, 79-58-24.0)
3800	Uttar Pradesh	Etawah	(26-52-12.42, 78-48-19.26); (26-52-13.56, 78-45-22.8); (26-52-19.14, 78-48-19.44); (26-52-18.72, 78-49-15.18); (26-52-2.22, 78-48-10.8); (26-52-8.82, 78-48-30.78); (26-52-20.76, 78-48-12.78); (26-52-18.36, 78-48-4.14)
3801	Uttar Pradesh	Etawah	(26-46-03.69, 78-55-53.56); (26-45-51.79, 78-55-50.35); (26-45-51.27, 78-55-28.84); (26-46-05.00, 78-55-35.25)
3802	Uttar Pradesh	Etawah	(26-47-11.09, 78-55-19.44); (26-46-54.47, 78-55-10.36); (26-46-50.33, 78-55-28.90); (26-47-04.49, 78-55-33.36
3803	Uttar Pradesh	Etawah	
3805	Uttar Pradesh	Etawah	(26-46-57.39, 78-51-51.00); (26-46-49.65, 78-52-03.10); (26-47-00.1, 78-52-17.95); (26-47-10.34, 78-52-05.69)
3807	Uttar Pradesh	Etawah	
3808	Uttar Pradesh	Etawah	(26-49-44.2, 78-54-22.30); (26-48-42.41, 78-54-22.00); (26-48-44.89, 78-54-43.67); (26-48-54.14, 78-54-39.23)
3810	Uttar Pradesh	Etawah	
3812	Uttar Pradesh	Etawah	
3816	Uttar Pradesh	Etawah	
3820	Uttar Pradesh	Etawah	
3821	Uttar Pradesh	Etawah	(26-48-07.18, 78-55-50.40); (26-47-50.07, 78-55-45.94); (26-47-44.24, 78-56-00.87); (26-47-55-54, 78-56-10.06)

3825	Uttar Pradesh	Etawah	(26-34-55.95, 79-05-17.11); (26-35-00.18, 79-05-12.26); (26-34-49.48, 79-05-06.81); (26-34-55.81, 79-05-01.11)
3826	Uttar Pradesh	Etawah	(26-48-15.62, 78-53-02.99); (26-48-02.92, 78-53-49.38); (26-47-58.08, 78-54-08.37); (26-48-09.71, 78-54-14.40)
3828	Uttar Pradesh	Etawah	(26-37-17.08, 79-02-20.61); (26-37-29.83, 79-02-05.80); (26-37-38.75, 79-02-37.03); (26-37-26.07, 79-02-48.91)
3831	Uttar Pradesh	Etawah	(26-30-10.40, 79-03-51.96); (26-36-02.74, 79-04-09.63); (26-36-10.70, 79-04-17.63); (26-36-22.57, 79-03-59.62)
3832	Uttar Pradesh	Etawah	(26-48-48.30, 78-52-08.92); (26-48-30.73, 78-52-04.85); (26-48-29.39, 78-52-15-71); (26-48-44.66, 78-52-22.31)
3833	Uttar Pradesh	Etawah	(26-35-45.81, 79-04-40.97); (26-35-41.85, 79-04-38.40); (26-35-44.63, 79-04-31.90); (26-35-48.63, 79-04-32.17)
3834	Uttar Pradesh	Etawah	(26-46-50.75, 78-57-48.44); (26-46-55.16, 78-57-58.07); (26-46-42.94, 78-58-10.51); (26-46-29.52, 78-57-56.50)
3836	Uttar Pradesh	Etawah	(26-38-44.73, 79-01-18.63); (26-38-56.27, 79-01-10.989); (26-39-02.10, 79-02-25.47); (26-38-51.80, 79-01-34.80)
3838	Uttar Pradesh	Etawah	(26-35-14.08, 79-06-09.72); (26-35-20.65, 79-06-05.25); (26-35-27.25, 79-06-22.18); (26-35-19.19, 79-06-25.11)
3840	Uttar Pradesh	Etawah	(26-40-09.81, 79-10-6.28); (26-40-30.28, 79-05-0.82); (26-40-30.18, 79-01-0.99); (26-40-18.60, 79-01-16.55)
3842	Uttar Pradesh	Etawah	(26-41-28.61, 79-00-13.00); (26-41-44.27, 79-00-0.28); (26-41-50.47, 79-00-11.72); (26-41-34.82, 79-00-21.97)
3843	Uttar Pradesh	Etawah	(26-51-27.54, 78-49-4.26); (26-51-31.56, 78-49-19.38); (26-51-47.94, 78-49-15.36); (26-51-44.7, 78-48-59.82)
3844	Uttar Pradesh	Etawah	(26-49-37.98, 78-50-57.24); (26-49-27.24, 78-51-6.66); (26-49-31.44, 78-51-21.12); (26-49-45.66, 78-51-9.72)
3845	Uttar Pradesh	Etawah	
3846	Uttar Pradesh	Etawah	
3847	Uttar Pradesh	Etawah	(26-50-9.96, 78-50-22.26); (26-50-21.42, 78-50-14.7); (26-50-30.78, 78-50-27.72); (26-50-18.84, 78-50-36.72)
3848	Uttar Pradesh	Etawah	
3849	Uttar Pradesh	Etawah	(26-52-19.62, 78-48-46.98); (26-52-29.88, 78-48-38.4); (26-52-38.58, 78-48-59.22); (26-52-29.7, 78-49-2.94)

3850	Uttar Pradesh	Etawah	(26-34-56.33, 79-04-19.78); (26-34-58.49, 79-04-19.78); (26-35-03.57, 79-04-19.31); (26-35-01.05, 79-04-23.12)
3851	Uttar Pradesh	Etawah	(26-37-27.23, 79-01-59.18); (26-37-29.56, 79-01-56.17); (26-37-34.00, 79-02-01.01); (26-37-30.99, 79-02-04.21)
3852	Uttar Pradesh	Etawah	(26-41-39.48, 79-01-58.38)
3853	Uttar Pradesh	Etawah	(26-42-48.24, 79-02-18.18)
3854	Uttar Pradesh	Etawah	(26-44-14.04, 79-58-32.03)
3855	Uttar Pradesh	Etawah	
3856	Uttar Pradesh	Etawah	
3857	Uttar Pradesh	Etawah	
3858	Uttar Pradesh	Etawah	
3860	Uttar Pradesh	Etawah	
3862	Uttar Pradesh	Etawah	
3864	Uttar Pradesh	Etawah	
3867	Uttar Pradesh	Etawah	
3868	Uttar Pradesh	Etawah	
3870	Uttar Pradesh	Etawah	(26-34-58.76, 79-05-07.20); (26-35-10.17, 79-05-08.84); (26-34-06.38, 79-05-32.71); (26-34-54.09, 79-05-30.01)
3872	Uttar Pradesh	Etawah	(26-37-31.19, 79-02-04.41); (26-37-35.15, 79-02-00.41); (26-37-36.66, 79-02-02.61); (26-37-32.84, 79-02-06.07); (26-36-46.86, 79-02-39.64); (26-37-11.97, 79-02-24.53); (26-37-26.83, 79-03-05.88); (26-37-07.31, 79-03-21.60)
3875	Uttar Pradesh	Etawah	(26-36-29.62, 79-03-58.39); (26-36-38.21, 79-04-05.85); (26-36-29.16, 79-04-22.42); (26-36-19.83, 79-04-17.01); (26-36-18.55, 79-03-31.86); (26-36-28.23, 79-03-36.61); (26-36-22.15, 79-03-47.88); (26-36-14.33, 79-03-41.75)
3877	Uttar Pradesh	Etawah	(26-45-22.2, 78-59-9); (26-44-34.2, 78-59-12); (26-45-11.4, 79-00-1.8); (26-45-27.6, 79-00-1.8)
3878	Uttar Pradesh	Etawah	(26-58-14.34, 79-09-00.10)
3879	Uttar Pradesh	Etawah	(26-35-04.86, 79-06-47.27); (26-35-28.14, 79-07-03.93); (26-35-50.00, 79-04-24.09); (26-35-51.63, 79-06-58.56)
3880	Uttar	Etawah	

	Pradesh		
3881	Uttar Pradesh	Etawah	(26-51-26.04, 78-49-7.26); (26-51-23.46, 78-49-7.56); (26-51-24.84, 78-49-14.82); (26-51-27.54, 78-49-14.22); (26-51-30, 78-49-22.92); (26-51-32.1, 78-49-36.18); (26-51-48.6, 78-49-30.54); (26-51-48.24, 78-49-13.98)
3882	Uttar Pradesh	Etawah	(26-45-20.52, 78-59-37.22); (26-45-14.06, 78-59-35.1); (26-45-11.97, 78-59-42.87)
3883	Uttar Pradesh	Etawah	
3884	Uttar Pradesh	Etawah	(26-43-16.5, 79-01-0.06); (26-43-17.34, 79-01-9.24); (26-43-10.32, 79-01-8.76); (26-43-9.96, 79-01-0.66)
3885	Uttar Pradesh	Etawah	(26-44-57, 79-01-19.68); (26-44-53.76, 79-01-29.34); (26-44-47.16, 79-01-26.04); (26-44-50.7, 79-01-18.24)
3886	Uttar Pradesh	Etawah	(26-49-49.68, 78-51-27.42); (26-49-53.82, 78-51-27.78); (26-49-30.36, 78-51-32.52); (26-49-51.24, 78-51-33.48); (26-49-46.5, 78-51-10.56); (26-49-32.76, 78-51-21.78); (26-49-39.48, 78-51-33.18); (26-49-48.54, 78-51-26.94)
3887	Uttar Pradesh	Etawah	(26-42-38.64, 79-01-46.5); (26-42-31.08, 79-01-53.28); (26-42-28.8, 79-01-45.3); (26-42-33, 79-01-41.22)
3888	Uttar Pradesh	Etawah	(26-41-39, 79-02-28.56); (26-41-31.38, 79-02-33.48); (26-41-29.82, 79-02-27.3); (26-41-35.04, 79-02-22.74)
3889	Uttar Pradesh	Etawah	(26-50-10.92, 78-50-34.5); (26-50-13.62, 78-50-30.3); (26-50-16.44, 78-50-23.7); (26-50-13.26, 78-50-37.8); (26-50-14.04, 78-50-4.92); (26-50-19.08, 78-50-1.62); (26-50-33.18, 78-50-28.14); (26-50-37.14, 78-50-38.34)
3890	Uttar Pradesh	Etawah	(26-42-42.84, 79-02-37.74); (26-42-35.82, 79-02-43.02); (26-42-31.92, 79-02-38.64); (26-42-39.18, 79-02-33.54)
3891	Uttar Pradesh	Etawah	(26-52-41.34, 78-49-8.28); (26-52-43.62, 78-49-53.1), (26-52-45.84, 78-49-7.62); (26-52-44.1, 78-49-36.54); (26-52-28.56, 78-48-32.16); (26-52-35.94, 78-48-18.54); (26-52-45.78, 78-48-24.78); (26-52-34.56, 78-48-45.96)
3892	Uttar Pradesh	Etawah	(26-44-22.00, 79-58-02.90); (26-44-16.37, 79-58-59.57); (26-44-20.30, 79-57-57.72)
3893	Uttar Pradesh	Etawah	
3894	Uttar Pradesh	Etawah	(26-54-47.45, 78-46-14.16); (26-54-50.93, 78-46-00.96); (26-54-53.55, 78-46-11.89); (26-54-50.67, 78-46-16.18); (26-54-38.38, 78-46-08.15); (26-54-54.11, 78-45-48.16); (26-55-00.81, 78-45-53.58); (26-54-44.26, 78-46-16.17)
3895	Uttar Pradesh	Etawah	
3896	Uttar Pradesh	Etawah	(26-53-39.06, 78-46-38.04); (26-53-55.02, 78-46-36.01); (26-53-56.05, 78-46-50.25); (26-53-41.99, 78-

			46-53.08); (26-53-48.54, 78-46-53.14); (26-53-52.50, 78-46-52.53); (26-53-52.71, 78-46-57.46); (26-53-49.40, 78-46-58.61)
3897	Uttar Pradesh	Etawah	
3898	Uttar Pradesh	Etawah	(26-53-25.86, 78-47-41.39); (26-53-30.49, 78-47-40.28), (26-53-31.27, 78-47-45.29); (26-53-27.63, 78-47-46.51); (26-53-30.32, 78-47-38.01); (26-53-40.43, 78-47-27.74); (26-53-48.49, 78-47-39.20); (26-53-37.57, 78-47-46.04)
3899	Uttar Pradesh	Etawah	(26-52-46.5, 78-47-34.62); (26-52-48.96, 78-47-32.4); (26-52-51.72, 78-47-35.28); (26-52-49.8, 78-47-40.14); (26-52-34.38, 78-47-37.14); (26-52-40.38, 78-47-45.36); (26-52-27.36, 78-47-55.14); (26-52-30.18, 78-47-45.42)
3900	Uttar Pradesh	Etawah	(26-54-18.96, 78-46-10.62); (26-54-21.52, 78-46-09.54); (26-54-23.31, 78-46-13.71); (26-54-20.50, 78-46-15.67); (26-54-00.06, 78-46-17.32); (26-54-16.15, 78-46-10.53); (26-54-21.01, 78-46-22.42); (26-54-05.32, 78-46-31.36)
3901	Uttar Pradesh	Etawah	(26-45-00.05, 78-57-14.42); (26-44-55.52, 78-57-09.05); (26-44-49.73, 78-57-13.97)
3902	Uttar Pradesh	Etawah	
3903	Uttar Pradesh	Etawah	(26-47-54.79, 78-56-11.49); (26-47-48.67, 78-56-05.70); (26-47-48.03, 78-56-12.72)
3904	Uttar Pradesh	Etawah	(26-48-08.27, 78-54-15.51); (26-48-00.60, 78-54-17.55); (26-47-59.04, 78-54-20.62)
3905	Uttar Pradesh	Etawah	(26-48-31.44, 78-52-05.58); (26-48-26.54, 78-52-06.38); (26-48-25.74, 78-52-14.95)
3906	Uttar Pradesh	Etawah	(26-46-44.31, 78-57-36.30); (26-46-45.02, 78-57-45.00); (26-46-39.36, 78-57-43.38)
3907	Uttar Pradesh	Etawah	(26-38-33.20, 79-01-30.07); (26-38-42.95, 79-01-20.88); (26-38-50.03, 79-01-35.89); (26-38-39.41, 79-01-46.39); (26-38-49.43, 79-14-5.95); (26-38-52.78, 79-16-45.8); (26-38-43.91, 79-14-9.66)
3908	Uttar Pradesh	Etawah	(26-40-38.27, 79-00-54.16); (26-40-51.50, 79-00-54.16); (26-40-56.82, 79-01-08.85); (26-40-41.96, 79-01-14.80); (26-40-11.29, 79-01-21.36); (26-40-21.79, 79-01-16.76); (26-40-27.69, 79-01-35.70); (26-40-16.67, 79-01-38.66)
3909	Uttar Pradesh	Etawah	(26-41-05.85, 79-00-11.94); (26-41-16.45, 79-00-06.72); (26-41-25.20, 79-00-21.93); (26-41-13.74, 79-00-30.96); (26-41-36.30, 79-59-55.49); (26-41-38.28, 79-59-54.03); (26-41-40.46, 79-00-00.33); (26-41-37.92, 79-00-01.90)
3910	Uttar Pradesh	Auraiya	(26-42-39.85,79-38-24.89)
3911	Uttar Pradesh	Auraiya	(26-24-35,79-29-43)
3912	Uttar	Auraiya	(26-27-38.98,79-30-36.324)

	Pradesh		
3913	Uttar Pradesh	Auraiya	(26-25-54.81,79-25-59.02); (26-26-00,79-26-07); (26-25-56,79-25-56); (26-26-01,79-25-54)
3914	Uttar Pradesh	Auraiya	(26-27-10,79-17-07); (26-27-19,79-16-39); (26-27-36,79-16-52)
3915	Uttar Pradesh	Auraiya	(26-23-20.55,79-30-54.54)
3916	Uttar Pradesh	Auraiya	(26-26-13.68,79-25-48.04); (26-26-18,79-25-48); (26-26-21,79-25-35); (26-26-27,79-25-45)
3917	Uttar Pradesh	Auraiya	(26-25-17.60,79-29-49.10); (26-25-57,79-25-59); (26-26-00,79-25-58); (26-26-04,79-26-11)
3918	Uttar Pradesh	Auraiya	(26-27-12,79-17-37); (26-27-14,79-18-01); (26-27-37,79-17-48)
3919	Uttar Pradesh	Auraiya	(26-24-39,79-31-41)
3920	Uttar Pradesh	Auraiya	(26-25-23.5,79-22-19.9); (26-25-17.6,79-22-42.2); (26-25-16.8,79-22-41.2); (26-25-15.6,79-22-55.2)
3921	Uttar Pradesh	Auraiya	(26-26-21.96,79-25-48.11); (26-26-20,79-25-14); (26-26-52,79-25-23)
3922	Uttar Pradesh	Auraiya	(26-26-35,79-24-37); (26-26-19,79-25-21); (26-47-05,79-25-16)
3923	Uttar Pradesh	Auraiya	(26-25-49.85,79-30-52.55)
3924	Uttar Pradesh	Auraiya	(26-24-35,79-29-43)
3925	Uttar Pradesh	Auraiya	(26-25-23.5,79-22-19.9); (26-25-17.6,79-22-42.2); (26-25-16.8,79-22-41.2); (26-25-15.6,79-22-55.2)
3926	Uttar Pradesh	Auraiya	(26-27-23,78-28-03)
3927	Uttar Pradesh	Auraiya	(26-27-53,79-30-18); (26-27-50,79-30-16); (26-27-48,79-30-18); (26-27-50,79-30-21)
3928	Uttar Pradesh	Auraiya	(26-26-16.16,79-27-51.34); (26-26-27,79-27-49); (26-26-19,79-27-41); (26-26-21,79-27-37)
3929	Uttar Pradesh	Auraiya	(26-25-11,79-20-31); (26-25-10,79-20-42); (26-25-05,79-20-50); (26-25-05,79-20-33)
3930	Uttar Pradesh	Auraiya	(26-28-51,79-16-38); (26-28-55,79-16-59); (26-29-03,79-16-43)
3931	Uttar Pradesh	Auraiya	(26-26-24.62,79-27-49.86); (26-26-19,79-28-11); (26-26-39,79-28-32); (26-26-59,79-28-10)
3932	Uttar Pradesh	Auraiya	(26-25-15,79-22-58)
3933	Uttar Pradesh	Auraiya	(26-29-03,79-16-50); (26-28-55,79-17-30); (26-29-32,79-16-58)
3934	Uttar Pradesh	Auraiya	(26-25-50.37,79-24-11.15); (26-25-47,79-24-08); (26-25-44,79-24-18); (26-25-41,79-24-07)
3935	Uttar Pradesh	Auraiya	(26-30-22,79-17-32); (26-30-32,79-17-49); (26-30-11,79-17-53)
3936	Uttar Pradesh	Auraiya	(26-25-33.31,79-24-08.18); (26-25-47,79-24-19); (26-25-46,79-24-14); (26-25-4,79-24-10)
3937	Uttar	Auraiya	(26-30-44,79-18-23); (26-30-52,79-18-40); (26-30-

	Pradesh		37,79-18-49); (26-30-49,79-18-53)
3938	Uttar Pradesh	Auraiya	(26-27-36,79-16-52)
3939	Uttar Pradesh	Auraiya	(26-30-28,79-18-51); (26-30-13,79-18-48); (26-30-21,79-18-23); (26-30-38,79-18-28)
3940	Uttar Pradesh	Auraiya	(26-29-01,79-17-02); (26-29-14,79-17-07); (26-28-54,79-17-31); (26-29-11,79-17-27)
3941	Uttar Pradesh	Auraiya	(26-34-35,79-15-28.44)
3942	Uttar Pradesh	Auraiya	(26-34-23.4,79-13-58.8); (26-33-49.74,79-13-40.26)
3943	Uttar Pradesh	Social Forestry Division, Firozabad	(26-53-59.9,78-39-58.1); (26-53-56.8,78-40-8.8); (26-54-12.3,78-40-2.5); (26-54-11.4,78-39-55.1)
3944	Uttar Pradesh	Social Forestry Division, Agra	(26-56-11.9,78-43-38.2)
3945	Uttar Pradesh	Social Forestry Division, Agra	(26-56-58.5,78-37-00.3)
3946	Uttar Pradesh	Social Forestry Division, Firozabad	(26-57-21.1,78-36-51.0); (26-55-59.0,78-36-47.2); (26-56-58.5,78-37-00.8); (26-57-09.9,78-37-01.4)
3947	Uttar Pradesh	Social Forestry Division, Agra	(26-53-51.8,78-40-00.4)
3948	Uttar Pradesh	Social Forestry Division, Agra	(26-55-55.3,78-43-29.7)
3949	Uttar Pradesh	Social Forestry Division, Firozabad	(27-07-47.80,78-16-45.20); (27-07-40.30,78-16-19.80); (27-07-54.80,78-16-18.20); (27-07-50.90,78-16-44.10)
3950	Uttar Pradesh	Social Forestry Division, Agra	(26-55-33.4,78-37-15.7)
3951	Uttar Pradesh	Social Forestry Division, Agra	(26-55-20.3,78-43-13.8)
3952	Uttar Pradesh	Social Forestry Division, Firozabad	(27-06-5.50,78-16-28.70); (27-06-49.40,78-16-12.60); (27-06-44.00,78-15-41.70); (27-06-21.80,78-15-44.90)
3953	Uttar Pradesh	Social Forestry Division, Agra	(27-07-37.30,78-16-27.70)
3954	Uttar Pradesh	Social Forestry Division, Agra	(27-06-49.40,78-22-28.38)
3955	Uttar Pradesh	Social Forestry Division, Firozabad	(27-07-33.60,78-15-03.50); (27-07-06.70,78-14-39.20); (27-07-11.40,78-14-34.10); (27-07-04.30,78-14-29.10)
3956	Uttar Pradesh	Social Forestry Division, Agra	(27-52-12.8,78-9-40.6)
3957	Uttar Pradesh	Social Forestry Division, Firozabad	(27-07-00.60,78-14-13.60); (27-06-56.20,78-13-52.20); (27-07-04.40,78-14-13.20); (27-07-32.90,78-13-37.00)
3958	Uttar Pradesh	Social Forestry Division, Agra	(26-56-20.6,78-37-47.5)
3959	Uttar Pradesh	Social Forestry Division, Agra	(27-06-40.80,78-15-11.30)
3960	Uttar Pradesh	Social Forestry Division, Agra	(27-05-14.50,78-14-12.80)

3961	Uttar Pradesh	Social Forestry Division, Agra	(26-59-02.28,78-33-43.29)
3962	Uttar Pradesh	Social Forestry Division, Firozabad	(26-59-03.23,78-33-48.95); (26-59-05.22,78-33-46.46); (26-58-59.20,78-33-41.88); (26-59-02.24,78-33-40.31)
3963	Uttar Pradesh	Social Forestry Division, Agra	(26-56-18.18,78-35-28.22)
3964	Uttar Pradesh	Social Forestry Division, Agra	(26-55-34.7,78-41-29.3)
3965	Uttar Pradesh	Social Forestry Division, Agra	(26-58-34.09,78-30-59.28)
3966	Uttar Pradesh	Social Forestry Division, Firozabad	(26-56-22.07,78-35-27.60); (26-59-15.09,78-35-25.19); (26-56-18.97,78-35-25.83); (26-56-18.18,78-35-28.22)
3967	Uttar Pradesh	Social Forestry Division, Agra	(27-02-48.6,78-26-41.64)
3968	Uttar Pradesh	Social Forestry Division, Firozabad	(26-58-41.21,78-30-59.34); (26-58-38.97,78-30-58.70); (26-58-33.37,78-30-56.63); (26-58-34.09,78-30-59.28)
3969	Uttar Pradesh	Social Forestry Division, Agra	(27-05-51.90,78-16-28.50)
3970	Uttar Pradesh	Social Forestry Division, Agra	(26-59-29.76,78-27-21.6)
3971	Uttar Pradesh	Social Forestry Division, Agra	(27-08-19.74,78-22-11.34)
3972	Uttar Pradesh	Social Forestry Division, Agra	(27-10-50.64,78-19-48.42)
3973	Uttar Pradesh	Social Forestry Division, Agra	(27-05-21.96,78-23-50.67)
3974	Uttar Pradesh	Social Forestry Division, Firozabad	(27-11-01.92,78-20-07.50); (27-11-02.10,78-20-07.50); (27-10-50.46,78-19-48.42); (27-10-50.64,78-19-48.42)
3976	Uttar Pradesh	Social Forestry Division, Agra	(27-06-20.16,78-22-28.38)
3977	Uttar Pradesh	Social Forestry Division, Agra	(27-18-19.40,78-16-56.30)
3978	Uttar Pradesh	Social Forestry Division, Firozabad	(27-02-06.0,78-26-43.50); (27-02-48.60,78-26-41.64); (27-02-46.20,78-26-40.20)
3979	Uttar Pradesh	Social Forestry Division, Agra	(26-59-35.82,78-27-23.7)
3980	Uttar Pradesh	Social Forestry Division, Agra	(27-04-58.14,78-22-15.24)
3981	Uttar Pradesh	Social Forestry Division, Agra	(27-08-58.90,78-16-53.90)
3982	Uttar Pradesh	Social Forestry Division, Firozabad	(26-59-35.82,78-27-23.70); (26-59-29.76,78-27-21.60); (26-59-31.98,78-27-09.78); (26-59-24.76,78-27-10.96)
3983	Uttar Pradesh	Social Forestry Division, Agra	(27-06-20.02,78-22-18.96)
3984	Uttar	Social Forestry	(27-05-21.96,78-23-50.64)

	Pradesh	Division, Agra	
3985	Uttar Pradesh	Social Forestry Division, Agra	(26-58-41.21,78-30-59.34)
3986	Uttar Pradesh	Social Forestry Division, Agra	(27-08-19.74,78-22-11.34)
3987	Uttar Pradesh	Social Forestry Division, Firozabad	(27-11-01.92,78-20-07.50); (27-11-02.10,78-20-07.50); (27-10-50.46,78-19-48.42); (27-10-50.64,78-19-48.42)
3988	Uttar Pradesh	Social Forestry Division, Firozabad	(27-06-52.02,78-22-18.96)
3989	Uttar Pradesh	Social Forestry Division, Agra	(26-59-03.23,78-33-48.95)
3990	Uttar Pradesh	Social Forestry Division, Agra	(27-03-28.2,78-26-12.72)
3991	Uttar Pradesh	Social Forestry Division, Firozabad	(27-05-40.16,78-19-58.52)
3992	Uttar Pradesh	Social Forestry Division, Agra	
3993	Uttar Pradesh	Social Forestry Division, Agra	(26-59-03.23,78-33-48.95)
3994	Uttar Pradesh	Social Forestry Division, Agra	(26-58-13.5,78-36-58.4)
3995	Uttar Pradesh	Social Forestry Division, Agra	(27-05-13.38,78-23-53.52)
3996	Uttar Pradesh	Social Forestry Division, Agra	(26-55-28.0,78-40-15.1)
3997	Uttar Pradesh	Social Forestry Division, Agra	
3998	Uttar Pradesh	Social Forestry Division, Agra	(26-56-22.07,78-35-27.60)
3999	Uttar Pradesh	Social Forestry Division, Firozabad	(26-56-23.25,78-35-28.61)
4000	Uttar Pradesh	Social Forestry Division, Firozabad	(27-06-47.72,78-22-42.51);(27-06-57.93,78-22-30.28)
4001	Uttar Pradesh	Hathras Forest Division	(27-18-47.61,77-56-44.27); (27-18-46.81,77-55-52.43);(27-18-45.35,77-55-40.45);(27-18-41.64,77-54-16.99);(27-19-6.38,77-53-19.48);(27-19-20.31,77-52-25.97);(27-19-57.71,77-52-13.80);(27-19-23.77,77-54-19.67);(27-19-23.77,77-54-19.67);(27-19-29.64,77-53-49.16);(27-19-14.80,77-54-36.95);(27-19-2.37,77-55-37.84);(27-19-2.78,77-55-15.89)
4002	Uttar Pradesh	Social Forestry Division, Agra	
5389	Uttar Pradesh	Social Forestry Division, Agra	(27-10-49.95,78-03-52.53)
5423	Uttar Pradesh	Social Forestry Division, Agra	(26-53-36.18,78-37-49.44);(26-56-29.10,78-35-59.28);(26-56-37.38,78-30-47.46);(26-56-21.12,78-31-55.32);(26-55-39.66,78-30-54.30)
5452	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-50-35.9,78-13-57.01)

5453	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-50-37.64,78-13-55.76)
5455	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-53-21.54,78-18-46.27)
5456	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-53-8.7,78-21-34.4)
5457	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-50-38.94,78-25-1.99)
5458	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-46-32.77,78-34-3.21)
5459	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-47-22.62,78-37-37.07)
5460	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-47-32.7,78-36-52.9)
5461	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-48-54.4,78-40-55.3)
5462	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-47-39.8,78-40-0.1)
5463	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-47-22.62,78-37-37.07)
5464	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-48-36.6,78-41-51.01)
5465	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-35-19.7,79-07-55.2)
5466	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-34-59.16,79-8-16.4)
5467	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-33-11.6,79-11-28.4)
5468	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-33-8.2,79-11-27.1)
5454	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-50-37.64,78-13-55.76)
5469	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-50-25.49,78-25-1.99)

5470	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-46-32.77,78-34-3.21)
5471	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-47-22.62,78-37-37.07)
5472	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-52-36,78-22-57.5)
5473	Uttar Pradesh	National Chambal Sanctuary Project Agra (UP)	(26-45-47.29 ,78-46-8.7);(26-46-4.3,78-37-7.5);(26-49-6.4,78-15-21.7);(26-46-54.6,78-30-32.5)

Annexure-5

GPS COORDINATES OF SITES FOR VARIOUS FORESTRY INTERVENTIONS IN RAJASTHAN

The following table gives GPS coordinates of the sites proposed by the state SFD at time of DPR formulation. The sites may be finalised, with suitable changes wherever required, and georeferenced at time of implementation of the DPR.

Site ID	State	Division	Geo-coordinates (Format: degree-minute-second ºN Lat., degree-minute-second ºE Long.)
2671	Rajasthan	Office of Senior research institute Bhilwara	(25-27-28.13,75-05-50.80); (25-25-58.56,75-03-35.44); (25-28-15.09,75-05-43.16); (25-28-54.21,75-06-44.66)
2672	Rajasthan	Office of Senior research institute Bhilwara	(25-25-57.25,75-05-16.06); (25-25-58.56,75-03-35.44); (25-25-40.02,75-03-55.07); (25-25-27.26,75-05-50.22)
2673	Rajasthan	Office of Senior research institute Bhilwara	(25-23-32.77,75-05-54.05); (25-23-49.34,75-04-38.96); (25-24-14.97,75-04-52.05); (25-23-27.22,75-05-47.70)
2674	Rajasthan	Office of Senior research institute Bhilwara	(25-10-33.73,74-27-05.41); (25-11-40.23,74-29-12.42); (25-11-59.63,74-29-29.57); (25-12-45.78,74-32-39.48)
2675	Rajasthan	SawaiMadhopur District	(26-06-43.41,76-00-49.07); (26-06-57.03,76-02-02.99); (26-07-59.46,76-02-13.16); (26-07-49.37,76-01-18.21)
2676	Rajasthan	Office of Senior research institute Bhilwara	(25-21-39.92,75-05-54.30); (25-23-49.34,75-04-38.96); (25-21-50.14,75-04-27.70); (25-21-13.63,75-04-54.55)
2677	Rajasthan	Office of Senior research institute Bhilwara	(25-12-47.96,74-33-57.46); (25-12-36.71,74-28-30.82); (25-12-45.54,74-33-13.33); (25-12-34.20,74-30-13.13)
2678	Rajasthan	Office of Senior research institute Bhilwara	(25-13-01.64,74-35-53.06); (25-13-53.90,74-33-19.75); (25-12-43.55,74-34-40.76); (25-13-52.18,74-32-41.34)
2679	Rajasthan	Office of Senior research institute Bhilwara	(25-31-00.51,75-05-50.94); (25-30-50.82,75-05-57.68); (25-30-39.24,75-07-19.87); (25-29-45.65,75-05-53.33)
2680	Rajasthan	Office of Senior research institute Bhilwara	(25-12-56.94,74-36-49.69); (25-12-57.57,74-34-34.90); (25-12-43.64,74-37-08.68); (25-14-37.20,74-37-50.26)
2681	Rajasthan	SawaiMadhopur District	(26-08-40.76,76-02-50.48); (26-08-55.96,76-03-42.50); (26-08-15.52,76-04-05.22); (26-08-59.34,76-05-29.27); (26-09-23.36,76-03-51.93)
2682	Rajasthan	Office of Senior research institute Bhilwara	(25-11-59.04,74-30-49.37); (25-12-32.11,74-33-21.24); (25-12-18.18,74-34-11.50); (25-11-18.34,74-36-57.93)
2683	Rajasthan	Office of Senior	(25-29-11.4387,75-05-13.8732); (25-29-48.2847,75-05-

		research institute Bhilwara	06.5457); (25-29-44.1196,75-06-28.447); (25-29-33.7065,75-06-08.7280)
2684	Rajasthan	SawaiMadhopur District	(26-09-05.79,76-05-22.89); (26-10-57.93,76-06-57.74); (26-11-48.23,76-09-08.53); (26-11-54.50,76-12-49.99); (26-12-44.22,76-14-10.59); (26-13-08.38,76-17-47.74)
2686	Rajasthan	Office of Senior research institute Bhilwara	(25-13-00.40,74-38-56.24); (25-12-01.35,74-39-26.11); (25-15-07.97,74-39-00.95); (25-14-30.25,74-39-52.65)
2687	Rajasthan	Office of Senior research institute Bhilwara	(25-27-47.8193,75-04-37.0256); (25-28-20.7156,75-05-14.4848); (25-28-05.3690,75-05-06.1505); (25-27-01.8466,75-03-15.3069)
2688	Rajasthan	Office of Senior research institute Bhilwara	(25-15-07.97,74-39-00.95); (25-14-28.60,74-39-51.00); (25-14-36.71,74-41-20.29); (25-13-26.90,74-39-51.39)
2689	Rajasthan	Office of Senior research institute Bhilwara	(25-28-00.7628,75-01-54.3934); (25-26-52.8484,75-02-48.4618); (25-28-06.9613,75-03-09.2378); (25-27-54.0982,75-01-51.7283)
2690	Rajasthan	Office of Senior research institute Bhilwara	(25-19-04.21,75-05-46.24); (25-20-12.57,75-03-56.19); (25-19-28.11,75-04-17.21); (25-19-34.27,75-04-14.47)
2692	Rajasthan	Office of Senior research institute Bhilwara	(25-14-27.69,74-41-53.74); (25-14-05.90,74-43-38.96); (25-14-05.90,74-43-38.96); (25-13-42.68,74-44-27.36)
2693	Rajasthan	SawaiMadhopur District	(26-12-39.70,76-22-16.03); (26-13-16.34,76-23-37.82); (26-13-14.82,76-31-35.00); (26-12-43.50,76-29-19.00); (26-11-17.70,76-22-22.32)
2694	Rajasthan	Office of Senior research institute Bhilwara	(25-15-07.42,74-37-39.43); (25-13-49.65,74-36-19.79); (25-15-32.37,74-38-57.74); (25-15-07.42,74-37-39.43)
2695	Rajasthan	Office of Senior research institute Bhilwara	(25-15-13.16,74-40-27.40); (25-16-16.62,74-38-05.39); (25-14-39.40,74-41-26.64); (25-16-26.45,74-39-50.74)
2697	Rajasthan	Office of Senior research institute Bhilwara	(25-16-52.68,75-05-30.86); (25-17-32.39,75-04-34.25); (25-17-11.41,75-04-15.13); (25-16-00.75,75-04-47.97)
2698	Rajasthan	Office of Senior research institute Bhilwara	(25-14-33.78,74-41-36.57); (25-15-05.29,74-44-58.77); (25-15-06.49,74-45-00.07); (25-16-15.53,74-46-36.37)
2699	Rajasthan	SawaiMadhopur District	(26-13-51.15,76-35-04.81); (26-14-29.98,76-36-05.03); (26-13-39.82,76-37-25.19); (26-11-10.02,76-38-52.08); (26-10-20.78,76-38-40.54)
2700	Rajasthan	Office of Senior research institute Bhilwara	(25-16-19.99,74-46-55.23); (25-15-47.23,74-45-19.16); (25-15-57.71,74-44-15.26); (25-16-36.58,74-46-07.18)
2702	Rajasthan	Office of Senior research institute Bhilwara	(25-14-49.26,74-46-14.36); (25-13-46.84,74-44-30.99); (25-15-39.64,74-47-31.35); (25-14-56.90,74-48-26.09)
2703	Rajasthan	Office of Senior research institute Bhilwara	(25-26-06.6924,75-02-12.3167); (25-26-37.3102,75-02-39.5911); (25-25-29.5655,75-02-02.9444); (25-26-13.1694,75-02-56.0873)
2704	Rajasthan	Office of Senior	(25-14-42.62,75-03-55.06); (25-17-14.43,75-04-18.15);

		research institute Bhilwara	(25-14-58.67,75-02-11.80); (25-13-41.32,75-03-01.53)
2705	Rajasthan	SawaiMadhopur District	(26-10-13.38,76-38-07.03); (26-08-57.08,76-38-20.18); (26-09-01.27,76-39-53.12); (26-08-14.74,76-41-01.89); (26-08-41.48,76-36-44.84); (26-10-20.69,76-37-29.52)
2706	Rajasthan	Office of Senior research institute Bhilwara	(25-24-50.1972,75-03-18.3393); (25-26-13.1694,75-02-56.0873); (25-25-24.0257,75-04-03.1642); (25-24-28.3414,75-04-06.6042)
2707	Rajasthan	SawaiMadhopur District	(26-06-38.93,76-40-32.86); (26-05-50.19,76-42-33.27); (26-03-45.13,76-42-48.63); (26-02-39.36,76-42-10.96); (26-02-19.97,76-41-33.33)
2708	Rajasthan	Office of Senior research institute Bhilwara	(25-20-44.4251,75-02-31.1115); (25-25-24.0257,75-04-03.1642); (25-21-34.1182,75-03-03.5294); (25-20-11.1495,75-02-33.3963)
2709	Rajasthan	Office of Senior research institute Bhilwara	(25-13-22.94,75-01-26.54); (25-14-08.08,75-01-53.13); (25-13-55.77,75-00-09.05); (25-14-09.90,75-00-36.34)
2710	Rajasthan	Office of Senior research institute Bhilwara	(25-13-48.28,75-00-16.65); (25-14-10.71,75-01-47.80); (25-13-43.61,75-00-33.91)
2711	Rajasthan	Office of Senior research institute Bhilwara	(25-14-37.78,74-57-14.76); (25-13-58.29,74-55-15.42); (25-14-26.58,74-55-34.74)
2713	Rajasthan	SawaiMadhopur District	(26-07-46.12,76-03-56.90); (26-08-12.59,76-05-10.61); (26-08-08.03,76-05-53.09); (26-11-21.61,76-20-16.62); (26-11-21.61,76-20-16.62)
2714	Rajasthan	Office of Senior research institute Bhilwara	(25-40-47.32,75-14-10.98); (25-42-06.69,75-16-30.11); (25-40-43.80,75-13-28.34)
2715	Rajasthan	Tonk District	(26-13-23.2830,75-49-07.2994); (26-13-21.1757,75-49-34.4645); (26-14-22.9575,75-50-05.8660)
2716	Rajasthan	Office of Senior research institute Bhilwara	(25-40-47.32,75-14-10.98); (25-41-16.21,75-16-23.16); (25-39-34.10,75-13-48.06)
2717	Rajasthan	Office of Senior research institute Bhilwara	(25-38-12.89,75-12-17.78); (25-39-34.10,75-13-48.06); (25-39-02.72,75-12-27.02)
2718	Rajasthan	SawaiMadhopur District	(26-11-37.01,76-21-41.68); (26-10-31.94,76-22-54.43); (26-12-33.79,76-28-17.56); (26-09-28.99,76-23-10.99); (26-10-45.07,76-21-57.06)
2719	Rajasthan	SawaiMadhopur District	(26-12-00.57,76-35-51.93); (26-11-20.28,76-37-00.83); (26-11-17.36,76-35-07.24); (26-11-26.83,76-35-33.46)
2720	Rajasthan	Office of Senior research institute Bhilwara	(25-38-12.89,75-12-17.78); (25-39-34.10,75-13-48.06); (25-39-02.72,75-12-27.02)
2721	Rajasthan	Office of Senior research institute Bhilwara	(25-32-28.76,75-08-03.96); (25-31-56.85,75-09-08.54); (25-30-32.86,75-07-27.90)
2722	Rajasthan	Office of Senior research institute Bhilwara	(25-34-17.05,75-09-58.59); (25-34-15.20,75-11-18.50); (25-34-05.20,75-11-10.45)

2723	Rajasthan	SawaiMadhopur District	(26-08-29.45,76-36-25.18); (26-07-38.12,76-37-19.31); (26-08-23.08,76-36-04.62); (26-08-17.72,76-36-21.09); (26-06-10.15,76-39-01.94)
2724	Rajasthan	Office of Senior research institute Bhilwara	(25-36-19.22,75-12-18.47); (25-38-51.85,75-13-41.42); (25-36-37.53,75-13-44.87)
2726	Rajasthan	Office of Senior research institute Bhilwara	(25-39-12.28,75-14-34.64); (25-38-26.90,75-13-55.04); (25-39-36.58,75-14-13.53)
2727	Rajasthan	SawaiMadhopur District	(26-05-55.58,76-40-15.04); (26-04-39.22,76-40-26.78); (26-00-35.63,76-39-31.31); (25-56-31.48,76-41-49.33)
2728	Rajasthan	Office of Senior research institute Bhilwara	(25-38-33.86,75-15-51.46); (25-39-53.78,75-16-14.54); (25-39-49.63,75-16-07.39)
2730	Rajasthan	Tonk District	(26-13-21.16,75-49-31.73); (26-14-24.16,75-49-58.16); (26-14-7.24,75-50-40.56)
2731	Rajasthan	Office of Senior research institute Bhilwara	(25-39-49.15,75-17-39.91); (25-39-51.04,75-16-11.44); (25-40-05.46,75-17-48.00)
2732	Rajasthan	Office of Senior research institute Bhilwara	(25-42-19.89,75-17-52.07); (25-44-26.97,75-17-49.13)
2733	Rajasthan	Office of Senior research institute Bhilwara	(25-44-48.54,75-19-25.66); (25-45-58.04,75-19-07.11)
2734	Rajasthan	Office of Senior research institute Bhilwara	(25-33-32.9,75-12-26.72); (25-34-36.75,75-12-00.81)
2735	Rajasthan	Office of Senior research institute Bhilwara	(25-35-59.18,75-15-05.87); (25-38-17.27,75-13-51.93)
2736	Rajasthan	Office of Senior research institute Bhilwara	(25-35-16.07,75-13-50.67); (25-34-40.90,75-12-07.90)
2737	Rajasthan	Office of Senior research institute Bhilwara	(25-31-40.54,75-11-19.13); (25-31-31.67,75-09-42.72)
2738	Rajasthan	Office of Senior research institute Bhilwara	(25-29-56.10,75-09-08.03); (25-29-58.75,75-08-11.30)
2739	Rajasthan	Office of Senior research institute Bhilwara	(25-17-29.7412,75-02-38.2627); (25-16-33.9111,75-02-14.5148); (25-16-20.1304,75-01-22.2220); (25-18-52.8918,75-03-00.2523)
2740	Rajasthan	Office of Senior research institute Bhilwara	(25-18-39.0162,74-55-56.8170); (25-18-05.9358,74-55-19.9014); (25-17-33.1048,74-56-35.7411); (25-17-44.8668,74-57-41.0777)
2741	Rajasthan	Office of Senior research institute Bhilwara	(25-16-56.0924,74-51-09.8255); (25-15-48.6221,74-52-09.4650); (25-15-51.3448,74-51-50.000); (25-16-24.4686,74-51-55.4875)
2742	Rajasthan	Office of Senior research institute	(25-16-18.1156,74-49-56.2743); (25-15-51.4527,74-48-03.4314); (25-15-51.4527,74-48-03.4314); (25-15-

		Bhilwara	48.0619,74-46-19.8872)
2743	Rajasthan	Office of Senior research institute Bhilwara	(25-16-58.34444,74-54-18.6389); (25-16-46.0616,74-57-06.0627); (25-16-40.0185,74-52-14.6072); (25-17-08.4773,74-54-24.3116)
2744	Rajasthan	Office of Senior research institute Bhilwara	(25-15-43.5263,74-53-59.8529); (25-16-40.0185,74-52-13.8333); (25-16-46.0804,74-55-32.7075); (25-16-20.6719,74-53-33.5415)
2746	Rajasthan	Office of Senior research institute Bhilwara	(25-14-47.0341,74-50-44.0649); (25-15-39.6430,74-47-31.3506); (25-15-32.2168,74-52-07.9895); (25-14-29.5494,74-51-42.1048)
2747	Rajasthan	Tonk District	(26-13-32.1496,75-51-20.4730); (26-12-39.9071,75-51-56.7254); (26-10-45.9691,75-55-26.8991); (26-11-20.0218,75-53-57.1896)
2748	Rajasthan	Tonk District	(26-13-32.1496,75-51-20.4730); (26-12-39.9071,75-51-56.7254); (26-10-45.9691,75-55-26.8991); (26-11-20.0218,75-53-57.1896)
2750	Rajasthan	Office of Senior research institute Bhilwara	(25-13-47.1897,74-53-06.7449); (25-14-19.6725,74-52-32.3210); (25-13-26.0771,74-54-39.2774); (25-13-56.5518,74-52-44.2730)
2751	Rajasthan	Tonk District	(26-10-45.9691,75-55-26.8991); (26-10-24.1662,75-56-50.9695); (26-11-07.0110,75-57-59.3294); (26-12-00.6548,75-55-14.4484)
2752	Rajasthan	Tonk District	(26-10-45.9691,75-55-26.8991); (26-10-24.1662,75-56-50.9695); (26-11-07.0110,75-57-59.3294); (26-12-00.6548,75-55-14.4484)
2756	Rajasthan	Tonk District	(26-10-24.3813,75-56-50.4422); (26-11-06.8662,75-57-59.6247); (26-07-20.6587,75-59-33.3739); (26-08-22.5155,75-59-57.1916)
2757	Rajasthan	Tonk District	(26-10-24.3813,75-56-50.4422); (26-11-06.8662,75-57-59.6247); (26-07-20.6587,75-59-33.3739); (26-08-22.5155,75-59-57.1916)
2759	Rajasthan	Tonk District	(26-08-56.61,75-57-05.13); (26-10-17.77,75-54-54.50); (26-06-59.42,75-58-50.04); (26-09-09.36,75-57-49.49)
2760	Rajasthan	Tonk District	(26-08-56.61,75-57-05.13); (26-10-17.77,75-54-54.50); (26-06-59.42,75-58-50.04); (26-09-09.36,75-57-49.49)
2761	Rajasthan	Tonk District	(26-10-20.0795,75-54-44.5668); (26-10-15.8817,75-54-59.3142); (26-09-12.3153,75-54-58.1632); (26-10-01.2806,75-51-28.2668)
2762	Rajasthan	Tonk District	(26-10-20.0795,75-54-44.5668); (26-10-15.8817,75-54-59.3142); (26-09-12.3153,75-54-58.1632); (26-10-01.2806,75-51-28.2668)
2763	Rajasthan	Tonk District	(26-11-23.90,75-51-12.29); (26-10-22.51,75-54-41.20); (26-10-12.55,75-52-40.75); (26-10-07.04,75-51-18.61)
2764	Rajasthan	Tonk District	(26-11-23.90,75-51-12.29); (26-10-22.51,75-54-41.20); (26-10-12.55,75-52-40.75); (26-10-07.04,75-51-18.61)
2765	Rajasthan	Tonk District	(26-11-28.29,75-50-45.62); (26-11-23.66,75-51-14.43); (26-10-08.02,75-51-17.57); (26-11-24.45,75-49-01.63)
2766	Rajasthan	Tonk District	(26-11-28.29,75-50-45.62); (26-11-23.66,75-51-14.43); (26-10-08.02,75-51-17.57); (26-11-24.45,75-49-01.63)
2767	Rajasthan	Tonk District	(26-12-36.22,75-48-07.03); (26-11-02.71,75-47-00.84); (26-12-36.22,75-48-07.13); (26-11-28.29,75-50-45.62)

2768	Rajasthan	Tonk District	(26-12-36.22,75-48-07.03); (26-11-02.71,75-47-00.84); (26-12-36.22,75-48-07.13); (26-11-28.29,75-50-45.62)
2769	Rajasthan	Tonk District	(26-11-35.43,75-46-08.84); (26-09-42.71,75-44-34.16); (26-11-46.19,75-46-33.90); (26-09-50.77,75-45-38.44)
2770	Rajasthan	Tonk District	(26-11-35.43,75-46-08.84); (26-09-42.71,75-44-34.16); (26-11-46.19,75-46-33.90); (26-09-50.77,75-45-38.44)
2771	Rajasthan	Tonk District	(26-10-32.88,75-44-16.62); (26-08-45.60,75-43-37.33); (26-09-50.28,75-43-23.22); (26-08-28.66,75-41-41.27)
2772	Rajasthan	Tonk District	(26-10-32.88,75-44-16.62); (26-08-45.60,75-43-37.33); (26-09-50.28,75-43-23.22); (26-08-28.66,75-41-41.27)
2773	Rajasthan	Tonk District	(26-09-42.00,75-41-36.53); (26-05-55.98,75-40-13.08); (26-06-23.20,75-41-19.17); (26-08-29.96,75-41-41.91)
2774	Rajasthan	Tonk District	(26-09-42.00,75-41-36.53); (26-05-55.98,75-40-13.08); (26-06-23.20,75-41-19.17); (26-08-29.96,75-41-41.91)
2775	Rajasthan	Tonk District	(26-01-46.69,75-41-25.44); (26-05-30.85,75-41-44.79); (26-05-55.98,75-40-13.08); (26-03-09.65,75-41-27.66)
2776	Rajasthan	Tonk District	(26-01-46.69,75-41-25.44); (26-05-30.85,75-41-44.79); (26-05-55.98,75-40-13.08); (26-03-09.65,75-41-27.66)
2778	Rajasthan	Tonk District	(25-59-51.31,75-41-14.56); (26-02-53.77,75-42-42.63); (26-01-01.56,75-42-23.36); (26-01-20.63,75-41-12.20)
2779	Rajasthan	Tonk District	(25-59-51.31,75-41-14.56); (26-02-53.77,75-42-42.63); (26-01-01.56,75-42-23.36); (26-01-20.63,75-41-12.20)
2781	Rajasthan	Tonk District	(26-07-22.00,76-3-48)
2783	Rajasthan	Tonk District	(26-12-54.00,75-45-48.48); (26-14-13.79,75-47-01.49); (26-14-25.04,75-47-41.96)
2787	Rajasthan	Tonk District	(26-07-22.0,76-3-48); (26-06-14.0,76-3-33)
2788	Rajasthan	Tonk District	(26-13-23.28,75-49-07.29); (26-13-21-17,75-49-34.46); (26-14-22.95`,75-50-05.86)
2790	Rajasthan	Bhilwara	(25-9-17.85,74-29-46.42); (25-14-10.78,74-29-10.42); (25-10-15.74,74-28-38.92); (25-8-57.48,74-25-46.77)
2791	Rajasthan	Bhilwara	(25-10-29.85,74-29-46.42); (25-14-10.78,74-29-10.57); (25-10-15.74,74-28-38.92); (25-8-57.48,74-25-46.77)
2792	Rajasthan	Bhilwara	(25-13-47.92,74-38-0.56); (25-14-20.46,74-40-56.05); (25-14-22.94,74-41-20.01); (25-13-43.29,74-40-55.36)
2793	Rajasthan	Bhilwara	(25-13-04,74-39-06); (25-13-04,74-39-06); (25-13-05,74-39-07)
2795	Rajasthan	Bhilwara	(25-11-27.36,74-30-6.36); (25-11-15.3,74-38-50.82); (25-13-20,74-34-54.04); (25-12-41.04,74-40-14.5)
2796	Rajasthan	Bhilwara	(25-12-34.0,74-39-58); (25-12-34.0,74-39-57); (25-12-36.0,74-39-58)
2797	Rajasthan	Bhilwara	(25-16-48.83,74-58-2.81); (25-17-2.89,74-58-9.07); (25-22-54.39,74-58-46.03)
2799	Rajasthan	Bhilwara	(25-15-31.59,75-18-29.00)
2801	Rajasthan	Bhilwara	(25-15-48.43,74-3-52.09)
2802	Rajasthan	Bhilwara	(25-15-36.22,75-3-10.96); (25-15-49.31,75-3-17.29); (25-15-41.47,75-3-23.85)
2803	Rajasthan	Bhilwara	(25-15-59.33,75- 3-30.24)
2811	Rajasthan	Deputy Conservator Karoli	(26-19-29.94,77-18-4.38); (26-19-23.4,77-18-1.74); (26-19-1.5,77-18-3.9); (26-19-15.54,77-18-25.2)

2813	Rajasthan	Bundi	
2814	Rajasthan	Jhalawar	(24-48-05.28,76-13-33.46); (24-47-30.67,76-13-10.68); (24-47-27.22,76-13-17.39); (24-47-58.79,76-13-37.61)
2816	Rajasthan	Deputy Conservator Karoli	(26-19-50.99,77-17-53.53); (26-19-51.46,77-17-53.53); (26-22-48.46,77-21-23.43); (26-22-52.69,77-21-17.03)
2817	Rajasthan	Bundi	
2818	Rajasthan	Bhilwara	(25-15- 58.03,75-3-34.18)
2819	Rajasthan	Jhalawar	(24-48-05.28,76-13-33.46); (24-47-30.67,76-13-10.68); (24-47-27.22,76-13-17.39); (24-47-58.79,76-13-37.61)
2820	Rajasthan	Bhilwara	(25-13-56.46,75-1-12.06); (25-14-2.0,75-1-13.02); (25-14-6.24,75-16-41.19)
2821	Rajasthan	Deputy Conservator Karoli	(26-20-20.22,77-17-52.08); (26-19-56.88,77-17-35.88); (26-20-48.06,77-17-18.78); (26-20-37.2,77-17-41.58)
2822	Rajasthan	Office of Senior research institute Bhilwara	(25-30-58.0499,74-49-31.6204); (25-13-59.7422,74-48-52.0216); (25-14-14.5904,74-49-18.0121); (25-14-20.0187,74-49-49.4585)
2824	Rajasthan	Jhalawar	(24-39-29.75,76-15-51.63); (24-39-16.73,76-15-34.62); (24-39-14.01,76-15-39.38); (24-39-31.67,76-15-55.79)
2827	Rajasthan	Bundi	
2829	Rajasthan	Bhilwara	
2830	Rajasthan	Jhalawar	(24-29-29.75,76-15-51.63); (24-39-16.73,76-15-34.62); (24-39-14.01,76-15-39.38); (24-39-31.67,76-15-55.79)
2831	Rajasthan	Bundi	
2832	Rajasthan	Bhilwara	(25-19-58.50,75-16-9.10)
2833	Rajasthan	Deputy Conservator Karoli	(26-17-22.44,77-15-39); (26-17-17,77-16-9.6); (26-17-56,77-16-03); (26-17-60,77-16-19)
2834	Rajasthan	Bhilwara	(25-16-30.44,75-0-8.24)
2835	Rajasthan	Bhilwara	(25-19-44.32,75-15-40.88)
2836	Rajasthan	Bhilwara	(25-25-35.55,75-30-41.12)
2837	Rajasthan	Bhilwara	(25-20-4.98,74-59-28.68)
2838	Rajasthan	Bundi	(25-34-28,75-42-54); (25-34-27,75-42-00); (25-33-43,75-42-21); (25-34-04,75-42-43)
2840	Rajasthan	Deputy Conservator Karoli	(26-19-48.65,77-17-53.59); (26-19-52.37,77-17-53.91); (26-19-54.91,77-17-57.15)
2842	Rajasthan	Bhilwara	(25-15-32.03,75-19-17.13)
2846	Rajasthan	Deputy Conservator Karoli	(26-20-52.38,77-17-47.28); (26-20-43.5,77-17-47.4); (26-20-54.72,77-17-21.24)
2848	Rajasthan	Bhilwara	(25-15-32.98,75-19-17.98)
2849	Rajasthan	Deputy Conservator Karoli	(26-20-11.38,77-17-31.89); (26-15-42.92,77-18-26.97); (26-19-35.07,77-17-28.35)
2850	Rajasthan	Bundi	(25-27-36,75-27-37); (25-27-20,75-26-00); (25-28-15,75-25-45); (25-28-45,75-25-54); (25-27-30,75-22-46); (25-27-41,75-23-36); (25-26-1275-25-36);
2851	Rajasthan	Bhilwara	(25-19-52.86,75-16-5.88)

2854	Rajasthan	Bhilwara	(25-33-00.87,75-26-39.12)
2856	Rajasthan	Deputy Conservator Karoli	(26-20-43.03,77-17-14.72); (26-20-45.51,77-17-10.74); (26-20-46.03,77-17-10.03)
2857	Rajasthan	Bundi	(25-30-00,75-24-46); (25-29-01,75-24-20); (25-29-06,75-23-16); (25-31-24,75-21-48); (25-30-45,75-23-59); (25-29-38,75-24-18)
2860	Rajasthan	Bhilwara	(25-19-34.32,75-16-11.79)
2861	Rajasthan	Deputy Conservator Karoli	(26-18-16.4,77-14-10.6); (26-18-25.11,77-14-21.2); (26-18-41.2,77-14-38.1)
2863	Rajasthan	Bhilwara	(25-19-49.62,75-16-9.86)
2864	Rajasthan	Bundi	(25-25-37,75-16-11); (25-25-20,75-15-46); (25-25-00,75-15-40); (25-25-03,75-16-48); (25-25-17,75-16-45); (25-25-17,75-16-19)
2867	Rajasthan	Deputy Conservator Karoli	(26-20-46.32,77-17-16.68); (26-26-9.63,77-17-16.12); (26-20-46.03,77-17-22.99)
2874	Rajasthan	Bhilwara	(25-25-87.5,75-32-22.58)
2875	Rajasthan	Bundi	(25-26-05,75-20-40); (25-25-53,75-19-50); (25-26-32,75-20-00); (25-24-59,75-18-37); (25-24-59,75-18-37); (25-24-12,75-19-09); (25-25-2675-20-29);
2877	Rajasthan	Deputy Conservator Karoli	(26-18-49.8,77-17-48.06); (26-18-50.76,77-17-48.66); (26-19-7.2,77-16-55.26)
2878	Rajasthan	Bundi	(25-32-56,75-28-23); (25-32-57,75-26-31); (25-31-38,75-27-39); (25-29-44,75-25-40); (25-32-02,75-26-19); (25-33-40,75-25-19); (25-35-1675-27-13); (25-34-3675-27-54)
2879	Rajasthan	Bhilwara	(25-25-60,75-30-38.15)
2880	Rajasthan	Deputy Conservator Karoli	(26-20-3.36,77-17-26.55); (26-20-6.97,77-17-28.05); (26-20-5.71,77-17-14.13)
2881	Rajasthan	Bhilwara	(25-15-11.56,75-18-23.15)
2883	Rajasthan	Bhilwara	(25-15-31.59,74-18-29.00)
2884	Rajasthan	Bundi	(25-25-33,75-24-12); (25-24-27,75-24-10); (25-24-04,75-21-13); (25-25-10,75-22-38); (25-25-29,75-20-38); (25-25-56,75-21-55); (25-26-3475-21-05); (25-26-3975-22-15)
2885	Rajasthan	Bhilwara	(25-16-48.33,74-57-39.92)
2886	Rajasthan	Van MandalJhalawar	(24-29-10.64,76-13-43.73); (24-29-19.92,76-14-1.64); (24-28-50.54,76-14-55.85); (24-28-33.92,76-14-37.34)
2890	Rajasthan	Bundi	(25-33-29,75-31-01); (25-34-10,75-31-38); (25-34-33,75-32-46); (25-34-49,75-31-46); (25-35-27,75-31-48); (25-35-57,75-33-00); (25-34-3775-33-59); (25-33-4875-36-06)
2894	Rajasthan	Wildlife Kota	(25-29-20.90,75-43-47.55); (25-29-22.69,75-43-50.30)
2897	Rajasthan	Van MandalJhalawar	(24-32-1.57,76-14-14.58); (24-32-13.07,76-14-28.06); (24-31-28.72,76-14-40.97); (24-31-17.076,76-14-41.57)
2898	Rajasthan	Wildlife Kota	(25-32-42.72,75-43-41.11); (25-32-36.41,75-43-47.09); (25-32-54.60,75-44-51.48); (25-32-57.24,75-44-48.75)
2901	Rajasthan	Wildlife Kota	(25-29-19.15,75-43-16.71); (25-29-14.57,75-43-19.79); (25-29-27.64,75-44-3.40); (25-29-40.34,75-44-17.34)

2904	Rajasthan	Wildlife Kota	(25-30-36.92,75-46-43.94); (25-30-28.06,75-46-47.23); (25-30-36.81,75-47-37.90); (25-30-49.90,75-47-38.68)
2906	Rajasthan	Van MandalJhalawar	(24-32-1.57,76-14-14.58); (24-32-13.07,76-14-28.06); (24-31-28.72,76-14-40.97); (24-31-17.07,76-14-41.57)
2908	Rajasthan	Wildlife Kota	(25-36-21,75-54-31); (25-36-13,75-54-53); (25-35-53,75-54-44); (25-35-54,75-54-18)
2909	Rajasthan	Bhilwara	(25-19-26.76,75-6-48.96); (25-19-22.44,75-6-55.8); (25-32-8.31,75-11-8.28); (25-32-21.96,75-11-4.78)
2912	Rajasthan	Bhilwara	(25-18-26.49,75-2-34.99); (25-18-13.29,75-2-37.34); (25-19-0.41,75-2-31.11); (25-18-59.09,75-2-47.38)
2914	Rajasthan	Van MandalJhalawar	(24-37-1.30,76-12-9.92); (24-37-5.58,76-12-13.95); (24-36-32.42,76-12-48.94); (24-36-39.21,76-12-52.54)
2916	Rajasthan	Bhilwara	(25-25-16,75-5-1)
2918	Rajasthan	Bhilwara	(25-36-29.84,75-16-11.42)
2919	Rajasthan	Wildlife Kota	(24-55-37.32,75-33-24.41); (24-55-36.85,75-33-26.03); (24-55-35.34,75-33-25.66); (24-55-35.71,75-33-24.01)
2920	Rajasthan	Wildlife Kota	(24-54-04.66,75-53-49.10); (24-54-49.10,75-34-26.77); (24-54-14.57,75-34-10.12); (24-54-15.05,75-34-07.95)
2921	Rajasthan	Bhilwara	(25-29-1,75-07-50)
2922	Rajasthan	Baran	(25-13-18.54,77-13-28.08); (25-14-47.58,77-13-14.63); (25-13-55.08,77-13-17.01); (25-14-21.54,77-13-42.06)
2923	Rajasthan	Bhilwara	(25-33-33,75-12-58)
2924	Rajasthan	Wildlife Kota	(24-53-00.11,75-32-56.40); (24-53-00.50,75-33-06.36); (24-53-80.11,75-33-39.11); (24-53-07.67,75-33-38.88)
2925	Rajasthan	Baran	(25-15-25,77-10-48)
2926	Rajasthan	Bhilwara	(25-57-25.88,75-20-56.13)
2928	Rajasthan	Bhilwara	(25-31-2.50,75-10-36.18)
2929	Rajasthan	Wildlife Kota	(24-49-33.01,75-32-17.02); (24-49-31.27,75-32-10.06); (24-49-02.23,75-32-07.56); (24-49-32.16,75-32-10.15)
2930	Rajasthan	Bhilwara	(25-22-10,75-05-50)
2931	Rajasthan	Wildlife Kota	(24-52-43.21,75-34-08.23); (24-53-18.75,75-33-57.79); (24-52-50.24,75-34-21.55); (24-52-48.21,75-34-20.16)
2932	Rajasthan	Van MandalJhalawar	(24-30-1.66,76-15-29.55); (24-30-8.82,76-15-47.61); (24-29-48.74,76-16-4.97); (24-29-45.56,76-15-59.97)
2933	Rajasthan	Baran	(25-36-39.4,77-29-14.2); (25-35-16.7,77-29-42.3); (25-35-67.2,77-31-34.1); (25-35-98,77-31-93.5)
2934	Rajasthan	Bhilwara	(25-33-25.02,75-12-15.78)
2935	Rajasthan	Baran	(25-36-39.4,77-29-14.2); (25-35-16.7,77-29-42.3); (25-35-67.2,77-31-34.1); (25-35-98,77-31-93.5)
2936	Rajasthan	Wildlife Kota	(24-55-57.78,75-32-35.1); (24-55-59.4,75-32-58.56); (24-56-14.44,75-32-59.49); (24-56-21.66,75-27-13.02)
2937	Rajasthan	Bhilwara	(25-33-49.72,75-11-56.17)
2938	Rajasthan	Bhilwara	(25-31-14,75-09-10)
2939	Rajasthan	Baran	(25-15-45.06,77-22-27.78); (25-15-66.12,77-22-13.54)
2940	Rajasthan	Van MandalJhalawar	(24-31-55.94,76-14-56.29); (24-30-2.73,76-14-47.74); (24-32-30.24,76-15-2.71); (24-31-53.57,76-15-14.47)
2941	Rajasthan	Wildlife Kota	(24-47-40.8,75-28-43.2); (24-47-44.22,75-28-46.2); (24-47-46.14,75-28-50.94); (24-47-46.32,75-28-51.2)
2942	Rajasthan	Bhilwara	(25-33-3,75-12-46)
2943	Rajasthan	Baran	(25-24-44.86,77-16-33.47)

2945	Rajasthan	Bhilwara	(25-26-24,75-03-39)
2946	Rajasthan	Van MandalJhalawar	(24-37-0.26,76-11-11.67); (24-37-0.26,76-11-4.68); (24-36-6.84,76-12-0.85); (24-36-12.84,76-12-6.33)
2947	Rajasthan	Bhilwara	(25-35-55.62,75-14-24.91)
2949	Rajasthan	Bhilwara	(25-31-26.78,75-10-7.90)
2950	Rajasthan	Wildlife Kota	(24-47-46.52,75-27-35.01); (24-47-39.95,75-27-31.70); (24-47-43.10,75-27-35.51); (24-47-42.19,75-29-34.90)
2951	Rajasthan	Baran	(24-44-32.71,76-56-23.29); (24-44-20.74,76-44-50.40); (24-45-0.09,76-57-13.41); (24-44-50.40,76-57-27.09)
2952	Rajasthan	Van MandalJhalawar	(24-33-18.68,76-14-6.59); (24-33-25.50,76-14-16.77); (24-33-2.02,76-14-25.76); (24-33-4.06,76-14-12.00)
2954	Rajasthan	Bhilwara	(25-25-33,75-4-51)
2955	Rajasthan	Wildlife Kota	(24-47-0.55,75-22-25.80); (24-48-00.26,75-22-00.03); (24-47-03.23,75-21-36.92); (24-47-51.17,75-22-07.98)
2957	Rajasthan	Bhilwara	(25-25-46,75-5-51)
2959	Rajasthan	Bhilwara	(25-26-13,75-04-55)
2960	Rajasthan	Bhilwara	(25-33-17.64,75-13-0.53)
2961	Rajasthan	DCF WL Kota	(24-39-47.68,76-33-02.35); (24-39-48.10,76-33-18.33); (24-39-57.17,76-35-11.52); (24-39-48.06,76-33-09.11)
2962	Rajasthan	Bhilwara	(25-32-56.82,75-12-2.7)
2963	Rajasthan	Baran	(24-43-12.06,76-57-26.74); (24-43-21.24,76-56-58.07); (24-43-41.67,76-57-32.46); (24-43-46.48,76-56-51.88)
2964	Rajasthan	Bhilwara	(25-16-57.72,75-36-46.8)
2965	Rajasthan	DCF WL Kota	(24-40-51.47,76-33-29.8); (24-40-47.2,76-33-10.82); (24-40-18.17,76-33-17.28); (24-40-17.59,76-33-34.52)
2969	Rajasthan	Chittorgarh	
2971	Rajasthan	Bhilwara	(25-25-47,75-04-15)
2972	Rajasthan	Bhilwara	(25-35-50.44,75-13-50.49)
2973	Rajasthan	Chittorgarh	
2974	Rajasthan	Jhalawar	(24-30-7.29,76-13-7.60); (24-29-39.28,76-13-38.36); (24-29-5.09,76-13-18.68); (24-29-10.54,76-13-5.36); (24-29-52.76,76-12-28.44); (24-29-52.76,76-12-28.44)
2976	Rajasthan	Bhilwara	(25-35-21.66,75-13-19.94)
2977	Rajasthan	Bhilwara	(25-35-22.98,75-13-20.44)
2979	Rajasthan	Jhalawar	(24-30-7.29,76-13-7.60); (24-29-39.28,76-13-38.36); (24-29-5.09,76-13-18.68)
2980	Rajasthan	Chittorgarh	
2981	Rajasthan	Bhilwara	(25-28-33,75-06-27)
2983	Rajasthan	Chittorgarh	
2984	Rajasthan	Bhilwara	(25-28-36,75-06-18)
2985	Rajasthan	Bhilwara	(25-28-32,75-06-24)
2987	Rajasthan	Bhilwara	(25-27-29,75-05-38)
2989	Rajasthan	Bhilwara	(25-28-36,75-06-34)
2991	Rajasthan	Bhilwara	(25-28-59,75-06-7)
2992	Rajasthan	Bhilwara	(25-54-57.83,75-19-07.44)
2994	Rajasthan	Bhilwara	(25-51-59.03,75-17-50.84)
2995	Rajasthan	Bhilwara	(25-26-53,75-05-42)
2996	Rajasthan	Bhilwara	(25-28-25,75-60-10)
2997	Rajasthan	Bhilwara	(25-25-27,75-4-48)
2999	Rajasthan	Bhilwara	(25-28-32,75-06-11)

3000	Rajasthan	Bhilwara	(25-31-20.86,75-9-58.98)
3002	Rajasthan	Bhilwara	(25-35-50.44,75-13-48.29); (25-35-50.44,75-13-50.49); (25-35-22.98,75-13-20.44)
3004	Rajasthan	Bhilwara	(25-51-59.03,75-17-50.84)
3006	Rajasthan	Bhilwara	(25-27-34,75-5-13)
3007	Rajasthan	Bhilwara	(25-32-51.02,75-04-55.31)
3009	Rajasthan	Bhilwara	(25-18-27.65,75-2-41.67)
3010	Rajasthan	Jhalawar	(24-36-47.00,76-11-01.16); (24-37-05.45,76-10-48.72); (24-37-27.24,76-11-49.70); (24-37-16.97,76-11-09.44); (24-37-27.23,76-10-35.10); (24-37-07.56,76-10-16.45)
3012	Rajasthan	Bhilwara	(25-31-2.50,75-10-36.18)
3013	Rajasthan	Baran	(24-43-11.42,76-59-29.22); (24-43-4.8,76-59-36.6); (24-42-51.40,76-59-32.87); (24-42-56.86,76-59-15.39)
3014	Rajasthan	Bhilwara	(25-14-41.00,75-19-34.16)
3015	Rajasthan	Bhilwara	(25-32-23.11,75-11-6.79)
3017	Rajasthan	Jhalawar	(24-37-27.14,76-10-35.10); (24-37-05.45,76-10-48.72); (24-37-16.97,76-11-09.44)
3018	Rajasthan	Bhilwara	(25-27-37,75-05-18)
3019	Rajasthan	Baran	(24-31-31.67,77-2-29.20); (24-31-44.99,77-2-7.92); (24-31-55.18,77-2-19.97); (24-31-36.97,77-2-32.90)
3020	Rajasthan	Bhilwara	(25-38-35.35,75-13-12.55)
3021	Rajasthan	Bhilwara	(25-58-47.88,75-21-47.47)
3022	Rajasthan	Baran	(24-31-32.52,77-2-8.95); (24-32-15.38,77-2-26.21); (24-32-48.25,77-3-39.63); (24-33-15.77,77-2-22.68)
3023	Rajasthan	Bhilwara	(25-35-53.55,75-13-48.29)
3025	Rajasthan	Bhilwara	(25-38-24.60,75-13-16.05)
3027	Rajasthan	Bhilwara	(25-38-35.84,75-13-19.08)
3028	Rajasthan	Bhilwara	(25-18-26.49,75-2-34.99)
3029	Rajasthan	Bhilwara	(25-19-23.09,75-2-54.97)
3030	Rajasthan	Bhilwara	(25-31-26.78,75-10-7.90)
3032	Rajasthan	Bhilwara	(25-27-9.0,75-05-53)
3033	Rajasthan	Bhilwara	(25-27-42,75-05-10)
3034	Rajasthan	Van Mandal Jhalawar	(24-28-52.43,76-13-30.45); (24-29-06.92,76-13-40.44); (24-28-27.60,76-14-37.39); (24-28-17.79,76-14-15.52); (24-28-48.34,76-13-37.52)
3035	Rajasthan	Bhilwara	(25-30-42.76,75-10-38.67)
3037	Rajasthan	Bhilwara	(25-51-57.97,75-17-56.55)
3038	Rajasthan	Bhilwara	(25-51-49.69,75-17-43.57)
3039	Rajasthan	Bhilwara	(25-28-28,75-60-16)
3040	Rajasthan	Bhilwara	(25-58-53.72,75-21-47.48)
3042	Rajasthan	Bhilwara	(25-33-03,75-10-55)
3043	Rajasthan	Bhilwara	(25-55-10.91,75-20-21.92)
3045	Rajasthan	Bhilwara	(25-33-49.72,75-11-56.16)
3047	Rajasthan	Bhilwara	(25-32-56.82,75-12-2.05)
3049	Rajasthan	Bhilwara	(25-38-26.36,75-13-21.46)
3052	Rajasthan	Baran	(24-48-19.95,76-47-37.88); (24-51-38.89,76-44-29.29); (24-51-50.54,76-42-51.58); (24-47-22.95,76-49-22.36)
3054	Rajasthan	Van Mandal Jhalawar	(24-33-51.71,76-13-39.30); (24-34-8.29,76-13-58.54); (24-33-56.64,76-14-9.78); (24-33-45.25,76-13-46.01)
3055	Rajasthan	Baran	(24-36-5.00,77-39-14.93); (24-36-22.10,70-3-9.036); (24-

			36-15.83,77-2-48.08); (24-35-24.25,77-2-56.72)
3057	Rajasthan	Baran	(24-43-59.85,76-52-5.81); (24-55-59.86,76-52-5.82)
3059	Rajasthan	Baran	(24-42-50.32,76-53-13.89); (24-44-26.77,76-53-21.20); (27-44-4.30,76-53-7.77); (24-44-8.27,76-53-1.64)
3061	Rajasthan	Baran	(24-37-41.32,76-32-55.08); (24-37-45.99,76-32-4.61); (24-37-20.24,76-32-38.54)
3062	Rajasthan	Baran	(24-43-35.43,76-34-25.26); (24-45-0.14,76-33-59.19); (24-43-34.01,76-33-50.18)
3063	Rajasthan	Baran	(24-53-11.70,76-41-45.50); (24-53-22.58,76-42-8.71); (24-52-38.39,76-42-14.91)
3066	Rajasthan	Baran	(24-54-27.95,76-40-35.87); (24-54-30.39,76-40-40.43); (24-55-16.48,76-40-8.22); (24-55-10.01,76-39-58.21)
3069	Rajasthan	Baran	(24-46-20,76-43-47); (24-46-21,76-43-40)
3071	Rajasthan	Baran	(24-46-20,76-43-47); (24-46-21,76-43-49)
3072	Rajasthan	Baran	(24-46-20,76-43-47); (24-46-21,76-43-49)
3077	Rajasthan	Baran	
3078	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3081	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3084	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3086	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3092	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3095	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3096	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3100	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3101	Rajasthan	Baran	(25-08-13.10,76-13-29.36); (25-08-18.89,76-13-14.91); (25-08-45.21,76-13-34.35); (25-08-27.94,76-13-41.75)
3106	Rajasthan	Baran	(25-08-13.10,76-13-29.36); (25-08-18.89,76-13-14.91); (25-08-45.21,76-13-34.35); (25-08-53.61,76-13-40.59)
3129	Rajasthan	Baran	(25-09-27.93,76-15-06.35); (25-09-39.82,76-14-51.53); (25-09-55.28,76-15-12.95); (25-09-32.54,76-15-13.32)
3158	Rajasthan	Baran	(25-18-17.73,76-23-12.56); (25-13-54.19,76-37-46.02); (25-14-14.89,76-37-28.04); (25-14-28.98,76-37-43.76)
3159	Rajasthan	Baran	(25-14-13.53,76-38-1.93); (25-13-54.19,76-37-46.02); (25-14-14.89,76-37-28.04); (25-14-28.98,76-37-43.76)
3163	Rajasthan	Baran	
3168	Rajasthan	Baran	(25-14-50.93,76-36-18.83); (25-14-28.80,76-35-24.34); (25-14-08.17,76-36-02.71); (25-13-54.26,76-36-36.27)
3170	Rajasthan	Baran	(25-14-56.01,76-33-44.87); (25-14-57.21,76-33-27.50); (25-14-27.81,76-34-41.60); (25-14-46.87,76-35-17.53)
3318	Rajasthan	Rajsamand Forest Division	(24-54-46.40,73-34-29.93); (24-53-52.65,73-34-1.38); (24-54-13.54,73-33-51.21); (24-55-20.63,73-34-20.94)
3320	Rajasthan	Rajsamand	(25-21-47.00,73-43-58.00); (25-21-39.80,73-43-55.10);

		Forest Division	(25-22-09.50,73-44-31.30); (25-22-18.70,73-44-21.30); (25-22-17.40,73-44-11.60)
3321	Rajasthan	Rajsamand Forest Division	(25-21-0.2,73-41-27.00); (25-21-9.3,73-41-30.30); (25-20-51.20,73-42-14.70); (25-20-35.41,73.41.50.60)
3323	Rajasthan	Rajsamand Forest Division	(25-9-15.26,73-57-20.41); (25-9-27.54,73-57-15.15); (25-9-33.44,73-57-21.6); (25-9-20.30,73-57-41.58)
3326	Rajasthan	Rajsamand Forest Division	(25-3-25.02,73-29-42.88); (25-3-4.11,73-29-43.11); (25-2-51.37,73-29-45.56); (25-2-43.68,73-29-41.93)
3348	Rajasthan	Udaipur	(25-51-31,74-12-16); (25-51-18,74-12-21); (25-51-51,74-12-8); (25-51-60,74-12-23)
3349	Rajasthan	Udaipur	(25-52-8.6,74-13-14.5); (25-51-59,74-72-49); (25-51-58,74-12-49); (25-52-20,74-13-2)
3350	Rajasthan	Udaipur	(25-54-21.9,74-17-33.6); (25-54-24.5,74-17-38.9); (25-54-35.4,74-17-46.4); (25-54-39.8,74-17-48.0); (25-54-42.4,74-17-49.8); (25-54-47.8,74-17-51.2); (25-54-49.8,74-17-51.2); (25-54-51.6,74-18-00.8)
3351	Rajasthan	Forest Wildlife Rajsamand	(25-04-47.00,73-31-08); (25-03-57.00,73-31-36); (25-04-09.00,73-31-39); (25-04-48.00,73-31-10)
3353	Rajasthan	Rajsamand Forest Division	(24-58-26.16,73-30-58.64); (25-3-39.0,73-36-22); (25-3-41.0,73-36-72); (25-3-00.0,73-35-5); (24-58-46,73-30-40); (24-58-11,73-30-57)
3354	Rajasthan	Forest Wildlife Rajsamand	(24-59-33.86,73-36-9.03); (24-59-39.84,73-36-9.82); (24-59-40.41,73-36-4.10); (24-59-30,73-35-55)
3355	Rajasthan	Forest Wildlife Rajsamand	(25-02-25.0,73-31-18.0); (25-2-23.0,73-31-21.0); (25-2-20.0,73-31-14.0); (25-2-28.0,73-30-56.0)
3356	Rajasthan	Forest Wildlife Rajsamand	(25-28-35,73-52-29); (25-28-30,73-52-47); (25-28-06,73-52-18); (25-27-51,73-52-30)
3357	Rajasthan	Forest Wildlife Rajsamand	(25-27-12,73-51-42); (25-28-12,73-51-50); (25-28-12,73-52-22)
3358	Rajasthan	Forest Wildlife Rajsamand	(25-26-59,73-53-12); (25-26-38,73-53-19); (25-26-33,73-52-44); (25-26-49,73-52-24); (25-27-17,73-52-55)
3360	Rajasthan	Forest Wildlife Rajsamand	(25-27-27,73-53-07); (25-27-21,73-53-05); (25-27-05,73-52-42); (25-26-49,73-52-24); (25-26-59,73-52-06)
3361	Rajasthan	Forest Wildlife Rajsamand	(25-26-37,73-53-19); (25-26-00,73-52-58); (25-26-05,73-52-43); (25-26-12,73-52-36); (25-26-38,73-53-18)
3362	Rajasthan	Forest Wildlife Rajsamand	(25-28-10.6,73-57-16.6); (25-28-39.13,73-57-23.54); (25-28-44.85,73-56-58.54); (25-28-30.60,73-56-48.54)
3363	Rajasthan	Forest Wildlife Rajsamand	(25-34-25.34,74-2-38.66); (25-34-26.41,74-3-8.63); (25-34-7.53,74-3-16.64); (25-34-25.00,74-2-5.16)
3364	Rajasthan	Forest Wildlife Rajsamand	(25-32-56,74-0-17); (25-33-11,74-0-43); (25-33-16,74-0-57); (25-33-11,74-0-43)
3365	Rajasthan	Forest Wildlife Rajsamand	(24-55-6.53,74-1-32.63); (24-56-56.16,74-1-21.39); (24-55-9.23,74-1-30.22); (24-55-8.74,74-1-32.91)
3366	Rajasthan	Forest Wildlife Rajsamand	
3371	Rajasthan	Rajsamand Forest Division	(25-4-18.12,73-28-13.08); (25-4-18.12,73-28-13.44); (25-04-2021,73-28-13.44); (25-4-22.44,73-28-13.8)
3372	Rajasthan	Forest Wildlife Rajsamand	(24-56-15,73-49-29); (24-56-25,73-49-32); (24-56-28,73-50-07); (24-56-14,73-50-03)
3374	Rajasthan	Forest Wildlife	(24-55-56,73-49-39); (24-56-06,73-49-35); (24-56-14,73-

		Rajsamand	50-09); (24-56-04,73-50-11)
3375	Rajasthan	Forest Wildlife Rajsamand	(24-55-49,73-49-42); (24-56-00,73-50-21); (24-55-53,73-50-26); (24-55-35,73-49-50)
3378	Rajasthan	Forest Wildlife Rajsamand	(25-21-46.02,73-43-37.01)
3379	Rajasthan	Forest Wildlife Rajsamand	(25-21-40,73-44-26)
3381	Rajasthan	Forest Wildlife Rajsamand	(25-21-52,73-44-20)
3383	Rajasthan	Forest Wildlife Rajsamand	(25-21-34.2,73-44-27.3)
3384	Rajasthan	Forest Wildlife Rajsamand	(25-21-42.9.02,73-43-34.0)
3386	Rajasthan	Forest Wildlife Rajsamand	(25-21-54.08,73-44-05.6)
3388	Rajasthan	Forest Wildlife Rajsamand	(25-22-5,73-44-11)
3389	Rajasthan	Forest Wildlife Rajsamand	(25-22-2,73-44-19)
3390	Rajasthan	Forest Wildlife Rajsamand	(25-22-5,73-44-11)
3394	Rajasthan	Rajsamand Forest Division	(25-42-10.93,74-2-21.92); (25-42-9.08,74-2-18.02); (25-42-7.7,74-2-18.50)
3396	Rajasthan	Udaipur	(25-52-11,74-15-12)
3398	Rajasthan	Udaipur	(25-53-17.02,74-16-57.24); (25-53-17,74-16-57)
3400	Rajasthan	Udaipur	(25-33-10.44,74-11-56.4)
3402	Rajasthan	Udaipur	(25-31-33.6,74-8-4.2)
3403	Rajasthan	Udaipur	(25-32-9.24,74-10-51.6)
3404	Rajasthan	Rajsamand Forest Division	(24-58-32.01,73-36-18.59); (24-58-32.04,73-36-18.61); (24-58-32.03,73-36-18.60)
3405	Rajasthan	Rajsamand Forest Division	(25-31-26.80,74-0-44.58)
3406	Rajasthan	Rajsamand Forest Division	(25-31-46.08,74-1-30.20)
3409	Rajasthan	Rajsamand Forest Division	(25-34-24.43,74-2-37.78)
3410	Rajasthan	Rajsamand Forest Division	(25-28-8.36,74-58-0.18)
3411	Rajasthan	Rajsamand Forest Division	(25-27- 47.67,73-57-53.26)
3412	Rajasthan	Rajsamand Forest Division	(25-28-19.66,73-58-5.37)
3413	Rajasthan	Rajsamand Forest Division	(25-31-43.64,73-55-0.09)
3414	Rajasthan	Rajsamand Forest Division	(25-33-22.67,73-3-10.80)
3415	Rajasthan	Rajsamand Forest Division	(25-33-4.89,73-0-4.07)
3416	Rajasthan	Rajsamand Forest Division	(25-34-21.60,73-2-43.08)

3417	Rajasthan	Rajsamand Forest Division	(25-22-25.96,73-48-48.30)
3418	Rajasthan	Rajsamand Forest Division	(25-22-28.65,73-48-51.31)
3419	Rajasthan	Rajsamand Forest Division	(25-22-25.92,73-48-48.53)
3420	Rajasthan	Rajsamand Forest Division	(25-22-29.37,73-48-51.88)
3421	Rajasthan	Rajsamand Forest Division	(25-22-29.84,73-49-2.78)
3422	Rajasthan	Rajsamand Forest Division	(25-22-33.96,73-48-39.74)
3423	Rajasthan	Rajsamand Forest Division	(25-31-43.64,73-55-0.09)
3424	Rajasthan	Rajsamand Forest Division	(25-25-13.47,73-52-23.92)
3425	Rajasthan	Rajsamand Forest Division	(25-26-35.36,73-53-2.46)
3426	Rajasthan	Rajsamand Forest Division	(25-26-29.97,73-52-51.35)
3427	Rajasthan	Rajsamand Forest Division	(25-28-22.78,73-52-21.22)
3428	Rajasthan	Rajsamand Forest Division	(25-28-23.69,73-52-23.09)
3429	Rajasthan	Rajsamand Forest Division	(25-28-16.84,73-52-19.38)
3430	Rajasthan	Rajsamand Forest Division	(25-23-10.67,73-49-36.90)
3431	Rajasthan	Rajsamand Forest Division	(25-23-8.60,73-49-36.48)
3432	Rajasthan	Rajsamand Forest Division	(25-22-42.90,73-48-45.34)
3433	Rajasthan	Rajsamand Forest Division	(25-22-29.92,73-49-0.45)
3434	Rajasthan	Rajsamand Forest Division	(25-22-28.19,73-48-57.51)
3435	Rajasthan	Rajsamand Forest Division	(25-22-38.87,73-48-42.70)
3436	Rajasthan	Rajsamand Forest Division	(25-22-42.85,73-48-52.23)
3437	Rajasthan	Rajsamand Forest Division	(25-22-42.80,25-22-42.80)
3438	Rajasthan	Rajsamand Forest Division	(25-22-42.93,73-48-52.21)
3439	Rajasthan	Rajsamand Forest Division	(25-22-44.50,73-48-47.25)
3440	Rajasthan	Rajsamand Forest Division	(25-22-29.97,73-48-52.24)
3441	Rajasthan	Rajsamand Forest Division	(25-22-29.99,73-48-52.61)

3442	Rajasthan	Rajsamand Forest Division	(25-22-32.84,73-48-54.65)
3443	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(24-40-12.23,76-10-15.75); (24-40-5.23,76-10-58.39); (24-39-43.51,76-10-7.01); (24-39-36.81,76-10-43.84)
3444	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(24-44-23.06,76-11-8.64); (24-41-18.27,76-10-58.37); (24-40-57.54,76-11-34.91); (24-41-48.37,76-11-32.50); (24-44-24.69,76-11-45.10)
3445	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(24-44-45.77,76-4-43.87); (24-43-59.93,76-3-26.55); (24-42-37.44,76-5-6.23); (24-41-2.22,76-6-29.37)
3446	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-7-50.00,75-42-46.64); (25-7-50.00,75-42-46.64); (25-7-56.06,75-43-37.03); (25-8-47.92,75-46-35.72); (25-8-26.74,75-47-18.08)
3449	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-7-50.03,75-42-46.67); (25-7-50.03,75-42-46.67); (25-7-56.09,75-43-37.06); (25-8-47.95,75-46-35.75); (25-8-26.77,75-47-18.11)
3450	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-2-57.64,75-36-12.89); (25-0-45.07,75-37-54.53); (24-59-46.99,75-36-59.80); (24-58-56.28,75-34-56.26); (24-58-57.62,75-33-30.20); (24-59-15.80,75-31-42.17); (24-58-24.43,75-31-20.99); (24-58-50.70,75-29-38.88)
3452	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-0-59.13,75-38-11.62); (25-1-9.17,75-38-4.50); (25-1-9.21,75-37-33.10); (25-2-29.74,75-36-45.75); (25-3-34.08,75-37-12.21); (25-4-2.98,75-38-22.05); (25-04-29.89,75-38-38.14); (25-06-8.72,75-41-25.61)
3454	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-0-25.66,75-38-0.61); (24-58-54.61,75-40-24.78); (25-0-59.34,75-51-18.50); (25-0-55.33,75-38-37.42)
3456	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-0-19.61,75-42-45.41); (25-1-2.22,75-41-39.34); (25-03-13.37,75-43-35.26); (25-02-31.25,75-45-1.37)
3457	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-1-2.10,75-38-33.99); (25-01-39.13,75-39-3.936); (25-03-50.46,75-42-39.66); (25-03-24.50,75-43-22.83); (25-2-37.55,75-42-51.06)
3458	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-5-49.34,75-48-10.63); (25-07-44.29,75-44-23.18); (25-7-36.74,75-43-43.12); (25-07-13.00,75-43-54.40); (25-07-9.38,75-44-45.84)
3545	Rajasthan	Bundi	(25-36-36,76-11-27)
3546	Rajasthan	Bundi	(25-36-13,76-10-36)
3547	Rajasthan	Bundi	(25-36-52,76-10-21)
3548	Rajasthan	Bundi	(25-37-51,76-12-5); (25-38-14,76-12-04)
3549	Rajasthan	Bundi	(25-30-22.89,75-55-27.28); (25-30-7.37,75-55-28.18); (25-29-54.80,75-56-12.38); (25-29-36.97,75-56-10.46); (25-29-16.92,75-56-07.78)
3550	Rajasthan	Bundi	(25-30-22.89,75-55-27.28); (25-30-7.37,75-55-28.18); (25-29-54.80,75-56-12.38); (25-29-36.97,75-56-10.46); (25-29-16.92,75-56-07.78)
3551	Rajasthan	Bhilwara	(25-9-17.85,74-29-46.42); (25-14-10.78,74-29-10.42); (25-10-15.74,74-28-38.92); (25-8-57.48,74-25-46.77)
3552	Rajasthan	Bhilwara	(25-10-29.85,74-29-46.42); (25-14-10.78,74-29-10.57); (25-10-15.74,74-28-38.92); (25-8-57.48,74-25-46.77)

3553	Rajasthan	Bhilwara	(25-13-47.92,74-38-0.56); (25-14-20.46,74-40-56.05); (25-14-22.94,74-41-20.01); (25-13-43.29,74-40-55.36)
3554	Rajasthan	Bhilwara	(24-37-1.30,74-39-10.08); (25-12-55.51,74-39-7.28); (25-13-28.83,74-39-2.67); (25-13-27.64,74-39-16.62)
3554	Rajasthan	Bhilwara	
3555	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-7-50.00,75-42-46.64); (25-7-56.06,75-43-37.03); (25-8-47.92,75-46-35.72); (25-8-26.74,75-47-18.08)
3556	Rajasthan	Bhilwara	(25-12-55.71,74-39-10.08); (25-12-55.51,74-39-7.28); (25-13-28.83,74-39-2.67); (25-13-27.64,74-39-16.62)
3557	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-2-57.64,75-36-12.89); (25-0-45.07,75-37-54.53); (24-59-46.99,75-36-59.80); (24-58-56.28,75-34-56.26); (24-58-57.62,75-33-30.20); (24-59-15.80,75-31-42.17); (24-58-24.43,75-31-20.99); (24-58-50.70,75-29-38.88)
3558	Rajasthan	Jhalawar	(24-30-7.29,76-13-7.60); (24-29-39.28,76-13-38.36); (24-29-5.09,76-13-18.68)
3559	Rajasthan	Bhilwara	(25-11-27.36,74-30-6.36); (25-11-15.3,74-38-50.82); (25-13-12,74-34-32.44); (25-12-24.62,74-40-14.5)
3560	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-0-59.13,75-38-11.62); (25-1-9.17,75-38-4.50); (25-1-9.21,75-37-33.10); (25-2-29.74,75-36-45.75); (25-3-34.08,75-37-12.21); (25-4-2.98,75-38-22.05); (25-04-29.89,75-38-38.14); (25-06-8.72,75-41-25.61)
3561	Rajasthan	Mukandra Hills Tiger Reserve, Kota	(25-0-25.66,75-38-0.61); (24-58-54.61,75-40-24.78); (25-0-59.34,75-51-18.50); (25-0-55.33,75-38-37.42)
3562	Rajasthan	Mukandra Hills Tiger Reserve, Kota	
3563	Rajasthan	Mukandra Hills Tiger Reserve, Kota	
3564	Rajasthan	Mukandra Hills Tiger Reserve, Kota	
3565	Rajasthan	Bhilwara	(25-25-92.35,75-31-98.38)
3566	Rajasthan	Bhilwara	(25-19-26.76,75-6-48.96); (25-19-22.44,75-6-55.8); (25-21-23.14,75-11-8.28)
3567	Rajasthan	Bhilwara	(25-19-26.76,75-6-48.96); (25-19-22.44,75-6-55.8); (25-21-23.14,75-11-8.28)
3568	Rajasthan	Bhilwara	(25-19-26.76,75-6-48.96); (25-19-22.44,75-6-55.8); (25-21-23.14,75-11-8.28)
3569	Rajasthan	Bhilwara	(25-18-15.69,75-2-34.99); (25-18-13.29,75-2-37.34); (25-19-0.41,75-2-31.11); (25-18-59.09,75-2-47.38)
3570	Rajasthan	Bhilwara	(25-18-26.49,75-2-34.99); (25-18-13.29,75-2-37.34); (25-19-0.418,75-2-31.11); (25-18-59.09,75-2-47.38)
3571	Rajasthan	Bhilwara	(25-18-26.49,75-2-34.99); (25-18-13.29,75-2-37.34); (25-19-0.418,75-2-31.11); (25-18-59.09,75-2-47.38)
3572	Rajasthan	Tonk District	(26-12-54.0027,75-45-48.4898); (26-14-13.7967,75-47-01.4968); (26-14-25.0411,75-47-41.9611); (26-13-14.8247,75-47-41.5354)
3573	Rajasthan	Tonk District	(26-12-54.0027,75-45-48.4898); (26-14-13.7967,75-47-

			01.4968); (26-14-25.0411,75-47-41.9611); (26-13-14.8247,75-47-41.5354)
3574	Rajasthan	Tonk District	(26-12-54.0027,75-45-48.4898); (26-14-13.7968,75-47-01.49); (26-14-25.04,75-47-41.96)
3575	Rajasthan	Tonk District	(26-13-23.2830,75-49-07.2994); (26-13-21.1757,75-49-34.4645); (26-14-22.9575,75-50-05.8660); (26-14-25.0337,75-47-41.6647)
3576	Rajasthan	Wildlife Kota	(24-55-37.32,75-33-24.41); (24-55-36.85,75-33-26.03); (24-55-35.34,75-33-25.66); (24-55-35.71,75-33-24.01)
3577	Rajasthan	Wildlife Kota	(24-54-04.66,75-53-49.10); (24-54-49.10,75-34-26.77); (24-54-14.57,75-34-10.12); (24-54-15.05,75-34-07.95)
3578	Rajasthan	Tonk District	(26-13-23.2830,75-49-07.2994); (26-13-21.1757,75-49-34.4645); (26-14-22.9575,75-50-05.8660); (26-14-25.0337,75-47-41.6647)
3579	Rajasthan	Wildlife Kota	(24-53-00.11,75-32-56.40); (24-53-00.50,75-33-06.36); (24-53-30.11,75-33-39.11); (24-53-07.67,75-33-38.88)
3580	Rajasthan	Wildlife Kota	(24-49-33.01,75-32-17.02); (24-49-31.27,75-32-10.06); (24-49-02.23,75-32-07.56); (24-49-32.16,75-32-10.15)
3581	Rajasthan	Wildlife Kota	(24-52-43.21,75-34-08.23); (24-53-18.75,75-33-57.79); (24-52-50.24,75-34-21.55); (24-52-48.21,75-34-20.16)
3582	Rajasthan	Wildlife Kota	(24-55-96.3,75-32-58.5); (24-55-99.0,75-32-97.6); (24-56-14.44,75-32-59.49); (24-56-36.1,75-27-21.7)
3583	Rajasthan	Tonk District	(26-13-21.16,75-49-31.73); (26-14-24.1679,75-49-58.16); (26-14-7.24,75-50-40.56)
3584	Rajasthan	Wildlife Kota	(24-49-68.0,75-28-72.0); (24-49-73.7,75-28-77.0); (24-47-76.9,75-28-84.9); (24-49-77.2,75-28-85.2)
3585	Rajasthan	Tonk District	(26-13-21.16,75-49-31.73); (26-14-24.1679,75-49-58.16); (26-14-7.24,75-50-40.56)
3586	Rajasthan	Wildlife Kota	(24-47-46.52,75-27-35.01); (24-47-39.95,75-27-31.70); (24-47-43.10,75-27-35.51); (24-47-42.19,75-29-34.90)
3587	Rajasthan	Wildlife Kota	(24-47-0.55,75-22-25.80); (24-48-00.26,75-22-00.03); (24-47-03.23,75-21-36.92); (24-47-51.17,75-22-07.98)
3588	Rajasthan	DCF WL Kota	(24-39-47.68,76-33-02.35); (24-39-48.10,76-33-18.33); (24-39-57.17,76-35-11.52); (24-39-48.06,76-33-09.11)
3589	Rajasthan	Tonk District	(26-13-32.1496,75-51-20.4730); (26-12-39.9071,75-51-56.7254); (26-10-45.9691,75-55-26.8991); (26-11-20.0218,75-53-57.1896)
3590	Rajasthan	Tonk District	(26-10-45.9691,75-55-26.8991); (26-10-24.1662,75-56-50.9695); (26-11-07.0110,75-57-59.3294); (26-12-00.6548,75-55-14.4484)
3591	Rajasthan	Tonk District	(26-10-24.3813,75-56-50.4422); (26-11-06.8662,75-57-59.6247); (26-07-20.6587,75-59-33.3739); (26-08-22.5155,75-59-57.1916)
3592	Rajasthan	Tonk District	(26-08-56.61,75-57-05.13); (26-10-17.77,75-54-54.50); (26-06-59.42,75-58-50.04); (26-09-09.36,75-57-49.49)
3593	Rajasthan	Tonk District	(26-10-20.0795,75-54-44.5668); (26-10-15.8817,75-54-59.3142); (26-09-12.3153,75-54-58.1632); (26-10-01.2806,75-51-28.2668)
3594	Rajasthan	Tonk District	(26-11-23.90,75-51-12.29); (26-10-22.51,75-54-41.20); (26-10-12.55,75-52-40.75); (26-10-07.04,75-51-18.61)

3595	Rajasthan	Tonk District	(26-11-28.29,75-50-45.62); (26-11-23.66,75-51-14.43); (26-10-08.02,75-51-17.57); (26-11-24.45,75-49-01.63)
3596	Rajasthan	Tonk District	(26-12-36.22,75-48-07.03); (26-11-02.71,75-47-00.84); (26-12-36.22,75-48-07.13); (26-11-28.29,75-50-45.62)
3597	Rajasthan	Tonk District	(26-11-35.43,75-46-08.84); (26-09-42.71,75-44-34.16); (26-11-46.19,75-46-33.90); (26-09-50.77,75-45-38.44)
3598	Rajasthan	Tonk District	(26-10-32.88,75-44-16.62); (26-08-45.60,75-43-37.33); (26-09-50.28,75-43-23.22); (26-08-28.66,75-41-41.27)
3599	Rajasthan	Tonk District	(26-01-46.69,75-41-25.44); (26-05-30.85,75-41-44.79); (26-05-55.98,75-40-13.08); (26-03-09.65,75-41-27.66)
3600	Rajasthan	Tonk District	(25-59-51.31,75-41-14.56); (26-02-53.77,75-42-42.63); (26-01-01.56,75-42-23.36); (26-01-20.63,75-41-12.20)
3601	Rajasthan	Tonk District	(26-07-22.00,76-3-48)
3602	Rajasthan	Bhilwara	(25-25-16,75-5-1)
3603	Rajasthan	Bhilwara	(25-36-29.84,75-16-11.42)
3604	Rajasthan	Bhilwara	(25-29-1,75-07-50)
3605	Rajasthan	Bhilwara	(25-33-33,75-12-58)
3606	Rajasthan	Bhilwara	(25-57-25.88,75-20-56.13)
3607	Rajasthan	Bhilwara	(25-31-2.5,75-10-36.1)
3608	Rajasthan	Bhilwara	(25-22-10,75-05-50)
3609	Rajasthan	Bhilwara	(25-33-25.02,75-12-15.78)
3610	Rajasthan	Bhilwara	(25-33-49.72,75-11-56.17)
3611	Rajasthan	Bhilwara	(25-31-14,75-09-10)
3612	Rajasthan	Bhilwara	(25-33-33.02,75-12-46)
3613	Rajasthan	Bhilwara	(25-26-24,75-03-39)
3614	Rajasthan	Bhilwara	(25-35-55.62,75-14-24.91)
3615	Rajasthan	Bhilwara	(25-31-26.78,75-10-7.903)
3616	Rajasthan	Baran	(24-40-51.47,76-33-29.8); (24-40-47.2,76-33-10.82); (24-40-18.17,76-33-17.28); (24-40-17.59,76-33-34.52)
3617	Rajasthan	Baran	
3618	Rajasthan	Baran	
3619	Rajasthan	Baran	
3620	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3621	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3622	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3623	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3624	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3625	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3626	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)
3627	Rajasthan	Baran	(24-54-46.40,73-34-29.93); (24-53-52.65,73-34-1.38); (24-54-13.54,73-33-51.21); (24-55-20.63,73-34-20.94)
3628	Rajasthan	Baran	(25-20-54.68,76-33-38.05); (25-21-04.51,76-33-17.06); (25-21-19.87,76-33-13.38); (25-21-54.41,76-34-28.85)

3629	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3630	Rajasthan	Rajsamand Forest Division	(24-54-46.40,73-34-29.93); (24-53-52.65,73-34-1.38); (24-54-13.54,73-33-51.21); (24-55-20.63,73-34-20.94)
3631	Rajasthan	Rajsamand Forest Division	(24-54-46.40,73-34-29.93); (24-53-52.65,73-34-1.38); (24-55-20.63,73-34-20.94); (24-54-13.54,73-33-51.21)
3632	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3633	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3634	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3635	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3636	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3637	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3638	Rajasthan	Baran	(25-22-22.91,76-36-27.37); (25-22-25.01,76-36-19.50); (25-22-57.51,76-36-21.97); (25-22-30.73,76-36-31.77)
3639	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3640	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3641	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3642	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3643	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3644	Rajasthan	Baran	(25-08-13.10,76-13-29.36); (25-08-18.89,76-13-14.91); (25-08-45.21,76-13-34.35); (25-08-27.94,76-13-41.75)
3645	Rajasthan	Baran	(25-08-51.05,76-14-03.31)
3646	Rajasthan	Baran	(25-08-13.10,76-13-29.36); (25-08-18.89,76-13-14.91); (25-08-45.21,76-13-34.35); (25-18-53.61,76-13-40.59)
3647	Rajasthan	Baran	(25-09-27.93,76-15-06.35); (25-09-39.82,76-14-51.53); (25-09-55.28,76-15-12.95); (25-09-32.54,76-15-13.32)
3648	Rajasthan	Baran	
3649	Rajasthan	Baran	(25-14-13.53,76-38-1.93); (25-13-54.19,76-37-046.02); (25-14-14.89,76-37-28.04); (25-14-28.98,76-37-43.76)
3650	Rajasthan	Rajsamand Forest Division	(25-12-10.41,73-32-9.70); (25-12-46.022,73-32-6.14); (25-12-46.65,73-32-37.91); (25-12-41.21,73-32-40.76)
3651	Rajasthan	Forest Wildlife Rajsamand	(24-55-12,73-48-38); (24-55-20,73-48-27); (24-55-41,73-48-44); (24-55-39,73-48-47)
3652	Rajasthan	Forest Wildlife Rajsamand	(25-21-46.02,73-43-37.01)
3653	Rajasthan	Forest Wildlife Rajsamand	(24-55-12,73-48-38); (24-55-20,73-48-27); (24-55-41,73-48-44); (24-55-39,73-48-47)
3654	Rajasthan	Forest Wildlife Rajsamand	(25-21-40,73-44-26)

3655	Rajasthan	Forest Wildlife Rajsamand	(25-21-52,73-44-20)
3656	Rajasthan	Forest Wildlife Rajsamand	(24-55-49,73-49-42); (24-56-00,73-50-21); (24-55-53,73-50-26); (24-55-35,73-49-50)
3657	Rajasthan	Forest Wildlife Rajsamand	(24-56-15,73-49-29); (24-56-25,73-49-32); (24-56-28,73-50-07); (24-56-14,73-50-03)
3658	Rajasthan	Forest Wildlife Rajsamand	(25-21-42.9.02,73-43-34.0)
3659	Rajasthan	Forest Wildlife Rajsamand	(24-59-33.86,73-36-9.0396); (24-59-39.84,73-36-9.828); (24-59-40.416,73-36-4.104); (24-59-36,73-36-12)
3660	Rajasthan	Forest Wildlife Rajsamand	(25-21-54.08,73-44-05.6)
3661	Rajasthan	Rajsamand Forest Division	(25-3-25.02,73-29-22.8); (25-3-4.11,73-29-43.11); (25-2-51.3,73-29-45.5); (25-2-43.6,73-29-41.9)
3662	Rajasthan	Forest Wildlife Rajsamand	(25-22-5,73-44-11)
3663	Rajasthan	Forest Wildlife Rajsamand	(25-22-2,73-44-19)
3664	Rajasthan	Forest Wildlife Rajsamand	(25-22-5,73-44-11)
3665	Rajasthan	Rajsamand Forest Division	(25-21-0.2,73-41-27.00); (25-21-9.3,73-41-30.30); (25-20-51.20,73-42-14.70); (25-20-35.41,73-41-50.60)
3666	Rajasthan	Rajsamand Forest Division	(25-21-0.2,73-41-27.00); (25-21-9.3,73-41-30.30); (25-20-51.20,73-42-14.70); (25-20-35.41,73-41-50.60)
3667	Rajasthan	Rajsamand Forest Division	(25-21-47.00,73-43-58.00); (25-21-39.80,73-43-55.10); (25-22-09.50,73-44-31.30); (25-22-18.70,73-44-21.30); (25-22-17.40,73-44-11.60)
3668	Rajasthan	Rajsamand Forest Division	(25-42-10.93,74-2-21.92); (25-42-9.08,74-2-18.02); (25-42-7.7,74-2-18.50)
3669	Rajasthan	Rajsamand Forest Division	(25-21-47.00,73-43-58.00); (25-21-39.80,73-43-55.10); (25-22-09.50,73-44-31.30); (25-22-18.70,73-44-21.30); (25-22-17.40,73-44-11.60)
3670	Rajasthan	Rajsamand Forest Division	(25-42-10.93,74-2-21.92); (25-42-9.08,74-2-18.02); (25-42-7.7,74-2-18.50)
3671	Rajasthan	Rajsamand Forest Division	(25-42-10.93,74-2-21.92); (25-42-9.08,74-2-18.02); (25-42-7.7,74-2-18.50)
3672	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3673	Rajasthan	Baran	(25-25-37.98,76-34-00.22); (25-25-45.30,76-34-07.50); (25-25-54.08,76-33-54.73); (25-25-16.62,76-34-45.04)
3676	Rajasthan	Deputy Conservator Karoli	
3677	Rajasthan	Deputy Conservator Karoli	
3678	Rajasthan	Deputy Conservator Karoli	
3679	Rajasthan	Deputy	

		Conservator Karoli	
3680	Rajasthan	Deputy Conservator Karoli	
3681	Rajasthan	Deputy Conservator Karoli	
3682	Rajasthan	Deputy Conservator Karoli	
3683	Rajasthan	Deputy Conservator Karoli	
3684	Rajasthan	Deputy Conservator Karoli	
3685	Rajasthan	Deputy Conservator Karoli	
3686	Rajasthan	Deputy Conservator Karoli	
3687	Rajasthan	Deputy Conservator Karoli	
3688	Rajasthan	Deputy Conservator Karoli	
3689	Rajasthan	Deputy Conservator Karoli	
3690	Rajasthan	Sawai Madhopur	(26-10-44.90,76-13-35.90); (26-09-28.30,76-14-00.10); (26-09-00.20,76-13-26.20); (26-08-17.30,76-13-18.50); (26-09-06.50,76-12-07.50); (26-09-41.50,76-12-24.50); (26-09-26.20,76-11-39.40); (26-10-21.30,76-10-55.60)
3691	Rajasthan	Deputy Conservator Karoli	
3692	Rajasthan	Deputy Conservator Karoli	
3693	Rajasthan	Deputy Conservator Karoli	
3694	Rajasthan	Sawai Madhopur	
3695	Rajasthan	Deputy Conservator Karoli	
3696	Rajasthan	Deputy Conservator	

		Karoli	
3697	Rajasthan	Deputy Conservator Karoli	
3698	Rajasthan	Deputy Conservator Karoli	
3699	Rajasthan	Sawai Madhopur	
3700	Rajasthan	Deputy Conservator Karoli	
3701	Rajasthan	Sawai Madhopur	
3702	Rajasthan	Deputy Conservator Karoli	
3703	Rajasthan	Deputy Conservator Karoli	
3704	Rajasthan	Deputy Conservator Karoli	
3705	Rajasthan	Sawai Madhopur	
3706	Rajasthan	Sawai Madhopur	
3707	Rajasthan	Sawai Madhopur	
3708	Rajasthan	Deputy Conservator Karoli	
3709	Rajasthan	Sawai Madhopur	
3710	Rajasthan	Deputy Conservator Karoli	
3711	Rajasthan	Sawai Madhopur	
3712	Rajasthan	Deputy Conservator Karoli	
3713	Rajasthan	Sawai Madhopur	
3714	Rajasthan	Deputy Conservator Karoli	
3715	Rajasthan	Deputy Conservator Karoli	
3716	Rajasthan	Sawai Madhopur	
3717	Rajasthan	Deputy Conservator Karoli	
3718	Rajasthan	Sawai Madhopur	
3719	Rajasthan	Deputy Conservator Karoli	

3720	Rajasthan	Sawai Madhopur	
3721	Rajasthan	Deputy Conservator Karoli	
3722	Rajasthan	Deputy Conservator Karoli	
3723	Rajasthan	Sawai Madhopur	
3724	Rajasthan	Deputy Conservator Karoli	
3725	Rajasthan	Deputy Conservator Karoli	
3726	Rajasthan	Sawai Madhopur	
3727	Rajasthan	Sawai Madhopur	
3728	Rajasthan	Sawai Madhopur	
3729	Rajasthan	Sawai Madhopur	(26-10-23.90,76-13-56.75); (26-10-34.20,76-14-35.60); (26-10-33.20,76-16-13.80); (26-11-03.80,76-16-16.40); (26-10-55.40,76-15-30.60); (26-11-07.20,76-15-04.80); (26-11-17.20,76-14-42.60); (26-10-05.20,76-14-23.60)
3730	Rajasthan	Deputy Conservator Karoli	
3731	Rajasthan	Sawai Madhopur	
3732	Rajasthan	Sawai Madhopur	
3733	Rajasthan	Sawai Madhopur	
3734	Rajasthan	Sawai Madhopur	
3735	Rajasthan	Deputy Conservator Karoli	
3736	Rajasthan	Deputy Conservator Karoli	
3737	Rajasthan	Sawai Madhopur	
3738	Rajasthan	Deputy Conservator Karoli	
3739	Rajasthan	Deputy Conservator Karoli	
3740	Rajasthan	Sawai Madhopur	
3741	Rajasthan	Deputy Conservator Karoli	
3742	Rajasthan	Deputy Conservator Karoli	
3743	Rajasthan	Deputy Conservator	

		Karoli	
3744	Rajasthan	Sawai Madhopur	(26-11-07.90,76-16-29.90); (26-10-47.05,76-16-29.10); (26-10-54.15,76-16-34.80); (26-10-10.30,76-17-09.20); (26-10-59.50,76-17-12.50); (26-10-55.30,76-16-53.70); (26-10-33.70,76-17-14.45); (26-10-32.55,76-18-20.55)
3745	Rajasthan	Deputy Conservator Karoli	
3746	Rajasthan	Deputy Conservator Karoli	
3747	Rajasthan	Sawai Madhopur	
3748	Rajasthan	Deputy Conservator Karoli	
3749	Rajasthan	Deputy Conservator Karoli	
3750	Rajasthan	Deputy Conservator Karoli	
3751	Rajasthan	Sawai Madhopur	
3752	Rajasthan	Deputy Conservator Karoli	
3753	Rajasthan	Deputy Conservator Karoli	
3754	Rajasthan	Deputy Conservator Karoli	
3755	Rajasthan	Sawai Madhopur	
3756	Rajasthan	Sawai Madhopur	
3757	Rajasthan	Sawai Madhopur	
3758	Rajasthan	Deputy Conservator Karoli	
3759	Rajasthan	Deputy Conservator Karoli	
3760	Rajasthan	Deputy Conservator Karoli	
3761	Rajasthan	Sawai Madhopur	(26-11-54.60,76-16-47.60); (26-11-44.50,76-16-49.15); (26-11-26.99,76-16-49.50); (26-11-26.55,76-18-56.20); (26-11-25.90,76-18-59.50); (26-11-38.70,76-19-02.80); (26-11-39.15,76-19-11.40); (26-11-42.80,76-19-19.55)
3762	Rajasthan	Deputy Conservator Karoli	
3763	Rajasthan	Sawai Madhopur	

3764	Rajasthan	Deputy Conservator Karoli	
3765	Rajasthan	Sawai Madhopur	
3766	Rajasthan	Deputy Conservator Karoli	
3767	Rajasthan	Deputy Conservator Karoli	
3768	Rajasthan	Deputy Conservator Karoli	
3769	Rajasthan	Sawai Madhopur	
3770	Rajasthan	Sawai Madhopur	
3772	Rajasthan	Sawai Madhopur	(26-12-23.00,76-20-21.80); (26-12-25.55,76-20-09.98); (26-12-05.10,76-19-24.45); (26-11-58.20,76-19-29.10); (26-11-56.05,76-19-37.75); (26-11-48.05,76-19-39.95); (26-11-48.02,76-19-40.18); (26-11-54.80,76-20-00.00)
3775	Rajasthan	Sawai Madhopur	
3778	Rajasthan	Sawai Madhopur	
3781	Rajasthan	Sawai Madhopur	(26-10-31.60,76-04-09.50); (26-10-05.80,76-04-06.70); (26-08-35.10,76-03-00.10); (26-08-15.09,76-02-46.15); (26-07-57.10,76-02-14.05); (26-08-00.56,76-02-12.10); (26-08-07.15,76-02-14.10); (26-08-34.60,76-02-41.80)
3782	Rajasthan	Sawai Madhopur	
3785	Rajasthan	Sawai Madhopur	
3795	Rajasthan	Sawai Madhopur	
3799	Rajasthan	Sawai Madhopur	
3804	Rajasthan	Sawai Madhopur	
3806	Rajasthan	Sawai Madhopur	
3809	Rajasthan	Sawai Madhopur	
3811	Rajasthan	Sawai Madhopur	
3813	Rajasthan	Sawai Madhopur	
3814	Rajasthan	Sawai Madhopur	
3815	Rajasthan	Sawai Madhopur	
3817	Rajasthan	Sawai Madhopur	
3818	Rajasthan	Sawai Madhopur	(26-13-4.63,76-20-32.08); (26-12-58.49,76-21-03.77); (26-13-22.9,76-21-8.27); (26-13-39.06,76-0-34.44); (26-12-57.19,76-21-38.74); (26-12-57.35,76-21-49.61); (26-12-33.46,76-21-55.21); (26-12-22.93,76-01-38.24)
3822	Rajasthan	Sawai Madhopur	
3823	Rajasthan	Sawai Madhopur	
3824	Rajasthan	Sawai Madhopur	
3827	Rajasthan	Sawai Madhopur	
3829	Rajasthan	Sawai Madhopur	
3830	Rajasthan	Sawai Madhopur	
3835	Rajasthan	Sawai Madhopur	(26-18-00.70,76-28-52.90); (26-18-10.20,76-29-18.80); (26-18-24.80,76-29-59.50); (26-19-08.20,76-30-53.30); (26-19-07.50,76-31-26.05); (26-19-17.90,76-31-58.60);

			(26-19-37.20,76-31-39.60); (26-19-29.10,76-31-26.15)
3837	Rajasthan	Sawai Madhopur	
3839	Rajasthan	Sawai Madhopur	
3841	Rajasthan	Sawai Madhopur	
3861	Rajasthan	Sawai Madhopur	
3863	Rajasthan	Sawai Madhopur	
3865	Rajasthan	Sawai Madhopur	
3866	Rajasthan	Sawai Madhopur	
3869	Rajasthan	Sawai Madhopur	(26-19-25.30,76-35-20.40); (26-20-02.60,76-35-39.70); (26-20-18.90,76-35-30.30); (26-20-34.50,76-34-43.50); (26-19-40.40,76-34-10.55)
3871	Rajasthan	Sawai Madhopur	
3873	Rajasthan	Sawai Madhopur	
3874	Rajasthan	Sawai Madhopur	
3876	Rajasthan	Sawai Madhopur	
4003	Rajasthan	Dholpur	(26-30-39.67,77-30-50.81)
4004	Rajasthan	Bharatpur	(26-30-38.82,77-19-18.04); (26-30-18.13,77-19-0.98); (26-30-26.41,77-18-57.58); (26-30-37.24,77-18-52.77)
4005	Rajasthan	Dholpur	(2- 25-30.94,77-27-54.77)
4007	Rajasthan	Dholpur	(26-25-31.77,77-28-17.38)
4008	Rajasthan	Dholpur	(26-25-36.68,77-29-45.31); (26-25-27.27,77-29-41.49); (26-25-28.68,77-29-41.97)
4009	Rajasthan	Bharatpur	(26-1- 3.3,77-9-7.30); (26-17-6.21,77-9-7.23); (26-17-7.58,77-9-5.79); (26-17-8.73,77-7-16.42)
4010	Rajasthan	Dholpur	(26-26-19.52,77-28-42.95)
4011	Rajasthan	Dholpur	(26-26-43.35,77-28-59.05)
4012	Rajasthan	Dholpur	(26-27-29.31,77-27-56.32)
4014	Rajasthan	Dholpur	(26-29-22.46,77-16-21.46); (26-29-7.52,77-17-19.92)
4015	Rajasthan	Dholpur	(26-25-31.66,77-29-29.27)
4016	Rajasthan	Dholpur	(26-20-35.5,77-15-5.32); (26-20-37.5,77-15-4.32); (26-20-36.42,77-15-3.78); (26-20-33.9,77-15-4.5)
4017	Rajasthan	Dholpur	(26-34-32.30,77-19-49.22)
4018	Rajasthan	Dholpur	(26-25-31.11,77-28-16.72)
4019	Rajasthan	Dholpur	(26-25-34.19,77-28-13.19)
4020	Rajasthan	Dholpur	(26-2- 57.3,76-52-10.63); (26-20-39.66,77-11-35.52); (26-20-44.34,77-11-36.78); (26-20-44.88,77-11-37.14)
4021	Rajasthan	Dholpur	(26-31-51.75,77-13-57.14)
4022	Rajasthan	Dholpur	(26-31-37.25,77-14-18.50)
4023	Rajasthan	Dholpur	(26-31-31.44,77-16-31.42)
4024	Rajasthan	Dholpur	(26-31-31.80,77-16-31.95)
4025	Rajasthan	Dholpur	(26-32-54.09,77-16-45.09)
4026	Rajasthan	Dholpur	(26-34-48.43,77-21-23.93)
4027	Rajasthan	Dholpur	(26-20-35.44,77-12-41.47)
4028	Rajasthan	Dholpur	(26-20-43.65,77-11-36.6)
4029	Rajasthan	Dholpur	(26-34-32.30,77-19-49.22)
4030	Rajasthan	Dholpur	(26-23-44.82,77-22-19.55); (26-23-43.81,77-22- 4.06); (26-23-57.43,77-22-22.09); (26-24-3.96,77-22-14.34)
4031	Rajasthan	Dholpur	(26-23-59.15,77-23- 8.41); (26-23-59.12,77-23-7.95); (26-23-51.46,77-23-8.8); (26-24-1.50,77-23-29.51)
4032	Rajasthan	Dholpur	(26-23-43.994,77-23-9.733); (26-23-43.82,77-23-7.04);

			(26-23-40.329,77-23-13.8); (26-23-39.01,77-23-9.121)
4033	Rajasthan	Dholpur	(26-18- 28.38,77-22-11.40); (26-23-16.37,77-21-31.22); (26-22-50.095,77-21-20.35); (26-22-50.64,77-21-24.62)
4034	Rajasthan	Dholpur	(26-30-37.936,77-30-28.67)
4035	Rajasthan	Dholpur	(26- 20-35.52,77-15-5.328)
4036	Rajasthan	DCF (Project) Tonk	(26-13-48.584,75-46.53.904); (26-14-49.025,75-47-0.071); (26-14-1.081,75-48-45.495); (26-13-13.677,75-47-53.950)
4037	Rajasthan	DCF (Project) Tonk	(26-15-0.127,75-48-52.937); (26-14-6.063,75-48-29.698); (26-13-16.055,75-49-32.609); (26-14-12.637,75-50-12.498)
4038	Rajasthan	DCF (Project) Tonk	(26-15-7.528,75-50-26.684); (26-13-36.249,75-51-35.143); (26-12-37.687,75-50-32.679); (26-13-16.055,75-49-32.609)
4039	Rajasthan	DCF (Project) Tonk	(26-13-51.366,75-53-11.468); (26-12-22.224,75-54-3.827); (26-11-17.695,75-53-54.944); (26-12-37.687,75-50-32.679)
4040	Rajasthan	DCF (Project) Tonk	(26-12-36.816,75-55-36.394); (26-12-4.494,75-57-20.077); (26-11-44.588,75-58-57.326); (26-10-25.087,75-56-35.345)
4041	Rajasthan	DCF (Project) Tonk	(26-11-44.588,75-58-57.326); (26-9-44.251,76-0-16.068); (26-7-15.759,75-59-33.445); (26-9-6.605,75-58-24.477)
4042	Rajasthan	DCF (Project) Tonk	(26-10-17.460,75-54-53.671); (26-9-37.854,75-57-5.535); (26-7-3.667,75-59-2.317); (26-6-37.501,75-58-37.898)
4043	Rajasthan	DCF (Project) Tonk	(26-10-23.325,75-54-41.910); (26-9-23.776,75-55-7.547); (26-8-52.482,75-52-44.490); (26-10-1.578,75-51-37.712)
4044	Rajasthan	DCF (Project) Tonk	(26-11-18.029,75-51-21.229); (26-10-55.358,75-52-55.634); (26-10-23.325,75-54-41.910); (26-10-4.546,75-51-29.647)
4045	Rajasthan	DCF (Project) Tonk	(26-11-22.444,75-50-56.497); (26-11-41.766,75-49-34.397); (26-10-33.022,75-50-7.696); (26-10-4.546,75-51-29.647)
4046	Rajasthan	DCF (Project) Tonk	(26-11-45.843,75-46-47.00); (26-12-36.070,75-48-56.420); (26-11-22.444,75-50-56.497); (26-11-41.766,75-49-34.397)
4047	Rajasthan	DCF (Project) Tonk	(26-10-43.436,75-44-29.657); (26-11-45.843,75-46-47.00); (26-10-53.623,75-46-59.100); (26-9-29.531,75-44-51.841)
4048	Rajasthan	DCF (Project) Tonk	(26-9-59.421,75-43-34.205); (26-8-28.810,75-42-19.971); (26-6-48.588,75-42-32.820); (26-6-2.440,75-43-6.930)
4049	Rajasthan	DCF (Project) Tonk	(26-8-5.736,75-39-48.131); (26-9-38.377,75-40-51.916); (26-9-59.421,75-43-34.205); (26-7-50.263,75-42-53.379)
4050	Rajasthan	DCF (Project) Tonk	(26-2-22.709,75-41-41.065); (26-3-40.787,75-43-37.224); (26-5-43.326,75-43-48.585); (26-6-48.588,75-42-32.820)
4051	Rajasthan	DCF (Project) Tonk	(26-2-5.024,75-41-42.849); (25-59-55.551,75-41-8.989); (26-1-30.537,75-42.28.193); (26-1-27.697,75-44-16.177)
4052	Rajasthan	DCF (Project) Tonk	(26-6-41.585,75-59-10.357); (26-6-6.663,76-2-23.453); (26-5-33.042,76-0-22.567); (26-4-51.925,75-59-22.604)
4053	Rajasthan	DCF (Project) Tonk	(27-7-26.354,76-3-54.538); (26-6-36.514,76-4-56.016); (26-4-51.612,76-4-16.857); (26-3-59.657,76-2-10.765)

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4509	Rajasthan	NCS Sawai Madhopur	
4510	Rajasthan	NCS Sawai Madhopur	
4513	Rajasthan	Tonk District	(26-13-48.58,75-46-53.90); (26-14-49.02,75-47-0.07); (26-14-1.08,75-48-45.49); (26-13-13.67,75-47-53.95)
4514	Rajasthan	Tonk District	(26-10-43.436,75-44-29.657); (26-11-45.843,75-46-47); (26-10-53.623,75-46-59.100); (25-9-39.531,75-44-51.841)
4515	Rajasthan	Tonk District	(26-15-0.12,75-48-52.93); (26-14-6.06,75-48-29.69); (26-13-16.05,75-49-32.60); (26-14-12.63,75-50-12.49)
4516	Rajasthan	Tonk District	(26-9-59.421,75-43-34.205); (26-8-28.810,75-42-19.971); (26-6-48.588,75-42-32.820); (26-6-2.4,75-43-6.930)
4517	Rajasthan	Tonk District	(26-8-5.736,75-39-48.131); (26-9-38.77,75-40-51.916); (26-9-59.421,75-43-34.205); (26-7-50.263,75-42-53.379)
4518	Rajasthan	Tonk District	(26-15-7.52,75-50-26.68); (26-13-36.24,75-51-35.14); (26-12-37.68,75-50-32.67); (26-13-16.05,75-49-32.60)
4519	Rajasthan	Tonk District	(26-13-51.36,75-53-11.46); (26-12-22.22,75-54-3.82); (26-11-17.69,75-53-54.94); (26-12-37.68,75-50-32.67)
4520	Rajasthan	Tonk District	(26-2-22.709,75-41-41.065); (26-3-40.7,75-43-37.22); (26-5-43.326,75-43-48.585); (26-6-48.588,75-42-32.82)
4521	Rajasthan	Tonk District	(26-12-36-81,75-55-36.39); (26-12-4.49,75-57-20.07); (26-11-44.58,75-58-57.32); (26-10-25.08,75-56-35.34)
4522	Rajasthan	Tonk District	(26-11-44.58,75-58-57.32); (26-09-44.25,76-0-16.06); (26-7-15.75,75-59-33.44); (26-9-6.60,75-58-24.47)
4523	Rajasthan	Tonk District	(26-2-5.02,75-41-42.84); (25-59-55.5,75-41-8.98); (26-1-30.5,75-42-28.19); (26-1-27.6,75-44-16.17)
4524	Rajasthan	Tonk District	(26-10-17.46,75-54-53.67); (26-9-37.85,75-57-5.53); (26-7-3.66,75-59-2.31); (26-6-37.50,75-58-37.89)
4525	Rajasthan	Tonk District	(26-6-41.5,75-59-10.35); (26-6-6.6,76-2-23.45); (26-5-33.04,76-0-22.56); (26-4-51.9,75-59-22.60)
4526	Rajasthan	Tonk District	(27-7-26.35,76-3-54.5); (26-6-36.5,76-4-56.01); (26-4-51.61,76-4-16.85); (26-3-39.6,76-2-10.76)
4527	Rajasthan	Tonk District	(26-10-23.32,75-54-41.91); (26-09-23.77,75-55-7.54); (26-8-52.48,75-52-44.49); (26-10-1.57,75-51-37.71)
4528	Rajasthan	Tonk District	(26-11-18.02,75-51-21.22); (26-10-55.35,75-52-55.63); (26-10-23.32,75-54-41.91); (26-10-4.54,75-51-29.64)
4529	Rajasthan	Tonk District	(26-11-45.84,75-46-47.00); (26-12-36.07,75-48-56-.42); (26-11-22.44,75-50-56.49); (26-11-41.76,75-49-34.39)
4530	Rajasthan	Tonk District	(26-11-22.44,75-50-56.49); (26-11-41.76,75-49-34.39); (26-10-33.02,75-50-7.69); (26-10-4.54,75-51-29.64)
4531	Rajasthan	Sawai Madhopur	(25-51-52.56,76-34-26.62); (25-52-36.05,76-32-19.89); (25-53-28.11,76-31-18.01); (25-54-32.31,76-33-0.80)
4532	Rajasthan	Sawai Madhopur	(25-44-51.48,76-21-37..52); (25-45-3.64,76-21-34.30); (25-46-4.83,76-18-55.76); (25-48-0.88,76-21-50-77); (25-47-18.97,76-22-30.69)
4533	Rajasthan	Sawai Madhopur	(25-52-42.88,76-35-41.47); (25-54-18.38,76-35-44.05);

			(25-55-27.87,76-34-17.35); (25-56-44.98,76-36-20.92)
4534	Rajasthan	Sawai Madhopur	(25-54-50.76,76-44-15.72); (25-55-51.16,76-42-36.57); (25-58-37.50,76-42-08.67); (26-11-14.99,76-46-1.25)
4535	Rajasthan	Sawai Madhopur	(25-45-43.75,76-23-48.82); (25-48-0.88,76-21-50.77); (25-48-49.15,76-24-32.30); (25-51-6.76,76-25-49.39)
4536	Rajasthan	Sawai Madhopur	(26-2-15.15,76-51-0.04); (26-4-31.50,76-49-7.08); (26-7-31.67,76-51-37.60); (26-10-13.19,76-57-58.99)
4537	Rajasthan	Sawai Madhopur	(25-49-58.72,76-28-13.59); (25-49-54.68,76-27-57.26); (25-51-6.76,76-25-49.39); (25-52-21.40,76-26-14.41); (25-52-54.67,76-26-53.98)
4538	Rajasthan	Deputy Conservator Karoli	(26-10-37.28,76-02-5.88); (26-12-41.09,76-59-40.77); (25-13-11.47,77-3-28.27); (26-15-39.04,77-5-14.96)
4539	Rajasthan	Deputy Conservator Karoli	(26-16-52.57,77-16-28.58); (26-18-28.98,77-13-27.92); (26-23-11.90,77-18-4.32); (26-24-24.55,77-20-52.97)
4540	Rajasthan	Sawai Madhopur	(25-50-48.58,76-20-0.08); (25-51-35.01,76-27-52.76); (25-52-54.67,76-26-53.98); (25-53-32.51,76-28-29.51); (25-53-28.11,76-31-18.01)
4597	Rajasthan	NCS Sawai Madhopur	(25-27-36.12,76-10-34.10); (25-27-13.76,76-10-15.81); (25-29-36.87,76-10-23.79); (25-27-23.76,25-27-23.76)
4598	Rajasthan	Forest Wildlife Rajsamand	(25- 0-35.97,73-51-3.60)
4599	Rajasthan	Forest Wildlife Rajsamand	(25- 0-35.97,73-51-3.60)
4600	Rajasthan	Forest Wildlife Rajsamand	(24-58-53,73-46-43)
4601	Rajasthan	Forest Wildlife Rajsamand	(24-53-18,73-42-18); (24-53-14,73-42-46); (24-53-27,73-43-00)
4602	Rajasthan	Forest Wildlife Rajsamand	(24-53-42,73-34-8.4)
4603	Rajasthan	Forest Wildlife Rajsamand	(24-53-42,73-34-8.5)
4605	Rajasthan	Forest Wildlife Rajsamand	(24-53-42,73-34-8.5)
4606	Rajasthan	Forest Wildlife Rajsamand	(24-58-1.2,73-36-25.2)
4607	Rajasthan	Forest Wildlife Rajsamand	(24-58-1.2,73-36-25.2)
4608	Rajasthan	Forest Wildlife Rajsamand	
4609	Rajasthan	Forest Wildlife Rajsamand	(24-53-42,73-42-10.8)
4610	Rajasthan	Forest Wildlife Rajsamand	(24-53-42,73-42-10.8)
4611	Rajasthan	Forest Wildlife Rajsamand	(24-53-20.4,73-37-37.2)
4612	Rajasthan	Forest Wildlife Rajsamand	(24-58-1.2,73-36-25.2)
4613	Rajasthan	Forest Wildlife	(24-58-1.2,73-36-25.2)

		Rajsamand	
4614	Rajasthan	Forest Wildlife Rajsamand	(24-56-16,73-49-36); (24-56-01,73-49-56); (24-55-48,73-50-10); (24-55-22,73-48-40); (24-55-38,73-49-22); (24-55-41,73-49-45); (24-56-05,73-50-20)
4615	Rajasthan	Forest Wildlife Rajsamand	(25-0-59.16,73-48-27.12)
4616	Rajasthan	Forest Wildlife Rajsamand	(24-58-54.87,73-47-36.88); (24-59-25.40,73-50-22.98)
4617	Rajasthan	Forest Wildlife Rajsamand	
4618	Rajasthan	Forest Wildlife Rajsamand	(26-58-0.84,73-36-1.08)
4619	Rajasthan	Forest Wildlife Rajsamand	(24-59-14.89,73-36-41.61)
4620	Rajasthan	Forest Wildlife Rajsamand	(24-59-14.89,73-36-41.61)
4621	Rajasthan	Forest Wildlife Rajsamand	(24-59-14.89,73-36-41.61)
4622	Rajasthan	Forest Wildlife Rajsamand	(25- 0-35.97,73-51-3.60)
4623	Rajasthan	Forest Wildlife Rajsamand	(25- 0-35.97,73-51-3.60)
4624	Rajasthan	Forest Wildlife Rajsamand	(24-53-42,73-34-8.5)
4625	Rajasthan	Forest Wildlife Rajsamand	(24-58-1.2,73-36-25.2)
4626	Rajasthan	Forest Wildlife Rajsamand	(24-58-1.2,73-36-25.2)
4627	Rajasthan	Forest Wildlife Rajsamand	(24-59-14.89,73-36-41.61)
4628	Rajasthan	Tonk District	(25-58-32.23,75-34-8.55); (25-58-45.31,75-34-10.74); (25-58-51.35,75-34-29.01); (75-34-29.01,75-34-41.68)
4629	Rajasthan	Tonk District	(25-58-34.92,75-34-17.58)
4630	Rajasthan	Tonk District	(25-57-53.90,75-34-34.40)
4631	Rajasthan	Tonk District	(25-58-1.67,75-34-34.70)
4632	Rajasthan	Tonk District	(25-58-4.99,75-34-34.38)
4633	Rajasthan	Tonk District	(25-57-27.13,75-33-41.62)
4634	Rajasthan	Tonk District	(25-57-27.19,75-33-49.34)
4635	Rajasthan	Tonk District	(25-57-25.15,75-33-52.85)
4636	Rajasthan	Tonk District	(25-57-21.63,75-33-54.19)
4637	Rajasthan	Tonk District	(25-57-13.66,75-34-0.02)
4638	Rajasthan	Tonk District	(25-58-25.63,75-34-8.31)
4639	Rajasthan	Tonk District	(25-58-30.87,75-34-8.77)
4640	Rajasthan	Tonk District	(25-58-15.81,75-34-5.18); (25-58-32.23,75-34-8.65)
4641	Rajasthan	Tonk District	(25-58-12.57,75-34-20.40)
4642	Rajasthan	Tonk District	(25-52-55,75-26-54.42); (25-52-57.61,75-27-12.59)
4643	Rajasthan	Tonk District	(25-52-55,75-26-53)
4644	Rajasthan	Tonk District	(25-53-29.68,75-26-69.90)
4645	Rajasthan	Tonk District	(25-53-35.11,75-27-3.19)
4646	Rajasthan	Tonk District	(25-53-58.30,75-26-48.80)

4647	Rajasthan	Tonk District	(25-54-6.73,75-26-54.84)
4648	Rajasthan	Tonk District	(25-52-50.63,75-26-46.51)
4649	Rajasthan	Tonk District	(25-52-49.32,75-26-43.67)
4650	Rajasthan	Tonk District	(25-52-52.25,75-26-33.60)
4651	Rajasthan	Tonk District	(25-51-39.93,75-26-44.77); (25-52-20.71,75-26-21.40); (25-52-32.24,75-26-29.75); (25-52-10.27,75-26-55.26)
4652	Rajasthan	Tonk District	(25-52-21.35,75-27-14.74); (25-51-53.80,75-26-58.53)
4653	Rajasthan	Tonk District	(25-52-11.02,75-26-42.20)
4654	Rajasthan	Tonk District	(25-51-57.53,75-26-42.50)
4655	Rajasthan	Tonk District	(25-52-12.53,75-26-37.7)
4656	Rajasthan	Tonk District	(25-54-19.37,75-26-46.22)
4657	Rajasthan	Tonk District	(25-54-33.69,75-26-50.52)
4658	Rajasthan	Tonk District	(25-54-25.54,75-26-51.86)
4659	Rajasthan	Tonk District	(25-54-28.98,75-26-54.49)
4660	Rajasthan	Tonk District	(25-54-28.49,75-26-52.28)
4661	Rajasthan	Tonk District	(25-54-32.04,75-26-54.24)
4662	Rajasthan	Tonk District	(25-54-54.62,75-26-57.71)
4663	Rajasthan	Tonk District	(25-54-33.69,75-27-80.49)
4664	Rajasthan	Tonk District	(25-50-43,75-26-21)
4665	Rajasthan	Tonk District	(25-50-00,75-25-42); (25-49-37.58,75-25-40.43)
4666	Rajasthan	Tonk District	(25-50-8.41,75-25-32.79)
4667	Rajasthan	Tonk District	(25-50-26.64,75-26-10.33)
4668	Rajasthan	Tonk District	(25-50-6.99,75-25-48.05); (25-50-30.83,75-26-15.02)
4669	Rajasthan	Tonk District	(25-50-08.89,75-25-39.32); (25-50-14.59,75-25-31.94); (25-49-48.53,75-25-12.64); (25-49-40.80,75-25-12.48)
4670	Rajasthan	Tonk District	(25-39-29.54,75-26-29.54); (25-50-09.14,75-25-26.49)
4671	Rajasthan	Tonk District	(26-12-00.06,75-48-43.86)
4672	Rajasthan	Tonk District	(26-12-00.06,75-48-43.86)
4673	Rajasthan	Tonk District	(26-12-00.06,75-48-43.86)
4674	Rajasthan	Tonk District	(26-12-00.06,75-48-43.86)
4675	Rajasthan	Tonk District	(26-11-27.02,75-47-54.40)
4676	Rajasthan	Tonk District	(26-11-27.02,75-47-54.40)
4677	Rajasthan	Tonk District	(26-11-27.02,75-47-54.40)
4678	Rajasthan	Tonk District	(26-11-27.02,75-47-54.40)
4679	Rajasthan	Tonk District	(26-11-32.17,75-48-07.11)
4680	Rajasthan	Tonk District	(26-11-32.17,75-48-07.11)
4681	Rajasthan	Tonk District	(26-11-32.17,75-48-07.11)
4682	Rajasthan	Tonk District	(26-11-32.17,75-48-07.11)
4683	Rajasthan	Tonk District	(26-11-47.04,75-49-45.45)
4684	Rajasthan	Tonk District	(26-11-47.04,75-49-45.45)
4685	Rajasthan	Tonk District	(26-11-47.04,75-49-45.45)
4686	Rajasthan	Tonk District	(26-11-47.04,75-49-45.45)
4687	Rajasthan	Tonk District	(26-11-32.25,75-48-08.34)
4688	Rajasthan	Tonk District	(26-11-32.25,75-48-08.34)
4689	Rajasthan	Tonk District	(26-11-32.25,75-48-08.34)
4690	Rajasthan	Tonk District	(26-11-32.25,75-48-08.34)
4691	Rajasthan	Tonk District	(26-11-25.04,75-47-49.90)
4692	Rajasthan	Tonk District	(26-11-25.04,75-47-49.90)
4693	Rajasthan	Tonk District	(26-11-25.04,75-47-49.90)
4694	Rajasthan	Tonk District	(26-11-25.04,75-47-49.90)

4695	Rajasthan	Tonk District	(26-11-24.56,75-47-43.74)
4696	Rajasthan	Tonk District	(26-11-24.56,75-47-43.74)
4697	Rajasthan	Tonk District	(26-11-24.56,75-47-43.74)
4698	Rajasthan	Tonk District	(26-11-24.56,75-47-43.74)
4699	Rajasthan	Tonk District	(26-11-18.77,75-47-34.67)
4700	Rajasthan	Tonk District	(26-11-18.77,75-47-34.67)
4701	Rajasthan	Tonk District	(26-11-18.77,75-47-34.67)
4702	Rajasthan	Tonk District	(26-11-18.77,75-47-34.67)
4703	Rajasthan	Tonk District	(26-11-22.30,75-47-44.21)
4704	Rajasthan	Tonk District	(26-11-22.30,75-47-44.21)
4705	Rajasthan	Tonk District	(26-11-22.30,75-47-44.21)
4706	Rajasthan	Tonk District	(26-11-22.30,75-47-44.21)
4707	Rajasthan	Tonk District	(26-11-24.03,75-47-4)
4708	Rajasthan	Tonk District	(26-11-24.02,75-47-4)
4709	Rajasthan	Tonk District	(26-11-24.01,75-47-4)
4710	Rajasthan	Tonk District	(26-11-24.00,75-47-4)
4711	Rajasthan	Tonk District	(26-11-19.03,75-47-11)
4712	Rajasthan	Tonk District	(26-11-19.02,75-47-11)
4713	Rajasthan	Tonk District	(26-11-19.01,75-47-11)
4714	Rajasthan	Tonk District	(26-11-19.00,75-47-11)
4715	Rajasthan	Tonk District	(26-11-55.40,75-48-17.35)
4716	Rajasthan	Tonk District	(26-11-55.40,75-48-17.35)
4717	Rajasthan	Tonk District	(26-11-55.40,75-48-17.35)
4718	Rajasthan	Tonk District	(26-11-55.40,75-48-17.35)
4719	Rajasthan	Tonk District	(26-11-58.95,75-48-46.98)
4720	Rajasthan	Tonk District	(26-11-58.95,75-48-46.98)
4721	Rajasthan	Tonk District	(26-11-58.95,75-48-46.98)
4722	Rajasthan	Tonk District	(26-11-58.95,75-48-46.98)
4723	Rajasthan	Tonk District	(26-12-02.15,75-48-55.01)
4724	Rajasthan	Tonk District	(26-12-02.15,75-48-55.01)
4725	Rajasthan	Tonk District	(26-12-02.15,75-48-55.01)
4726	Rajasthan	Tonk District	(26-12-02.15,75-48-55.01)
4727	Rajasthan	Tonk District	(26-11-22.03,75-47-47.14)
4728	Rajasthan	Tonk District	(26-11-22.03,75-47-47.14)
4729	Rajasthan	Tonk District	(26-11-22.03,75-47-47.14)
4730	Rajasthan	Tonk District	(26-11-22.03,75-47-47.14)
4731	Rajasthan	Tonk District	(26-12-06.83,75-49-12.10)
4732	Rajasthan	Tonk District	(26-12-06.83,75-49-12.10)
4733	Rajasthan	Tonk District	(26-12-06.83,75-49-12.10)
4734	Rajasthan	Tonk District	(26-12-06.83,75-49-12.10)
4735	Rajasthan	Tonk District	(26-12-11.20,75-49-45.10)
4736	Rajasthan	Tonk District	(26-12-11.20,75-49-45.10)
4737	Rajasthan	Tonk District	(26-12-11.20,75-49-45.10)
4738	Rajasthan	Tonk District	(26-12-11.20,75-49-45.10)
4739	Rajasthan	Tonk District	(26-11-55.33,75-49-38.40)
4740	Rajasthan	Tonk District	(26-11-55.33,75-49-38.40)
4741	Rajasthan	Tonk District	(26-11-55.33,75-49-38.40)
4742	Rajasthan	Tonk District	(26-11-55.33,75-49-38.40)
4743	Rajasthan	\N	(26-11-28.34,75-49-30.54)

4744	Rajasthan	Tonk District	(26-11-28.34,75-49-30.54)
4745	Rajasthan	Tonk District	(26-11-28.34,75-49-30.54)
4746	Rajasthan	Tonk District	(26-11-28.34,75-49-30.54)
4747	Rajasthan	Tonk District	(26-11-28.34,75-49-30.54)
4748	Rajasthan	Tonk District	(28-11-48.07,75-50-29)
4749	Rajasthan	Tonk District	(28-11-48.06,75-50-29)
4750	Rajasthan	Tonk District	(28-11-48.05,75-50-29)
4751	Rajasthan	Tonk District	(28-11-48.04,75-50-29)
4752	Rajasthan	Tonk District	(28-11-48.03,75-50-29)
4753	Rajasthan	Tonk District	(28-11-48.02,75-50-29)
4754	Rajasthan	Tonk District	(28-11-48.01,75-50-29)
4755	Rajasthan	Tonk District	(28-11-48.00,75-50-29)
4756	Rajasthan	Tonk District	(26-14-5,75-51-39)
4757	Rajasthan	Tonk District	(26-14-5,75-51-39)
4758	Rajasthan	Tonk District	(26-14-5,75-51-39)
4759	Rajasthan	Tonk District	(26-14-5,75-51-39)
4760	Rajasthan	Tonk District	(26-13-41,75-51-43)
4761	Rajasthan	Tonk District	(26-13-41,75-51-43)
4762	Rajasthan	Tonk District	(26-13-41,75-51-43)
4763	Rajasthan	Tonk District	(26-13-41,75-51-43)
4764	Rajasthan	Tonk District	(26-14-0,75-51-28)
4765	Rajasthan	Tonk District	(26-14-0,75-51-28)
4766	Rajasthan	Tonk District	(26-14-0,75-51-28)
4767	Rajasthan	Tonk District	(26-14-0,75-51-28)
4768	Rajasthan	Tonk District	(26-13-38,75-31-34)
4769	Rajasthan	Tonk District	(26-13-38,75-31-34)
4770	Rajasthan	Tonk District	(26-13-38,75-31-34)
4771	Rajasthan	Tonk District	(26-13-38,75-31-34)
4772	Rajasthan	Tonk District	(26-14-2,75-52-25)
4773	Rajasthan	Tonk District	(26-14-2,75-52-25)
4774	Rajasthan	Tonk District	(26-14-2,75-52-25)
4775	Rajasthan	Tonk District	(26-14-2,75-52-25)
4776	Rajasthan	Tonk District	(26-14-3,75-52-12)
4777	Rajasthan	Tonk District	(26-14-3,75-52-12)
4778	Rajasthan	Tonk District	(26-14-3,75-52-12)
4779	Rajasthan	Tonk District	(26-14-3,75-52-12)
4780	Rajasthan	Tonk District	(26-14-0,75-52-9)
4781	Rajasthan	Tonk District	(26-14-0,75-52-9)
4782	Rajasthan	Tonk District	(26-14-0,75-52-9)
4783	Rajasthan	Tonk District	(26-14-0,75-52-9)
4784	Rajasthan	Tonk District	(26-13-53,75-52-15)
4785	Rajasthan	Tonk District	(26-13-53,75-52-15)
4786	Rajasthan	Tonk District	(26-13-53,75-52-15)
4787	Rajasthan	Tonk District	(26-13-53,75-52-15)
4788	Rajasthan	Tonk District	(26-13-58,75-52-17)
4789	Rajasthan	Tonk District	(26-13-58,75-52-17)
4790	Rajasthan	Tonk District	(26-13-58,75-52-17)
4791	Rajasthan	Tonk District	(26-13-58,75-52-17)
4792	Rajasthan	Tonk District	(26-13-53,75-51-39)

4793	Rajasthan	Tonk District	(26-13-53,75-51-39)
4794	Rajasthan	Tonk District	(26-13-53,75-51-39)
4795	Rajasthan	Tonk District	(26-13-53,75-51-39)
4796	Rajasthan	Tonk District	(26-11-48.00,75-51-27); (26-11-43.00,75-51-42)
4797	Rajasthan	Tonk District	(26-11-43.00,75-51-42); (26-11-52.00,75-51-50)
4798	Rajasthan	Tonk District	(26-11-43.00,75-51-42); (26-11-52.00,75-51-50)
4799	Rajasthan	Tonk District	(26-11-43.00,75-51-42); (26-11-52.00,75-51-50)
4800	Rajasthan	Tonk District	(26-11-46.00,75-51-26); (26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50); (26-11-41.00,75-52-12); (26-11-44.00,75-52-21); (26-12-02.00,75-52-22); (26-12-75.00,75-52-05)
4801	Rajasthan	Tonk District	(26-11-46.00,75-51-26); (26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50); (26-11-41.00,75-52-12); (26-11-44.00,75-52-21); (26-12-02.00,75-52-22); (26-12-75.00,75-52-05)
4802	Rajasthan	Tonk District	(26-11-46.00,75-51-26); (26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50); (26-11-41.00,75-52-12); (26-11-44.00,75-52-21); (26-12-02.00,75-52-22); (26-12-75.00,75-52-05)
4803	Rajasthan	Tonk District	(26-11-46.00,75-51-26); (26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50); (26-11-41.00,75-52-12); (26-11-44.00,75-52-21); (26-12-02.00,75-52-22); (26-12-75.00,75-52-05)
4804	Rajasthan	Tonk District	(26-11-46.00,75-51-26); (26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50); (26-11-41.00,75-52-12); (26-11-44.00,75-52-21); (26-12-02.00,75-52-22); (26-12-75.00,75-52-05)
4805	Rajasthan	Tonk District	(25-56-30,75-27-48)
4806	Rajasthan	Tonk District	(25-56-30,75-27-48)
4807	Rajasthan	Tonk District	(25-56-30,75-27-48)
4808	Rajasthan	Tonk District	(25-56-30,75-27-48)
4809	Rajasthan	Tonk District	(25-55-23,75-23-58); (25-57-0,75-29-39)
4810	Rajasthan	Tonk District	(25-55-23,75-23-58); (25-57-0,75-29-39)
4811	Rajasthan	Tonk District	(25-55-23,75-23-58); (25-57-0,75-29-39)
4812	Rajasthan	Tonk District	(25-55-23,75-23-58); (25-57-0,75-29-39)
4813	Rajasthan	Tonk District	(26-05-38.00,75-59-58); (26-05-20.00,75-0-40)
4815	Rajasthan	Tonk District	(26-05-38.00,75-59-59); (26-05-60.00,75-45-45); (26-05-10.00,75-59-20); (26-05-40.00,75-59-25)
4816	Rajasthan	Tonk District	(26-12-00.06,75-48-43.86)
4817	Rajasthan	Tonk District	(26-12-00.06,75-48-43.86)
4818	Rajasthan	Tonk District	(26-11-27.02,75-47-54.40)
4819	Rajasthan	Tonk District	(26-11-27.02,75-47-54.40)
4820	Rajasthan	Tonk District	(26-11-32.17,75-48-07.11)
4821	Rajasthan	Tonk District	(26-11-32.17,75-48-07.11)
4822	Rajasthan	Tonk District	(26-11-47.04,75-49-45.45)
4823	Rajasthan	Tonk District	(26-11-47.04,75-49-45.45)
4824	Rajasthan	Tonk District	(26-11-32.25,75-48-08.34)
4825	Rajasthan	Tonk District	(26-11-32.25,75-48-08.34)
4826	Rajasthan	Tonk District	(26-11-25.04,75-47-49.90)
4827	Rajasthan	Tonk District	(26-11-25.04,75-47-49.90)

4828	Rajasthan	Tonk District	(26-11-24.56,75-47-43.74)
4829	Rajasthan	Tonk District	(26-11-24.56,75-47-43.74)
4830	Rajasthan	Tonk District	(26-11-18.77,75-47-34.67)
4831	Rajasthan	Tonk District	(26-11-18.77,75-47-34.67)
4832	Rajasthan	Tonk District	(26-11-22.30,75-47-44.21)
4833	Rajasthan	Tonk District	(26-11-22.30,75-47-44.21)
4834	Rajasthan	Tonk District	(26-11-24.00,75-47-4)
4835	Rajasthan	Tonk District	(26-11-24.00,75-47-4)
4836	Rajasthan	Tonk District	(26-11-19.00,75-47-11)
4837	Rajasthan	Tonk District	(26-11-19.00,75-47-11)
4838	Rajasthan	Tonk District	(26-11-55.40,75-48-17.35)
4839	Rajasthan	Tonk District	(26-11-55.40,75-48-17.35)
4840	Rajasthan	Tonk District	(26-11-58.95,75-48-46.98)
4841	Rajasthan	Tonk District	(26-11-58.95,75-48-46.98)
4842	Rajasthan	Tonk District	(26-12-02.15,75-48-55.01)
4843	Rajasthan	Tonk District	(26-12-02.15,75-48-55.01)
4844	Rajasthan	Tonk District	(26-11-22.03,75-47-47.14)
4845	Rajasthan	Tonk District	(26-11-22.03,75-47-47.14)
4846	Rajasthan	Tonk District	(26-12-06.83,75-49-12.10)
4847	Rajasthan	Tonk District	(26-12-06.83,75-49-12.10)
4848	Rajasthan	Tonk District	(26-12-11.20,75-49-45.10)
4849	Rajasthan	Tonk District	(26-12-11.20,75-49-45.10)
4850	Rajasthan	Tonk District	(26-11-55.33,75-49-38.40)
4851	Rajasthan	Tonk District	(26-11-55.33,75-49-38.40)
4852	Rajasthan	Tonk District	(26-11-28.34,75-49-30.54)
4853	Rajasthan	Tonk District	(26-11-28.34,75-49-30.54)
4854	Rajasthan	Tonk District	(28-11-48.00,75-50-29)
4855	Rajasthan	Tonk District	(28-11-48.00,75-50-29)
4856	Rajasthan	Tonk District	(28-11-48.00,75-50-29)
4857	Rajasthan	Tonk District	(28-11-48.00,75-50-29)
4858	Rajasthan	Tonk District	(26-14-5,75-51-39)
4859	Rajasthan	Tonk District	(26-14-5,75-51-39)
4860	Rajasthan	Tonk District	(26-13-41,75-51-43)
4861	Rajasthan	Tonk District	(26-13-41,75-51-43)
4862	Rajasthan	Tonk District	(26-14-0,75-51-28)
4863	Rajasthan	Tonk District	(26-14-0,75-51-28)
4864	Rajasthan	Tonk District	(26-13-38,75-31-34)
4865	Rajasthan	Tonk District	(26-13-38,75-31-34)
4866	Rajasthan	Tonk District	(26-14-2,75-52-25)
4867	Rajasthan	Tonk District	(26-14-2,75-52-25)
4868	Rajasthan	Tonk District	(26-14-3,75-52-12)
4869	Rajasthan	Tonk District	(26-14-3,75-52-12)
4870	Rajasthan	Tonk District	(26-14-0,75-52-9)
4871	Rajasthan	Tonk District	(26-14-0,75-52-9)
4872	Rajasthan	Tonk District	(26-13-53,75-52-15)
4873	Rajasthan	Tonk District	(26-13-53,75-52-15)
4874	Rajasthan	Tonk District	(26-13-58,75-52-17)
4875	Rajasthan	Tonk District	(26-13-58,75-52-17)
4876	Rajasthan	Tonk District	(26-13-53,75-51-39)

4877	Rajasthan	Tonk District	(26-13-53,75-51-39)
4878	Rajasthan	Tonk District	(26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50)
4879	Rajasthan	Tonk District	(26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50)
4880	Rajasthan	Tonk District	(26-11-46.00,75-51-26); (26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50); (26-11-41.00,75-52-12); (26-11-44.00,75-52-21); (26-12-02.00,75-52-22); (26-12-75.00,75-52-05)
4881	Rajasthan	Tonk District	(26-11-46.00,75-51-26); (26-11-48.00,75-51-27); (26-11-43.00,75-51-42); (26-11-52.00,75-51-50); (26-11-41.00,75-52-12); (26-11-44.00,75-52-21); (26-12-02.00,75-52-22); (26-12-75.00,75-52-05)
4882	Rajasthan	Tonk District	(25-56-30,75-27-48)
4883	Rajasthan	Tonk District	(25-56-30,75-27-48)
4884	Rajasthan	Tonk District	(25-55-23,75-23-58); (25-57-0,75-29-39)
4885	Rajasthan	Tonk District	(25-55-23,75-23-58); (25-57-0,75-29-39)
4886	Rajasthan	Tonk District	(26-10-51.01,75-45-05.89); (26-10-56.06,75-45-22.34)
4887	Rajasthan	Tonk District	(26-10-51.01,75-45-05.89); (26-10-56.06,75-45-22.34)
4888	Rajasthan	Tonk District	(26-10-51.01,75-45-05.89); (26-10-56.06,75-45-22.34)
4889	Rajasthan	Tonk District	(26-10-51.01,75-45-05.89); (26-10-56.06,75-45-22.34)
4890	Rajasthan	Tonk District	(26-10-51.01,75-45-05.89); (26-10-56.06,75-45-22.34)
4891	Rajasthan	Tonk District	(26-10-51.01,75-45-05.89); (26-10-56.06,75-45-22.34)
4892	Rajasthan	Tonk District	(26-11-34.28,75-49-36-40)
4893	Rajasthan	Tonk District	(26-11-34.28,75-49-36-40)
4894	Rajasthan	Tonk District	(26-11-34.28,75-49-36-40)
4895	Rajasthan	Tonk District	(26-11-34.28,75-49-36-40)
4896	Rajasthan	Tonk District	(26-11-34.28,75-49-36-40)
4897	Rajasthan	Tonk District	(26-11-34.28,75-49-36-40)
4898	Rajasthan	Tonk District	(26-11-17.56,75-50-44.03); (26-11-22.39,75-50-30.69)
4899	Rajasthan	Tonk District	(26-11-17.56,75-50-44.03); (26-11-22.39,75-50-30.69)
4900	Rajasthan	Tonk District	(26-11-17.56,75-50-44.03); (26-11-22.39,75-50-30.69)
4901	Rajasthan	Tonk District	(26-11-17.56,75-50-44.03); (26-11-22.39,75-50-30.69)
4902	Rajasthan	Tonk District	(26-11-17.56,75-50-44.03); (26-11-22.39,75-50-30.69)
4903	Rajasthan	Tonk District	(26-11-17.56,75-50-44.03); (26-11-22.39,75-50-30.69)
4905	Rajasthan	Tonk District	(26-11-22.39,75-50-30.69); (26-11-25.31,75-51-12.29); (26-11-17.56,75-50-44.03); (26-11-19.24,75-50-28.83)
4906	Rajasthan	Tonk District	
4907	Rajasthan	Tonk District	
4908	Rajasthan	Tonk District	
4909	Rajasthan	Tonk District	(26-11-48.13,75-48-6.11); (26-12-4.61,75-49-4.59); (26-11-52.28,75-49-5.78); (26-11-45.09,75-48-12.23)
4910	Rajasthan	Tonk District	(26-11-48.13,75-48-6.11); (26-12-4.61,75-49-4.59); (26-11-52.28,75-49-5.78); (26-11-45.09,75-48-12.23)
4911	Rajasthan	Tonk District	(26-11-48.13,75-48-6.11); (26-12-4.61,75-49-4.59); (26-11-52.28,75-49-5.78); (26-11-45.09,75-48-12.23)
4912	Rajasthan	Tonk District	(26-11-48.13,75-48-6.11); (26-12-4.61,75-49-4.59); (26-11-52.28,75-49-5.78); (26-11-45.09,75-48-12.23)
4913	Rajasthan	Tonk District	(26-11-48.13,75-48-6.11); (26-12-4.61,75-49-4.59); (26-11-52.28,75-49-5.78); (26-11-45.09,75-48-12.23)

4914	Rajasthan	Tonk District	(26-05-38.00,75-59-58); (26-05-20.00,75-0-40)
4915	Rajasthan	Tonk District	(25-55-4,75-28-7)
4916	Rajasthan	Tonk District	(25-55-4,75-28-7)
4917	Rajasthan	Tonk District	(25-55-4,75-28-7)
4918	Rajasthan	Tonk District	(25-55-4,75-28-7)
4919	Rajasthan	Tonk District	(25-55-4,75-28-7)
4920	Rajasthan	Tonk District	(25-55-4,75-28-7)
4921	Rajasthan	Tonk District	(25-55-4,75-28-7)
4922	Rajasthan	Tonk District	(25-55-4,75-28-7)
4923	Rajasthan	Tonk District	(25-55-4,75-28-7)
4924	Rajasthan	Tonk District	(25-55-4,75-28-7)
4925	Rajasthan	Tonk District	(25-55-4,75-28-7)
4926	Rajasthan	Tonk District	(25-55-4,75-28-7)
4927	Rajasthan	Tonk District	(25-54-4,75-28-10); (25-55-6,75-28-56)
4928	Rajasthan	Tonk District	(25-54-4,75-28-10); (25-55-6,75-28-56)
4929	Rajasthan	Tonk District	(25-54-4,75-28-10); (25-55-6,75-28-56)
4930	Rajasthan	Tonk District	(25-54-4,75-28-10); (25-55-6,75-28-56)
4931	Rajasthan	Tonk District	(25-54-4,75-28-10); (25-55-6,75-28-56)
4932	Rajasthan	Tonk District	(25-54-4,75-28-10); (25-55-6,75-28-56)
4933	Rajasthan	Tonk District	(25-55-34,75-27-54)
4934	Rajasthan	Tonk District	(25-55-34,75-27-54)
4935	Rajasthan	Tonk District	(25-55-34,75-27-54)
4936	Rajasthan	Tonk District	(25-55-34,75-27-54)
4937	Rajasthan	Tonk District	(25-55-34,75-27-54)
4938	Rajasthan	Tonk District	(25-55-34,75-27-54)
4939	Rajasthan	Tonk District	(25-56-7,75-27-33)
4940	Rajasthan	Tonk District	(25-56-7,75-27-33)
4941	Rajasthan	Tonk District	(25-56-7,75-27-33)
4942	Rajasthan	Tonk District	(25-56-7,75-27-33)
4943	Rajasthan	Tonk District	(25-56-7,75-27-33)
4944	Rajasthan	Tonk District	(25-56-7,75-27-33)
4945	Rajasthan	Tonk District	(26-56-40,75-27-49)
4946	Rajasthan	Tonk District	(26-56-40,75-27-49)
4947	Rajasthan	Tonk District	(26-56-40,75-27-49)
4948	Rajasthan	Tonk District	(26-56-40,75-27-49)
4949	Rajasthan	Tonk District	(26-56-40,75-27-49)
4950	Rajasthan	Tonk District	(26-56-40,75-27-49)
4951	Rajasthan	Tonk District	(26-14-53,75-52-52); (26-15-20,75-53-5); (26-15-13,75-52-25); (26-15-19,75-52-46)
4952	Rajasthan	Tonk District	(26-14-53,75-52-52); (26-15-20,75-53-5); (26-15-13,75-52-25); (26-15-19,75-52-46)
4953	Rajasthan	Tonk District	(26-14-53,75-52-52); (26-15-20,75-53-5); (26-15-13,75-52-25); (26-15-19,75-52-46)
4954	Rajasthan	Tonk District	(26-14-53,75-52-52); (26-15-20,75-53-5); (26-15-13,75-52-25); (26-15-19,75-52-46)
4955	Rajasthan	Tonk District	(26-14-53,75-52-52); (26-15-20,75-53-5); (26-15-13,75-52-25); (26-15-19,75-52-46)
4956	Rajasthan	Tonk District	(26-14-53,75-52-52); (26-15-20,75-53-5); (26-15-13,75-52-25); (26-15-19,75-52-46)
4957	Rajasthan	Tonk District	(26-14-48,75-51-59)

4958	Rajasthan	Tonk District	(26-14-48,75-51-59)
4959	Rajasthan	Tonk District	(26-14-48,75-51-59)
4960	Rajasthan	Tonk District	(26-14-48,75-51-59)
4961	Rajasthan	Tonk District	(26-14-48,75-51-59)
4962	Rajasthan	Tonk District	(26-14-48,75-51-59)
4963	Rajasthan	Tonk District	(26-14-55,75-52-41)
4964	Rajasthan	Tonk District	(26-14-55,75-52-41)
4965	Rajasthan	Tonk District	(26-14-55,75-52-41)
4966	Rajasthan	Tonk District	(26-14-55,75-52-41)
4967	Rajasthan	Tonk District	(26-14-55,75-52-41)
4968	Rajasthan	Tonk District	(26-14-55,75-52-41)
4969	Rajasthan	Tonk District	(26-14-53,75-52-50)
4970	Rajasthan	Tonk District	(26-14-53,75-52-50)
4971	Rajasthan	Tonk District	(26-14-53,75-52-50)
4972	Rajasthan	Tonk District	(26-14-53,75-52-50)
4973	Rajasthan	Tonk District	(26-14-53,75-52-50)
4974	Rajasthan	Tonk District	(26-14-53,75-52-50)
4975	Rajasthan	Tonk District	(26-14-59,75-52-43)
4976	Rajasthan	Tonk District	(26-14-59,75-52-43)
4977	Rajasthan	Tonk District	(26-14-59,75-52-43)
4978	Rajasthan	Tonk District	(26-14-59,75-52-43)
4979	Rajasthan	Tonk District	(26-14-59,75-52-43)
4980	Rajasthan	Tonk District	(26-14-59,75-52-43)
4981	Rajasthan	Tonk District	(25-57-32,75-27-57); (25-57-34,75-27-58); (25-56-34,75-27-42); (25-56-36,75-27-39)
4982	Rajasthan	Tonk District	(25-57-32,75-27-57); (25-57-34,75-27-58); (25-56-34,75-27-42); (25-56-36,75-27-39)
4983	Rajasthan	Tonk District	(25-57-32,75-27-57); (25-57-34,75-27-58); (25-56-34,75-27-42); (25-56-36,75-27-39)
4984	Rajasthan	Tonk District	(25-57-32,75-27-57); (25-57-34,75-27-58); (25-56-34,75-27-42); (25-56-36,75-27-39)
4985	Rajasthan	Tonk District	(25-57-32,75-27-57); (25-57-34,75-27-58); (25-56-34,75-27-42); (25-56-36,75-27-39)
4986	Rajasthan	Tonk District	(25-57-32,75-27-57); (25-57-34,75-27-58); (25-56-34,75-27-42); (25-56-36,75-27-39)
4987	Rajasthan	Tonk District	(26-11-23.51,75-45-28.36); (26-11-03.61,75-44-57.05); (26-10-51.01,75-45-05.89); (26-11-00.45,75-45-29.99)
4989	Rajasthan	Tonk District	(26-11-23.51,75-45-28.36); (26-11-03.61,75-44-57.05); (26-10-51.01,75-45-05.89); (26-11-00.45,75-45-29.99)
4990	Rajasthan	Tonk District	(26-11-23.51,75-45-28.36); (26-11-03.61,75-44-57.05); (26-10-51.01,75-45-05.89); (26-11-00.45,75-45-29.99)
4991	Rajasthan	Tonk District	(26-11-23.51,75-45-28.36); (26-11-03.61,75-44-57.05); (26-10-51.01,75-45-05.89); (26-11-00.45,75-45-29.99)
4992	Rajasthan	Tonk District	(26-11-23.51,75-45-28.36); (26-11-03.61,75-44-57.05); (26-10-51.01,75-45-05.89); (26-11-00.45,75-45-29.99)
4993	Rajasthan	Tonk District	(26-11-23.51,75-45-28.36); (26-11-03.61,75-44-57.05); (26-10-51.01,75-45-05.89); (26-11-00.45,75-45-29.99)
4994	Rajasthan	Tonk District	(25-54-29,75-28-36); (25-54-32,75-28-31); (25-55-6,75-28-56); (25-55-12,75-28-49)
4995	Rajasthan	Tonk District	(25-54-29,75-28-36); (25-54-32,75-28-31); (25-55-6,75-

			28-56); (25-55-12,75-28-49)
4996	Rajasthan	Tonk District	(25-54-29,75-28-36); (25-54-32,75-28-31); (25-55-6,75-28-56); (25-55-12,75-28-49)
4997	Rajasthan	Tonk District	(25-54-29,75-28-36); (25-54-32,75-28-31); (25-55-6,75-28-56); (25-55-12,75-28-49)
4998	Rajasthan	Tonk District	(25-54-29,75-28-36); (25-54-32,75-28-31); (25-55-6,75-28-56); (25-55-12,75-28-49)
4999	Rajasthan	Tonk District	(25-54-29,75-28-36); (25-54-32,75-28-31); (25-55-6,75-28-56); (25-55-12,75-28-49)
5000	Rajasthan	NCS Sawai Madhopur	(26-38-46.32,77-48-37.51); (77-48-37.51,77-50-11.08); (26-39-52.97,77-51-21.62); (26-32-59.75,77-50-32.14)
5001	Rajasthan	NCS Sawai Madhopur	(26-40-4.71,77-53-55.74); (26-39-36.50,77-54-11.74); (26-39-47.39,77-54-31.30); (26-40-12.15,77-54-17.49)
5002	Rajasthan	NCS Sawai Madhopur	(26-39-11.49,77-53-13.73); (26-39-9.27,77-53-22.35); (26-39-34.16,77-53-58.69); (26-39-47.00,77-53-57.31)
5003	Rajasthan	NCS Sawai Madhopur	(26-39-52.20,77-53-34.54); (26-39-32.73,77-53-52.74); (26-39-47.10,77-54-21.30)
5004	Rajasthan	NCS Sawai Madhopur	(26-39-30.43,77-48-28.70); (26-39-31.87,77-49-19.82); (26- 40-37.76,77-48-55.39); (26-39-44.29,77-48-8.812)
5005	Rajasthan	NCS Sawai Madhopur	(26-21-52.44,77-22-30.97); (26-22-32.15,77-22-34.12); (26-24-55.77,77-27-2.53)
5006	Rajasthan	NCS Sawai Madhopur	(26-35-13.50,77-44-23.1); (26-34-46.63,77-44-40.21); (26-35-3.235,77-45-3.57); (26-34-46.39,77-44-39.84)
5007	Rajasthan	NCS Sawai Madhopur	(26-40-14.07,77-54-26.43); (26-40-16.86,77-54-50.73); (26-40-3.54,77-55-5.19); (26-39-52.60,77-54-47.12)
5008	Rajasthan	NCS Sawai Madhopur	(26-35-19.93,77-44-22.69); (26-35-28.11,77-44-48.52); (26-37-57.78,77-43-7.08); (26-37-18.3,77-42-7.023)
5009	Rajasthan	NCS Sawai Madhopur	(26-36-18.37,77-44-24.29); (26-36-45.53,77-45-23.25); (26-37-56.88,77-43-14.38); (26-38-24.273,77-45-7.86)
5010	Rajasthan	NCS Sawai Madhopur	(25-15-35.53,76-0-44.08); (25-15-9.54,76- 0-13.77); (25-15-4.57,76-0-18.83); (25-15-24.92,76-0-48.38)
5011	Rajasthan	NCS Sawai Madhopur	(25-45-35.96,76-25-24.18); (25-45-30.35,76-25-10.3); (25-45-28.42,76-25-23.69)
5012	Rajasthan	NCS Sawai Madhopur	(26-35-26.68,77-45-22.73); (26-36-49.76,77-46-57.60); (26-35-12.01,77-45-47.541); (26-37-49.64,77-45-57.07)
5013	Rajasthan	NCS Sawai Madhopur	(25-46-13.10,76-26-32.4); (25-46-2.34,76-26-7.08); (25-45-36.93,76-26-20.85); (25-45-39.59,76-26-27.12)
5014	Rajasthan	NCS Sawai Madhopur	(25-50-0.63,76-33-3.22); (25-49-58.83,76-32-30.76); (25-49-48.63,76-32-30.36)
5015	Rajasthan	NCS Sawai Madhopur	(26-37-41.07,77-46-25.503); (26-38-25.11,77-46-52.26); (26-37-39.67,77-47-54.85); (26-36-59.99,77-47-4.39)
5016	Rajasthan	NCS Sawai Madhopur	(25-31-55.44,76-17-17.33); (25-31-51.52,76-17-11.12); (25-31-43.08,76-17-25.39)
5017	Rajasthan	NCS Sawai Madhopur	(25-20-12.47,76-7-48.41); (25-19-50.20,76-8-12.23); (25-19-36.90,76-8-43.06)
5018	Rajasthan	NCS Sawai Madhopur	(25-18-45.33,76-2-48.62); (25-18-40.97,76-3-5.30); (25-18-54.31,76-3-23.36)
5019	Rajasthan	NCS Sawai Madhopur	(25-20-51.14,76-7-41.67); (25-20-17.08,76-7-9.99); (25-19-45.53,76-7-32.43); (25-20-24.74,76-7-50.45)
5020	Rajasthan	NCS Sawai	(25-50-7.64,76-28-36.00); (25-49-51.78,76-28-30.39);

		Madhopur	(25-28-36.0,76-29-26.68); (25-49-20.02,76-29-26.44)
5021	Rajasthan	NCS Sawai Madhopur	(25-48-3.90,76-28-8.64); (25-47-47.56,76-27-55.9); (25-47-47.56,76-27-55.97)
5022	Rajasthan	NCS Sawai Madhopur	(25-43-3.71,76-21-23.02); (25-43-0.93,76-21-41.02); (25-42-7.44,76-21-10.91)
5023	Rajasthan	NCS Sawai Madhopur	(25-34-30.35,76-17-40.22); (25-34-9.56,76-17-46.21); (25-32-53.28,76-17-44.35); (25-34-14.74,76-17-51.91)
5024	Rajasthan	Bhilwara	(25-27-13.96,75-4-43.68); (25-26-55.68,75-4-54.00); (25-26-26.98,75-4-32.98); (25-26-47.76,75-4-14.998)
5025	Rajasthan	NCS Sawai Madhopur	(25-46-1.36,76-26-1.31); (25-45-51.87,76-25-34.9); (25-45-34.50,76-25-37.23); (25-45-30.88,76-26-2.24)
5026	Rajasthan	NCS Sawai Madhopur	(25-21-5.3,76-9-25.73); (25-20-14.77,76-8-53.67); (25-20-11.32,76-9-32.99); (25-21-32.6,76-10-1.32)
5027	Rajasthan	Bhilwara	(25-41-1.006,74-9-22.83); (25-25-31.00,75-5-6.972); (25-25-39.97,75-4-54.998); (25-25-17.000,75-4-35.97)
5028	Rajasthan	NCS Sawai Madhopur	(25-23-49.61,76-9-36.39); (25-22-47.48,76-8-58.87); (25-21-13.10,76-9-27.27); (25-21-12.98,76-9-42.38)
5029	Rajasthan	Bhilwara	(25-32-41.61,75-11-35.25); (25-32-33.94,75-11-46.75); (25-32-31.95,75-11-19.57); (25-32-19.489,75-11-28.989)
5030	Rajasthan	NCS Sawai Madhopur	(25-44-48.53,76-24-2.48); (25-44-59.35,76-23-55.96); (25-44-46.83,76-24-2.63); (25-45-2.03,76-24-21.78)
5031	Rajasthan	Bhilwara	(25-32-31.95,75-11-19.57); (25-32-19.489,75-11-28.98); (25-32-15.72,75-11-7.576); (25-32-23.67,75-11-1.316)
5032	Rajasthan	NCS Sawai Madhopur	(25-39-8.43,76-19-36.15); (25-38-22.75,76-19-8.2); (25-37-58.24,76-19-23.53); (25-39-6.71,76-19-42.96)
5033	Rajasthan	Bhilwara	(25-23-56.40,75-3-12.67); (25-23-36.96,75-2-58.49); (25-23-52.285,75-3-16.53); (25-23-40.52,75-2-54.46)
5034	Rajasthan	Bhilwara	(25-19-1.00,75-2-32.164); (25-19-0.321,75-2-48.31); (25-19-33.43,75- 2-39.31); (25-19-11.96,75-2- 39.15)
5035	Rajasthan	NCS Sawai Madhopur	(25-38-15.51,76-18-55.0); (25-37-16.73,76-17-35.78); (25-37-20.49,76-17-53.59); (25-37-35.25,76-18-28.12)
5036	Rajasthan	NCS Sawai Madhopur	(25-20-43.03,76-5-23.86); (25-20-16.18,76-5-8.50); (25-19-19.34,76-6-21.03); (25-19-52.38,76-6-38.96)
5037	Rajasthan	Bhilwara	(25-18-20.14,75-2-21.12); (25-18-22.41,75-2-8.772); (25-18-8.974,75-2-21.23); (25-18-12.48,75- 2-36.45)
5038	Rajasthan	NCS Sawai Madhopur	(25-39-59.82,76-18-1.84); (25-39-23.09,76-18-58.05); (25-39-27.16,76-19-8.00); (25-40-4.31,76-18-31.82)
5039	Rajasthan	Bhilwara	(25-21-54.49,75-59-26.28); (25-22-8.89,75- 59-24.88); (25-22-1.696,74-59-43.36); (25-21-52.75,74-59-40.09)
5040	Rajasthan	NCS Sawai Madhopur	(25-31-35.41,76-16-51.19); (25-31-15.90,76-16-56.61); (25-31-16.67,76-17-6.63); (25-31-33.39,76-17-14.28)
5041	Rajasthan	Bhilwara	(25-32-25.20,75-10-57.30); (25-32-24.46,75-10-53.87); (25-32-22.52,75-10-52.97)
5042	Rajasthan	NCS Sawai Madhopur	(25-25-4.14,76-9-33.68); (25-24-12.91,76-8-26.05); (25-23-40.42,76-9-12.19); (25-24-43.12,76-10-2.70)
5043	Rajasthan	Bhilwara	(25-32-41.89,75-10-39.13)
5044	Rajasthan	NCS Sawai Madhopur	(25-26-5.78,76-9-42.35); (25-24-50.72,76-9-50.02); (25-26-12.63,76-9-41.24); (25-26-12.34,76-9-53.64); (25-26-2.73,76-10-11.1); (25-26-22.57,76-10-16.82); (25-28-3.19,76-10-57.56); (25-26-21.80,76-10-20.54)

5045	Rajasthan	Bhilwara	(25-32-31.66,75-12-12.84); (25-32-35.76,75-12-10.27); (25-32-41.91,75-12-7.00)
5046	Rajasthan	NCS Sawai Madhopur	(25-42-0.11,76-20-47.20); (25-41-52.91,76-20-30.16); (25-41-25.52,76-20-36.35); (25-41-58.87,76-21-5.59)
5047	Rajasthan	Bhilwara	(25-36-30.28,75-15-43.65); (25-36-15.89,75-15-30.32); (25-36-6.361,75-14-59.35)
5048	Rajasthan	NCS Sawai Madhopur	(25-19-36.62,76-8-58.77); (25-19-58.49,76-9-24.71); (25-20-0.41,76-9-17.64); (25-19-50.39,76-9-0.56)
5049	Rajasthan	Bhilwara	(25-38-35.35,75-13-12.55); (25-38-24.60,75-13-16.05); (25-38-35.84,75-13-19.084); (25-38-26.36,75-13-21.46)
5050	Rajasthan	NCS Sawai Madhopur	(25-42-16.72,76-27-48.11); (25-46-38.97,76-27-19.45); (25-46-27.13,76-27-33.19); (25-47-0.672,76-27-54.1)
5051	Rajasthan	NCS Sawai Madhopur	(25-30-2.62,76-13-45.84); (25-29-44.18,76-13-44.02); (25-29-47.28,76-14-17.15); (25-29-53.13,76-14-28.96)
5052	Rajasthan	Bhilwara	(25-33-49.24,75-13-19.20); (25-35-41.42,75-14-48.34); (25-34-53.79,75-14-14.92); (25-35-4.16,75-14- 4.606)
5053	Rajasthan	Bhilwara	(25-30-15.39,75-9-15.93); (25-31-24.43,75-10-51.06)
5054	Rajasthan	Bhilwara	(25-31-41.72,75-10- 8.66); (25- 31-23.28,75-10-6.07); (25-31-19.00,75-9-55.53); (25-31-37.88,75-9- 54.079)
5055	Rajasthan	Bhilwara	(25-30- 3.07,75- 9-31.98)
5056	Rajasthan	Bhilwara	(25-31-7.647,75-10-38.64); (25-31-2.50,75-10- 0.188); (25-31- 6.031,75-10-41.97); (25-30-58.97,75-10-29.33)
5057	Rajasthan	Bhilwara	(25-22-43.86,74-59-31.606); (25-22-34.51,74-59-46.17); (25-22-25.80,75- 0-41.720); (25-22-39.72,75-1-4.98)
5058	Rajasthan	Bhilwara	(25-24-28.51,75- 1-54.645); (25-24-27.67,75-1-59.246); (25-24- 21.63,75-2-13.81); (25-24-13.93,75- 2-4.38)
5059	Rajasthan	Bhilwara	(25- 25- 7.38,75-2-49.12); (25-25- 7.38,75-2-35.55); (25-25- 14.9,75-3- 15.040); (25-25-8.781,75- 3-51.89)
5060	Rajasthan	Bhilwara	(25-3-1.673,75-3-32.4); (25-31-16.75,75-3-20.52); (25-30-42.90,75-3-11.044); (25-30-39.68,75-3-26.51)
5061	Rajasthan	NCS Sawai Madhopur	(25-15-49.1,77-13-45.81); (26-15-39.04,77-14-35.23); (26-16-39.83,77-16-5.31); (26-17-17.25,77-16-17.31)
5062	Rajasthan	NCS Sawai Madhopur	(26-21-57.84,77-20-38.52); (26-21-37.95,77-21-15.02); (26-21-55.89,77-21-53.36); (26-22-33.17,77-22-5.09)
5063	Rajasthan	Bhilwara	(25-27-57.67,75-3-11.768); (25-27-38.36,75-2-54.92); (25-28- 6.57,75-2- 56.44); (25-28-1.78,75-3-8.23)
5064	Rajasthan	NCS Sawai Madhopur	(26-18-46.23,77-17-52.30); (26-18-40.3,77-17-58.05); (26-20-57.45,77-19-46.10)
5065	Rajasthan	NCS Sawai Madhopur	(26-10-38.04,77-1-7.98); (26-10-15.25,77-1-31.83); (26-10-31.56,77-2-8.82); (26-10-59.09,77-1-41.54)
5066	Rajasthan	NCS Sawai Madhopur	(26-2-51.04,77-51-1.93); (26-2-23.26,77-52-14.77); (26-9-42.01,77-0-56.62); (26-9-36.53,77-0-5.73)
5067	Rajasthan	NCS Sawai Madhopur	(26-2-50.11,77-51-3.06); (26-2-20.78,77-3-43.53); (26-4-42.04,77-59-41.93); (26-5-33.41,77-53-24.18)
5068	Rajasthan	Bhilwara	(25-25- 48.32,75-4-15.6); (25- 25-44.58,75-4-0.973); (25-25-55.124,75-4-28.516); (25-25- 45.23,75- 4- 10.94)
5069	Rajasthan	Bhilwara	(25-26-15,75-4-15.6); (25-26-17.06,75-5-10.00); (25-28-54.159,75-30-33.75); (25-26-3.98,75-5-4.00)
5070	Rajasthan	Bhilwara	(25-27- 45,75-54-9.99); (25-27-37.99,75-6-11.98); (25-28-26,75-30-33.75); (25-28-14.998,75-6- 0.997)

5071	Rajasthan	Bhilwara	(25-28- 40.00,75-6-36.99); (25- 28-42.99,75-6-39.99); (25-28-35.97,75-6-18.99); (25- 28-32.00,75-6-11.98)
5072	Rajasthan	NCS Sawai Madhopur	(25-28-38.12,76-10-50.61); (25-27-51.97,76-10-17.69); (25-28-15.84,76-10-12.89); (25-27-55.43,76-10-38.02)
5073	Rajasthan	NCS Sawai Madhopur	(25-21-39.69,76-5-6.06); (25-21-13.72,76-4-45.57); (25-21-5.64,76-5-27.36); (25-21-28.03,76-5-32.78)
5074	Rajasthan	NCS Sawai Madhopur	
5075	Rajasthan	NCS Sawai Madhopur	(25-39-59.03,76-17-50.20); (25-39-59.33,76-17-10.17); (25-39-7.36,76-28-49.36); (25-39-38.58,76-17-58.53)
5076	Rajasthan	NCS Sawai Madhopur	(25-33-23.11,76-17-9.36); (25-33-33.86,76-16-51.09); (25-32-59.47,76-16-39.87); (25-32-56.97,76-17-4.82)
5077	Rajasthan	NCS Sawai Madhopur	(25-24-53.53,25-24-53.53); (25-24-41.66,76-7-58.01); (25-27-42.99,76-7-58.08)
5078	Rajasthan	NCS Sawai Madhopur	(25-42-48.04,76-18-23.27); (25-42-38.23,76-18-23.06); (25-42-35.19,76-18-25.74); (25-42-47.56,76-18-28.72)
5079	Rajasthan	NCS Sawai Madhopur	(25-22-34.97,76-8-13.35); (25-22-19.91,76-7-32.30); (25-21-40.27,76-7-55.72); (25-22-0.82,76-8-28.90)
5080	Rajasthan	NCS Sawai Madhopur	(25-31-8.63,76-14-16.90); (25-30-41.29,76-14-33.53); (25-30-36.25,76-14-59.89); (25-30-44.28,76-15-58.60)
5081	Rajasthan	NCS Sawai Madhopur	(25-21-12.44,76-7-2.72); (25-21-8.74,76-7-14.29); (25-18-14.96,76-7-30.09); (25-21-28.11,76-7-33.42)
5082	Rajasthan	NCS Sawai Madhopur	(25-30-39.61,76-13-44.15); (25-30-11.94,76-12-36.64); (25-29-50.59,76-12-50.44); (25-30-17.57,76-13-53.16)
5083	Rajasthan	NCS Sawai Madhopur	(25-31-0.24,76-14-9.67); (25-30-56.14,76-13-48.06); (25-30-35.20,76-13-54.63); (25-30-43.64,76-14-12.84)
5084	Rajasthan	NCS Sawai Madhopur	(25-35-11.39,76-16-50.44); (25-34-58.71,76-16-57.84); (25-35-3.15,76-17-9.15); (25-35-17.07,76-17-9.10)
5085	Rajasthan	NCS Sawai Madhopur	(25-35-19.20,76-17-37.86); (25-35-19.41,76-17-14.65); (25-34-33.58,76-16-20.24); (25-34-19.45,25-34-19.45)
5086	Rajasthan	NCS Sawai Madhopur	(25-20-55.60,76-3-19.77); (25-20-13.49,76-2-56.34); (25-19-36.24,76-3-26.4); (25-20-26.12,76-3-57.82)
5087	Rajasthan	NCS Sawai Madhopur	(25-21-21.38,76-5-45.05); (25-20-35.81,76-5-54.70); (25-20-0.78,76-6-32.57); (25-20-15.81,76-6-53.64)
5088	Rajasthan	NCS Sawai Madhopur	(25-25-21.01,76-8-25.36); (25-24-58.55,76-7-46.14); (25-24-54.29,76-8-10.60); (25-24-58.46,76-8-36.78)
5089	Rajasthan	NCS Sawai Madhopur	(25-27-11.94,76-10-29.47); (25-26-58.35,76-9-46.2); (25-26-25.95,76-9-49.51); (25-26-25.18,76-10-10.44)
5090	Rajasthan	NCS Sawai Madhopur	(25-23-42.03,76-7-25.51); (25-23-19.75,76-7-37.30); (25-23-32.64,76-7-57.62); (25-23-49.62,76-7-53.28)
5091	Rajasthan	DCF (Project) Tonk	
5092	Rajasthan	DCF (Project) Tonk	
5093	Rajasthan	DCF (Project) Tonk	
5094	Rajasthan	DCF (Project) Tonk	
5095	Rajasthan	DCF (Project) Tonk	

5096	Rajasthan	DCF (Project) Tonk	
5097	Rajasthan	DCF (Project) Tonk	
5098	Rajasthan	DCF (Project) Tonk	
5099	Rajasthan	DCF (Project) Tonk	
5100	Rajasthan	DCF (Project) Tonk	
5101	Rajasthan	DCF (Project) Tonk	
5102	Rajasthan	DCF (Project) Tonk	
5103	Rajasthan	DCF (Project) Tonk	
5104	Rajasthan	DCF (Project) Tonk	
5105	Rajasthan	DCF (Project) Tonk	
5106	Rajasthan	DCF (Project) Tonk	
5107	Rajasthan	DCF (Project) Tonk	
5108	Rajasthan	DCF (Project) Tonk	
5109	Rajasthan	S.P.R & E.O, Banas Project	
5110	Rajasthan	S.P.R & E.O, Banas Project	
5111	Rajasthan	S.P.R & E.O, Banas Project	
5112	Rajasthan	S.P.R & E.O, Banas Project	
5113	Rajasthan	S.P.R & E.O, Banas Project	
5114	Rajasthan	S.P.R & E.O, Banas Project	
5115	Rajasthan	S.P.R & E.O, Banas Project	
5116	Rajasthan	S.P.R & E.O, Banas Project	
5117	Rajasthan	S.P.R & E.O, Banas Project	
5118	Rajasthan	S.P.R & E.O, Banas Project	
5119	Rajasthan	S.P.R & E.O, Banas Project	
5120	Rajasthan	S.P.R & E.O, Banas Project	

5121	Rajasthan	S.P.R & E.O, Banas Project	
5122	Rajasthan	S.P.R & E.O, Banas Project	
5123	Rajasthan	S.P.R & E.O, Banas Project	
5124	Rajasthan	S.P.R & E.O, Banas Project	
5125	Rajasthan	S.P.R & E.O, Banas Project	
5126	Rajasthan	S.P.R & E.O, Banas Project	
5128	Rajasthan	S.P.R & E.O, Banas Project	
5129	Rajasthan	S.P.R & E.O, Banas Project	
5130	Rajasthan	S.P.R & E.O, Banas Project	
5131	Rajasthan	S.P.R & E.O, Banas Project	
5132	Rajasthan	S.P.R & E.O, Banas Project	
5133	Rajasthan	S.P.R & E.O, Banas Project	
5134	Rajasthan	S.P.R & E.O, Banas Project	
5135	Rajasthan	S.P.R & E.O, Banas Project	
5136	Rajasthan	S.P.R & E.O, Banas Project	
5137	Rajasthan	S.P.R & E.O, Banas Project	
5138	Rajasthan	S.P.R & E.O, Banas Project	
5139	Rajasthan	S.P.R & E.O, Banas Project	
5140	Rajasthan	S.P.R & E.O, Banas Project	
5141	Rajasthan	S.P.R & E.O, Banas Project	
5142	Rajasthan	S.P.R & E.O, Banas Project	
5143	Rajasthan	S.P.R & E.O, Banas Project	
5144	Rajasthan	S.P.R & E.O, Banas Project	
5145	Rajasthan	S.P.R & E.O, Banas Project	
5146	Rajasthan	S.P.R & E.O, Banas Project	

5147	Rajasthan	S.P.R & E.O, Banas Project	
5148	Rajasthan	S.P.R & E.O, Banas Project	
5149	Rajasthan	S.P.R & E.O, Banas Project	
5150	Rajasthan	S.P.R & E.O, Banas Project	
5151	Rajasthan	S.P.R & E.O, Banas Project	
5152	Rajasthan	S.P.R & E.O, Banas Project	
5153	Rajasthan	S.P.R & E.O, Banas Project	
5154	Rajasthan	S.P.R & E.O, Banas Project	
5155	Rajasthan	S.P.R & E.O, Banas Project	
5156	Rajasthan	S.P.R & E.O, Banas Project	
5157	Rajasthan	S.P.R & E.O, Banas Project	
5158	Rajasthan	S.P.R & E.O, Banas Project	
5159	Rajasthan	S.P.R & E.O, Banas Project	
5160	Rajasthan	S.P.R & E.O, Banas Project	
5161	Rajasthan	S.P.R & E.O, Banas Project	
5162	Rajasthan	S.P.R & E.O, Banas Project	
5163	Rajasthan	S.P.R & E.O, Banas Project	
5164	Rajasthan	S.P.R & E.O, Banas Project	
5165	Rajasthan	Soil Conservation (Banas Project)	
5166	Rajasthan	Soil Conservation (Banas Project)	
5167	Rajasthan	Soil Conservation (Banas Project)	
5168	Rajasthan	Soil Conservation (Banas Project)	
5169	Rajasthan	Soil Conservation	

		(Banas Project)	
5170	Rajasthan	Soil Conservation (Banas Project)	
5171	Rajasthan	Soil Conservation (Banas Project)	
5172	Rajasthan	Soil Conservation (Banas Project)	
5173	Rajasthan	Soil Conservation (Banas Project)	
5174	Rajasthan	Soil Conservation (Banas Project)	
5175	Rajasthan	Soil Conservation (Banas Project)	
5176	Rajasthan	Soil Conservation (Banas Project)	
5177	Rajasthan	Soil Conservation (Banas Project)	
5178	Rajasthan	Soil Conservation (Banas Project)	
5179	Rajasthan	Soil Conservation (Banas Project)	
5180	Rajasthan	Soil Conservation (Banas Project)	
5181	Rajasthan	Soil Conservation (Banas Project)	
5182	Rajasthan	Soil Conservation (Banas Project)	
5183	Rajasthan	Soil Conservation (Banas Project)	
5184	Rajasthan	Soil Conservation (Banas Project)	
5185	Rajasthan	Soil Conservation (Banas Project)	
5186	Rajasthan	Soil Conservation	

		(Banas Project)	
5187	Rajasthan	Soil Conservation (Banas Project)	
5188	Rajasthan	Soil Conservation (Banas Project)	
5189	Rajasthan	Soil Conservation (Banas Project)	
5190	Rajasthan	Soil Conservation (Banas Project)	
5191	Rajasthan	Soil Conservation (Banas Project)	
5192	Rajasthan	Soil Conservation (Banas Project)	
5193	Rajasthan	Soil Conservation (Banas Project)	
5194	Rajasthan	Soil Conservation (Banas Project)	
5195	Rajasthan	Soil Conservation (Banas Project)	
5196	Rajasthan	Soil Conservation (Banas Project)	
5197	Rajasthan	Soil Conservation (Banas Project)	
5198	Rajasthan	Soil Conservation (Banas Project)	
5199	Rajasthan	Soil Conservation (Banas Project)	
5200	Rajasthan	Soil Conservation (Banas Project)	
5201	Rajasthan	Soil Conservation (Banas Project)	
5202	Rajasthan	Soil Conservation (Banas Project)	
5203	Rajasthan	Soil Conservation	

		(Banas Project)	
5204	Rajasthan	Soil Conservation (Banas Project)	
5205	Rajasthan	Soil Conservation (Banas Project)	
5206	Rajasthan	Soil Conservation (Banas Project)	
5207	Rajasthan	Soil Conservation (Banas Project)	
5208	Rajasthan	Soil Conservation (Banas Project)	
5209	Rajasthan	Soil Conservation (Banas Project)	
5210	Rajasthan	Soil Conservation (Banas Project)	
5211	Rajasthan	Soil Conservation (Banas Project)	
5212	Rajasthan	Soil Conservation (Banas Project)	
5213	Rajasthan	Soil Conservation (Banas Project)	
5214	Rajasthan	Soil Conservation (Banas Project)	
5215	Rajasthan	Soil Conservation (Banas Project)	
5216	Rajasthan	Soil Conservation (Banas Project)	
5217	Rajasthan	Tonk District	(25-51-57.53,75-26-42.20)
5218	Rajasthan	Tonk District	(25-54-19.37,75-26-46.22)
5219	Rajasthan	Soil Conservation (Banas Project)	
5220	Rajasthan	Soil Conservation (Banas Project)	
5221	Rajasthan	Soil Conservation (Banas Project)	

5222	Rajasthan	Soil Conservation (Banas Project)	
5223	Rajasthan	\N	(26-3- 0.36,77-19-35.51)
5224	Rajasthan	\N	(26-3- 0.36,77-19-35.51)
5225	Rajasthan	Soil Conservation (Banas Project)	
5226	Rajasthan	Soil Conservation (Banas Project)	
5227	Rajasthan	\N	(26-31-0.40,77-19-35.51)
5228	Rajasthan	Soil Conservation (Banas Project)	
5229	Rajasthan	Soil Conservation (Banas Project)	
5230	Rajasthan	Soil Conservation (Banas Project)	
5231	Rajasthan	Soil Conservation (Banas Project)	
5232	Rajasthan	Soil Conservation (Banas Project)	
5233	Rajasthan	Soil Conservation (Banas Project)	
5234	Rajasthan	Soil Conservation (Banas Project)	
5235	Rajasthan	Soil Conservation (Banas Project)	
5236	Rajasthan	Soil Conservation (Banas Project)	
5237	Rajasthan	Soil Conservation (Banas Project)	
5244	Rajasthan	NCS, Sawai Madhopur	(25-54-54.15,76-43-57.5); (25-55-24.9,76-46-19.17); (25-56-28.9,76-45-16.3); (25-57-2.89,76-45-6.12)

Annexure-6

GPS COORDINATES OF SITES FOR VARIOUS FORESTRY INTERVENTIONS IN MADHYA PRADESH

The following table gives GPS coordinates of the sites proposed by the state SFD at time of DPR formulation. The sites may be finalised, with suitable changes wherever required, and georeferenced at time of implementation of the DPR.

Site ID	State	Division	Geo-coordinates (Format: degree-minute-second ºN Lat., degree-minute-second ºE Long.)
808	Madhya Pradesh	Guna	(24-32-22,77-06-24); (24-32-34,77-06-16)
809	Madhya Pradesh	South Panna	(24-05-04.19,79-53-24.74); (24-5-4.19,79-52-14.79); (24-32-39,77-06-09); (24-32-25,77-06-05)
810	Madhya Pradesh	South Panna	(24-8-52.63,79-55-28.11); (24-8-59.13,79-55-56.74); (24-4-52.31,79-51-42.16); (24-4-16.12,79-52-39.26)
812	Madhya Pradesh	South Panna	(24-5-4.19,79-53-24.74); (24-5-4.19,79-52-14.79); (24-8-10.56,79-56-45.48); (24-8-3.79,79-56-5.81)
824	Madhya Pradesh	Chhattarpur	(24-49-41.23,79-20-50.47); (24-50-14.05,79-21-03.23); (24-4-52.31,79-51-42.16); (24-4-16.12,79-52-39.26)
825	Madhya Pradesh	Chhattarpur	(25-12-10.52,79-18-02.86); (25-12-09.24,79-18-08.14); (24-50-44.39,79-21-23.33); (24-50-14.68,79-21-16.15); (24-50-32.12,79-21-37.55); (24-49-55.79,79-21-09.43)
826	Madhya Pradesh	Chhattarpur	(25-18-16.02,79-18-39.01); (25-18-47.00,79-18-15.93); (25-12-55.00,79-18-12.62); (25-12-57.98,79-18-17.91); (25-12-45.20,79-18-21.15)
827	Madhya Pradesh	SFD Datia	(25-44-27.5,78-18-02.5); (25-44-37.5,78-17-31.5); (25-18-30.43,79-17-16.27); (25-18-42.40,79-16-51.26); (25-19-04.10,79-16-48.78); (25-19-21.88,79-17-32.94); (25-18-31.27,79-18-54.53);
828	Madhya Pradesh	Chhattarpur	(25-17-41.66,79-19-05.80); (25-18-36.28,79-19-09.81); (25-44-58.2,78-17-10.1); (25-44-40.2,78-17-08.1); (25-44-20.3,78-17-10.1); (25-44-18.1,78-17-30.1)
829	Madhya Pradesh	SFD Datia	(25-44-27.5,78-18-02.5); (25-44-37.5,78-17-31.5); (25-19-03.69,79-19-41.22); (25-18-21.74,79-19-26.63); (25-17-51.03,79-19-15.05)
830	Madhya Pradesh	SFD Datia	(25-44-27.5,78-18-02.5); (25-44-37.5,78-17-31.5); (25-44-58.2,78-17-10.1); (25-44-40.2,78-17-08.1); (25-44-20.3,78-17-10.1); (25-44-18.1,78-17-30.1)
831	Madhya Pradesh	Chhattarpur	(25-11-34.08,79-20-07.56); (25-11-53.06,79-20-16.10-); (25-44-58.2,78-17-10.1); (25-44-40.2,78-17-08.1); (25-44-20.3,78-17-10.1); (24-44-18.1,78-17-30.1)
833	Madhya Pradesh	Chhattarpur	(24-48-00.79,79-22-06.42); (24-48-07.04,79-22-39.40); (25-11-03.91,79-20-08.46); (25-12-26.48,79-19-48.14); (25-12-04.66,79-19-42.82); (25-11-59.07,79-20-03.52)
835	Madhya Pradesh	SFD Datia	(25-44-20.1,78-17-01); (25-44-35,78-17-35.2); (24-47-37.51,79-22-45.94); (24-47-30.53,79-22-24.86)

836	Madhya Pradesh	SFD Datia	(25-47-10,78-15-35); (25-47-10,78-18-27); (25-44-37.5,78-16-20.2)
837	Madhya Pradesh	SFD Datia	(25-44-20.1,78-17-01); (25-44-35,78-17-35.2); (25-46-55,78-18-15); (25-46-45,78-15-33); (25-46-00,78-18-25)
838	Madhya Pradesh	SFD Datia	(25-44-20.1,78-17-01); (25-44-35,78-17-35.2); (25-44-37.5,78-16-20.2)
839	Madhya Pradesh	SFD Datia	(25-47-10,78-15-35); (25-47-10,78-18-27); (25-44-37.5,78-16-20.2)
840	Madhya Pradesh	SFD Datia	(25-47-10,78-15-35); (25-47-10,78-18-27); (25-46-53,78-18-15); (25-46-45,78-15-33); (25-46-00,78-18-25)
844	Madhya Pradesh	SFD Datia	(25-43-15.1,78-15-52.5); (25-42-58.5,78-15-57.5); (25-46-55,78-18-15); (25-46-45,78-15-33); (25-46-00,78-18-25)
846	Madhya Pradesh	SFD Datia	(25-46-15,78-21-45); (25-46-18,78-21-44); (25-42-58.5,78-16-17.5); (25-43-30.1,78-16-40.1)
847	Madhya Pradesh	SFD Datia	(25-43-15.1,78-15-52.5); (25-42-58.5,78-15-57.5); (25-46-10,78-21-50); (25-45-43,78-21-08)
848	Madhya Pradesh	SFD Datia	(25-43-15.1,78-15-52.5); (25-42-58.5,78-15-57.5); (25-42-58.5,78-16-17.5); (25-43-30.1,78-16-40.1)
850	Madhya Pradesh	SFD Datia	(25-46-15,78-21-45); (25-46-18,78-21-44); (25-42-58.5,78-16-17.5); (25-43-30.1,78-16-40.1)
852	Madhya Pradesh	SFD Datia	(25-46-15,78-21-45); (25-46-18,78-21-44); (25-46-10,78-21-15); (25-45-43,78-21-08)
853	Madhya Pradesh	SFD Datia	(25-46-05,78-17-55); (25-46-20,78-17-53); (25-46-10,78-21-15); (25-45-43,78-21-08)
854	Madhya Pradesh	Chhattarpur	(25-07-16.19,79-44-02.00); (25-07-31.14,79-44-08.03); (25-46-30,78-17-45); (25-45-55,78-17-40)
856	Madhya Pradesh	Guna	(24-32-26,77-6-34); (24-32-36,77-6-23); (25-07-55-.05,79-44-29.77); (25-07-53.71,79-44-32.76); (25-07-32.45,79-44-20.10); (25-07-15.24,79-44-04.51)
859	Madhya Pradesh	SFD Datia	(25-46-40,78-21-30); (25-46-40,78-21-20); (24-32-23,77-6-26); (24--32-33,77-6-16)
860	Madhya Pradesh	SFD Datia	(25-46-05,78-17-55); (25-46-20,78-17-53); (25-46-23,78-21-14); (25-46-21,78-21-20)
861	Madhya Pradesh	SFD Datia	(25-46-05,78-17-55); (25-46-20,78-17-53); (25-46-30,78-17-45); (25-45-55,78-17-40)
862	Madhya Pradesh	SFD Datia	(25-46-40,78-21-30); (25-46-40,78-21-20); (25-46-30,78-17-45); (25-45-55,78-17-40)
863	Madhya Pradesh	SFD Datia	(25-43-45,78-12-20); (25-43-44,78-15-47); (25-46-23,78-21-14); (25-46-21,78-21-20)
864	Madhya Pradesh	SFD Datia	(25-43-45,78-15-20); (25-43-44,78-15-47); (25-44-46,78-15-43); (25-44-25,70-15-21)
865	Madhya Pradesh	SFD Datia	(25-43-45,78-15-20); (25-43-44,78-15-47); (25-44-46,78-15-43); (25-44-25,78-15-21)
866	Madhya Pradesh	SFD Datia	(25-46-40,78-21-30); (25-46-4-,78-21-20); (25-44-46,78-15-43); (25-44-25,78-15-21)
867	Madhya Pradesh	SFD Datia	(25-46-55,78-17-30); (25-46-47,78-17-05); (25-46-23,78-21-14); (25-46-21,78-21-20)
869	Madhya Pradesh	SFD Datia	(25-46-55,78-17-30); (25-46-47,78-17-05); (25-46-40,78-17-15); (25-46-25,78-16-55); (25-46-20,78-16-45); (25-46-30,78-17-20); (25-46-27,78-17-10);

870	Madhya Pradesh	SFD Datia	(25-47-05,78-20-05); (25-47-11,78-20-11); (25-46-40,78-17-15); (25-46-25,78-16-55); (25-46-20,25-46-30); (78-17-20,25-46-27); (78-17-10,);
871	Madhya Pradesh	SFD Datia	(25-47-05,78-20-05); (25-47-11,78-20-11); (25-47-05,78-20-58); (25-46-50,78-21-10)
872	Madhya Pradesh	SFD Datia	(25-46-55,78-17-30); (25-46-47,78-17-05); (25-47-05,78-20-58); (25-46-50,78-21-10)
873	Madhya Pradesh	SFD Datia	(25-47-05,78-20-05); (25-47-11,78-20-11); (25-46-40,78-17-15); (25-46-25,78-16-55); (25-46-20,78-16-45); (25-46-20,78-17-20); (25-46-27,78-17-10);
876	Madhya Pradesh	Datia	(25-49-40,78-23-05); (25-49-55,78-23-05); (25-47-05,78-20-58); (25-46-50,78-21-10)
877	Madhya Pradesh	Datia	(25-45-30.5,78-16-55.7); (25-45-35.04,78-16-35.08); (25-49-35,78-22-40)
878	Madhya Pradesh	Datia	(25-49-40,78-23-5); (25-49-55,78-23-5); (25-46-10.05,78-16-30.02); (25-46-0.9,78-16-55.1); (25-45-40.3,78-16-25.7); (25-45-15.3,78-17-05)
879	Madhya Pradesh	Datia	(25-49-40,78-23-5); (25-49-55,78-23-5); (25-49-35,78-22-40)
881	Madhya Pradesh	Datia	(25-45-30.5,78-16-55.7); (25-45-35.04,78-16-35.08); (25-49-35,78-22-40)
883	Madhya Pradesh	Datia	(25-43-30,78-15-50); (25-43-20,78-16-25); (25-46-10.05,78-16-30.02); (25-16-0.9,78-16-55.1); (25-45-40.3,78-16-25.7); (25-45-15.3,78-17-05)
884	Madhya Pradesh	Datia	(25-45-30.5,78-16-55.7); (25-45-35.04,78-16-35.08)
885	Madhya Pradesh	Datia	(25-43-30,78-15-50); (25-43-20,78-16-25); (25-46-10.05,78-16-30.02); (25-46-0.9,78-16-55.1); (25-45-40.3,78-16-25.7); (25-45-15.3,78-17-05)
886	Madhya Pradesh	Datia	(25-43-30,78-15-50); (25-43-20,78-16-25)
891	Madhya Pradesh	Chhattarpur	(25-18-10.22,80-18-45.10); (25-17-22.10,80-17-45.46)
892	Madhya Pradesh	Chhattarpur	(25-13-36.70,80-4-10.80); (25-13-51.8,80-03-54.90); (25-16-40.51,80-18-01.34); (25-17-59.40,80-17-40.94); (25-16-53.13,80-17-28.77); (25-17-19.31,80-18-23.57)
893	Madhya Pradesh	Chhattarpur	(24-48-24.93,80-4-03.08); (24-48-28.5,80-4-7.1); (25-14-12.36,80-4-11.92); (25-13-39.18,80-04-33.27)
898	Madhya Pradesh	Chhattarpur	(25-16-59.24,80-17-18.74); (25-16-50.66,80-17-30.43); (24-48-20.84,80-04-17.57); (24-48-19.13,80-04-42.27)
899	Madhya Pradesh	Chhattarpur	(24-56-45.92,79-57-24.82); (24-56-35.30,79-57-10.73); (25-16-37.96,80-17-57.82); (25-15-50.83,80-17-15.33)
901	Madhya Pradesh	Chhattarpur	(25-15-39.28,80-02-57.54); (25-12-53.50,80-02-38.73); (24-56-41.70,79-56-58.30); (24-57-04.30,79-57-1.90)
903	Madhya Pradesh	North Panna	(24-53-13.69,80-5-6.71); (24-53-24.31,80-5-44.25); (25-13-22.68,80-02-58.93); (25-12-53.16,80-03-15.59)
904	Madhya Pradesh	North Panna	(24-53-13.69,80-5-6.71); (24-53-24.31,80-5-44.25); (24-53-11.44,80-6-1.66); (24-52-53.24,80-5-47.61); (24-52-40.86,80-5-10.77)
906	Madhya Pradesh	Guna	(24-57-50.14,77-20-56.48); (24-58-6.27,77-20-44.47); (24-53-11.44,80-6-1.66); (24-52-53.24,80-5-47.61); (24-52-

			40.86,80-5-10.77)
909	Madhya Pradesh	Damoh	(23-37-58.08,79-29-28.00); (23-38-8.35,79-30-35.73); (24-58-10.20,77-20-44.02); (24-58-17.42,77-20-46.86)
914	Madhya Pradesh	Damoh	(23-50-38,79-41-38); (23-50-27,79-41-29); (23-38-31.33,79-29-52.75); (23-38-0.62,79-29-27.7)
917	Madhya Pradesh	Damoh	(23-20-35.73,79-20-40.34); (23-21-28.2,79-20-28.84); (23-50-31,29-41-19); (23-50-40,79-41-11)
918	Madhya Pradesh	Indore	(22-32-20,75-40-20); (22-30-42,75-40-38); (23-20-40.34,79-20-20.18); (23-21-8.61,79-20-51.23)
921	Madhya Pradesh	Indore	(22-39-00,75-58-18) (22-29-34.8,75-41-16.2); (22-28-34,75-40-42)
922	Madhya Pradesh	Indore	(22-39-00,75-58-18)
923	Madhya Pradesh	Indore	(22-39-00,75-58-18)
926	Madhya Pradesh	Indore	(22-39-00,75-58-18)
933	Madhya Pradesh	Madhav National Park	(25-23-03.3,77-40-46.4)
934	Madhya Pradesh	Madhav National Park	(25-22-41.7,77-40-02.5)
937	Madhya Pradesh	Madhav National Park	(25-23-02.6,77-40-24.4)
938	Madhya Pradesh	Madhav National Park	(25-22-46.9,77-39-57.8)
939	Madhya Pradesh	Madhav National Park	(25-32-05,77-47-30)
940	Madhya Pradesh	Madhav National Park	(25-26-21,77-40-49)
941	Madhya Pradesh	Madhav National Park	(25-28-10,77-40-47)
942	Madhya Pradesh	Madhav National Park	(25-34-38.8,77-42-09.2)
943	Madhya Pradesh	Madhav National Park	(25-32-51.32,77-38-47.3)
944	Madhya Pradesh	MadhavNational Park	(25-27-44.24,77-42-5.5)
945	Madhya Pradesh	Madhav National Park	(25-33-12.36,77-38-50.17)
946	Madhya Pradesh	Madhav National Park	(25-32-28.46,77-39-55.99)
948	Madhya Pradesh	Madhav National Park	(25-32-30.98,77-39-56.42)
949	Madhya Pradesh	Madhav National Park	(25-35-15.8,77-39-25.3)
950	Madhya Pradesh	Madhav National Park	(25-34-28.7,77-42-20.6)
951	Madhya Pradesh	Madhav National Park	(25-21-38,77-41-26)
952	Madhya	Madhav	(25-34-57.7,77-39-23.8)

	Pradesh	National Park	
954	Madhya Pradesh	Madhav National Park	(25-33-47.4,77-38-56.4)
955	Madhya Pradesh	Madhav National Park	(25-32-26,77-47-43)
956	Madhya Pradesh	Madhav National Park	(25-23-16,77-43-25)
959	Madhya Pradesh	Madhav National Park	(25-28-46,77-51-21)
960	Madhya Pradesh	Madhav National Park	(25-28-42,77-51-0)
962	Madhya Pradesh	Madhav National Park	(25-25-33.3,77-50-49)
963	Madhya Pradesh	Madhav National Park	(25-31-57,77-47-15)
964	Madhya Pradesh	Madhav National Park	(25-26-03.2,77-52-09.5)
965	Madhya Pradesh	Madhav National Park	(25-32-32,77-47-54)
966	Madhya Pradesh	Madhav National Park	(25-26-12.7,77-51-13.0)
967	Madhya Pradesh	Madhav National Park	(25-32-35,77-48-14)
968	Madhya Pradesh	Madhav National Park	(25-24-20.1,77-54-8.7)
969	Madhya Pradesh	Madhav National Park	(25-24-21.5,77-52-36.1)
970	Madhya Pradesh	Madhav National Park	(25-32-29,77-48-30)
971	Madhya Pradesh	Madhav National Park	(25-27-41.1,77-51-24.1)
972	Madhya Pradesh	Madhav National Park	(25-28-03,77-47-07)
973	Madhya Pradesh	Madhav National Park	(25-26-33.9,77-49-5.9)
974	Madhya Pradesh	Madhav National Park	(25-31-89,77-49-13)
975	Madhya Pradesh	Madhav National Park	(25-28-00,77-46-50)
976	Madhya Pradesh	Madhav National Park	(25-27-37.5,77-49-58.7)
977	Madhya Pradesh	Madhav National Park	(25-27-27.5,77-47-11)
978	Madhya Pradesh	Madhav National Park	(25-27-22,77-48-44)
979	Madhya Pradesh	Madhav National Park	(25-29-50,77-48-38)
980	Madhya Pradesh	Madhav National Park	(25-27-19,77-47-26)
982	Madhya	Madhav	(25-27-02,77-48-07)

	Pradesh	National Park	
983	Madhya Pradesh	Madhav National Park	(25-29-44,77-48-51)
984	Madhya Pradesh	MadhavNational Park	(25-28-55,77-48-38.5)
985	Madhya Pradesh	Madhav National Park	(25-34-48,77-48-32)
986	Madhya Pradesh	Madhav National Park	(25-33-56.4,77-49-31.5)
987	Madhya Pradesh	Madhav National Park	(25-32-48,77-47-16)
988	Madhya Pradesh	Madhav National Park	(25-33-24,77-47-48)
989	Madhya Pradesh	Madhav National Park	(25-33-14,77-48-16)
990	Madhya Pradesh	Madhav National Park	(25-36-11,77-48-19)
991	Madhya Pradesh	Madhav National Park	(25-36-57.5,77-47-16.1)
992	Madhya Pradesh	Madhav National Park	(25-29-41,77-51-27)
993	Madhya Pradesh	Madhav National Park	(25-30-51.4,77-42-52.7)
994	Madhya Pradesh	Madhav National Park	(25-29-21,77-51-13)
995	Madhya Pradesh	Madhav National Park	(25-32-42,77-42-30)
996	Madhya Pradesh	Madhav National Park	(25-30-03.5,77-51-21.8)
997	Madhya Pradesh	Madhav National Park	(25-30-19,77-42-12.9)
998	Madhya Pradesh	Madhav National Park	(25-31-13.5,77-50-18.6)
999	Madhya Pradesh	Madhav National Park	(25-31-02.5,77-51-12)
1000	Madhya Pradesh	Madhav National Park	(25-34-14,77-42-42)
1001	Madhya Pradesh	Madhav National Park	(25-31-10.6,77-43-23.2)
1002	Madhya Pradesh	Madhav National Park	(25-29-58.2,77-50-46.4)
1003	Madhya Pradesh	Madhav National Park	(25-32-41.8,77-42-19.9)
1004	Madhya Pradesh	Madhav National Park	(25-30-27.5,77-51-03.9)
1005	Madhya Pradesh	Madhav National Park	(25-34-10,77-41-18)
1006	Madhya Pradesh	Madhav National Park	(25-30-16.4,77-50-48.6)
1007	Madhya	Madhav	(25-29-1.2,77-42-33.0)

	Pradesh	National Park	
1008	Madhya Pradesh	Madhav National Park	(25-32-42.1,77-42-53.8)
1009	Madhya Pradesh	Madhav National Park	(25-28-49.4,77-41-7.7)
1010	Madhya Pradesh	Madhav National Park	(25-29-31,77-42-6.5)
1011	Madhya Pradesh	Madhav National Park	(25-30-1.1,77-41-51.9)
1012	Madhya Pradesh	Madhav National Park	(25-32-12.1,77-42-52.9)
1013	Madhya Pradesh	Madhav National Park	(25-29-35.2,77-40-50.9)
1014	Madhya Pradesh	Madhav National Park	(25-30-50.8,77-40-34.6)
1015	Madhya Pradesh	Madhav National Park	(25-32-25.3,77-43-12.5)
1016	Madhya Pradesh	Madhav National Park	(25-29-30.2,77-42-26.8)
1017	Madhya Pradesh	Madhav National Park	(25-33-5,77-42-2.2)
1018	Madhya Pradesh	Madhav National Park	(25-34-37.9,77-42-26.8)
1019	Madhya Pradesh	Madhav National Park	(25-29-4,77-51-24)
1020	Madhya Pradesh	Madhav National Park	(25-36-01,77-47-55)
1021	Madhya Pradesh	Madhav National Park	(25-33-40.1,77-49-10.3)
1026	Madhya Pradesh	South Panna	(24-08-30.64,79-52-50.55); (24-08-59.73,79-53-41.11)
1028	Madhya Pradesh	South Panna	(24-4-35.07,79-51-23.08); (24-4-45.63,79-52-11.08); (24-07-40.16,79-54-06.15); (24-07-39.2,79-53-38.6)
1029	Madhya Pradesh	South Panna	(24-04-00.53,79-47-54.02); (24-02-57.72,79-48-36.10); (24-3-33.99,79-52-24.63); (24-3-9.65,79-52-31.92)
1030	Madhya Pradesh	South Panna	(24-03-57.49,79-47-52.01); (24-02-57.02,79-48-29.94); (24-03-10.39,79-49-29.33); (24-04-15.64,79-48-20.95)
1034	Madhya Pradesh	South Panna	(24-02-09.44,79-45-39.86); (24-02-57.02,79-47-42.13); (24-02-34.86,79-48-07.95); (24-03-01.80,79-47-4.54)
1036	Madhya Pradesh	South Panna	(24-09-17.24,79-56-30.07); (24-08-44.99,79-57-00.77); (24-02-31.56,79-48-5.88); (24-01-52.06,79-47-44.21)
1050	Madhya Pradesh	Chhattarpur	(24-47-52.25,79-19-22.85); (24-47-25.06,79-18-46.57); (29-50-15.09,77-9-7.94); (29-48-47.64,77-8-18.34)
1058	Madhya Pradesh	Chhattarpur	(24-48-52.28,79-20-4.04); (24-49-14.85,79-20-11.83); (24-47-52.13,79-19-29.09); (24-48-26.43,79-19-33.93)
1693	Madhya Pradesh	Mandsour	(24-40-17.23,75-33-30.23); (24-40-12.80,75-33-4.26); (30-50-22.44,77-59-39.84)
1696	Madhya Pradesh	Mandsour	(24-39-24.75,75-32-55.07);(24-39-50.50,75-33-11.24); (24-39-59.26,75-33-36.91)
1698	Madhya	Morena	(26-36-02.1,77-53-58.9); (26-36-24.8,77-54-26.5)

	Pradesh		
1699	Madhya Pradesh	Mandsaur	(24-34-33.82,75-43-54.79); (24-34-28.75,75-43-53.81); (26-36-38.2,77-54-14.6); (26-36-18.2,77-53-34.9)
1700	Madhya Pradesh	SFD Datia	(25-57-49.0,78-29-22); (25-57-38,78-28-30); (24-34-19.55,75-43-55.37)
1701	Madhya Pradesh	Morena	(26-36-13.5,77-52-23.2); (26-36-20,77-53-04.5); (25-56-34,78-29-10.1); (25-56-30,78-29-33.2)
1702	Madhya Pradesh	Mandsour	(24-36-06.42,75-32-18.8); (24-36-42.01,75-32-31.98); (26-36-07.0,77-53-05.0); (26-36-02,77-52-44.4)
1703	Madhya Pradesh	Mandsaur	(24-40-18.32,75-40-19.22); (24-39-50.87,75-40-36.79); (24-36-51.69,75-32-00.73); (24-36-07.65,75-32-43.59)
1704	Madhya Pradesh	Mandsour	(24-58-37.75,75-5-49.75); (24-57-40.42,75-53-68.02); (24-39-30.94,75-40-56.12); (24-39-10.71,75-41-17.94)
1706	Madhya Pradesh	SFD Datia	(26-05-16.4,78-38-31.6); (26-05-10.1,78-38-43.6); (24-57-58.53,75-54-28.72); (24-58-44.53,75-54-47.33)
1708	Madhya Pradesh	Mandsour	(24-39-33.88,75-32-16.17); (24-41-41.67,75-32-10.44); (26-04-35.5,78-38-37.5); (26-04-16.2,78-38-27.3); (26-04-26.2,78-38-1.1)
1709	Madhya Pradesh	Mandsaur	(24-39-55.52,75-41-21.36); (24-39-46.82,75-41-40.60); (24-42-22.56,75-31-24.96); (24-41-56.46,75-32-9.53)
1710	Madhya Pradesh	Mandsour	(24-39-4.2,75-30-6.4); (24-39-3.2,75-30-8.03); (24-39-37.19,75-41-47.02)
1712	Madhya Pradesh	Mandsaur	(24-31-43.70,75-47-08.67); (24-31-36.21,75-47-39.77); (24-39-10.8,75-31-13.2); (24-38-31.0,75-29-19.00)
1713	Madhya Pradesh	Mandsour	(24-39-3.0,75-29-57.0); (24-39-12.81,75-29-49.55); (24-31-35.33,75-47-40.53)
1714	Madhya Pradesh	Mandsour	(24-36-27.41,75-27-19.10); (24-36-7.8,75-27-15.59); (24-39-24.84,75-30-31.08); (24-39-26.69,75-30-24.15)
1715	Madhya Pradesh	Mandsaur	(24-38-46.24,75-39-42.19); (24-38-56.80,75-39-57.13); (24-36-34.37,75-27-6.6); (24-36-8.8,75-26-58.23)
1716	Madhya Pradesh	Mandsour	(24-39-4.74,75-27-57.5); (24-38-57.2,75-28-25.6); (24-39-09.84,75-40-10.75)
1717	Madhya Pradesh	Madhav National Park	(25-26-17.0,77-42-09);(24-39-06.09,75-28-29.0)
1718	Madhya Pradesh	SFD Datia	(26-11-54,78-48-35); (26-11-39,78-48-53)
1719	Madhya Pradesh	Mandsaur	(24-38-58.02,75-46-52.06); (24-38-50.80,75-47-00.00); (26-11-45,78-49-30); (26-12-15,78-49-30); (26-12-05,78-49-13); (26-11-50,78-48-55);
1720	Madhya Pradesh	Mandsour	(24-38-9.9,75-23-3.1); (24-38-11.7,75-23-4.8); (24-38-44.60,75-47-14.40)
1721	Madhya Pradesh	Madhav National Park	(25-28-43.3,77-42-27.9);(24-38-13.1,75-23-6.6); (24-38-12.1,75-23-7.3)
1722	Madhya Pradesh	Mandsaur	(24-34-23.25,75-45-51.99); (24-34-48.70,75-45-48.70)
1723	Madhya Pradesh	Mandsour	(24-38-7.7,75-24-11.00); (24-37-21.3,75-24-20.20); (24-34-56.29,75-45-48.41)
1724	Madhya Pradesh	Mandsaur	(24-35-04.09,75-41-46.88); (24-34-10.41,75-42-08.28); (24-38-47.2,75-25-2.2); (24-38-40.4,75-25-54.8)
1727	Madhya	Mandsour	(24-41-1.9,75-24-24.29); (24-41-51.9,75-23-41.4); (24-38-

	Pradesh		09.37,75-42-06.05)
1728	Madhya Pradesh	Madhav National Park	(25-23-05,77-43-16);(24-40-48.2,75-23-43.6); (24-40-30.4,75-24-24.8)
1729	Madhya Pradesh	Mandsaur	(24-38-19.57,75-44-49.97); (24-38-00-00,75-44-57.46)
1730	Madhya Pradesh	Mandsaur	(24-40-54.39,75-43-26.57); (24-40-58.10,75-43-07.85); (24-38-10.62,75-45-03.66)
1731	Madhya Pradesh	Mandsaur	(24-33-42.00,75-43-38.00); (24-33-49.00,75-43-31.00); (24-41-17.65,75-43-22.65)
1733	Madhya Pradesh	Mandsaur	(24-32-30.00,75-44-47.00); (24-32-29.00,75-44-30.00); (24-33-28.00,75-43-28.00)
1734	Madhya Pradesh	Mandsaur	(24-21-20.84,75-35-21.73); (24-21-39.47,75-34-25.30); (24-32-24.00,75-45-00.00)
1735	Madhya Pradesh	Madhav National Park	(25-24-44,77-42-31);(24-22-09.73,75-34-34.89); (24-21-51.18,75-34-58.74)
1737	Madhya Pradesh	Mandsaur	(24-32-50.00,75-43-35.00); (24-32-57.00,75-43-26.00)
1738	Madhya Pradesh	Mandsaur	(24-32-52.00,75-43-20.00)
1739	Madhya Pradesh	Mandsaur	
1740	Madhya Pradesh	Mandsaur	(24-24-06.56,75-31-37.09); (24-24-53.24,75-32-0.34)
1741	Madhya Pradesh	Mandsaur	(24-09-45,75-42-05.00); (24-09-44,75-42-45); (24-24-30.88,75-32-33.17); (24-25-52.58,75-32-7.64)
1742	Madhya Pradesh	Mandsaur	(24-10-55,75-33-48.00); (24-10-55,75-38-08.00); (24-09-05,75-44-44); (24-08-50,75-44-50)
1747	Madhya Pradesh	Damoh	(23-30-55.00,79-35-24.03); (23-35-14.02,79-28-23.07); (24-09-48,75-34-39); (24-09-45,75-33-55)
1748	Madhya Pradesh	Gwalior	(26-04-28.0,78-37-14.0); (26-04-35.0,78-37-22); (23-34-52.08,79-28-05.07); (23-34-58.7,79-28-02.2)
1749	Madhya Pradesh	Gwalior	(26-4-58.00,78-35-49); (26-05-10.00,78-36-07.10); (26-04-34.0,78-38-14); (26-04-11.0,78-38-1.2); (26-04-21.8,78-37-44)
1750	Madhya Pradesh	Damoh	(23-34-47.7,79-35-32.94); (23-36-54.42,79-34-27.3); (26-05-14.0,78-36-29.5); (26-05-2.00,78-37-08); (26-04-35.00,78-37-22); (26-04-28.00,78-37-14);
1751	Madhya Pradesh	Madhav National Park	(25-23-21.3,77-42-02.0)
1752	Madhya Pradesh	Gwalior	
1753	Madhya Pradesh	Damoh	(23-21-47.64,79-21-43.89); (23-22-27.20,79-21-11.97)
1754	Madhya Pradesh	Damoh	(23-21-22.44,79-22-16.82); (23-21-53.1,79-22-4.21); (23-21-42.25,79-21-12.87)
1755	Madhya Pradesh	Gwalior	(26-02-51.2,78-35-6.3); (26-3-19.2,78-35-22.9); (23-22-35.11,79-22-5.50)
1756	Madhya Pradesh	Damoh	(23-42-03.71,79-33-39.1); (23-25-27.48,79-19-45.04); (26-3-14.3,78-35-57.1); (26-2-54.8,78-36-4.3); (26-2-14.6,78-35-56.2); (26-02-35.0,78-35-32.5);

1757	Madhya Pradesh	Saleya	(23-53-27.38,79-43-11.89); (23-53-31.07,79-43-21.265); (23-25-6.69,79-19-31.66)
1759	Madhya Pradesh	Saleya	(23-52-15.47,79-43-02.81); (23-52-18.55,79-43-20.88); (23-53-06.83,79-43-43.57); (23-53-1.82,79-43-35.60)
1761	Madhya Pradesh	Damoh	(23-16-06.3,79-20-07.8);(23-51-56.30,79-43-0.6.88); (23-51-58.79,79-43-25.18)
1762	Madhya Pradesh	Neemuch	(24-34-02.00,75-27-23.00); (24-34-02.20,75-27-23.10)
1763	Madhya Pradesh	Ashoknagar	(24-29-35,78-14-1.86); (24-29-21.9,78-14-14.69); (24-34-02.90,75-27-23.20); (24-34-02.30,75-27-23.10)
1764	Madhya Pradesh	Shivpuri (Territorial)	(25-39-52,77-58-35); (25-39-48,77-59-18); (24-29-26.15,78-14-18.56); (24-29-31.76,78-14-28.59); (24-29-37,78-14-27.61); (24-29-39,78-14-55);
1767	Madhya Pradesh	Shivpuri (Territorial)	(25-38-52.41,77-59-05.80); (25-39-01.14,77-59-32.93); (25-38-57,77-58-30); (25-39-41,77-58-38)
1768	Madhya Pradesh	Neemuch	(24-31-21.60,75-17-38.16); (24-31-32.64,75-18-07.90); (25-39-15.24,77-59-52.97); (25-39-14.15,77-59-30.96)
1769	Madhya Pradesh	Neemuch	(24-35-03.00,75-28-49.00); (24-35-55.00,75-29-06.00); (24-31-49.92,75-18-19.61); (24-31,75-18-07.42); (24-31-56.64,75-18-08.40); (24-32-02.40,75-17-25.44);
1770	Madhya Pradesh	Ratlam	(23-46-54.90,75-37-29.60); (23-47-1.70,75-38-4.20); (24-35-29.00,75-29-15.00)
1771	Madhya Pradesh	Ashoknagar	(24-46-8.23,78-13-33.73); (24-46-13.23,78-12-59.33); (23-46-33.30,75-38-8.80); (23-46-26.60,75-37-55.50); (23-46-22.60,75-37-34.70); (23-46-59.50,75-37-46.80);
1774	Madhya Pradesh	Ratlam	(23-46-54.90,75-37-29.60); (23-47-1.70,75-38-4.20); (24-46-16.50,78-13-3.93); (24-46-17.81,78-13-6.17); (24-46-24.12,78-13-12.86); (24-46-22.21,78-13-21.93);
1775	Madhya Pradesh	Neemuch	(24-34-33.00,75-29-20.00); (24-34-22.80,75-29-19.80); (23-46-33.30,75-38-8.80); (23-46-26.60,75-37-55.50)
1776	Madhya Pradesh	Neemuch	(24-45-26,75-7-11); (24-45-26,75-07-52); (24-34-32.90,75-29-19.90); (24-34-33.60,75-29-20.10)
1777	Madhya Pradesh	Ratlam	(23-53-23.70,75-27-17.60); (23-53-7.80,75-27-30.80); (24-45-18,75-08-06); (24-45-53,75-07-45)
1778	Madhya Pradesh	Neemuch	(24-33-11.00,75-30-14.00); (24-33-11.30,75-30-13.90); (23-53-19.30,75-27-50.70); (23-53-36.80,75-27-32.20); (23-53-33.80,75-27-24.40)
1779	Madhya Pradesh	Ratlam	(23-53-23.70,75-27-17.60); (23-53-7.80,75-27-30.80); (24-33-11.60,75-30-13.60); (24-33-11.00,75-30-13.80)
1784	Madhya Pradesh	Neemuch	(24-30-32.64,75-19-38.16); (24-30-32.64,75-20-18.55); (23-53-19.30,75-27-50.70); (23-53-36.80,75-27-32.20); (23-53-33.80,75-27-24.40); (23-53-35.00,75-28-0.20);
1785	Madhya Pradesh	Neemuch	(24-34-07.80,75-21-41.80); (24-34-46.00,75-21-46.60); (24-31-24.00,75-20-18.55); (24-31-00.00,75-19-39.75)
1786	Madhya Pradesh	Obedullaganj	(23-06-22.64,77-35-39.37); (23-06-19.11,77-35-39.61); (24-35-01.90,75-22-00-00); (24-34-46.00,75-22-01.90); (24-34-28.50,75-22-05.70)
1788	Madhya Pradesh	Obedullaganj	(23-05-27.35,77-36-23.00); (23-05-28.21,77-36-09.07); (23-06-33.72,77-36-16.93); (23-06-31.03,77-36-16.94)
1792	Madhya Pradesh	Obedullaganj	(23-05-53.79,77-37-19.46); (23-05-51.79,77-37-26.22); (23-05-45.60,77-36-06.72); (23-05-42.23,77-36-27.58)

1793	Madhya Pradesh	Neemuch	(24-35-03.00,75-28-49.00); (24-35-55.00,75-29-06.00); (23-06-06.30,77-37-50.15); (23-06-04.09,77-37-50.95)
1794	Madhya Pradesh	Neemuch	(24-45-50,75-06-46); (24-45-33,75-07-24); (24-35-29.00,75-29-15.00)
1796	Madhya Pradesh	Obedullaganj	(23-08-44.88,77-35-18.85); (23-08-47.94,77-35-31.59); (24-45-52,75-7-52); (24-46-12,75-07-10)
1798	Madhya Pradesh	Neemuch	(24-48-07,75-10-17); (24-48-24,75-10-09); (23-08-39.07,77-35-32.13); (23-08-36.37,77-35-19.64)
1799	Madhya Pradesh	Obedullaganj	(23-10-27.64,77-39-11.21); (23-10-26.70,77-39-19.64); (24-49-09,75-10-46); (24-48-49,75-10-10)
1805	Madhya Pradesh	Neemuch	(24-48-16,75-12-39); (24-48-42,75-13-01); (23-10-18.03,77-39-12.96); (23-10-20.61,77-39-09.50)
1808	Madhya Pradesh	Raisen	(23-16.40.34,77-41-52.16); (23-16-29.30,77-41-50.91); (24-48-36,75-13-22); (24-48-12,75-13-17)
1809	Madhya Pradesh	Neemuch	(24-39-46.9,75-10-18.0); (24-40-22.4,75-10-16.9); (23-16-26.82,77-41-55.76); (23-16-31.21,77-42-4.15)
1810	Madhya Pradesh	Neemuch	(24-49-40,75-13-55); (24-49-55,75-13-55); (24-40-30.1,75-10-40.9); (24-40-47.6,75-10-32.1)
1811	Madhya Pradesh	Raisen	(23-17-19.80,77-42-10.07); (23-17-15.57,77-42-10.22); (24-49-51,75-14-50); (24-49-41,75-14-33.5)
1814	Madhya Pradesh	Neemuch	(24-40-14.5,75-11-09.9); (24-40-39.6,75-11-35.7); (23-17-9.51,77-42-27.13); (23-17-18.53,77-42-27.47)
1815	Madhya Pradesh	Neemuch	(24-34-53.8,75-16-46.2);(24-40-27.8,75-10-53.7)
1816	Madhya Pradesh	Neemuch	(24-40-48.0,75-20-49.0); (24-41-13.0,75-21-01.5)
1817	Madhya Pradesh	Neemuch	(24-36-12.0,75-12-15.0);(24-41-13.0,75-20-03.0); (24-40-52.5,75-20-04.0)
1821	Madhya Pradesh	Neemuch	(24-37-7.50,75-14-13.9)
1822	Madhya Pradesh	Obedullaganj	(23-03-51.10,77-23-24.99); (23-03-51.10,77-23-33.71)
1823	Madhya Pradesh	Neemuch	(24-35-6.90,75-25-32.90); (24-35-5.30,75-25-32.70); (23-04-08.43,77-23-24.99); (23-04-08.43,77-23-33.51)
1826	Madhya Pradesh	Neemuch	(24-39-09.3,75-18-00.0); (24-38-39.8,75-17-59.1); (24-35-5.30,75-25-34.60); (24-35-7.00,75-25-35.50)
1827	Madhya Pradesh	Neemuch	(24-34-38.0,75-05-23.5); (24-35-07.0,75-05-230); (24-38-40.03,75-17-23.0); (24-39-07.8,75-17-21.9)
1828	Madhya Pradesh	Neemuch	(24-37-00.0,75-14-43.0); (24-37-25.0,75-14-30.0); (24-35-07.00,75-05-55.00); (24-34-38.0,75-05-54.0)
1829	Madhya Pradesh	Neemuch	(24-34-11.0,75-08-7.5); (234-34-22.5,75-08-46.5); (24-37-27.0,75-15-11.0); (24-37-02.5,75-15-22.4)
1835	Madhya Pradesh	Neemuch	(24-38-15.1,75-09-4.9); (24-38-12.6,75-09-27.2); (24-34-22.05,75-08-08.5); (24-34-10.0,75-10-05.5)
1838	Madhya Pradesh	Obedullaganj	(23-04-24.61,77-23-34.14); (23-04-30.31,77-23-37.85); (24-37-36.9,75-09-02.6); (24-37-37.1,75-09-16.9)
1840	Madhya Pradesh	Neemuch	(24-48-55,75-07-39);(23-04-14.92,77-23-37.85); (23-04-11.50,77-23-57.01)
1841	Madhya Pradesh	Obedullaganj	(23-04-38.50,77-24-21.33); (23-04-43.43,77-24-21.33)

1842	Madhya Pradesh	Neemuch	(24-48-6.5,75-10-19);(23-04-43.96,77-24-34.10); (23-04-40.38,77-24-34.71)
1844	Madhya Pradesh	Obedullaganj	(23-02-58.00,77-23-20.00); (23-02-23.50,77-23-20.00)
1846	Madhya Pradesh	Neemuch	(24-39-34,74-54-28); (24-39-30,74-57-40); (23-03-38.20,77-23-58.40); (23-03-25.00,77-23-47.50)
1847	Madhya Pradesh	Neemuch	(24-50-23.0,75-03-47.0); (24-50-18.0,75-04-16.0); (24-39-00,74-57-34); (24-39-10.5,74-57-46)
1848	Madhya Pradesh	Obedullaganj	(23-03-37.00,77-22-35.40); (23-03-54.00,77-22-36.50); (24-49-53.0,75-04-16.0); (24-49-55.0,75-03-47.0)
1849	Madhya Pradesh	Neemuch	(24-38-4.9,75-18-58.3); (24-38-5.9,75-19-37.8); (23-03-57.00,77-23-16.50); (23-03-34.50,77-23-17.50)
1851	Madhya Pradesh	Obedullaganj	(23-03-04.00,77-23-2.00); (23-03-12.5,77-23-1.50); (24-38-30.09,75-19-43.9); (24-38-29,75-19-00)
1852	Madhya Pradesh	Neemuch	(24-36-00,75-10-39); (24-36-10,75-10-24); (23-03-13.00,77-23-16.50); (23-03-5.00,77-23-15.00)
1853	Madhya Pradesh	Neemuch	(24-18-06,74-46-54.5); (24-18-06,75-47-33.5); (24-37-06,75-11-40.0); (24-37-00.0,75-12-06.0)
1854	Madhya Pradesh	Neemuch	(24-15-00,74-45-00); (24-15-00,74-46-02); (24-17-48,74-46-54); (24-17-19,74-47-37); (24-18-28.5,74-47-41)
1855	Madhya Pradesh	Neemuch	(24-33-03.0,75-13-53.2);(24-14-50,74-45-58); (24-14-46,74-45-12)
1856	Madhya Pradesh	Neemuch	(24-34-44.7,75-17-11.5); (24-35-12.7,75-17-0.9)
1857	Madhya Pradesh	Neemuch	(24-34-15.,75-19-34.7); (24-34-12.6,75-19-10.8); (24-35-12.09,75-17-35.9); (24-34-44.7,75-17-34.4)
1862	Madhya Pradesh	Neemuch	(24-34-04.0,75-15-25.0); (24-34-05.0,75-16-00.0); (24-34-51.06,24-34-51.6); (75-19-33.9,)
2843	Madhya Pradesh	Madhav National Park	(25-26-15,77-42-18)
2844	Madhya Pradesh	Madhav National Park	(25-26-09,77-41-26)
2847	Madhya Pradesh	Madhav National Park	(25-27-16,77-41-08)
2852	Madhya Pradesh	Madhav National Park	(25-28-40.7,77-42-10)
2855	Madhya Pradesh	Madhav National Park	(25-27-49.3,77-40-50.2)
2858	Madhya Pradesh	Madhav National Park	(25-27-47.4,77-42-1.2)
2859	Madhya Pradesh	Madhav National Park	(25-28-19.8,77-40-57.92)
2862	Madhya Pradesh	Madhav National Park	(25-28-35,77-42-57)
2865	Madhya Pradesh	Madhav National Park	(25-28-13,77-43-28)
2866	Madhya Pradesh	Madhav National Park	(25-28-02,77-43-42)
2869	Madhya Pradesh	Madhav National Park	(25-28-01,77-43-48)

2870	Madhya Pradesh	Madhav National Park	(25-28-04,77-44-04)
2871	Madhya Pradesh	Madhav National Park	(25-28-33,77-44-17)
2872	Madhya Pradesh	Madhav National Park	(25-28-35,77-44-15)
2873	Madhya Pradesh	Madhav National Park	(25-28-41,77-44-12)
2882	Madhya Pradesh	Madhav National Park	(25-26-20,77-43-8)
2887	Madhya Pradesh	Madhav National Park	(25-25-50,77-43-44)
2888	Madhya Pradesh	Madhav National Park	(25-25-38.7,77-44-27.4)
2891	Madhya Pradesh	Madhav National Park	(25-26-08,77-43-11)
2892	Madhya Pradesh	Madhav National Park	(25-26-27,77-43-10)
2893	Madhya Pradesh	Madhav National Park	(25-26-49,77-43-49)
2895	Madhya Pradesh	Madhav National Park	(25-27-01,77-42-18)
2899	Madhya Pradesh	Madhav National Park	(25-21-51,77-41-28)
2911	Madhya Pradesh	Madhav National Park	(25-24-57.8,77-41-35.4); (25-23-35.6,77-41-14.8)
2915	Madhya Pradesh	Madhav National Park	(25-31-52,77-48-44)
2917	Madhya Pradesh	Madhav National Park	(25-31-26,77-49-03)
3074	Madhya Pradesh	Mandsour	(24-40-17.23,75-33-30.23); (24-40-12.80,75-33-4.26); (24-39-50.50,75-33-11.24); (24-39-59.26,75-33-36.91)
3085	Madhya Pradesh	Mandsour	(24-36-06.42,75-32-18.8); (24-36-42.01,75-32-31.98); (24-36-51.69,75-32-00.73); (24-36-07.65,75-32-43.59)
3090	Madhya Pradesh	Mandsour	(24-58-37.75,75-5-49.75); (24-57-40.42,75-53-68.02); (24-57-58.53,75-54-28.72); (24-58-44.53,75-54-47.33)
3094	Madhya Pradesh	SFD Datia	(25-44-20.1,78-17-01); (25-44-35,78-17-35.2); (25-44-35.1,78-17-35.2); (25-44-17.5,78-16-29.2)
3097	Madhya Pradesh	Mandsour	(24-39-10.70,75-32-3.86); (24-41-5.05,75-32-21.76)
3102	Madhya Pradesh	SFD Datia	(25-43-15.1,78-15-52.1); (25-42-58.5,78-16-17.5); (25-43-24.1,78-16-40.1); (25-42-58.5,78-16-17.5-)
3105	Madhya Pradesh	Mandsour	(24-39-51.4,75-31-52.3); (24-39-32.68,75-31-48.32); (24-39-47.48,75-31-56.29); (24-40-06.64,75-31-42.01)
3110	Madhya Pradesh	SFD Datia	(25-41-05,75-20-40); (25-41-05,78-20-45); (25-41-00,78-20-45); (25-41-00,78-20-40)
3114	Madhya Pradesh	SFD Datia	(25-46-37,78-21-33.5); (25-46-36,78-21-23); (25-46-26,78-21-15)
3118	Madhya Pradesh	Mandsour	(24-38-39.18,75-30-21.16); (24-38-52.22,75-30-13.92); (24-38-23.15,75-30-29.86); (24-38-36.25,75-29-17.57)

3120	Madhya Pradesh	SFD Datia	(25-43-45,78-15-20); (25-43-42,78-52-42); (25-44-46,78-15-43); (25-44-25,78-15-21)
3122	Madhya Pradesh	Mandsour	(24-38-15.37,75-31-0.64); (24-38-50.43,75-31-41.56); (24-38-25.50,75-31-31.81); (24-39-45.35,75-31-47.24)
3123	Madhya Pradesh	Datia	(25-49-4-,78-23-05); (25-49-55,78-23-05); (25-49-35,78-22-40)
3128	Madhya Pradesh	Mandsour	(24-39-3.0,75-29-57.0); (24-39-12.81,75-29-49.55); (24-39-24.84,75-30-31.08); (24-39-26.69,75-30-24.15)
3131	Madhya Pradesh	Madhav National Park	(25-26-04,77-43-05)
3133	Madhya Pradesh	Mandsour	(24-36-23.68,75-26-56.66)
3134	Madhya Pradesh	SFD Datia	(25-46-33,78-17-18); (25-46-30,78-16-00); (25-46-40,78-17-10); (25-46-50,78-17-35)
3135	Madhya Pradesh	SFD Datia	(25-46-05,78-17-55); (25-46-20,78-17-53); (25-46-30,78-17-45); (25-45-55,78-17-40)
3140	Madhya Pradesh	Datia	(25-43-30,78-15-50); (25-43-20,78-16-25); (25-44-10,78-15-50)
3143	Madhya Pradesh	SFD Datia	(25-44-27.5,78-18-02.5); (25-44-37.5,78-17-31.5); (25-44-58.2,78-17-10.1); (25-44-40.2,78-17-08.1); (25-44-20.3,78-17-10.1); (24-44-18.1,78-17-30.1)
3147	Madhya Pradesh	Mandsour	(24-39-30.34,75-23-56.9); (24-39-5.7,75-26-49.06); (24-39-24.2,75-24-10.2); (24-39-31.3,75-24-4.01)
3149	Madhya Pradesh	Mandsour	(24-38-7.7,75-24-11.00); (24-37-21.3,75-24-20.20); (24-38-47.2,75-25-2.2); (24-38-40.4,75-25-54.8)
3150	Madhya Pradesh	Datia	(25-45-27,78-17-10); (25-45-37,78-16-45); (25-45-45,78-17-10)
3152	Madhya Pradesh	Mandsour	(24-41-1.9,75-24-24.29); (24-41-51.9,75-23-41.4); (24-40-48.2,75-23-43.6); (24-40-30.4,75-24-24.8); (24-39-48.8,75-26-49.6)
3155	Madhya Pradesh	Mandsaur	(24-41-21.39,77-35-38.97); (24-41-6.16,75-35-52.31); (24-40-54.89,75-35-33.05); (24-41-10.73,75-35-14.52)
3157	Madhya Pradesh	SFD Datia	(25-47-00,78-18-30); (25-47-05,78-18-30.0); (25-47-05,78-18-25); (25-47-00,78-18-25)
3161	Madhya Pradesh	Mandsaur	(24-21-20.84,75-35-21.73); (24-21-39.47,75-34-25.30); (24-22-09.73,75-34-34.89); (24-21-51.18,75-34-58.74)
3165	Madhya Pradesh	Mandsaur	(24-21-20.84,75-35-21.73); (24-21-39.47,75-34-25.30); (24-22-09.73,75-34-34.89); (24-21-51.18,75-34-58.74)
3169	Madhya Pradesh	Mandsaur	(24-21-20.84,75-35-21.73); (24-21-39.47,75-34-25.30); (24-22-09.73,75-34-34.89); (24-21-51.18,75-34-58.74)
3171	Madhya Pradesh	Mandsaur	(24-21-20.84,75-35-21.73); (24-21-39.47,75-34-25.30); (24-22-09.73,75-34-34.89); (24-21-51.18,75-34-58.74)
3172	Madhya Pradesh	Mandsaur	(24-21-20.84,75-35-21.73); (24-21-39.47,75-34-25.30); (24-22-09.73,75-34-34.89); (24-21-51.18,75-34-58.74)
3173	Madhya Pradesh	Madhav National Park	(25-29-44,77-48-51)
3174	Madhya Pradesh	Mandsaur	
3175	Madhya Pradesh	Mandsaur	

3176	Madhya Pradesh	Mandsaur	
3177	Madhya Pradesh	Mandsaur	(24-24-06.56,75-31-37.09); (24-24-53.24,75-32-00.34); (24-24-30.88,75-32-33.17); (24-25-52.58,75-32-7.64)
3178	Madhya Pradesh	Mandsaur	(24-24-06.56,75-31-37.09); (24-24-53.24,75-32-00.34); (24-24-30.88,75-32-33.17); (24-25-52.58,75-32-7.64)
3179	Madhya Pradesh	Mandsaur	(24-09-45,75-42-05.00); (24-09-44,75-42-45); (24-09-05,75-44-44); (24-08-50,75-44-50)
3180	Madhya Pradesh	Mandsaur	(24-09-45,75-42-05.00); (24-09-44,75-42-45); (24-09-05,75-44-44); (24-08-50,75-44-50)
3182	Madhya Pradesh	Mandsaur	(24-10-55,75-33-48.00); (24-10-55,75-38-08.00); (24-09-48,75-34-39); (24-09-45,75-33-55)
3183	Madhya Pradesh	Mandsaur	(24-10-55,75-33-48.00); (24-10-55,75-38-08.00); (24-9-48,75-34-39); (24-9-45,75-33-55)
3187	Madhya Pradesh	Madhav National Park	(25-32-42.9,77-42-37.4)
3188	Madhya Pradesh	Madhav National Park	(25-32-20.4,77-43-4.6)
3189	Madhya Pradesh	Madhav National Park	(25-30-57.1,77-41-41.9)
3192	Madhya Pradesh	Madhav National Park	(25-30-53.3,77-42-29.3)
3193	Madhya Pradesh	Madhav National Park	(25-34-47.1,77-40-48.3)
3194	Madhya Pradesh	Madhav National Park	(00-35-11.8,77-42-46.8)
3195	Madhya Pradesh	Madhav National Park	(00-34-47.1,77-41-03.1)
3196	Madhya Pradesh	Madhav National Park	(25-32-08.1,77-43-25.3)
3197	Madhya Pradesh	Madhav National Park	(00-35-10.0,77-40-24.5)
3198	Madhya Pradesh	Madhav National Park	(00-36-20.4,77-41-03.1)
3199	Madhya Pradesh	Madhav National Park	(25-30-50.7,77-42-55.3)
3200	Madhya Pradesh	Madhav National Park	(25-33-33.02,77-39-53.04)
3201	Madhya Pradesh	Madhav National Park	(25-31-41.52,77-40-42.65)
3202	Madhya Pradesh	Madhav National Park	(25-34-21.8,77-39-49.6)
3203	Madhya Pradesh	Madhav National Park	(25-34-21.8,77-39-49.6)
3207	Madhya Pradesh	Madhav National Park	(25-36-13.1,77-40-5.2)
3210	Madhya Pradesh	Madhav National Park	(25-35-46.3,77-39-16.4)
3212	Madhya Pradesh	Madhav National Park	(25-33-39.2,77-38-50.5)

3214	Madhya Pradesh	Madhav National Park	(25-28-45,77-51-6)
3216	Madhya Pradesh	Madhav National Park	(25-29-10,77-50-30)
3218	Madhya Pradesh	Madhav National Park	(25-29-1.8,77-43-22.2)
3219	Madhya Pradesh	Madhav National Park	(25-27-8.00,77-49-16.00)
3221	Madhya Pradesh	Madhav National Park	(25-34-20,77-42-48)
3222	Madhya Pradesh	Madhav National Park	(25-27-6.4,77-51-33.4)
3223	Madhya Pradesh	Madhav National Park	(25-32-10,77-42-41)
3224	Madhya Pradesh	Madhav National Park	(25-27-6.4,77-51-33.4)
3227	Madhya Pradesh	Madhav National Park	(25-27-27,77-46-47)
3228	Madhya Pradesh	Madhav National Park	(25-29-50,77-48-38)
3230	Madhya Pradesh	Madhav National Park	(25-29-19,77-47-10)
3231	Madhya Pradesh	Madhav National Park	(25-29-22,77-48-32)
3232	Madhya Pradesh	Madhav National Park	(25-27-24,77-47-42)
3235	Madhya Pradesh	Chhattarpur	(24-48-24.93,80-04-3.08); (24-48-28.5,80-04-07.1); (24-48-20.84,80-04-17.57); (24-48-19.13,80-05-42.27)
3238	Madhya Pradesh	Morena	(26-33-18,77-50-04); (26-33-04,77-50-15)
3240	Madhya Pradesh	Morena	(26-33-16,77-50-03); (26-33-16,77-50-33); (26-32-48,77-50-04); (26-32-50,77-50-32)
3241	Madhya Pradesh	Morena	(26-33-16,77-50-03); (26-33-16,77-50-33); (26-32-48,77-50-04); (26-32-50,77-50-32)
3243	Madhya Pradesh	Morena	(26-34-45,70-50-30); (26-34-55,77-50-35); (26-35-15,77-51-50); (26-34-15,77-51-28)
3244	Madhya Pradesh	Morena	(26-34-45,70-50-30); (26-34-55,77-50-35); (26-35-15,77-51-50); (26-34-15,77-51-28)
3245	Madhya Pradesh	Morena	(26-34-45,77-50-30); (26-34-15,77-51-28); (26-34-18,77-50-28); (26-33-50,77-51-33); (26-33-55,77-50-49); (26-34-05,77-51-38)
3246	Madhya Pradesh	Morena	(26-34-45,77-50-30); (26-34-15,77-51-28); (26-34-18,77-50-28); (26-33-50,77-51-33); (26-33-55,77-50-49); (26-34-05,77-51-38)
3248	Madhya Pradesh	SFD Datia	(25-54-19,78-28-44); (25-54-28,78-28-25); (25-53-43,78-28-20); (25-54-7,78-27-53)
3249	Madhya Pradesh	SFD Datia	(26-9-28,78-45-43); (26-9-10,78-45-50); (26-9-10,78-45-25); (26-9-35,79-45-05); (26-9-44,78-45-15); (26-9-37,78-45-20)
3252	Madhya	Mandsaur	(24-11-56.00,75-40-40.00); (24-12-34.00,75-40-35.00);

	Pradesh		(24-12-27.00,75-41-11.00); (24-11-55.00,75-40-53.00)
3253	Madhya Pradesh	Mandsaur	(24-09-36.00,75-35-04.00); (24-10-07.00,75-35-18.00); (24-10-06.00,75-35-45.00); (24-09-50.00,75-35-59.00)
3255	Madhya Pradesh	Mandsaur	(24-10-28.00,75-34-8.00); (24-10-29.00,75-34-16.00); (24-09-57.00,75-34-34.00); (24-09-456.00,75-34-19.00)
3257	Madhya Pradesh	Mandsaur (Teritorial)	(24-6-40,75-20-42); (24-6-15,75-20-43); (24-6-10,75-20-43)
3258	Madhya Pradesh	Mandsaur	(24-35-09.77,75-45-29.76); (24-35-17.65,75-45-07.66); (24-35-51.03,75-45-08.19)
3259	Madhya Pradesh	Mandsaur	(24-35-09.77,75-45-29.76); (24-35-17.65,75-45-07.66); (24-35-51.03,75-45-08.19)
3260	Madhya Pradesh	Mandsaur	(24-34-33.82,75-43-54.79); (24-34-28.75,75-43-53.81); (24-34-19.55,75-43-55.37)
3261	Madhya Pradesh	Mandsaur	(24-40-18.32,75-40-19.22); (24-39-50.87,75-40-36.79); (24-39-30.94,75-40-56.12); (24-39-10.71,75-41-17.94)
3262	Madhya Pradesh	Mandsaur	(24-39-55.52,75-41-21.36); (24-39-46.82,75-41-40.60); (24-39-37.19,75-41-47.02)
3263	Madhya Pradesh	Mandsaur	(24-31-43.70,75-47-08.67); (24-31-36.21,75-47-39.77); (24-31-35.33,75-47-40.53)
3264	Madhya Pradesh	SFD Datia	(26-11-54,78-48-35); (26-11-39,78-48-53); (26-11-45,78-49-30); (26-12-15,78-49-30)
3265	Madhya Pradesh	Mandsaur	(24-38-46.24,75-39-42.19); (24-38-56.80,75-39-57.13); (24-39-09.84,75-40-10.75)
3266	Madhya Pradesh	SFD Datia	(26-9-28,78-45-43); (26-9-10,78-45-50); (26-9-10,78-45-25); (26-9-35,78-45-5)
3267	Madhya Pradesh	Mandsaur	(24-38-58.02,75-46-52.06); (24-38-50.80,75-47-00.00); (24-38-44.60,75-47-14.40)
3268	Madhya Pradesh	SFD Datia	(26-05-16.4,78-38-31.6); (26-05-10.1,78-38-43.6); (26-04-35.5,78-38-37.5); (26-04-16.2,78-38-27.3); (26-04-26.2,78-38-1.1); (26-04-46.6,78-38-18.9)
3269	Madhya Pradesh	Mandsaur	(24-34-23.25,75-45-51.99); (24-34-48.70,75-45-48.70); (24-34-56.29,75-45-48.41)
3270	Madhya Pradesh	SFD Datia	(25-54-19,78-28-44); (25-54-28,78-28-25); (25-53-43,78-28-20); (25-54-7,78-27-53)
3271	Madhya Pradesh	Mandsaur	(24-35-04.09,75-41-46.88); (24-34-10.41,75-42-08.28); (24-38-09.37,75-42-06.05)
3272	Madhya Pradesh	SFD Datia	(25-57-49,78-29-22); (25-57-38,78-28-3); (25-56-34,78-29-10.1); (25-56-30,78-29-33.2)
3273	Madhya Pradesh	Mandsaur	(24-38-19.57,75-44-49.97); (24-38-00-00,75-44-57.46); (24-38-10.62,75-45-03.66)
3274	Madhya Pradesh	Gwalior	(26-04-28.0,78-37-14.0); (26-04-35.0,78-37-22); (26-04-34.0,78-38-14); (26-04-11.0,78-38-1.2); (26-03-58.0,78-37-44)
3275	Madhya Pradesh	Mandsaur	(24-40-54.39,75-43-26.57); (24-40-58.10,75-43-07.85); (24-41-17.65,75-43-22.65)
3276	Madhya Pradesh	Gwalior	(26-04-58.00,78-35-49); (26-05-10.00,78-36-07.10); (26-05-14.0,78-36-29.5); (26-05-2.00,78-37-08); (26-04-35.00,78-37-22); (26-04-28.00,78-37-14)
3277	Madhya Pradesh	Mandsaur	(24-33-42.00,75-43-38.00); (24-33-49.00,75-43-31.00); (24-33-28.00,75-43-28.00)

3278	Madhya Pradesh	Gwalior	
3279	Madhya Pradesh	Mandsaur	(24-32-30.00,75-44-47.00); (24-32-29.00,75-44-30.00); (24-32-24.00,75-45-00.00)
3280	Madhya Pradesh	Gwalior	(26-02-51.2,78-35-6.3); (26-3-19.2,78-35-22.9); (26-3-14.3,78-35-57.1); (26-2-54.8,78-36-4.3); (26-2-14.6,78-35-56.2); (26-02-35.0,78-35-32.5)
3281	Madhya Pradesh	Mandsaur	(24-32-50.00,75-43-35.00); (24-32-57.00,75-43-26.00); (24-32-52.00,75-43-20.00)
3282	Madhya Pradesh	Mandsaur	
3314	Madhya Pradesh	Mandsaur	(24-45-54.27,75-33-19.23); (24-24-45.32,75-32-59.46); (24-25-03.65,75-32-50.81); (24-25-07.84,75-33-05.32)
3317	Madhya Pradesh	Tikamgarh	(25-32-12.43,78-52-41.65); (25-32-27.50,78-53-7.03); (25-32-54.77,78-53-16.70); (25-32-52.95,78-52-35.99); (25-33-1.20,78-53-38.94); (25-32-52.79,78-53-6.77); (25-32-28.9,78-52-47.03); (25-32-50.58,78-53-28.10)
3319	Madhya Pradesh	Tikamgarh	(25-33-0.78,78-53-38.96); (25-33-00.0,78-54-8.45); (25-32-43.35,78-54-04.45); (25-32-40.54,78-53-39.42); (25-33-05.97,78-53-54.57); (53-32-47.35,78-53-47.99)
3322	Madhya Pradesh	Shivpuri (Territorial)	(25-39-52,77-58-35); (25-39-48,77-59-18); (25-38-57,77-58-30); (25-39-41,77-58-38)
3324	Madhya Pradesh	Shivpuri (Territorial)	(25-38-52.41,77-59-05.80); (25-39-01.14,77-59-32.93); (25-39-15.24,77-59-52.97); (25-39-14.15,77-59-30.96)
3325	Madhya Pradesh	Ashoknagar	(24-29-35,78-14-1.86); (24-29-21.9,78-14-14.69); (24-29-26.15,78-14-18.56); (24-29-31.76,78-14-28.59); (24-29-37,78-14-27.61); (24-29-39,78-14-55)
3327	Madhya Pradesh	Ashoknagar	(24-46-8.23,78-13-33.73); (24-46-13.23,78-12-59.33); (24-46-16.50,78-13-3.93); (24-46-17.81,78-13-6.17); (24-46-24.12,78-13-12.86); (24-46-22.21,78-13-21.93)
3330	Madhya Pradesh	SFD Datia	(25-46-33,78-17-18); (25-46-30,78-16-00); (25-46-40,78-17-10); (25-46-50,78-17-35)
3333	Madhya Pradesh	Neemuch	(24-45-55.0,75-5-53.0); (24-46-29,75-06-00); (24-46-29.0,75-05-33.5); (24-45-55,75-05-04)
3342	Madhya Pradesh	Neemuch	(24-50-54,75-06-24); (24-50-10,75-06-54); (24-49-36,75-07-04); (24-49-26,75-06-58)
3343	Madhya Pradesh	Neemuch	(24-49-23,74-56-15); (24-49-25,74-56-36); (24-48-38,74-56-33.1); (24-28-38,74-56-23)
3459	Madhya Pradesh	Madhav National Park	(25-23-10,77-44-23)
4054	Madhya Pradesh	Shivpuri (Territorial)	(25-39-52,77-58-35); (25-39-48,77-59-18); (25-38-57,77-58-30); (25-39-41,77-58-38)
4055	Madhya Pradesh	Shivpuri (Territorial)	(25-19-18.00,77-52-34..00); (25-19-21.00,77-53-29.00); (25-19-52.00,77-52-57.00)
4056	Madhya Pradesh	Shivpuri (Territorial)	(25-29-37.00,77-54-25.00)
4057	Madhya Pradesh	Shivpuri (Territorial)	(25-31-0.03,77-53-50.08); (25-31-0.08,77-53-48.01); (25-30-48.01,77-53-48.02); (25-30-49.06,77-53-46.01)
4058	Madhya Pradesh	Shivpuri (Territorial)	(25-38-52.41,77-59-05.80); (25-39-01.14,77-59-32.93); (25-39-15.24,44-59-32.97); (25-39-14.15,77-59-30.96)

4059	Madhya Pradesh	Shivpuri (Territorial)	(25-13-43.36,77-43-55.10); (25-13-51.46,77-43-36.30); (25-14-10.10,77-43-40.07); (25-14-13.38,77-43-56.45)
4060	Madhya Pradesh	Shivpuri (Territorial)	(25-12-38.35,77-42-00.00); (25-12-37.66,77-41-43.13); (25-13-06.24,77-41-33.27); (25-12-58.68,77-42-00.37)
4061	Madhya Pradesh	Shivpuri (Territorial)	(25-17-11.00,77-49-13.00); (25-16-56.00,77-48-35.00); (25-16-56.00,77-49-15.00); (25-16-45.00,77-48-36.00)
4062	Madhya Pradesh	Shivpuri (Territorial)	(25-11-56.86,77-41-00.00); (25-12-25.09,77-40-48.61); (25-12-08.37,77-41-30.03); (25-11-59.35,77-41-18.04)
4063	Madhya Pradesh	Shivpuri (Territorial)	(25-16-11.08,77-44-09.64); (25-16-32.17,77-44-16.19); (25-16-37.94,77-43-50.33); (25-16-14.94,77-43-52.69)
4064	Madhya Pradesh	Shivpuri (Territorial)	(25-19-01.88,77-49-06.12); (25-18-51.32,77-48-49.63); (25-19-27.157,77-49-25.44); (25-19-13.14,77-49-39.15)
4065	Madhya Pradesh	Shivpuri (Territorial)	(25-17-39.00,77-48-47.00); (25-17-14.00,77-48-28.00); (25-17-41.00,77-49-21.00); (25-17-15.00,77-49-36.00)
4066	Madhya Pradesh	Shivpuri (Territorial)	(25-19-01.88,77-49-06.12); (25-18-51.32,77-48-49.63); (25-19-27.157,77-49-25.44); (25-19-13.14,77-49-39.15)
4067	Madhya Pradesh	Shivpuri (Territorial)	(25-19-01.88,77-49-06.12); (25-18-51.32,77-48-49.63); (25-19-27.157,77-49-25.44); (25-19-13.14,77-49-39.15)
4068	Madhya Pradesh	Shivpuri (Territorial)	(25-17-39.00,77-48-47.00); (25-17-14.00,77-48-28.00); (25-17-41.00,77-49-21.00); (25-17-15.00,77-49-36.00)
4069	Madhya Pradesh	Shivpuri (Territorial)	(25-19-17.97,77-48-37.24); (25-19-22.24,77-49-04.12); (25-19-01.88,77-49-06.12); (25-18-51.32,77-48-49.63)
4070	Madhya Pradesh	Shivpuri (Territorial)	(25-19-17.97,77-48-37.24); (25-19-22.24,77-49-04.12); (25-19-01.88,77-49-06.12); (25-18-51.32,77-48-49.63)
4071	Madhya Pradesh	Shivpuri (Territorial)	(25-19-27.157,77-49-25.44); (25-19-13.14,77-49-39.15); (25-19-48.50,77-49-38.15); (25-19-33.50,77-49-56.57)
4072	Madhya Pradesh	Shivpuri (Territorial)	(25-31-06.07,77-53-23.08); (25-31-04.06,77-53-16.06)
4073	Madhya Pradesh	Shivpuri (Territorial)	(25-19-27.157,77-49-25.44); (25-19-13.14,77-49-39.15); (25-19-48.50,77-49-38.15); (25-19-33.50,77-49-56.57)
4074	Madhya Pradesh	Shivpuri (Territorial)	(25-31-0.03,77-53-50.08); (25-31-0.08,77-53-48.01); (25-30-48.01,77-53-48.02); (25-30-49.06,77-53-46.01)
4075	Madhya Pradesh	Shivpuri (Territorial)	(25-17-0.28,77-44-38.41); (25-17-7.76,77-44-18.20); (25-17-19.53,77-44-14.84); (25-17-41.29,77-44-16.42)
4076	Madhya Pradesh	Shivpuri (Territorial)	(25-30-35-09,77-53-46.07); (25-30-39.04,77-53-86.05); (25-30-57.02,77-53 -46.02); (25-30-33.04,77-53-45.09)
4077	Madhya Pradesh	Shivpuri (Territorial)	(25-17-0.28,77-44-38.41); (25-17-7.76,77-44-18.20); (25-17-19.53,77-44-14.84); (25-17-41.29,77-44-16.42)
4078	Madhya Pradesh	Shivpuri (Territorial)	(25-17-0.28,77-44-38.41); (25-17-7.76,77-44-18.20); (25-17-19.53,77-44-14.84); (25-17-41.29,77-44-16.42)
4079	Madhya Pradesh	Shivpuri (Territorial)	(25-26-12.07,77-55-53.05); (25-26-41.05,77-55-85.03); (25-25-16.09,77-55-54.07); (25-25-46.00,77-56-20.07)
4080	Madhya Pradesh	Shivpuri (Territorial)	(25-25-57.07,77-56-35.03); (25-26-13.06,77-56-16.05); (25-26-28.05,77-56-29.02); (25-26-11.00,77-56-48.07)
4081	Madhya Pradesh	Shivpuri (Territorial)	(24-59-19.89,78-17-30.41); (24-59-22.89,78-17-45.30); (24-59-45.96,78-17-40.88); (24-59-41.92,78-17-26.16)
4082	Madhya Pradesh	Shivpuri (Territorial)	(24-59-19.89,78-17-30.41); (24-59-22.89,78-17-45.30); (24-59-45.96,78-17-40.88); (24-59-41.92,78-17-26.16)
4083	Madhya Pradesh	Shivpuri (Territorial)	(24-57-49.57,78-16-36.57); (24-58-12.80,78-16-48.13); (24-58-20.71,78-16-32.08); (24-58-11.04,78-16-21.35)

4084	Madhya Pradesh	Shivpuri (Territorial)	(24-57-49.57,78-16-36.57); (24-58-12.80,78-16-48.13); (24-58-20.71,78-16-32.08); (24-58-11.04,78-16-21.35)
4085	Madhya Pradesh	Shivpuri (Territorial)	(24-56-30.59,78-14-49.45); (24-55-59.27,78-14-55.91); (24-55-50.84,78-14-30.93); (24-55-45.32,78-14-37.5)
4086	Madhya Pradesh	Shivpuri (Territorial)	(24-58-07.08,78-17-05.16); (24-58-20.09,78-17-15.04); (24-58-30.60,78-16-51.45); (24-58-19.38,78-16-49.03)
4087	Madhya Pradesh	Shivpuri (Territorial)	(24-58-07.08,78-17-05.16); (24-58-20.09,78-17-15.04); (24-58-30.60,78-16-51.45); (24-58-19.38,78-16-49.03)
4088	Madhya Pradesh	Shivpuri (Territorial)	(25-23-14.09,77-56-56.03); (25-23-15.07,77-56-53.00); (25-23-23.06,77-56-21.14); (25-23-11.08,77-56-27.06)
4089	Madhya Pradesh	Shivpuri (Territorial)	(24-58-45.49,78-17-26.84); (24-58-15.04,78-17-33.14); (24-59-13.97,78-17-44.70); (24-58-40.42,78-17-59.22)
4090	Madhya Pradesh	Shivpuri (Territorial)	(24-58-45.49,78-17-26.84); (24-58-15.04,78-17-33.14); (24-59-13.97,78-17-44.70); (24-58-40.42,78-17-59.22)
4091	Madhya Pradesh	Shivpuri (Territorial)	(25-24-32.19,77-56-27.16); (25-24-26.50,77-56-14.13); (25-25-24.06,77-57-0.08); (25-23-47.08,77-57-12.03)
4092	Madhya Pradesh	Shivpuri (Territorial)	(24-59-18.37,78-17-21.27); (24-58-57.18,78-17-01.67); (24-58-43.98,78-17-09.92); (24-59-09.05,78-17-30.66)
4093	Madhya Pradesh	Shivpuri (Territorial)	(25-21-52.02,77-53-49.07); (25-21-57.04,77-53-55.08)
4094	Madhya Pradesh	Shivpuri (Territorial)	(24-59-18.37,78-17-21.27); (24-58-57.18,78-17-01.67); (24-58-43.98,78-17-09.92); (24-59-09.05,78-17-30.66)
4095	Madhya Pradesh	Shivpuri (Territorial)	(25-20-75.08,77-52-86.09); (25-20-44.01,77-53-13.08); (25-21-32.02,77-53-24.07); (25-22-55.04,77-54-0.06)
4096	Madhya Pradesh	Shivpuri (Territorial)	(25-22-55.05,77-55-12.09); (25-22-42.02,77-55-21.07)
4097	Madhya Pradesh	Shivpuri (Territorial)	(25-21-57.04,77-54-44-03); (25-22-23.05,77-53-55.08)
4098	Madhya Pradesh	Shivpuri (Territorial)	(25-24-0.04,77-57-10.0); (25-23-35.0,77-57-12.0); (25-23-40.0,77-57-25.0); (25-23-30.0,77-57-12.0)
4099	Madhya Pradesh	Shivpuri (Territorial)	(25-28-22.04,77-54-39-08); (25-27-53.04,77-54-29.07)
4100	Madhya Pradesh	Sheopur (T)	
4101	Madhya Pradesh	Sheopur (T)	
4102	Madhya Pradesh	Sheopur (T)	
4103	Madhya Pradesh	Sheopur (T)	
4104	Madhya Pradesh	Sheopur (T)	
4105	Madhya Pradesh	Sheopur (T)	
4106	Madhya Pradesh	Sheopur (T)	
4107	Madhya Pradesh	Sheopur (T)	
4108	Madhya Pradesh	Sheopur (T)	

4109	Madhya Pradesh	Sheopur (T)	
4111	Madhya Pradesh	Sheopur (T)	
4112	Madhya Pradesh	Sheopur (T)	
4113	Madhya Pradesh	Sheopur (T)	
4114	Madhya Pradesh	Sheopur (T)	
4115	Madhya Pradesh	Sheopur (T)	
4116	Madhya Pradesh	Sheopur (T)	
4117	Madhya Pradesh	Sheopur (T)	
4118	Madhya Pradesh	Sheopur (T)	
4119	Madhya Pradesh	Sheopur (T)	
4120	Madhya Pradesh	Sheopur (T)	
4121	Madhya Pradesh	Sheopur (T)	
4122	Madhya Pradesh	Sheopur (T)	
4123	Madhya Pradesh	Sheopur (T)	
4124	Madhya Pradesh	Sheopur (T)	
4125	Madhya Pradesh	Sheopur (T)	
4126	Madhya Pradesh	Sheopur (T)	
4127	Madhya Pradesh	Sheopur (T)	
4128	Madhya Pradesh	Sheopur (T)	
4129	Madhya Pradesh	Sheopur (T)	
4130	Madhya Pradesh	Sheopur (T)	
4131	Madhya Pradesh	Sheopur (T)	
4132	Madhya Pradesh	Sheopur (T)	
4133	Madhya Pradesh	Sheopur (T)	
4134	Madhya Pradesh	Sheopur (T)	

4135	Madhya Pradesh	Sheopur (T)	
4136	Madhya Pradesh	Sheopur (T)	
4137	Madhya Pradesh	Sheopur (T)	
4138	Madhya Pradesh	Sheopur (T)	
4139	Madhya Pradesh	Sheopur (T)	
4140	Madhya Pradesh	Sheopur (T)	
4141	Madhya Pradesh	Sheopur (T)	
4142	Madhya Pradesh	Sheopur (T)	
4143	Madhya Pradesh	Sheopur (T)	
4144	Madhya Pradesh	Sheopur (T)	
4145	Madhya Pradesh	Sheopur (T)	
4146	Madhya Pradesh	Sheopur (T)	
4147	Madhya Pradesh	Sheopur (T)	
4148	Madhya Pradesh	Sheopur (T)	
4149	Madhya Pradesh	Sheopur (T)	
4150	Madhya Pradesh	Sheopur (T)	
4151	Madhya Pradesh	Sheopur (T)	
4152	Madhya Pradesh	Sheopur (T)	
4153	Madhya Pradesh	Sheopur (T)	
4154	Madhya Pradesh	Sheopur (T)	
4155	Madhya Pradesh	Sheopur (T)	
5238	Madhya Pradesh	Ratlam	(23-53-23.70,75-27-17.60); (23-53-7.80,75-27-30.80); (23-53-19.30,75-27-50.70); (23-53-36.80,75-27-32.20); (23-53-33.80,75-27-24.40)
5239	Madhya Pradesh	Ratlam	(23-53-23.70,75-27-17.60); (23-53-7.80,75-27-30.80); (23-53-19.30,75-27-50.70); (23-53-36.80,75-27-32.20); (23-53-33.80,75-27-24.40)
5240	Madhya Pradesh	Ratlam	(23-53-23.70,75-27-17.60); (23-53-7.80,75-27-30.80); (23-53-19.30,75-27-50.70); (23-53-36.80,75-27-32.20); (23-53-

			33.80,75-27-24.40)
5241	Madhya Pradesh	Ratlam	(23-45-49.72,75-38-25.41); (23-45-56.31,75-37-55.28); (23-46-15.89,75-37-52.84); (23-46-17.67,75-37-24.86); (23-46-57.53,75-37-23.28); (23-47-02.83,75-38-11.37); (23-46-18.18,75-38-09.69)
5242	Madhya Pradesh	Ratlam	(23-45-49.72,75-38-25.41); (23-45-56.31,75-37-55.28); (23-46-15.89,75-37-52.84); (23-46-17.67,75-37-24.86); (23-46-57.53,75-37-23.28); (23-47-02.83,75-38-11.37); (23-46-18.18,75-38-09.69)
5243	Madhya Pradesh	Ratlam	(23-45-49.72,75-38-25.41); (23-45-56.31,75-37-55.28); (23-46-15.89,75-37-52.84); (23-46-17.67,75-37-24.86); (23-46-57.53,75-37-23.28); (23-47-02.83,75-38-11.37); (23-46-18.18,75-38-09.69)

Annexure-7

Formats Used for Data Collection (Set I to IV)

Set - I

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
PROFORMA OF DATA COLLECTION FOR PROPOSED SITE
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN)

A. FORESTRY INTERVENTIONS	**NATURAL LANDSCAPE**
B. MODEL NO.	***Filled later on***

C. TREATMENT SITE (DETAILS)		
1.	NAME OF SITE	
2.	AREA (IN HECTARE)	
D. GEOGRAPHICAL DETAILS		
1.	State	
2.	District	
3.	Forest Division	
4.	Forest Range	
5.	Forest Block	
6.	Forest Beat	
7.	Development Block Name	
8.	Tehsil	
9.	Panchayat	
E. BASELINE DATA		
1.	Current Status of Flora and Fauna	
2.	Current land use	
3.	Legal Status of land	
4.	Geology and Soil type	
5.	Slope and Aspect	
6.	Average Annual Rainfall (in mm)	
7.	Special features of the site, if any	

8.	Distance from Road (Approximate)				
9.	Distance from Main River with Name of the river (Approximate)				
10.	Distance from Main Tributary with name of tributary (Approximate)				
11.	Suggestive species for plantation				
12.	Details of Fencing works, if required before plantation				
13.	Details of SMC works, if required before plantation				
14.	Eradication of weeds, if any required before plantation				
15.	Number of plants planted /ha				
16.	Establishment Planting Cost including seed, nursery, advance soil works, pitting etc. (Approximate)				
17.	Maintenance Cost of plantation with years (Approximate)				
18.	ANR Operations with cost, if required as acitivity				
19	Remarks, if any				
20.	GPS coordinates of the site at all the corners (As per the shape of site, minimum 4 points are required)	1.	2.	3.	4.
		5.	6.	7.	8.
F. ROUGH SKETCH OF TREATMENT SITE / MAP (AS AN ATTACHMENT)		YES □ NO □			
G. CURRENT PHOTOGRAPH		YES □ NO □			

Name and Designation of Concerned Person:

Mobile No.:

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
DIVISION LEVEL PROFORMA OF DATA COLLECTION
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

FORESTRY INTERVENTIONS	**NATURAL LANDSCAPE**				
State					
District					
Forest Division					
MODEL NO.					
	Filled later on				
NAME OF TREATMENT SITE					

S.N.	**Activity**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.	Establishment cost of plantation including seed, nursery, plantation etc.												
2.	Maintenance cost												
3.	Fencing												
4.	Eradication of weeds												
5.	SMC works												
6.	ANR Operations												
7.													
											GRAND TOTAL		

Note: Area must be in Hectare and cost must be in Rs. (Lakh) only.

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA

STATE LEVEL PROFORMA OF DATA COLLECTION

(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

FORESTRY INTERVENTIONS	**NATURAL LANDSCAPE**				
State					
MODEL NO.					
	Filled later on				

S.N.	**Division Name**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.													
2.													
3.													
4.													
5.													
											GRAND TOTAL		

Note: Area must be in Hectare and cost must be in Rs. (Lakh) only.

Set - II

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
PROFORMA OF DATA COLLECTION FOR PROPOSED SITE
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN)

A. FORESTRY INTERVENTIONS	**AGRICULTURE LANDSCAPE**
B. MODEL NO.	***Filled later on***

C. TREATMENT SITE (DETAILS)		
1.	NAME OF SITE	
2.	AREA (IN HECTARE)	
D. GEOGRAPHICAL DETAILS		
1.	State	
2.	District	
3.	Forest Division	
4.	Forest Range	
5.	Forest Block	
6.	Forest Beat	
7.	Development Block Name	
8.	Tehsil	
9.	Panchayat	
E. BASELINE DATA		
1.	Current Status of Flora and Fauna	
2.	Current land use	
3.	Legal Status of land	
4.	Geology and Soil type	
5.	Slope and Aspect	
6.	Average Annual Rainfall (in mm)	

7.	Special features of the site, if any				
8.	Distance from Road (Approximate)				
9.	Distance from Main River with Name of the river (Approximate)				
10.	Distance from Main Tributary with name of tributary (Approximate)				
11.	Suggestive species for plantation				
12.	Number of plants planted /ha				
13.	Establishment Cost of plantation in community areas (Approximate)				
14.	Maintenance Cost of plantation with years in community areas (Approximate)				
15.	Distribution of plants for farmers – number of tree species and fruit species				
16.	Cost of plants for distribution for farmers				
17.	Maintenance Cost – for farmers				
18.	Numbers of farmers for plant distribution				
19.	Remarks, if any				
20.	GPS coordinates of the site at all the corners (As per the shape of site, minimum 4 points are required)	1.	2.	3.	4.
		5.	6.	7.	8.
F. ROUGH SKETCH OF TREATMENT SITE / MAP (AS AN ATTACHMENT)		YES □ NO □			
G. CURRENT PHOTOGRAPH		YES □ NO □			

Name and Designation of Concerned Person:

Mobile No.:

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
DIVISION LEVEL PROFORMA OF DATA COLLECTION
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

FORESTRY INTERVENTIONS	**AGRICULTURE LANDSCAPE**				
State					
District					
Forest Division					
MODEL NO.					
	Filled later on				

S.N.	**Activity**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.	Establishment cost of plantation including seed, nursery, plantation etc. – in community areas.												
2.	Maintenance Cost– in community areas.												
3.	Cost of plants for distribution for farmers												
3.	Establishment Cost of plantation for farmers												
4.	Maintenance Cost for farmers												
											GRAND TOTAL		

Note: Area must be in Hectare and cost must be in Rs. (Lakh) only.

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
STATE LEVEL PROFORMA OF DATA COLLECTION
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

FORESTRY INTERVENTIONS	**AGRICULTURE LANDSCAPE**				
State					
MODEL NO.					
	Filled later on				

S.N.	**Division Name**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.													
2.													
3.													
4.													
5.													
											GRAND TOTAL		

Note: Area must be in Hectare and cost must be in Rs. (Lakh) only.

Set - III

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
PROFORMA OF DATA COLLECTION FOR PROPOSED SITE
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN)

A. FORESTRY INTERVENTIONS	**URBAN LANDSCAPE**
Tick where applicable	☐ **. Bioremediation & Bio-filtration** ☐ **. River Front Development & Ecotourism** ☐ **. Yamuna Van (Eco Park Development)** ☐ **. Institutional / Industrial Plantation** ☐ **. Any Other (Please Specify……..)**

B. SITE DETAILS		
1.	NAME OF SITE	
2.	AREA (IN HECTARE)	
C. GEOGRAPHICAL DETAILS		
1.	State	
2.	District	
3.	Forest Division	
4.	Forest Range	
5.	Forest Block	
6.	Forest Beat	
7.	Development Block Name	
8.	Tehsil	
9.	Name of Town	
10.	Municipal Corporation / Notified area committee	
D. BASELINE DATA		
1.	Current land use	
2.	Status five year ago	

3.	Legal Status of land				
4.	Soil Type				
5.	Average Annual Rainfall (in mm)				
6.	Special features of the site				
8.	Distance from Road (Approximate)				
9.	Distance from Main River with Name of the river (Approximate)				
10.	Distance from Main Tributary with name of tributary (Approximate)				
Institutional / Industrial Plantation					
11.	Suggestive species for plantation				
12.	Details of Fencing works, if required				
13.	Details of SMC works, if required before plantation				
14.	Eradication of weeds, if any required before plantation				
15.	Number of plants planted /ha				
16.	Establishment cost of plantation including including nursery cost (Approximate)				
17.	Maintenance Cost of plantation with years (Approximate)				
Yamuna Van (Eco Park Development)		Details & cost:			
River Front Development & Ecotourism		Details &cost:			
Bioremediation & Bio-filtration		Details & cost:			
18.	Remarks, if any				
19.	GPS coordinates of the site at all the corners (As per the shape of site, minimum 4 points are required)	1.	2.	3.	4.
		5.	6.	7.	8.
F. ROUGH SKETCH OF TREATMENT SITE / MAP (AS AN ATTACHMENT)		YES □ NO □			

G. CURRENT PHOTOGRAPH (GEOREFEENCED FROM ONE CORNER AS PER POINT 7. ABOVE	YES □ NO □	

Name and Designation of Concerned Person:

Mobile No.:

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
FOREST DIVISION LEVEL PROFORMA OF DATA COLLECTION
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

DISTRICT						
STATE						
FOREST DIVISION						
FORESTRY INTERVENTIONS	**URBAN LANDSCAPE**					
Tick where applicable	☐ **Bioremediation & Bio-filtration** **a.** ☐ **Front Development & Ecotourism** **b. River** ☐ **Yamuna Van (Eco Park Development)** **c.** ☐ **Institutional / Industrial Plantation** **d.** ☐ **Other (Please Specify……..)** **e. Any**					
MODEL NO	***Filled later on***					

Treatment Site Name	**Activity**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.													
2.													
3.													
4.													
5.													

											GRAND TOTAL		

Note: 1. Area must be in Hectare and cost must be in Rs. (Lakh) only.
2. InBioremediations works, length & width should also be given in case nallaha's. (Km &meter).

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
STATE LEVEL PROFORMA OF DATA COLLECTION
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

STATE					
FORESTRY INTERVENTIONS	**URBAN LANDSCAPE**				
Tick where applicable	☐ **Bioremediation & Bio-filtration** **a.** ☐ **River Front Development & Ecotourism** **b.** ☐ **Yamuna Van (Eco Park Development)** **c.** ☐ **Institutional / Industrial Plantation** **d.** ☐ **Any Other (Please Specify……..)** **e.**				
MODEL NO	***Filled later on***				

S.N.	**Division Name**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.													
2.													

3.													
4.													
5.													
GRAND TOTAL													

Note: Area must be in Hectare and cost must be in Rs. (Lakh) only.

Set - IV

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
PROFORMA OF DATA COLLECTION FOR PROPOSED SITE
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN)

A. OTHER INTERVENTIONS *(Tick where applicable)*	☐ **Wetland Management (Natural and Artificial)** ☐ **Riparian Wildlife Management** ☐ **and Water Conservation**

B. SITE DETAILS		
1.	NAME OF SITE	
2.	AREA (IN HECTARE)	
C. GEOGRAPHICAL DETAILS		
1.	State	
2.	District	
3.	Forest Division	
4.	Forest Range	
5.	Forest Block	
6.	Forest Beat	
7.	Development Block Name	
8.	Tehsil	
9.	Panchayat	
D. BASELINE DATA		
1.	Current land use	
2.	Status five year ago	
3.	Legal Status of land	
4.	Soil Type	
5.	Average Annual Rainfall (in mm)	

6.	Special features of the site				
7.	Distance from Road (Approximate)				
8.	Distance from Main River with Name of the river (Approximate)				
9.	Distance from Main Tributary with name of tributary (Approximate)				
Wetland Management (Natural and Artificial)		Details & cost:			
Riparian Wildlife Management		Details & cost:			
Soil and Water Conservation		Details & cost:			
10.	Remarks, if any				
11.	GPS coordinates of the site at all the corners (As per the shape of site, minimum 3 points are required)	1.	2.	3.	4.
		5.	6.	7.	8.
F. ROUGH SKETCH OF TREATMENT SITE / MAP (AS AN ATTACHMENT)		YES □ NO □			
G. CURRENT PHOTOGRAPH (GEOREFEENCED FROM ONE CORNER AS PER POINT 7. ABOVE		YES □ NO □			

Name and Designation of Concerned Person:

Mobile No.

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
FOREST DIVISION LEVEL PROFORMA OF DATA COLLECTION
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

DISTRICT					
STATE					
FOREST DIVISION					
A. OTHER INTERVENTIONS	☐ **a. Wetland Management (Natural and Artificial)** ☐ **b. Riparian Wildlife Management** ☐ **c. Soil and Water Conservation**				
MODEL NO.	***Filled later on***				

S.N.	**Activity**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.	SMC works												
2.	Wetland Management												
3.	Riparian Wildlife Management												
											GRAND TOTAL		

Note: 1. Area must be in Hectare and cost must be in Rs. (Lakh) only.
2. In SMC works, length & width should also be given in case nallaha's. (Km &meter).

DPR PREPARATION OF FORESTRY INTERVENTIONS FOR YAMUNA
STATE LEVEL PROFORMA OF DATA COLLECTION
(FOREST RESEARCH INSTITUTE, P.O. NEW FOREST DEHRADUN-248006)

STATE					
A. OTHER INTERVENTIONS	☐ **a. Wetland Management (Natural and Artificial)** ☐ **b. Riparian Wildlife Management** ☐ **c. Soil and Water Conservation**				
MODEL NO.	***Filled later on***				

S.N.	**Division Name**	**1st Year**		**2nd Year**		**3rd Year**		**4th Year**		**5th Year**		**Total Area (ha)**	**Total Cost (lac)**
		Area (ha)	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**	**Area (ha)**	**Cost (lac)**		
1.													
2.													
3.													
GRAND TOTAL													

Note: Area must be in Hectare and cost must be in Rs. (Lakh) on

ADDENDUM

(To be incorporated in chapters in the final DPR)

A. Other important considerations during implementation of DPR (to be included in stae chapters as applicable)

- The priority of species in a model may vary with micro environment. The species may, therefore, be selected based on local site conditions, objective and availability of planting material. Hence, the species under various models are not listed in order of priority. A species not listed under a model can also be planted if it is expected to perform well based on experience or technical literature.
- In Uttar Pradesh, *Dendrocalamus strictus* may not be planted in natural landscape owing to its poor performance in many areas. Other species of namoo such as *Bambusa balcooa, B. nutans, Dendrocalamus hamiltonii, D. giganteus,* etc. that are being planted under National Bamboo Mission, may be planted.
- Assisted natural regeneration (ANR) model may be considered as the principal treatment model for plantation activities in hills of Uttarakhand state and, as far as possible, this model may be adopted as first option in the forest areas. Other plantation models may be adopted only in such areas where ANR cannot be implemented.
- Decision support system of MoEF&CC may be used for finalisation of sites during implementation of the project.
- The quantum of soil and moisture conservation (SMC) works in the DPR may be considered as indicative. The area mentioned in the DPR under SMC works is purely notional in all states. The actual quantum and area of works in Uttarakhand should be decided on the basis of field level hydrological assessments. The spring shed Consortium Model as is being used by Uttarakhand government should be extended to the SMC works in this state under the project. GIS mapping may be done for designing and mapping of SMC works.
- Use of pine needles for making check dams may be encouraged in the hills of Uttarakhand and Himachal Pradesh. This provides an effective may of conserving soil and water, reduces probability of forest fire and generates local livelihood opportunities.
- Inaccessible and difficult areas may be identified for assigning to Eco Task Force for treatment. Model and geo-location of suitable site may be suggested.
- For urban landscape, detailed specifications such as design and implementation of models may be prescribed with indicative percentage of parts of work. The use of cement concrete will be minimised, stone would be preferred to RCC wherever stone can replace RCC. The RCC work would not cover more than 15 per cent area. Green spaces and water bodies would occupy at least 70 per cent area.



Fig. A specimen Eco-park (https://ta.m.wikipedia.org/wiki, Longwanqun National Forest Park Creek, China)

- For check dam, pond and wetland development, local, low-cost material must be used.
- For wildlife management and wetland management models, detailed diagram and design with indicative percentage of parts of work may be provided.



Fig. Components of Chambal Wildlife Sanctuary

In riparian wildlife management, the land area and water bodies may constitute about 50-80 percent and 20-50 of the treated area respectively. In wetland management, the land area and water bodies may constitute about 10-40 percent and 40-90 of the treated area respectively. Built up area will not be created in these two models under the project.

- Use of improved water management technologies such as sprinkler system, drip irrigation, etc. may be suggested in agricultural land for agroforestry.
- Species with high water use efficiency may be used for planting in forest and non-forest areas.

B. Ongoing and Proposed Schemes in Delhi NCT (to be included in Chater 4, Section 4.5)

Delhi Development Authority (DDA) has already taken up the restoration and rejuvenation of floodplain of Yamuna in areas falling under the jurisdiction of DDA from Wazirabad barrage to Okhla barrage. A total of ten projects (Table 1) have been taken up and work is being carried out on directions and guidelines of the Principal Committee of experts constituted by the Hon'ble National Green Tribunal (reference letter no. PS/PC (Pers./Hort./LS)2020/DDA/28 dated 27 January 2020 of Principal Commissioner (Pers./Horticulture/Landscape), DDA, New Delhi). 300 m wide green buffer of plantation of riverine ecology of Riparian species. 150 m wide greenway where some recreational activities are permitted is being developed for public interface with kachcha walkways and open spaces. The existing depressions and detention basins are being restored and deepened for water augmentation and ground water recharge. The areas having potential to be developed as Biodiversity parks are being developed as Biodiversity parks on the line of Yamuna Biodiversity park, upstream of Wazirabad. Work
has been entrusted to Prof. C.R. Babu and his team from CEMDE. The wetlands will be treated for the cleansing of waste water passing in the drains through floodplains of River Yamuna, Prof. Gauhar Mehmood, Wetland expert from Jamia Millia Islamia University has been taken on board for the consultancy. Indigenous species are only proposed in the total stretch to control the soil erosion and to improve the ecology and micro climate in the catchment areas of Yamuna.

Table 1. Summary of projects taken up by DDA on directions and guidelines of the Principal Committee of experts constituted by the Hon'ble National Green Tribunal

Sr No	Project	Area	Proposal/Design Intent
1.	Old Railway Bridge to ITO Barrage (Western Bank)- **Asita West**	200 Hectares	1. The proposal of the area of 100-150 m of greenway that consists of cycle track, pedestrian pathways are proposed to be restored as water nodes and the area along the river is to developed as green buffer up to 50 to 300 m. 2. A separate zone for the treatment of the waste water from the Shantivan Drain has been proposed by the means of constructed wet lands and phytoremediation.
2.	Geeta Colony Bridge to ITO Barrage (Western Bank) **Eco-Tourism Bundh**	30 Hectares	1. It was recommended by the Principal Committee of Hon'ble NGT that the fly ash dumps of the Rajghat Power Plant have to be completely removed and the area should be detoxified. 2. DDA suggests in its proposal to use the

			existing low lying area to be capacitated into a waterbody collecting water from surface runoff and treated water from the drain entering from Memorial complex side connecting to River through underneath the bridge, to develop them for recreational purpose like boating. 3. The area falls outside 1 in 25 years floodplains, DDA also proposes to setup a River museum and an Oceanarium in this area for promoting education, public awareness and Eco-Tourism. 4. The land area is proposed to be a compliment to the ecological aspect of the site as the idea is to develop it into a domain of Eco-tourism for the city people to enjoy the natural landscape design features by way of Eco-tourism activities. 5. To verify the justification of detoxification, soil testing in a ash dyke vis-a-vis on filled up good earth has been taken up on experimental basis on one acre piece of land respectively. The results will be submitted to Wetland Consultant for suggesting the remedial measures/suggestion(s) for further treatment and testing for its efficiency accordingly the work for construction of water body will be taken up.
3.	Old Railway Bridge (Eastern Bank)- **Asita East**	**PART A:** 90 Hectares land within DDA's jurisdiction **PART B:** 107 Hectare with UP irrigation Department	**PART A:** This site has been divided into four zones namely — ecological zone, human-nature interactive zone, public recreational zone and eco-urban linkage. **Ecological zone** proposed along the river edge would comprise of 20-25mts of marsh area adjoining which would be floodplain forests and grasslands. It also aims to restore the existing depressions and restore them as catchment wetlands to store the flood waters and also to improve the groundwater recharge. These wetlands have been kept natural and no construction has been allowed on the floodplains as per the directions of the Hon'ble NGT. **Human-nature interactive zone** would comprise

			of congregational spaces with bamboo shelters and floodplain forest and grasslands. **Public recreational zone** will have facilities like kid's play areas, recreational waterbodies with cross-over bridges, watch towers made of bamboo. **The Eco urban linkage** would serve as the link between the river, floodplains and the zone beyond the floodplains. **PART B:** Financial bids have been opened and L-l decided but the award of work is held up for deposition of fund by U.P. irrigation department.
4.	NH24 to DND Flyway **(Western Bank)**	**PART A:** Approx. 100 Hectares (Incl. 25 Ha Art of Living area **PART B:** Remaining area is presently occupied by construction activities for	**Part A:** Sludge forming due to the water from the drains mixing with the rainwater is found to be maximum in this stretch. Thus the 300 m along the River Yamuna will be developed as a **green buffer** with its edge planted with species of riverine ecology and species that can sustain the prevailing sub-surface conditions. The connection between the Barapullah drain with River Yamuna will be revived once the pilot project for the treatment of the waste water in the Barapullah Drain is treated. Thus a **wetland system** has been proposed spreading throughout the site which would collect treated water from the Barapullah drain and then flow from this wetland system and finally into River Yamuna. Approximately 150mts along the DND Flyway has been proposed that includes the greenway with vehicular access way and cycleway in rammed earth and pathways in murram lined with trees and grasses suitable for the soil and conditions. Adjoining the Groundwater greenway interactive spaces for multi-functional activities are arranged along the proposed wetland system. **Part B:** Permanently and temporarily allotted to various agencies like DMRC, PWD, and Delhi Transco, etc. for infrastructure projects. Need to be restored to its original condition first after repossessing of the allotted land since a-lot of

		DMRC & PWD and other agencies.	concretization and damage to the floodplains has taken place due to batching plants and other related construction activities.
5.	DND to proposed Kalindi By-pass **(Western Bank)- Khijrabad**	115 Hectares Entrusted to CEMDE	The work is being executed in the supervision of Prof. C.R. Babu. The construction of constructed wetlands for treatment of sewage water from incoming drains. Water hyacinth and *Alternanthera* has been removed from wetlands covering an area of 25 ha. The de-weeding of waterbodies has reduced the mosquito populations. In some wetlands, after removal of water hyacinth, lemna has been growing and removing high levels of nitrates and phosphates from the sewage water and hence improvement in the quality of polluted water. This also serves as a food material for aquatic birds. In these wetlands fish that feed on detritus has also been recorded. Some of the wetlands, where Water hyacinth was removed, has already been attracting birds. **Greenway and recreational park development** A small stretch of 500 m long and 10 m wide strip along the Ashram Road has been planted with 300 plants. A large solid waste dump behind the Kalindi Colony has been landscaped and this is being developed into a recreational park. **Development of Nature Trails** Two nature trails - one trail from Ashram Road to DND Flyover has been made; both sides of this nature trail would be developed into a greenway. **Development of Terrestrial Communities** About 20 ha of elevated portion beneath the DND flyover has been prepared for planting 15000 saplings of native trees.
6.	NH-24 to DND Flyway **(Eastern Bank) Part Area-1**	**PART A:** 28 hectares approx. of	**PART A:** 28 hectares approx. of land has been allotted for compensatory plantation

		land has been allotted for compensatory plantation 1. Site analysis and studies carried out. Design development under progress. **PART B:** Request for release of funds has been sent to the UP Irrigation Department for 162.75 Ha of land on the basis of thumb rule (tentative) costing	1. Site analysis and studies carried out. Design development under progress. **PART B:** Request for the release of funds has been sent to the UP Irrigation Department for 162.75 Ha of land on the basis of thumb rule (tentative) costing,
7.	NH-24 to DND Flyway **(Eastern Bank) Part Area-II-Hindon Cut Wetlands I&II**	45 Hectares (15 Ha with DDA+30 Ha with UP) Entrusted to CEMDE	Water hyacinth from both the wetlands has already been removed.
8.	Wazirabad Barrage to ISBT Bridge **(Eastern Bank)** around Garhi Mandu Village & Usmanpur Village	236.5 Hectares	1. The entire area remains inundated for long periods of time after the monsoons. 2. DDA has already planted trees in 25 Ha. of an area near Signature Bridge, and two wetlands have been cleared of hyacinths. 3. The design development of the entire area is under process.
9.	Wazirabad to Old Railway Bridge	66 Hectares	1. As recommended by the Principal Committee of Hon'ble NGT, the area entrusted to INTACH, as

	(Western Bank)		the area has historical and cultural significance. 2. Drawings for Qudsia Ghat of an area 16.4 Ha has been issued and the estimate is under preparation and the work is proposed to be completed by June 2020. 3. Area of Sur Ghat (13.6 Ha) is being taken up and which will be submitted for estimation purpose soon. 4. The area along the River edge to be afforested and proposed for River walk and Eco-Trail, will also be submitted at the earliest. 5. The area of 32 Ghats involving interdepartmental coordination and demolition of encroachments and unauthorized structures, revival of cultural activities and redevelopment of Ghats is under study and analysis.
10.	ITO to NH-24 **(Eastern Bank)** - Area south of Commonwealth Games Village Area	90 Hectares	1. The comprehensive master plan was developed to create ecological green infrastructure by creating a series of wetlands for water augmentation and planting riparian community of riverine ecology. 2. To increase the water augmentation, receding time f flood water is reduced by creating areas of recharge zones which eventually would turn into an ecological pockets with indigenous species. 3. The flowing water channels will also have Gabion walls and phytoremediation methodology for the treatment of water. 4. Boardwalks have been strategically designed that would give the public a controlled access throughout the site to provide connect to the River without hampering the ecology (flora and fauna) at site. The elevated Boardwalks will be taken up in the second phase on account of high expenditure and maintenance involved.

The total recorded forest area in Delhi is 102 km^2 i.e. 6.88% of the geographic area of which the Reserved and Protected Forests constitute 76.48% and 23.52% of the total forest area respectively. The forest cover of Delhi has increased from 192.41 km^2 to 195.44 km^2 during 2017-2019. The Forest department is working to increase the forest and tree cover in Delhi to 371 km^2 by the end of 2022.

Hence, additional works are not proposed by Delhi NCT under the DPR on rejuvenation of Yamuna river through forestry interventions. However, work on rehabilitation of existing water and soil conservation structures is proposed by the DPR in the catchment area of Yamuna in Delhi state.







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