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Environment Assessment & Management Framework

Himachal Pradesh Forests for Prosperity Project

Submitted By

Himachal Pradesh Forests Department,
Government of Himachal Pradesh, India

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EXECUTIVE SUMMARY

About the Project

The Himalayan ecosystem is fragile and one of the most complex and diverse ecosystem on the earth. It includes over 51 million people who practice hill agriculture and remains vulnerable. The Himalayan ecosystem is vital to the ecological security of the Indian landmass, through providing forest cover, feeding perennial rivers that are the source of drinking water, irrigation, and hydropower. It also conserves unique biodiversity, providing a rich base for high value agriculture, and spectacular landscapes for sustainable tourism. Thus, forests form the important components of Himalayan ecosystem.

In Himachal Pradesh (HP), forests are an important natural asset with 67% of forest land of total geographical area. In this total forest area, 46 % of land support, coniferous and broad leaved forests while the remaining 54 % include, high altitude areas above the tree line, snow peaks, alpine pastures, and river beds. In Himachal Pradesh, Himachal Pradesh Forest Department (HPFD) owns and manages the forest related issues. It is a unitary body and undertakes all functions of forest management, spanning from policy formulation and planning, to provision of forest goods and services, to monitoring and evaluation, to enforcement of rules and regulations. According to HP Forest Sector Policy and Strategy of 2005, the goal of the HPFD is to promote sustainable forest management in the state to maintain and rehabilitate forests and enhance rural livelihoods. As per the provisions of the 14th Finance Commission, the HPFD secure financial resources for state development programs, while maintaining forest cover of the state. Timber, firewood, fodder, and other Non-timber Forest Products (NTFP) produced by HPFD on public forests enhance local livelihoods. Similarly, HPFD ensure sediment retention and water regulation services to the benefit of the hydropower sector though catchment area management plans. The Department has also zoned 22.65% of the legally classified forest area as protected areas (5 national parks, 26 wildlife sanctuaries and 3 conservation reserves) to protect biodiversity and promote ecotourism in these areas. It also manages all the activities falling place in these areas.

Project Description

The Project Development Objective is *'To improve the governance, management, and community use of forests, pastures, and watersheds at selected sites in Himachal Pradesh.'* The critical aspects in this objective are the institutional improvements and the institutional development approach to address the issues mentioned before. These two elements will contribute to building the momentum for reforming the forest sector. The project will contribute to improving forest quality in the state of Himachal Pradesh by strengthening the core functions and service delivery of the HP Forest Department; and facilitating participation of communities and private sector in forest sector activities. This will ensure the sustainable delivery of key ecosystem services from forest land while contributing to the state's economic development goals. Systemic improvements in the states afforestation programs will help to increase the fiscal allocations to the state, from the center, a part of which are made based on forest quality. This will lead to an overall increase in the state budget for development programmes. A more inclusive institutional regime will enable the provision of incentives for community participation in forest and pasture management. The project will focus on increasing benefits from sustainable managed value chains of Non-Timber Forest products (NTFPs).

Institutional changes will also be brought about to increase accountability and create an enabling policy environment for private sector investments in the forestry sector.

Project Components

The HP Forests for Prosperity Project is designed to address: i) the poor quality and density of HP's forests (caused by increasing pressure on the forests and the low technical and institutional capacity of the HPFD), through a combination of institutional reform, capacity building and investments in the field targeted through a watershed based approach, and ii) the limited community participation and benefit sharing from forest and pasture management. These issues are then addressed through a number of critical interventions, so that the project can help HP move towards improved forest management and community participation in the medium term, with the outcomes of improved quality of forest and pasture, increased allocation from the finance commission, strengthened climate resilience of forests and pastures and improved livelihoods, job creation and income for targeted communities achievable in the longer term

- Component 1: Improving the provision of forest sector goods and services by HPFD
  - Sub-component 1A: Institutional strengthening of the Himachal Pradesh Forest Department (HPFD)
  - Sub-component 1B: Investing in Seed and Nursery Development and Planting and Maintenance
  - Sub-component 1C: Improving effectiveness of the Comprehensive Catchment Area Treatment (CCAT) plan
- Component 2. Facilitating better and more sustainable community and private sector forest and pasture use
  - Sub-component 2A: Supporting an enabling environment for NTFP value chain development
  - Sub-component 2B: Supporting community and private sector participation in management of forest land and pastures
- Component 3. Institutional Coordination and Project Management
  - Sub-component 3A: Institutional coordination
  - Sub-component 3B: Project management

Preparation of Environment Assessment and Management Framework

The Environmental Management Framework (EMF) is developed to incorporate environmental and social concerns into the main project planning, execution and operation. It will be applied to all the sub-projects in different stages of the project cycle. The framework has been developed considering three broad stages of project cycle viz. project preparation, project implementation and project operation. For each stage, potential adverse environmental and social issues have been identified and mitigation measures proposed that have been integrated with the EMF implementation process.

The specific objectives of the EMF are as under:

a. To provide a systematic approach for identifying the various possible environmental impacts at the different stages of the project cycle.

b. To identify appropriate mitigation measures for addressing the identified environmental impacts.
c. To devise an institutional arrangement for mainstreaming environmental management in project implementation processes.

Environmental Baseline

Himachal is in the western Himalayas covering an area of 55,673 km^2 Most of the state lies on the foothills of the Dhauladhar Range. At 6,816 m Reo Purgyil is the highest mountain peak in the state of Himachal Pradesh.The drainage system of Himachal is composed both of rivers and glaciers. Himalayan rivers crisscross the entire mountain chain. Himachal Pradesh provides water to both the Indus and Ganges basins. The drainage systems of the region are the Chandra Bhaga or Chenab, Ravi, Beas, Sutlej, and Yamuna rivers. These rivers are perennial and are fed by snow and rainfall. They are protected by an extensive cover of natural vegetation.

- The state is divided into three main topographical regions; (i) the Shivalik (ii) the lesser Himalayas and (iii) the Greater Himalayas.
- The Sutlej valley has relatively poor sandy loam constituting exposed bedrock, and gravel soil. The soils in the study area as grouped under Udalts – Ochrepts soils are shallow, veneer and brown in color with high base in Lahul and Spiti and Kinnaur region; Othents – Ochrepts soil are combination of shallow red loamy and sandy ideally suitable for horticulture in Kullu and Kinnaur district; Udoll soil characterization of cold desert and found in Kinnaur district.
- The elevation in Sutlej basin varies from 300 meters to 7000 meters. After Mandi district, the variation in altitude of Sutlej catchment area is not high as much as in Kinnaur, Kullu, Shimla, and Mandi districts. It flows from moderate slope at an altitude of 656 meters to 290 meters
- The Sutlej basin lies in seismically sensitive zones (zone V and IV) as per the Seismic Zoning Map of India (Ref: IS: 1893-1984 Fourth Revision). Thirty Two percent of the total geographical area of the State is prone to the severe seismic risks as it falls into the Very High Damage Risk Zone V.
- The climate of the state varies from place to place depending on the altitude. It varies from hot and sub-humid tropical (450-900 m) in the southern low tracts, warm and temperate (900-1,800 m), cool and temperate (1,900-2,400 m) and cold alpine and glacial (2,400-4,800 m) in the northern and eastern high mountain ranges.
- The climate of basin varies from hot and sub-humid tropical in the southern part and while the glacier and alpine are seen in the eastern and northern part of the basin. In the region, the temperature generally starts rising from the beginning of March till June, which is the hottest month of the year.
- Sutlej basin receives precipitation from western disturbances. The western disturbance passes over the northwestern part during the winter. Sutlej valley faced the heavy monsoon of the outer Himalayas and heavy snowfall of the arid Tibetan.
- Climate change is affecting ecosystems and vegetation in the state. Vegetation in Himachal Pradesh especially in upper altitudes is more vulnerable because of its sensitivity to higher temperatures. Analysis of temperature trends in the Himalayan region shows that temperature increases are greater in the uplands than that in the lowlands (Shrestha et al., 1999).

The total area of Himachal Pradesh is 55,673 km^2, out of this 66.52% of the area of the state is legally defined as forestland (37033 $km^{2)}$. But forest and tree cover constitutes only 27.63% of the total geographical area (FSI, 2013). It has been reported that only 30.5% of the recorded forest area can support vegetation, as rest of the area is uncultivable because of terrain and snow (HPFD, 2005). State has 14683 sq km of forest cover and 697 sq. km of tree cover constituting a total of 15380 sq. km of forest and tree cover (ibid). Forests are distributed across four zones in the State- viz sub-tropical forests, sub-temperate forests, wet-temperate and dry temperate forests (GoHP, 2002).

The forest Types in Himachal Pradesh are:

- *Sub-tropical forests* occur at an elevation up to 915 meters above mean sea level (msl) with annual rainfall between 700 to 1000 mm.
- *Sub temperate forests* are found at an elevation between 916 to 1523 MSL with an annual rainfall of 900 to 1200 mm.
- *Wet temperate forests* are found at an elevation ranging from 1524 to 2472 meters above msl with annual rainfall of 1000 to 2500 mm.
- *Dry temperate forests* are found above 2472 meters where mean annual precipitation of 2500 mm.

Forests fall under three legal categories of reserve, protected and unclassed forests. The reserve forests offer minimum rights of use for local people (5.12%). The protected forests recognize many rights including timber, grazing and non-timber forest produce for local people. Almost 90% of the state forests fall under this category, 57% of the protected forest areas have not been demarcated i.e. their limits have not been set through legislative orders. The unclassed is a category of forest in transition i.e. after surveys and settlement of rights, these could be either shifted to reserve or protected forest category (Vasan, 2001)

In case of Himachal Pradesh, the area under very dense forest cover has been stable from 2005 to 2013. Area under the category of moderately dense forests has slightly declined during this period. The open and scrub forest area constitute 35% of the total forest cover.

The hills contain western Himalayan broadleaf forests and Himalayan subtropical pine forests. Various deciduous and evergreen oaks live in the broadleaf forests, while chir pine dominates the pine forests. Western Himalayan subalpine conifer forests grow near tree line, with species that include East Himalayan fir, West Himalayan spruce, deodar (the state tree), and blue pine.

Himachal Pradesh supports 463 bird and 359 animal species, including the leopard, snow leopard (the state animal), ghoral, musk deer and western tragopan. Himachal Pradesh has two National Parks, (Great Himalayan National Park and Pin Valley National Park, (The Great Himalayan National Park in Kullu district was created to conserve the flora and fauna of the main Himalayan range, while the Pin Valley National Park to conserve the flora and fauna of the cold desert), 30 Wildlife Sanctuaries, and 3 conservation reserves. Of which two wildlife sanctuaries fall within the project area. The Majthal Sanctuary is situated in Solan District and has steep and rugged terrain. The sanctuary is about 10 km on the kacha road Kararaghat (Shimla-Bilaspur Highway) to Kashlog. The sanctuary is said to have a large population of endangered cheer pheasant, and there is also a large goral population. Rupi-Bhaba Wildlife Sanctuary is locally well known for its vast and extensive alpine pastures above 3500m.

The permanent pastures including alpine meadows form a very important and stable ecosystem, and cover more than 12,000km^2 and constitute 21% of state geographical area. Various natural scrub forests cover an area of 566km^2 and constitute another 1% of the state geographical area. Both alpine and scrub pastures provide important habitats to medicinal and aromatic plants in the state. HP land use estimates indicate the area under permanent pastures and grazing lands was 1,163,402 Ha (11,634 km^2) in 1966, 1,193,602 (11,936 km^3) in 1995 and 1,471,536 (15,190km^2) in 2000. The increase in alpine pasture are recorded in 4 districts (Shimla, Kinnaur, Lahaul and Spiti, Una, and Hamirpur) where settlement operations have been fully or partially completed, otherwise all other districts show a decrease.

Himachal's landscape and pastures are under threat by invasive species and weeds, and this has become a cause of serious concern from the ecological, biodiversity, socio-economic and health point of view. Key species of concerns are Lantana *camara* L.; *Parthenium hysterophorus* L.;*Ageratum conyzoides* L; *Eupatorium adenophorum* Sp. These invasive are a major issue in the subtropical and lower temperate areas in the State, and affect the quality of forests and the pasture lands, and availability of fodder.

Legal and Regulatory Framework

Project would be implemented with following key applicable acts, notifications, and policies: Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; National Policy on Tribal Development, 1999;Panchayati Raj Act, PESA 1996; Right to Information Act, 2005; Environment (Protection) Act and amendments,1986; National Forest Policy, 1988; Indian Forest Act, 1927; Forest Conservation Act, 1980; HP State Forest Policy, 1980; Payment for Ecosystem Services (PES) policy 2013; Wildlife (Protection) Act, 1972; Himachal Pradesh Participatory Forest Management Regulations, 2001 etc. World Bank' operational policies on Environmental Assessment OP/ BP 4.01; Natural Habitats OP/BP 4.04; Forests OP/BP 4.36; Pest Management OP/BP 4/.09; Physical and Cultural Resources OP/BP 4.11 and World Bank EHS Guidelines would be applicable as well.

Stakeholder Consultations

In accordance with the World Bank Safeguard policies, consultations have been carried out with all relevant stakeholders those who have been identified through stakeholder analysis to create awareness and generate understanding about the project and to collect their opinion, suggestions for planning and designing of the project . The consultation process has been carried out at three levels (state, district, and village level).

- Two district level consultations were held in Reckong Peo (District Kinnaur) and Rampur (District Shimla) with the representatives from HP forest department, associated line department officials, block officers, forest guards, elected members of village assembly, JFMCs, NTFP collectors and sellers, community members, NGOs, and technical/research groups. The objective of the consultation sessions was to improve the project's interventions with regard to environmental management and to seek views from the stakeholders on the environmental issues and the ways these could be resolved.
- Village level consultation meetings were also held in 14 villages to create awareness and generate understanding about the project among stakeholders, and to collect their opinion, suggestions for planning and designing of the project.

- State level institutional consultations were undertaken with government officials in Forest Department, Wildlife Conservators, Department of Environment, Science and Technology, Agriculture Producer Marketing Board, Forest Development Corporation, Forest Training Institute, and Himalayan Forest Research Institute, and Indian Grassland and Fodder Research Institute.
- Since the project area involves two forest ranges in wild life sanctuary area; consultations specifically to address their viewpoints were held at Rupi WL and Chandi WL forest ranges.

Key Environment Risks and Impacts

The forests of Himachal Pradesh are a storehouse of rich biodiversity, in addition to providing forest cover, they feed perennial rivers that are the source of drinking water, irrigation, and hydropower and provide ecosystem services such as carbon sequestration, soil moisture regulation, erosion control, support pollination and water and climate regulation. The forests currently face challenges of degradation, including (i) irregular and diminished flow of natural springs, (ii) loss of soil fertility due to erosion (iii) widening gap between demand and supply of fuel wood and fodder, and (iv) increase incidences of forest fires, and invasive weeds leading to deterioration in habitat quality and pastures. The project interventions themselves are designed to mitigate these issues.

The project has the potential for causing small adversely impact on the local environment if not appropriately designed, executed and/or operated. The potential adverse impacts/risks of project financed activities which would be managed through the provisions in the EMF include (i) pest control strategies in forest nurseries (ii) disposal of plastic root trainers and polybags (iii) integration of species selection, nursery planning with the planting site to ensure good survival rates (iv) construction and repair of small erosion control structures (check dams) if not implemented with due caution could lead to localized drainage problems and/or habitat disturbance (v) with project investment in value chain infrastructure and enterprise support to NTFPs, there could be unsustainable expansion/intensification of NTFP harvesting, and demand for feeder roads. There is also a need to ensure that all small scale civil works (post-harvest infrastructure, nursery up-gradation, and staff quarters) do not lead to adverse impacts on soil, drainage, noise and air quality that could impact sensitive and pristine habitats. In the same way, component 2 activities need to ensure that incentives provided to communities to manage forests are sustainable from environmental and sylvicultural standpoints.

Environmental Management

The Environmental Management Framework (EMF) is developed to incorporate environmental and concerns into the main project planning, execution and operation. The main purpose of the EMF is to provide a transparent framework with clear accountability for managing environment impacts and risks associated with the project, outlining the criteria and procedures that the project should follow to help ensure compliance with the Bank's safeguard policies.

Since, the precise details and exact locations of the site-specific investments within the targeted ranges will take place during project implementation, and are not yet known, an Environmental Management Framework (EMF) has been prepared in accordance with the provisions of OP/BP 4.01 category B

requirements. The EMF mainstreams environmental considerations within the project, minimizing adverse impacts and provides mitigation actions, institutional and monitoring requirements for supervision, which will be integrated into the Project Implementation Manual. All civil works supported by the project will be screened for environmental risks, and specified mitigations will be adopted, where required, such as in the case of a centralized seed center, a standalone EMP would be prepared before any works commence. Specific to the project activities the EMF includes (i) screening of project investments based on their potential environmental impacts and benefits; (ii) compliance measures with regulatory requirements and forest department management plans (iv) impact identification and associated mitigation measures, and (v) guidelines based on best management practices for (a) seed collection, management and storage; (b) nursery upgradation and management; (c) plantation establishment; (d) soil and water conservation works (e) pest and disease control; (f) forest fire control and response; (g) management of invasive weeds; (h) NTFP and MAP harvesting; (i) development of NTFP pre and post-harvest value chain infrastructure, and enterprise facilitation centres; (j) health and safety management in forestry operations; and, (k) detailed guidance on preparation of standalone EMPs for investments which will be identified through detailed studies in project implementation such as the seed center.

Institutional and Implementation Arrangements

The project implementation arrangements are anchored on the HPFD. The project will be managed under the overall umbrella of the forest governance and management structure in India and following the HPFD rules, including circles, division's, ranges and JFMCs.

(a) **State Level:**

i. State Level Steering Committee: The project management and coordination will be the responsibility of the HPFD under the overall supervision and control of the State Level Steering Committee (SLSC). The SLSC will be headed by the Additional Chief Secretary of the Government of HP who also heads the Department of Forest and Environment

ii. State Project Management Unit (SPMU): The project will be implemented by HPFD through a State Project Management Unit headed by a Chief Project Director (CPD) who would have day-to-day executive control of the project. The core personnel of the SPMU are 3 Deputy Project Directors (DPD) one each for (ia) General Administration, (iib) Operations, and (iii) Liaison, Coordination and Training (LCT). Project will have Subject Matter Specialists (SMS) one each for Social and Community Institution Development, Environment Management, Forest Based Livelihood, Communications and Knowledge Management, IT, Procurement, Monitoring and Evaluation). Besides, activities such as Finance and Accounts, Administration and Staff Matters will be handled by the superintendent staff deputed from the HPFD to the project.

(b) Circle Office Level: The administrative control of all forest divisions rests with respective Circles Offices headed by the Conservator of Forests who will execute the project at the field level. An officer of the level of DFO will be appointed to coordinate and plan project activities at the Circle level and supervise performance of divisions with respective circles. The nodal officer will be supported by a Superintendent Junior Engineer (JE) and an Office Assistant.

(c) Division Office Level: The project operations at the division will be planned and supervised by

respective Division Forest Officers. He will be supported by an Assistant Conservator of Forests, Senior Assistance and Office Assistant.

(d) Range Office Level: Range will be the basic unit of project planning and implementation. All activities of component 1 and 2 will be planned through a Range Management Plan. Each Range Officer will be supported by their respective Dy. Rangers, Office Assistants and Beat Managers (Forest Guards). Each beat will have community facilitator, hired from the local community, to mobilize communities for project activities.

(e) JFMC / User Group Level: all operations will be conducted through JFMCs / Forest User Groups as per the provision of PFM regulations 2001. Members of JFMCs will be trained in various aspects of sustainable forest management.

Monitoring and Evaluation

The Forest Department, GoHP has prior experience and expertise to implement World Bank funded operations. It is agreed that GoHP will have an Environmental Specialist as a core team member in the SPMU who will be supported, as required; by consultants. The SPMU will monitor overall implementation of the EMF. In addition, focal points may be identified at the range level for site based monitoring of project interventions, facilitating the screening, and reviewing the implementation of mitigation measures. The Environment Specialist would be responsible for analysis of the screening process and inspection of project sites to assess compliance with EMF procedures, work with the communities to integrate any required measures into the activities. Implementation of mitigation actions and environmental good practice guidelines will be regularly monitored by the project M&E system and during supervision missions.

Implementation Plans

The SPMU will undertake overall planning and implementation of the project. It will be responsible for reviewing and finalizing fund flow mechanisms, procurement management, reporting and monitoring, policy advocacy and awareness generation. It will prepare guidelines and technical manual for programme activities, including the community operational manual. Moreover, it will provide infrastructural and institutional support to district, block and village level units. Specifically, the DPD – Operations will be responsible for planning and implementation of field operations such as development of range-plans, nursery management, plantations, fire management, community mobilization and commercial projects under PPP, and forest based livelihood promotion.

The Range will be the basic unit of project planning and implementation. All activities of component 1 and 2 will be planned through a Range Management Plan. Each Range Officer will be supported by their respective Dy. Rangers, Office Assistants and Beat Managers (Forest Guards). Each beat will have community facilitator, hired from the local community, to mobilize communities for project activities. Since the project is community -driven, all operations will be conducted through JFMCs as per the provision of PFM regulations 2001. Members of JFMCs will be trained in various aspects of sustainable forest management.

Budget

Under the Project Implementation Plan (PIP), the cost for EMF implementation comprises of staffing arrangements at SPMU level, and associated trainings. The EMF will also support application of environmental best practices in preparation and implementation of the range management plans, trainings, capacity building workshops, action/innovation research, monitoring, tools etc. Most of the mitigation actions are already mainstreamed into the project design and do not require activities such as special constructions. The initial budget lines and estimate of lump sum amount necessary to cover the EMF. The cost of implementing some of the provisions of the EMF, over 5 years of the project, is up to 1% of the total project cost, for ensuring implementation of all activities proposed under the EMF.

Disclosure

The draft EMF report will be disclosed on the website of the Department of Forests (HPFD), the World Bank's InfoShop, publicized in newspapers (national and local) and will be made available to the project stakeholders through all the Divisional forest offices in Project area. The executive summary of the document has been translated in Hindi and made public at the local level at divisional level.

Chapter 1 Introduction to the Proposed Project

1.1 Background to the HP FPP project

India is world's fastest growing economy in which forest sector can play a key role in enabling a growth trajectory that is sustainable and climate resilient. Forests can help to meet the growing global demands for food, fiber, bio-fuel, shelter and other bio-products as the world population are estimated to increases 9 billion by 2050. Because, forest resources are renewable and store carbon as they grow. They have the potential to reduce greenhouse gas emissions and mitigate climate change by replacing non-renewable materials and substituting fossil fuels. The forest sector is also an important source of both formal and informal jobs, particularly in remote areas with are few economic alternatives. India is among the world's top ten most forested nations with 79.42 million Ha of forest and tree cover. According to Nation Forest Policy, Government has a goal of converting the current 24.16% of geographical area under forest cover to 33%. Under the Green India Mission, the government aims to increase forest area to 5 million Hectare and additional 5 million Hectares to enhance ecosystem services, contribute to carbon sequestration and to create livelihoods.

The Himalayan ecosystem is fragile and one of the most complex and diverse ecosystem on the earth. It includes over 51 million people who practice hill agriculture and remains vulnerable. The Himalayan ecosystem is vital to the ecological security of the Indian landmass, through providing forest cover, feeding perennial rivers that are the source of drinking water, irrigation, and hydropower. It also conserves unique biodiversity, providing a rich base for high value agriculture, and spectacular landscapes for sustainable tourism. Thus, forests form the important components of Himalayan ecosystem.

In Himachal Pradesh (HP), forests are an important natural asset with 67% of forest land of fatal geographical area. In this total forest area, 46 % of land support, coniferous and broad leaved forests while the remaining 54 % include, high altitude areas above the tree line, snow peaks, alpine pastures, and river beds. In Himachal Pradesh, Himachal Pradesh Forest Department (HPFD) owns and manages the forest related issues. It is a unitary body and undertakes all functions of forest management, spanning from policy formulation and planning, to provision of forest goods and services, to monitoring and evaluation, to enforcement of rules and regulations. According to HP Forest Sector Policy and Strategy of 2005, the goal of the HPFD is to promote sustainable forest management in the state to maintain and rehabilitate forests and enhance rural livelihoods. As per the provisions of the 14th Finance Commission, the HPFD secure financial resources for state development programs, while maintaining forest cover of the state. Timber, firewood, fodder, and other Non-timber Forest Products (NTFP) produced by HPFD on public forests enhance local livelihoods. Similarly, HPFD ensure sediment retention and water regulation services to the benefit of the hydropower sector though catchment area management plans. The Department has also zoned 22.65% of the legally classified forest area as protected areas (5 national parks, 26 wildlife sanctuaries and 3 conservation reserves) to protect biodiversity and promote ecotourism in these areas. It also manages all the activities falling place in these areas.

Himachal Pradesh, the land of apples and snow, is situated in the northern tip of India. It has geographical area of 55,673 km^2 and constitutes nearly 11 % of the total area of Himalaya (Map). Nearly 30 % of its geographical area is permanently under snow and more than 66 % is designated as forest with nearly 15 % falling within the Protected Area (PA) network. The state almost wholly comprises of mountain ranges, hills and valleys, and has 4 major agro-climatic zones viz., Sub-tropical low hills (Shivalik Range, below 800 ml), Mid-hills sub-temperate zone (between 800 to 2800 m), High hills, temperate wet and sub- alpine (above 2800 m) and High hill, temperate dry alpine zone (higher reaches of inner and outer Himalaya).
The High Hill Region covering Kinnaur, Lahaul & Spiti and Chamba districts accounts for > 30% of states geographical area. This zone is further divided into sub- alpine zones lies at an altitude of 3000 - 3500 m and alpine zone lies above 3500 m. About 80 % Inner Himalaya is under pastures, with cultivated and forested areas spreading over 10 % of land, and inhabited by transhumant indigenous communities that use these alpine pastures for grazing their livestock.

Forestry interventions have largely managed forests for tree production, with few interventions to augment the supply of firewood, fodder and grasses to meet the needs of local populations. The gap between demand and supply for these resources has subsequently been widening. To add to the problem, many forest areas that in the past served as grazing lands, including alpine pastures, have been negatively affected by invasive species. Similarly, while the NTFP resources of the state has a potential to supplement the livelihood of rural communities by adding the value of the products. The economic contribution of this sector has largely remained underexploited in the state.

Provision of forest ecosystem services to the hydropower sector is also falling short. Projects above 10 MW capacities are required to contribute at least 2.5% of total project investment costs to be invested by the HPFD to reduce the flow of sediment and regulate the flow of water to hydropower facilities. Despite investments in developing and implementing CAT plans, sediment continues to reduce the efficiency of hydropower facilities in the state. In 2012, the Nathpa Jhakri project alone was said to have lost USD 1.3M as a result of high levels of silt in the river, which halted power generation. In general, the technical capacity required to design effective CAT plans which is currently lacking in the state. Also the resources invested are insufficient to implement CAT plan activities at a large scale for the interventions to have an impact on sediment retention. At the same time, the lack of monitoring of CAT plan implementation and impacts has resulted in a lack of accountability. The state is also yet to realize the economic potential of forest ecotourism. Therefore, there is a need to revise the concession policy to promise private sector participation with the necessary checks and balances to prevent forest degradation.
Recognizing the challenges facing the forest sector, many of which are institutional and systemic, the Government of Himachal Pradesh (GoHP) has articulated a clear vision and commitment to reform the sector. Improving the effectiveness of forest-services provision by the HPFD – be it maintenance and improvement of forest cover, provision of timber, firewood, and fodder to local communities, catchment area management for sustainable hydropower – and minimizing the role of the HPFD in areas such as NTFP value chains and ecotourism where communities and private sector have a role to play, are the two main prongs of the reform strategy. These priorities underpin the scope of the proposed

Project. The GoHP has requested this Project as a follow on to the successful DPOs financed by the World Bank to realize the vision of a forest sector as an additional engine of green growth. This operation is part of a broader World Bank's strategic re-engagement with the forestry sector in India to achieve multiple goals: livelihoods, jobs, better service provision, and climate change adaptation and mitigation

Furthermore, the HPFD will soon receive substantial new funds from the Compensatory Afforestation Management and Planning Authority (CAMPA) program to spend on various afforestation activities. Enhancing the effectiveness of afforestation programs will help ensure that these funds are used effectively. The HPFD has identified several priorities for the forest sector, including improving community engagement and program accountability, as well as plantation and pasture management, to enhance forest quality and the economic contribution of these natural assets to the state economy.
As part of project preparation, the project management unit has undertaken an Environmental Assessment exercise to provide inputs into the design of HPFD in accordance with the World Bank Operational Guidelines. It involved identification of key environmental issues arising out of the proposed project activities and mainstream the environmental management measures in all stages of the project cycle.

Along with the many forest services listed above, forests also provide another key service, namely, the provision on drinking water. Springs and local streams play an important role in the provision of drinking water in hill states. Over 8000 schemes of the Irrigation and Public Health Department of Himachal Pradesh depend heavily on natural flows of water from springs, streams and rivers for providing water for drinking and domestic use and irrigating agriculture. However, in the last few decades the discharge in springs and streams is reducing and becoming seasonal. Such declines are common across the Himalayas and are linked to changes in precipitation patterns, climate change, infiltration, land use change, number of snow retention days etc., all leading to reduce infiltration and reduced base flows especially in summer. In addition, demand has increased exponentially, leading to a search for water further and further away. Revisiting forest management to integrate managing for water is an essential requirement in ensuring drinking water security. By improving the capacity of the HPFD to provide ecosystem services to the hydropower sector, namely by improving their capacity to management the catchment, the project will also enable the HPFD to provide other services provided by the catchment, including drinking water.
The Environmental Management Framework (EMF) is developed to incorporate environmental and social concerns into the main project planning, execution and operation. It will be applied to all the sub-projects in different stages of the project cycle. The framework has been developed considering three broad stages of project cycle viz. project preparation, project implementation and project operation. For each stage, potential adverse environmental and social issues have been identified and mitigation measures proposed that have been integrated with the EMF implementation process.

The project will contribute to improving forest quality in the state of Himachal Pradesh by strengthening the core functions and service delivery of the HP Forest Department; and facilitating participation of communities and private sector in forest sector activities. This will ensure the sustainable delivery of key ecosystem services from forest land while contributing to the state's economic development goals.

Systemic improvements in the states afforestation programs will help to increase the fiscal allocations to the state, from the center, a part of which are made based on forest quality. This will lead to an overall increase in the state budget for development programmes. A more inclusive institutional regime will enable the provision of incentives for community participation in forest and pasture management. The project will focus on increasing benefits from sustainable managed value chains of Non-Timber Forest products (NTFPs). Institutional changes will also be brought about to increase accountability and create an enabling policy environment for private sector investments in the forestry sector.

1.2 Project development objective (PDO)

The Project Development Objective is *'To improve the governance, management, and community use of forests, pastures, and watersheds at selected sites in Himachal Pradesh.'*

Two critical aspects in this objective are the institutional improvements and the institutional development approach to address the issues mentioned before. These two elements will contribute to building the momentum for reforming the forest sector

1.3 Project Beneficiaries

The Project will be implemented in 5 districts of Himachal Pradesh falling under the upper Sutlej river's catchment area. These comprise of Kinnaur, Shimla, Solan, Mandi and Kullu. As per the 2011 census, the total population of the target area is 690,312 of which 47 percent are female. The rural population comprises 73 percent of the total in the target area, and a significant proportion of the rural population is highly dependent on forests and pastures for their livelihoods.

Key beneficiaries from the project include local communities, especially women, and nomadic/transhumant/pastoral communities. Village communities depend on forest land for fuel wood and green fodder, and will benefit from the multi-layered plantations (including grass, herbs, shrubs, and trees) which will be undertaken as part of the Project. Improvements in the availability of fodder will benefit women, as they are the primary stakeholders involved with livestock management.

Women, and the community at large, will also benefit from employment opportunities in nursery and plantation activities and the development of NTFP value chains. Other employment opportunities for local community members will also arise as part of the Project, including as fire watchers for forest fire management. Community members will benefit from training on forest management as well as support on NTFP enterprise development. Improvements brought about under the project to the quality of pastures will also provide livelihood benefits to several indigenous nomadic/transhumant/pastoralist communities (such as the Kinnauris, Lahuals, Gaddis and Gujjars).

HPFD is expected to benefit from improved IT capabilities and staff capacity to manage forests better. The state of Himachal Pradesh, more generally, will benefit from the increased efficiency and accountability of HPFD as well as enhanced ecosystem services from forests and pasture land. The state also potentially stands to gain through increased financial allocations from the Centre because of better

forest quality. Through improved nursery and plantation techniques, the project will expedite the provision of a carbon sink - a global public good.

1.4 Detailed Description of the Project Components

The HP Forests for Prosperity Project is designed to address: i) the poor quality and density of HP's forests (caused by increasing pressure on the forests and the low technical and institutional capacity of the HPFD), through a combination of institutional reform, capacity building and investments in the field targeted through a watershed based approach, and ii) the limited community participation and benefit sharing from forest and pasture management. These issues are then addressed through a number of critical interventions, so that the project can help HP move towards improved forest management and community participation in the medium term, with the outcomes of improved quality of forest and pasture, increased allocation from the finance commission, strengthened climate resilience of forests and pastures and improved livelihoods, job creation and income for targeted communities achievable in the longer term.

Component 1 focuses on activities related to technical and institutional strengthening within the HPFD, including the implementation of an engagement strategy to launch a reform process, and targeting key investments in the forest to optimize the protection of the landscapes, while Component 2 covers activities related to enabling community and private sector participation in forest management through institutional strengthening and pilot activities in developing sustainable NTFP value chains. Component 3 will thread component 1 and 2 together through improved institutional coordination and project management. The detailed description of components is given below.

Component 1: Improving the provision of forest sector goods and services by HPFD

The objective of Component 1 is to improve the provision of forest sector services by HPFD, using an evidence-based approach to establish the facts of operational performance HPFD, and to tackle problems as they occur at each point along the management chain, towards the delivery of robust forest and pasture land that yields multiple benefits. The project intervention areas and activities for improved forest quality will be determined through a review of the performance and status of implementation of the State's Comprehensive Catchment Area Treatment (CCAT) plan for the Sutlej basin which specifically targets where interventions will have the most impact in terms of watershed management.

The project will strengthen the delivery of core functions of the HPFD, including the provision of public goods such as increased forest cover, improved forest quality and improved pasture quality resulting in enhanced ecosystem service provision. To enable this, the project will use a diagnostic approach by putting in place processes and systems to identify and address gaps in HPFDs planning and implementation of the CCAT plan. This will lead to the establishment of a model catchment management approach, as well as approaches that enhance technical capacity, accountability and community engagement. The project seeks to improve service delivery by HPFD, both through the application of state of the art technology with respect to planning, implementing and monitoring of forestry interventions as well as through institutional change that fosters improved forest management that is more inclusive and collaborative.

Sub-component 1A: ***Institutional strengthening of the Himachal Pradesh Forest Department (HPFD)*** will support: (i) an engagement strategy including an Institutional Assessment, to identify a vision, goal and timebound action plan for change, followed by the commencement of the change process; (ii) development of an IT strategy across HPFD, including preparation of a roadmap for the convergence of different applications on one common geospatial database platform and use of open source technology; (iii) development of a Monitoring and Evaluation System including updating the Management Information System (MIS), Geographical Information Systems (GIS) and Information Technology (IT) support to forest management in the state[1].; (iv) establishment of a centralized system of performance monitoring; and, (v) Training and Capacity Building within HPFD including development of a training plan[2], and strengthening the training infrastructure at the State Forest Training Institute at Chail.

The engagement strategy to launch the reform process of the HPFD, will commence with an Institutional Assessment (IA) which will include the HP State Forest Development Corporation (which undertakes activities including the harvesting and processing of timber and non-timber forest products such as resin). It will benchmark performance against similar Indian states but also regionally and more broadly internationally to identify areas for efficiency, accountability and transparency gains. This will be followed by a consultative and participatory process (to include a range of relevant stakeholders such as other related government institutions, the private sector, forestry communities, etc.) to develop overall institutional goal and vision and road map for implementation. This process will recognize the current political realities and the vision and roadmap will be based on what is achievable within the prevailing system and culture. This IA will include an analysis of the national and state level legal and regulatory framework, to identify constraints and bottlenecks. A time bound action plan with key milestones will be developed in conjunction with an appropriate monitoring framework with agreed indicators to track progress. The project will then provide support to start implementing these changes. Additionally, existing policies and procedures that hamper the effective and accountable participation of private sector in forest management, in areas such as NTFP trade and eco-tourism will be reviewed and appropriately revised. The institutional reform process will include:

- Agreeing on the overall vision and goal for the sector and institutions,
- Clarifying responsibilities of the different institutions and departments within the institutions, avoiding conflicting, overlapping and duplicating roles,
- Identifying the roles that private sector and local communities can play in contributing to sustainable forest management and how they can be a part of sustainable green growth in the state,
- Identifying legal constraints and bottlenecks and proposing the necessary amendments and changes, to ensure the change process is not unnecessarily hindered;
- Putting in place, and maintaining transparent systems for planning, budgeting, monitoring and accountability,

[1] This will include the strengthening of a GIS and MIS center at Shimla for integrated monitoring of forestry activities.

- Ensuring ownership and buy in of both government and the institutions themselves with influential champions to drive the process forward, and
- Developing clear benchmarks to monitor results going forward.

This process of reform will be undertaken in five steps: (1) Institutional Assessment, (2) Roadmap for reforms, (3) Implementation and monitoring framework, (4) Initial implementation of key reforms, and (5) Institutional functions within HPFD defined with clear separation. For example, as part of the project's interventions, an upgraded monitoring system will be designed and established. Part of this new system will be the need for both recording in the new IT system the geographically referenced site-specific plans that will identify the tasks to be implemented by the project and at what sites. These plans and their subsequent implementation will then be verified by staff from the monitoring department to ensure accurate reporting and follow up. Additionally, on a sample basis, plans and reporting will be verified by third party independent monitors. Through the introduction of this new monitoring system, institutional change will have already commenced through ensuring that the same departments do not set themselves targets and monitor their own performance.

Sub-component 1B: ***Investing in Seed and Nursery Development and Planting and Maintenance*** will support (i) Establishment of a system where seeds are collected from known 'plus' trees and the sources, location and provenance of the seed is accurately recorded and kept with the seeds and included in the FMIS; (ii) Enhancement of seed treatment through the establishment of a centralized seed center to process, treat, store and test the seed in controlled conditions; (ii) Design and implementation of a seed certification and distribution system of certified seed of known germination capacity to field nurseries; (iii) Establishment of a seed bank for storage of seeds of different species by origin in controlled conditions of humidity and temperature; (iv) Nursery establishment including selection of sites for nursery development and raising of seedlings in nurseries (v) Development of infrastructure and provision of machinery and equipment in identified nurseries and (vi) innovative methods of planting and maintenance under which new planting models will be piloted through simple treatment replication trials (of for example plant size, spacing, maintenance techniques etc.) at a proportion of selected sites[3] followed by cost benefit analysis of the different tested treatments.

Sub-component 1C: ***Improving effectiveness of the Comprehensive Catchment Area Treatment (CCAT) plan*** will: (i) Undertake a review of the CCAT plan to: extend the plan to include districts of Bilaspur and Una; review all the activities that have been undertaken since plan preparation and update their current status; identify the most important intervention activities within the Sutlej catchment and make recommendations for an enhanced menu of activities and improved action planning processes based on experience, advances in nursery and seedling establishment techniques and in research and development; (ii) Install measuring instruments for water flows and sediment load that will provide data for calibration and running of hydrological models for improved planning; and (iii) once the data are available run optimization software (e.g. InVEST models) to identify key hotspots and intervention

[3] Planting and maintenance will involve afforestation and reforestation (aligned to CCAT plan priorities) in open and medium density forests and slopes vulnerable to soil erosion and protection of plantations. Based on the success of these trials the project will adapt the program to follow the most successful options and the new techniques will be adopted as standard practice.

activities to maximize the silt retention and surface water absorption. These outputs will be used to refine the interventions proposed by the CCAT plan.

Component 2. Facilitating better and more sustainable community and private sector forest and pasture use

This component to encourage community and private sector participation in forest management, and technical constraints. It will identify and support commercially viable NTFP value chains for enhanced incomes and livelihoods. Apart from commercially important NTFPs such as Medicinal and Aromatic Plants (MAPs), the enhanced supply of fodder, fuel wood will be covered under this component.

Sub-component 2A: ***Supporting an enabling environment for NTFP value chain development*** will support (i) community level institutional review of institutions such as Joint Forest Management Committees (JFMCs), Self-Help Groups (SHGs), Farmer Producer Organizations and NGOs engaged in the NTFP trade. The review will cover challenges faced and recommend the way forward for community institutions to engage in propagation, conservation and sustainable harvesting and value addition of NTFPs, through co-management with the Forest Department; (ii) Research and mapping of NTFPs to identify 'priority NTFPs' for propagation in the wild, based on a market demand assessment. Based on this, a management plan and package of practices for the conservation and sustainable production of priority NTFPs will be developed; (iii) NTFP trade promotion including improvements in the existing transit permit system, designation of special purpose agencies for supply of certified planting material and raw drugs, review and piloting of relevant certification schemes, creation of financial incentives for NTFP enterprises including the establishment of a research and innovation fund and capital investments in community based NTFP enterprises; (iv) Strengthening of community NTFP enterprises through consultative meetings with growers/ collectors and key institutions with the aim of forming and federating institutions around NTFP clusters. NTFP clusters will be strengthened through the provision of linkages to training facilities, finances, infrastructure and markets/ e-markets for local NTFP value addition; and (v) Support to local entrepreneurs (private sector) to establish Enterprise Facilitation Centers to provide services for the NTFP clusters through the aggregation of NTFPs products, pre-harvest and post-harvest common facilities, processing facilities, loading and unloading bays, common procurement of inputs at whole sale price and on credit, provide linkages with banks, renting of material handling equipment, provision of market information, transportation of produce and establishment of market linkages. Ten Enterprise Facilitation Centers will be supported under the project.

Sub-component 2B: ***Supporting community and private sector participation in management of forest land and pastures*** will include: (i) Preparation of models for community participation in forest and pasture management and prevention of forest fires (ii) Study to delineate forest areas for the supply of fodder through the establishment of sustainable forest and pasture management practices; (iii) assessment of the damage caused by invasive species and scientific interventions for their control; (iv) regulatory standards for management of pastures will be developed and piloted, encouraging sustainable pasture management by women user groups and SHGs; (v) Investments for control of forest fires, including awareness generation and organizing and incentivizing communities (e.g. telecommunication allowances, watch and ward) as fire protection groups; provision of firefighting equipment and mobility facilities to HPFD and communities, undertaking an assessment of fire lines and development of new fires lines if required (in response to changes in species composition, climatic conditions and population pressures); implementation of forest fire danger rating and early warning

systems to anticipate fire incidences and warn communities about possibility of fire in specific seasons and more immediately; training communities on controlled burning; and development of van-sarovars ("forest lakes") in vulnerable areas for storing water to douse fires.

Component 3. Institutional Coordination and Project Management

Sub-component 3A: ***Institutional coordination*** will support, through the financing of recurrent expenditures, the creation and maintenance of the Project's Steering Committee (SC) as a key vehicle to ensure multi-sectoral coordination and participation among the HPFD and other relevant sectors that are involved with the project and have the institutional mandate to advise or implement activities related to watershed treatment, NTFPs, or ecotourism. The project will finance technical meetings of the SC; Quarterly district level meetings for convergence with other developmental schemes/programs of the Government which will be jointly chaired by the District Collector and the Conservator of Forest (Forest Circle-in-Charge) and attended by all agencies concerned with development in the district. These meetings will review strategies for convergence, status of implementation of convergence plans and provide opportunities for the participants to know and get involved in the project; exposure visits to project activity sites for information and learning from project implementation; International exposure visits and training of the PMU officials and other policy makers on best practices in forest management. Two such exposure visits and trainings will be organized in different parts of the world.

Sub-component 3B: ***Project management*** will finance Project management activities (mainly through consultant services), which will be undertaken by a Project Implementation Unit (PIU) established in the HPFD. The PIU activities will include (i) budgeting, (ii) preparing annual work plans, (iii) contract management, (iv) financial management, (v) procurement, (vi) environmental and social risk management, and (vii) monitoring and evaluation. Under this component, all reporting on implementation progress will be prepared, including monitoring of the PDO and the Results Framework indicators.

1.5 Project Implementation Area

Activities under the project will be implemented in the districts falling under the Sutlej river's catchment area. The seven districts of Una, Solan, Shimla, Bilaspur, Mandi, Kullu and Kinnaur will be covered. The administrative unit for work under the project are forest ranges and 19 ranges have been selected based on the level of degradation prescribed by the Comprehensive CAT Plan. The need for activity in new sites may have arisen since the CAT plan was drawn up and this possibility must also be catered for. The "NERIL Report", which is the analytical underpinning, was prepared for the Sutlej Basin up to a point where it entered Bilaspur district and the lower areas of the Districts of Bilaspur and Una were not considered. Therefore, some areas/ ranges of District Bilaspur and Una might have also become eligible for treatment which need to be taken up. Institutional strengthening activities will have a state-wide coverage, as their results will be applicable at the state level.

The Comprehensive CAT Plan for Sutlej Catchment in Himachal Pradesh was prepared by HP forest department in 2011. For better implementation Micro Watershed, being the smallest natural unit affected by the displacement of water and silt, was chosen to be the unit of study for preparation of Comprehensive CAT Plan As per the Methodology adopted in Comprehensive CAT Plan the Sutlej

Catchment was divided in sub catchments (SC) and micro-watershed (MWs) from Kol Dam onwards to Spiti. However, for Spiti valley and for the area between Wangtoo to upper Kinnaur nomenclature was yet to be done in All India Land Use and Soil Survey. Thus, nomenclature provided by the Himachal Pradesh Krishi Vishwa Vidyalaya (HPKVV) was used for this region.

So far, the interventions suggested in the CCAT Plan are being implemented by HPFD from last 4-5 years in consonance with individual CAT Plans of respective Hydro Power Projects in Sutlej basin under CAMPA (Compensatory Afforestation Fund Management and Planning Authority). However, to comprehensively treat the Sutlej basin HPFD has planned to treat the sub catchments in CCAT under two projects i.e. HP FPP and with JICA. HP FPP is going to treat 19 ranges having 25 sub catchments whereas the rest 16 are being taken up under JICA funded project.

It is to be noted that the NERIL CAT Plan Report was prepared for the Sutlej Basin up to a point where it entered Bilaspur district and the lower areas of Dist. Bilaspur & Una were not considered. Therefore, some areas/ ranges of District Bilaspur & Una might have also become eligible for treatment which needs to be taken up.

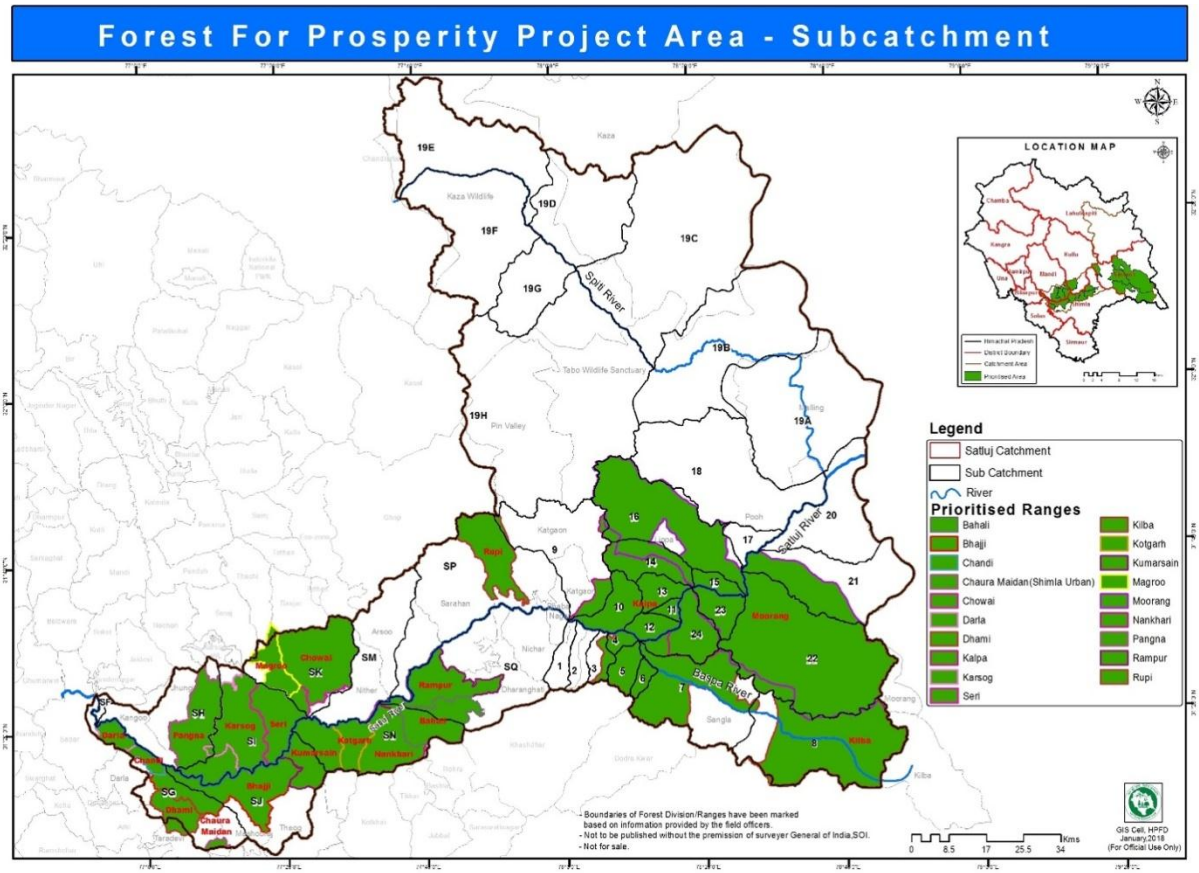


Figure 1 Project Area Forest Ranges

Figure2 HPFFP Project Area (identified Sub Catchments and Forest Ranges)

- *List of FFP forest Ranges (left)*
- *Administrative Map of HP (top right)*
- *HP FFP Project area within Sutlej basin (middle-right)*
- *HPFFP Project areas highlighted against slope in deg (bottom-Right)*

Sr. No.	Subcatchment	District	Division	Range
1	22	Kinnaur	Kinnaur	Moorang
2	16	Kinnaur	Kinnaur	Moorang & Kalpa
3	7	Kinnaur	Kinnaur	Kilba
4	Sp	Kinnaur	Sarahan WL	Rupi WL
		Shimla	Rampur	Rampur
5	10	Kinnaur	Kinnaur	Kalpa
6	Sq	Mandi	Karsog	Karsog
		Shimla	Rampur	Rampur, Bahli
7	Sj	Shimla	Shimla	Bhajji
			Kotgarh	Kumarsain
		Mandi	Karsog	Pangana
8	21	Kinnaur	Kinnaur	Moorang
9	Sh	Mandi	Karsog	Pangana
10	24	Kinnaur	Kinnaur	Kalpa & Kilba
11	Si	Mandi	Karsog	Karsog, Pangana, Seri
12	Sk	Kullu	Ani	Chowai
		Mandi	Karsog	Magroo, Seri
13	Sn	Shimla	Rampur	Nankhari, Bahli, Rampur,
			Kotgarh	Kumarsain, Kotgarh
14	9	Kinnaur	Kinnaur	Kalpa
15	13	Kinnaur	Kinnaur	Kalpa
16	5	Kinnaur	Kinnaur	Kilba
17	14	Kinnaur	Kinnaur	Moorang & Kalpa
18	23	Kinnaur	Kinnaur	Moorang
19	6	Kinnaur	Kinnaur	Kilba
20	3	Kinnaur	Kinnaur	Kilba
21	15	Kinnaur	Kinnaur	Moorang
22	12	Kinnaur	Kinnaur	Kalpa
23	11	Kinnaur	Kinnaur	Kalpa
24	Sg	Shimla	Shimla WL	Chandi WL
			Shimla UR	Shimla UR
			Shimla	Bhajji/Dhami
		Solan	Kunihar	Darlaghat
25	4	Kinnaur	Kinnaur	Kilba

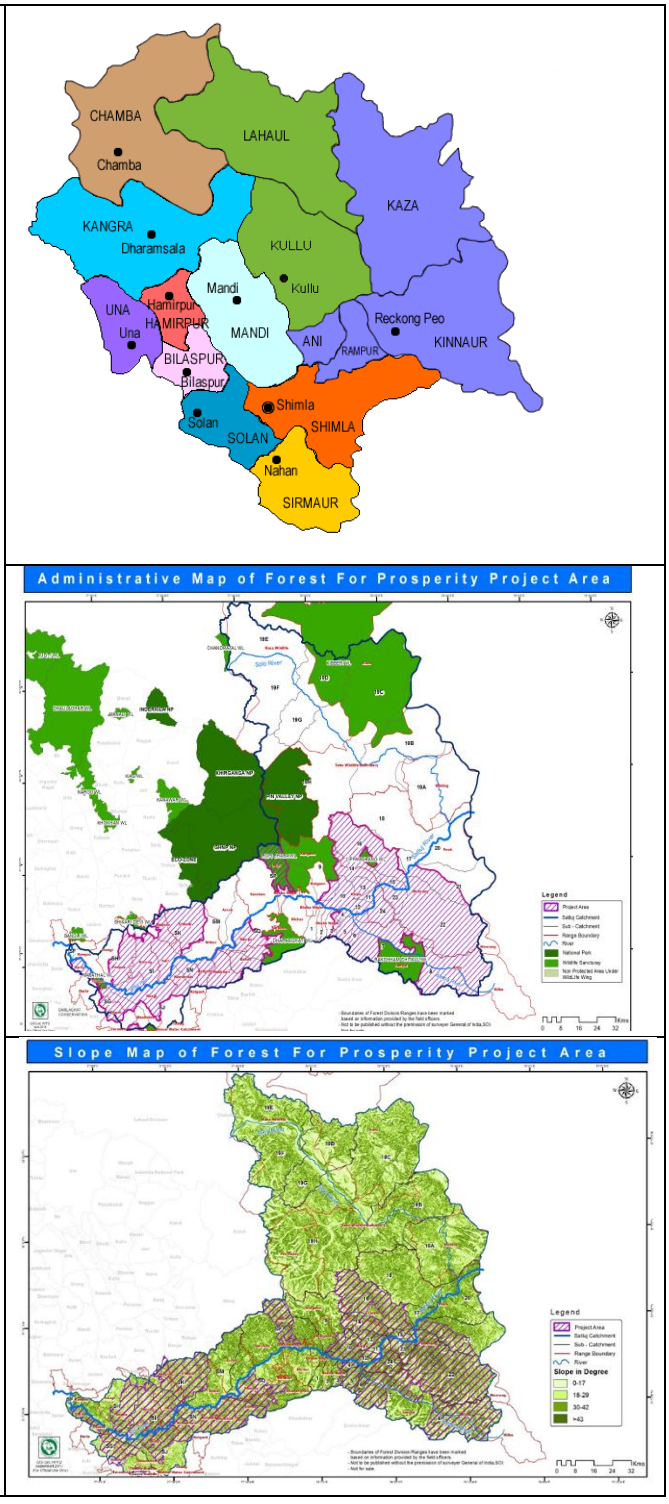


Figure 2 HPFPP Project Area

A major portion of the Sutlej basin lies in the greater Himalayan range. The elevation of the catchment varies widely from about 500 m to 7,000 m, although only a very small area exists above 6,000 m. The mean elevation of the basin is about 3,600 m. The gradient is very steep near its source and gradually reduces downstream. Owing to large differences in seasonal temperatures and great range of elevation in the catchment, the snowline is highly variable, descending to an elevation of about 2,000 m during winter.

Vegetation of the area mainly comprises of sub-tropical, temperate, sub- alpine and alpine types. The sub-tropical vegetation is mainly dominated by *Acacia catechu, Diospyros montana*, *Pinus roxburghii* and other miscellaneous species. The temperate forests are mainly dominated by *Pinus roxburghii, Cedrus deodara, Quercus leucotrichophora, Quercus floribunda, Pinus wallichiana, Picea smithiana, etc.* Sub-alpine vegetation is dominated by *Abies pindrow*, *Quercus semecarpifolia, Prunus cornuta, Betula utilis, Acer acuminatum, etc.* Alpine vegetation is dominated by alpine shrubs and herbaceous species. There are two Natural Habitats in the project area comprising of Chandi and Rupi Bhabha National Park. The Rupi Bhaba Wildlife Sanctuary lies in Nichar subdivision of Kinnaur district, Himachal Pradesh along the Upper Sutlej Valley. Chandi Wildlife Sanctuary falls in Arki -Sub Division of Solan District and remaining part falls under Shimla Rural Sub- Division (Sunni Tehsil) of Shimla District.

1.6. Methodology for Preparation of EMF

1.6.1 Objectives of the EMF

In order to ensure that the environmental issues are systematically identified and addressed in the various stages of the implementation of subprojects, an Environment Management Framework (EMF) has been developed for this project. The term EMF is used to depict operations with multiple subprojects/ interventions and spread over the lifetime of the project over a wide geographic area. Design of subprojects, exact locations as well as impacts are not determined at this stage

The specific objectives of the EMF are as under:

d. To provide a systematic approach for identifying the various possible environmental impacts at the different stages of the project cycle.
e. To identify appropriate mitigation measures for addressing the identified environmental impacts.
f. To devise an institutional arrangement for mainstreaming environmental management in project implementation processes.

The Environment Assessment is conducted by G.B. Pany Institute of Himalayan Studies, Kullu by a team subject specialists from on environmental issues and field facilitators.

1.6.2 Methodology

Task 1: Desk Review of Literature and Similar Projects

Review of secondary data and literature from the viewpoint of identifying key environment issues across the state, and the project area pertaining to forest and natural resource management. The review also included relevant environment policies, legal and regulatory provisions of the World Bank, Government of India and Government of Himachal Pradesh. Further, relevant projects of WB viz. HP Mid Himalayan Watershed project (HPMHWDP), HP Development Policy Lending phase I & II (HP DPL) and other donor

funded projects such as KfW Himachal Pradesh Forest Ecosystems Climate Proofing Project, , Indo-German Indo-German Eco-Development Project. and JICA funded " Himachal Pradesh Forests Ecosystem Management and Livelihoods Improvement Project" having an objective to manage and enhance forests area ecosystems in the project area by sustainable forests ecosystem management, biodiversity conservation, livelihoods improvement support and strengthening institutional capacity, thereby contributing to environmental conservation and sustainable socio economic development in the project area in the state of Himachal Pradesh. Subsequently, field visits for validating the above issues were conducted to the identified GP clusters. (For details of field visit please see Annex). Based on the desk review of forest sector in HP and initial discussions/ consultations with the various state agencies/ stakeholder's, the consultants have documented the key environmental issues that are identified in the project, and investments/activities that could pose higher environmental risks.

Task 2: Review of Legal and Policy Framework

Compliance of the project with the relevant legislations of GoI (MoEF & CC), GoHP, and policies of World Bank has been ascertained. Applicable legislations during implementation of the project and necessary provisions for compliance has also examined. The data gaps generated between these policies has been identified and fulfilled. The World Bank safeguard policies /directives that would be applicable by the proposed interventions has been reviewed, and the implications of which have been outlined.

Task 3: Generation of Baseline Data

For the accomplishment of objectives, both primary and secondary data were collected, analyzed, synthesized and documented. To identify the salient characteristics of the state, region and subproject districts, a complete profile of the environmental characteristics has been compiled. The secondary information are collected in such a way that are relevant to understanding the baseline, as well as the design of mitigation and enhancement measures, as pertaining to physical (topography, geology, soil characteristics, climate, seismicity, water resources (surface and groundwater), water quality, air quality, biological (flora, fauna, protected areas (sanctuaries, national parks, bio reserves, wetland etc.,) and forests (protected forest, reserved forest social forest etc.,)) and economy, Eco Tourism, and NTFPs. Secondary data was collected from the relevant Central/State Government Departments, Universities, different research organizations, local authorities etc. (Please see Annexure I for sources of information)**.** Field surveys were also undertaken in the done through interviews, interactive meetings and PRA's in selected villages in Kinnaur, Shimla, Ani, Karsog, and Kunihar Forest Divisions. Questionnaire based surveys and samplings will be done for the information on changes in land use pattern, floristic diversity, status of water resources, natural hazards, impacts of developmental activities on forest resources.

Task 4: Stakeholders Consultation and Disclosure

Consultations has been carried out with all relevant stakeholders those who have been identified through stakeholder analysis, these include government, community institutions, and private sector. The consultation process has been carried out at three levels (state level, forest division level, forest department officials and beneficiaries) in discussion with the respective line departments. In this context consultation-cum-interaction meetings were conducted at Reckong Peo (District Kinnaur) and Rampur (District Shimla) with the representatives from HP forest department, local NGO, elected members of village assembly, JFMC and residents of concerned villages. The objective of the consultation sessions is focused to improve the project's intervention with regard to environmental management and to seek

views from the stakeholders on the environmental issues and the ways these could be resolved. The procedure for conducting stakeholder and public consultations with relevant consultation formats/ questionnaires/ checklists has been prepared and enclosed with the EMF in Annexure 3, which acts as a guide for conducting consultations at any stage of the subproject implementation. In addition to consultations with community institutions, forest guards, NGOs and village members, the project also undertook institutional consultations with Forest Department, Department of Environment, Science and Technology, Agriculture Producer Marketing Company, Forest Corporation, Forest Training Institute, and Himalayan Forest Research Institute. A second round of consultations will be carried out once the draft EMF has been disclosed on the project website for stakeholder views and suggestions.

Task 5: Impact Prediction & Mitigation Measures

The potential impact (both positive and negative) due to the subprojects intervention has been determined through the identification, analysis and evaluation of these impacts on sensitive areas (natural habitats; sites of historic, cultural and conservation importance), and forest range areas. These have been identified as significant positive and negative impacts, direct, indirect, and residual impacts. For each impact that has been predicted from the above analysis, if unavoidable, a feasible and cost effective mitigation measures has been identified in order to reduce or mitigate them.

Task 6: Environment Management Plan

Based on the assessed Environmental Impacts, specific Environmental Guidelines, and EMPs are prepared, in such a manner that these are amenable for incorporation in the bidding/contract document. The EMP is prepared as per the requirements of Bank's safeguard polices. The EMP includes detailed environmental mitigation measures; separate for pre-construction, construction and operation period.

Task 7: Institutional Arrangement to Manage Environment Impacts Effectively

The institutional arrangement in HP Forest PMU for implementing the safeguards has been reviewed and outlines with roles and responsibilities, this pertains to inter-sectoral arrangements, management procedures and training, staffing, operation and maintenance and budgeting.

Public Disclosure: An Executive Summary of the safeguard documents will be prepared in Hindi, and a summary of the key safeguard documents (draft EMF) shall be published/ disclosed in the World Bank and HP Forest Departments for public view.

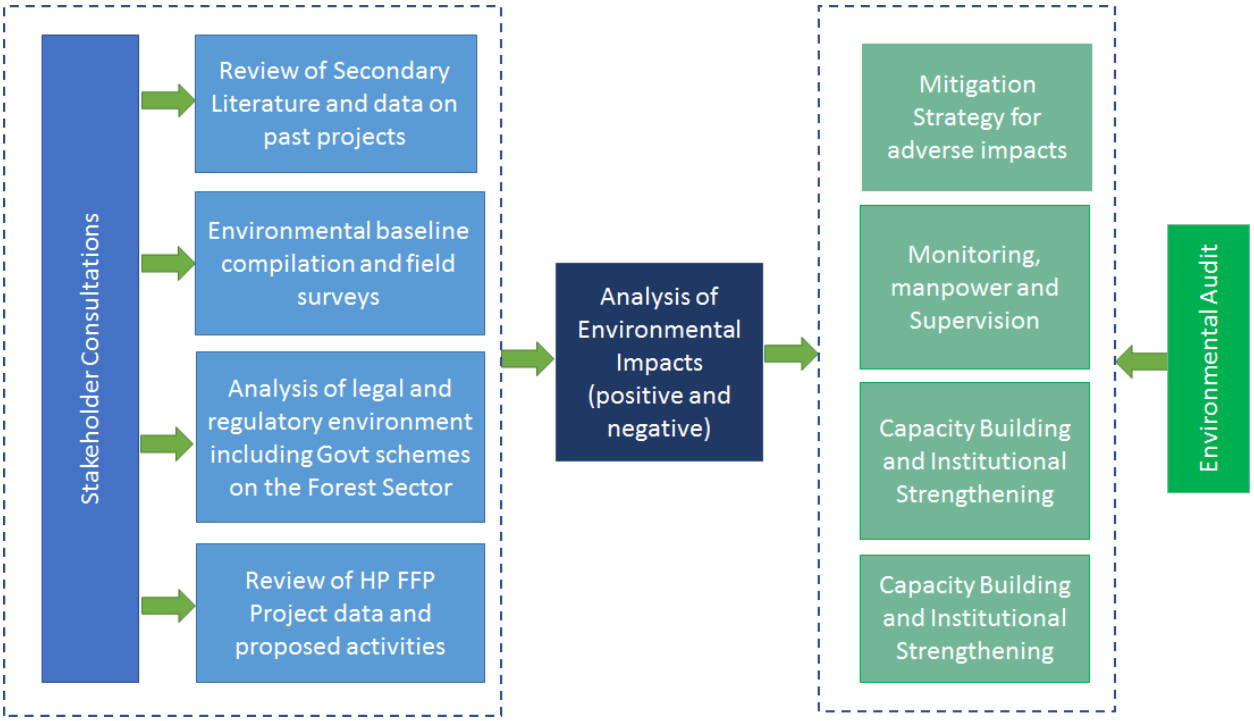


Figure 3 HP FFP EMF Overview

1.7 Organization of the Report

Chapter 1: Includes the project background, objectives and components of the project.
Chapter 2: Detailed Environmental Baseline
Chapter 3: Relevant laws, Regulations and Developmental Programmes
Chapter 4: Stakeholder Assessment Consultations and Disclosure
Chapter 5: Anticipated Impacts/Risks and Mitigation Strategy
Chapter 6: Environmental Management Plan
Chapter 7: Institutional and Implementation Arrangements

Annexures:

Annexure 1	List of References and Secondary Data Sources
Annexure 2	Baseline data collection form/ Field Survey
Annexure 3	List of Stakeholders Met
Annexure 4	Baseline Data from Field Survey
Annexure 5	Environmental Management Plan Formats/Checklist
Annexure 6	Pest Management Strategy
Annexure 7	Occupational Health and Safety Guidelines
Annexure 8	Screening checklists
Annexure 9	Detailed Environmental Baseline and permitted activities in Rupi Bhabha NP
Annexure 10	Detailed Environmental Baseline and permitted activities in Chandi WLS

Chapter 2 Environmental Baseline

2.1 Introduction and overview of Himachal Pradesh

Himachal Pradesh is a mountainous state with two-thirds of its geographical area under forest and other natural ecosystems (DoEST, undated). It is bound by Tibet to the east, Uttarakhand to the south, Punjab to the west and Jammu and Kashmir to the North. More than 90% of the population in the state is rural, most of which is dependent on forests for at least part of their livelihoods (DoEST, 2012; DoEST, undated). Besides supporting the livelihoods of people in the State, forests protect catchment of important river systems such as Sutlej, hence providing hydrological services to millions of people downstream (HPFD, 2005). Besides, forests in the state regulate weather and rainfall across the entire region, hence influencing the economies of neighboring states such as Haryana and Punjab.

State is rich in floral and faunal biodiversity. Its vegetation varies from dry scrub forests at lower altitudes to alpine pastures at higher altitudes (HPFD, undated). State is home to over 7% of the species out of the reported 45,000 floral species in the country, (ibid). More than 95% of the species are endemic to Himachal Pradesh. Similarly, there is a range of animal species including musk deer, ibex, snow leopard, Himalayan Tahr and western Tragopan.

The state has established a large network of protected areas including 2 national parks, 30 wildlife sanctuaries and 3 conservation reserves. It suggests that forests have a much large ecological significance beyond the state and should be conserved. But there are a range of issues affecting the quantity and quality of forests in the area. Open and scrub forests constitute over one-third of the forest cover in the state underlining the widespread degradation.
According to National Forest Policy, 1988, at least two third i. e 66.6% of the geographical area should be under forest cover in the hilly states like Himachal Pradesh. Keeping in view, out of 55,673 km^2 area, the 10000 km^2 is available for agricultural and horticultural activities. Area is expected to be covered is nearly 5-6% of the total available agricultural area. Himachal is known as the fruit bowl of the country, with orchards being widespread. Meadows and pastures are also seen clinging to steep slopes.

Table 1 General Overview of Himachal Pradesh

1	Total Area of the State	55,673 km^2 (1.7% of country)
2	Administrative Districts	12 [Shimla, Kullu, Kinnaur, Lahaul and Spiti, Mandi, Solan, Chamba, Hamirpur, Sirmaur, Nahan, Kangra and Bilaspur]
3	Villages	20,011
4	Population	6.08 million (0.57% of country)
5	Livestock population	5.11 million (1.1% of country)
6	Grazing land Available per livestock	0.26 ha
7	Recorded Forest Area	37,033 sq km (66.52%)
8	Forest Cover	15,100 sq km
9	Forest area under snow cover	16,376 sq km
10	Extent of Water Bodies in Forests	455 sq km
11	No. of Protected Areas [NPs and WLs)	2 NPs; 30 WLS

12	Canopy density (VDF)	3,110 sq km
13	Canopy density (MDF)	6705 sq km
14	Canopy density (scrub)	5285 sq km
15	Hydropower Potential	21000 MW
16	Land under miscellaneous Tree Crops	65 ha
17	Area under Fallow	15ha
18	Permanent Pastures and grazing lands	1496ha
19	Tourists	5.5 million per annum

Sources for further Information: *State of Environment Report for HP, Forest Department and FSI Report for Himachal Pradesh, 2017*

2.2 Overview of the Sutlej Basin

River Sutlej traverses a course of 320 km area within Himachal Pradesh and considered as a largest river among the four rivers (Beas, Ravi, Yamuna and Chenab). Sutlej basin covers 45 per cent of the total geographical area of the state. The elevation of the basin varies between 6680 m in sub catchment near Tidong in Kinnaur district; to 540 m in Bilaspur district. Along its course the river passes through Lahaul & Spiti, Kinnaur, Shimla, Kullu, Mandi, Solan and Bilaspur districts. It leaves the Himachal Boundary at Bhakhra Dam, which is the second highest dam 225.55 m in India. The total catchment area of River Sutlej is highest exists around 38 % area (20,398 km^2) among the five major rivers of Himachal Pradesh. The catchment area of about 50,140 km of the River Sutlej is located above the permanent snow line at an altitude of 4,500 meters. The bulk of annual precipitation in monsoon falls due to movement of the southeast monsoon from the Bay of Bengal.

On account of varying geographical features, the Sutlej basin topographically divided into two parts, i.e. the Upper Sutlej basin and lower Sutlej basin. Beyond the Nathpa village in Kinnaur district, Sutlej is considered to be the upper Sutlej basin, while southwestern part of the Nathpa village to Bilaspur, it is known as the lower Sutlej basin. Since the Upper Sutlej part has favorable slope conditions for a development of hydropower projects. Agriculture, horticulture and animal husbandry are the mainstay of 60-70% of the population despite very small area under irrigation. This basin is also rich in the herbal plant and chilgoza pine.

Major portion of the Sutlej catchment comprises of steep to very steep high hills. The major natural disasters or hazards experienced by the region over the years include earthquakes, landslides, flash floods, cloud burst, avalanches and hailstorms/droughts. The area is prone to the severest seismic risks as it falls into the Very High Damage Risk Zone V.

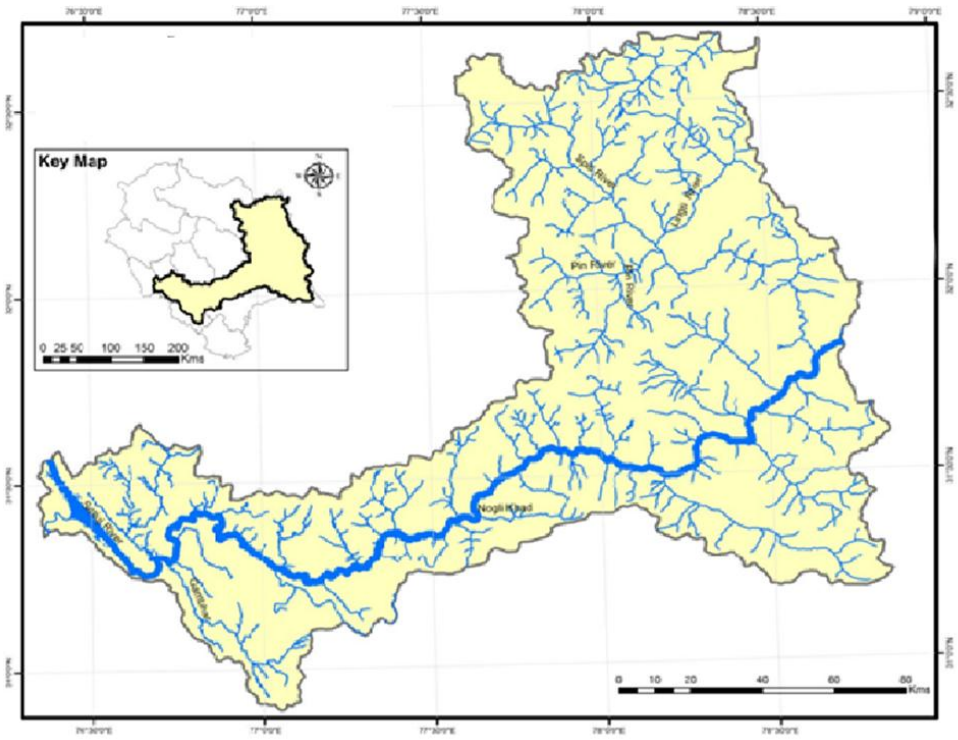


Figure 4 Geographical Map of Sutlej basin

Catchment Area Treatment Plan

There are several major hydroelectric projects on the Sutlej, e.g., the 1000 MW Karcham-Wangtoo Hydroelectric project, 1500 MW Nathpa-Jhakri Project, Shongtong-Karcham project-450 MW, Rampur Hydropower project 412 MW, Baspa Hydropower project- 300 MW, Kashang project 243 MW, Tidong project 100 MW. The State is moving towards a river basin approach to the development and implementation of Integrated Basin Catchment Area Treatment (CAT) Plans–deemed global best practice. The CAT Plan of Sutlej River basin covers an area of 20000 KM² upstream of Kol dam. It envisages an expenditure of Rs. 1440 crore on various treatment measures, over a period of ten years, to reduce the silt load in the streams catering to many hydro projects

The plan has been prepared for this purpose with the following objectives;

a. To facilitate the hydrological functioning of the catchment and to augment the quality of water of the river and its tributaries
b. Conservation of soil cover and to arrest the soil erosion, floods and siltation of the river and its tributaries and consequent reduction of siltation in the reservoir of the project
c. Demarcation of the priority of sub watersheds of treatment based on soil erosion intensity in the catchment area
d. Rehabilitation of degraded forest through afforestation measures
e. Soil conservation through biological and engineering measures to reduce sediment load in river and tributaries, thus improving the quality of water
f. Ecosystem conservation resulting from increased vegetative cover and water retaining properties of soil

2.3 Environmental Baseline

This section details the existing environmental profile of the state, and project districts namely Kinnaur, Solan, Kullu, Shimla, and Mandi. The environmental profile is based on the review of secondary information/ data collected from the respected departments, literature/ journals, websites and also observation obtained from the site visits to the project districts.

2.3.1 Physiographic Profile

Himachal is in the western Himalayas covering an area of 55,673 km^2 Most of the state lies on the foothills of the Dhauladhar Range. At 6,816 m Reo Purgyil is the highest mountain peak in the state of Himachal Pradesh.The drainage system of Himachal is composed both of rivers and glaciers. Himalayan rivers crisscross the entire mountain chain. Himachal Pradesh provides water to both the Indus and Ganges basins. The drainage systems of the region are the Chandra Bhaga or Chenab, Ravi, Beas, Sutlej, and Yamuna rivers. These rivers are perennial and are fed by snow and rainfall. They are protected by an extensive cover of natural vegetation.

Topography

The state can be divided into three main topographical regions; (i) the Shivalik (ii) the lesser Himalayas and (iii) the greater Himalayas.

The Shivalik or Outer Himalaya: It covers the lower hills of Kangra, Hamirpur, Una, Bilaspur, lower parts of Mandi, Solan and Sirmour districts. Within this zone, altitude varies from 350 m to 1500 m.

Inner Himalayas or Mid-mountains: Altitude varies from 1500 m to 4500 m and includes areas such as the upper parts of Pachhad and Renuka in Sirmaur district, Chachiot and Karsog tehsils of Mandi district and upper parts of Churah tehsil of Chamba district.

Alpine zone or the Greater Himalaya: Has altitude above 4500 m and comprises areas of Kinnaur district, Pangi tehsil of Chamba district and areas of Lahaul & Spiti district.

Soils:

The Sutlej valley has relatively poor sandy loam constituting exposed bedrock, and gravel soil. The soils in the study area as grouped under Udalts – Ochrepts soils are shallow, veneer and brown in color with high base in Lahul and Spiti and Kinnaur region; Othents – Ochrepts soil are combination of shallow red loamy and sandy ideally suitable for horticulture in Kullu and Kinnaur district; Udoll soil characterization of cold desert and found in Kinnaur district.

Glaciers and snow cap soils are found where the glaciers and snow cover is present throughout the year in Lahual and Spiti, and Kullu district. Medium deep, well-drained soil with loamy surface was observed in the lower reach of the Sutlej with limited area.

In the Sutlej basin plutonic rocks or hypabyssal rocks like Granites, Syenites, Diorites, Gabbros, and Volcanic rocks are found. Strong and durable character, interlocking texture, hard silicate mineral composition, absence of any inherent weak planes, resistance to weathering. The well cemented siliceous sandstones have good compressive strength and suitable. The Quartzites are very hard and

highly resistant to weathering and suitable for foundation of dam sites. Among the metamorphic rocks, Gneisses (granites) are most competent rocks, unless they possess a very high degree of foliation.

Topography and Elevation

The elevation in Sutlej basin varies from 300 meters to 7000 meters. The Kinnaur district varies from 2,550 meters to 6,791 meters. At the altitude of 2,670 meters Kalpa village is situated which is connected by link road of 14 kilometers from Powari to Rekong Peo. Village Moorang village (2,591 meters) is situated about 39 kilometers away from Kalpa on left bank of River Sutlej. Due to such variations in the altitudes, Sutlej River flows with high speed in district Kinnaur. Just after Kinnaur,River Sutlej has entered into Shimla district. The altitude of district varies from 300 meters to 6,000 meters. Rampur is situated on the banks of River Sutlej with an altitude of 924 meters along the Hindustan-Tibet road. Mandi district extents upto 754 meters of heights.Bilaspur varies between altitudes of 290 meters to 1,980 meters. From Kinnaur to Mandi River Sutlej flows from an altitude of 6000 meters to 656 meters. After Mandi district, the variation in altitude of Sutlej catchment area is not high as much as in Kinnaur, Kullu, Shimla, and Mandi districts. It flows from moderate slope at an altitude of 656 meters to 290 meters.

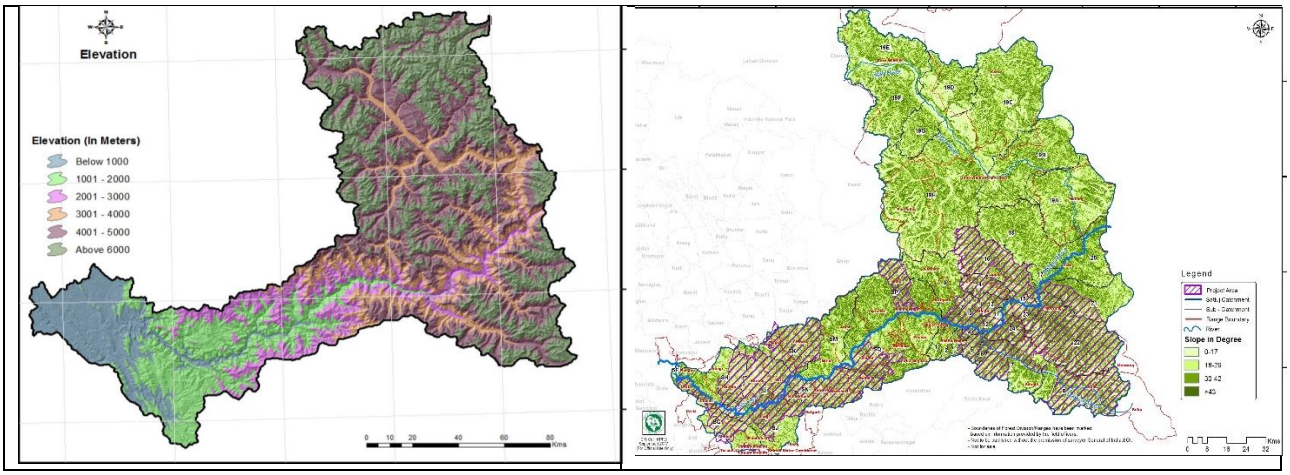


Figure 5 Elevation and Slope Map of the Project Area

Natural Disasters

The Sutlej basin lies in seismically sensitive zones (zone V and IV) as per the Seismic Zoning Map of India (Ref: IS: 1893-1984 Fourth Revision). Thirty Two percent of the total geographical area of the State is prone to the severe seismic risks as it falls into the Very High Damage Risk Zone V. The Kinnaur earthquake of January 19, 1975 (Magnitude (M) = 6.7) and the Dharamshala earthquake of April 26, 1986 (M = 5.7) are well recorded in respect of damages caused and losses incurred. During the past five decades, 20 earthquakes with magnitude > 5 have been recorded from the Sutlej Valley (Wulf et al., 2012).

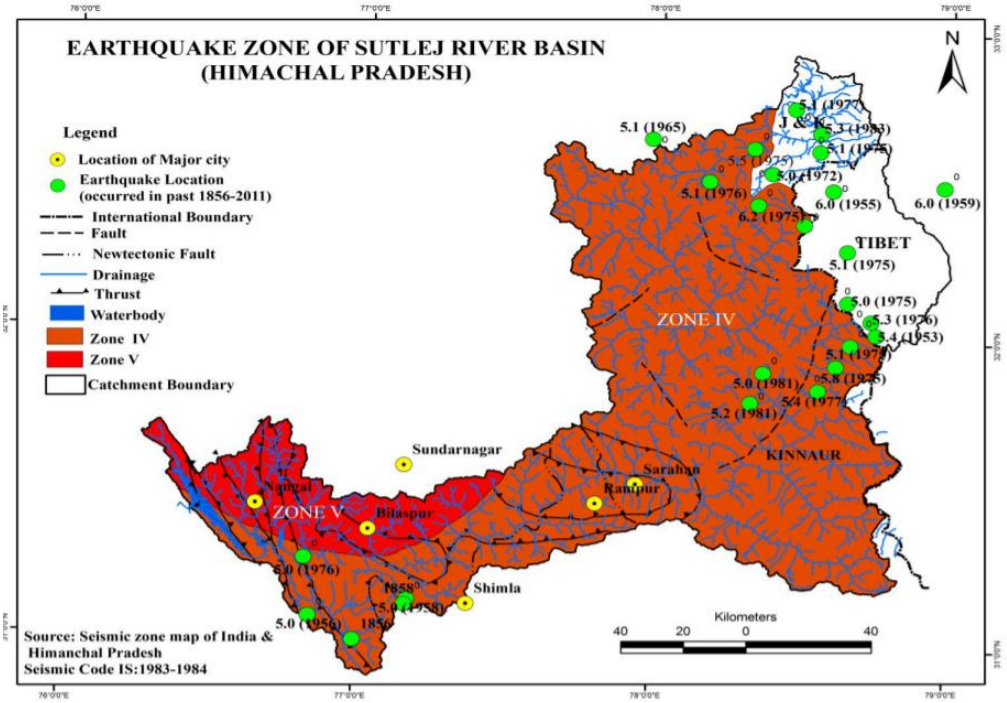


Figure 6 Earthquake Zones within the Sutlej basin

The hills and mountains are liable to landslides during monsoons and high intensity earthquakes. The vulnerability of the geologically young and not so stable steep slopes has been reported to be increasing in the recent decade due to inappropriate human activity like deforestation, road cutting, terracing and changes in agriculture crops cultivation that require more intense watering. (State Council for Science, Technology and Environment and Disaster Management, Himachal Pradesh 2012). The occurrence of water related natural disasters especially floods and flash floods in summer is also common.

Climate

The climate of the state varies from place to place depending on the altitude. It varies from hot and sub-humid tropical (450-900 m) in the southern low tracts, warm and temperate (900-1,800 m), cool and temperate (1,900-2,400 m) and cold alpine and glacial (2,400-4,800 m) in the northern and eastern high mountain ranges.

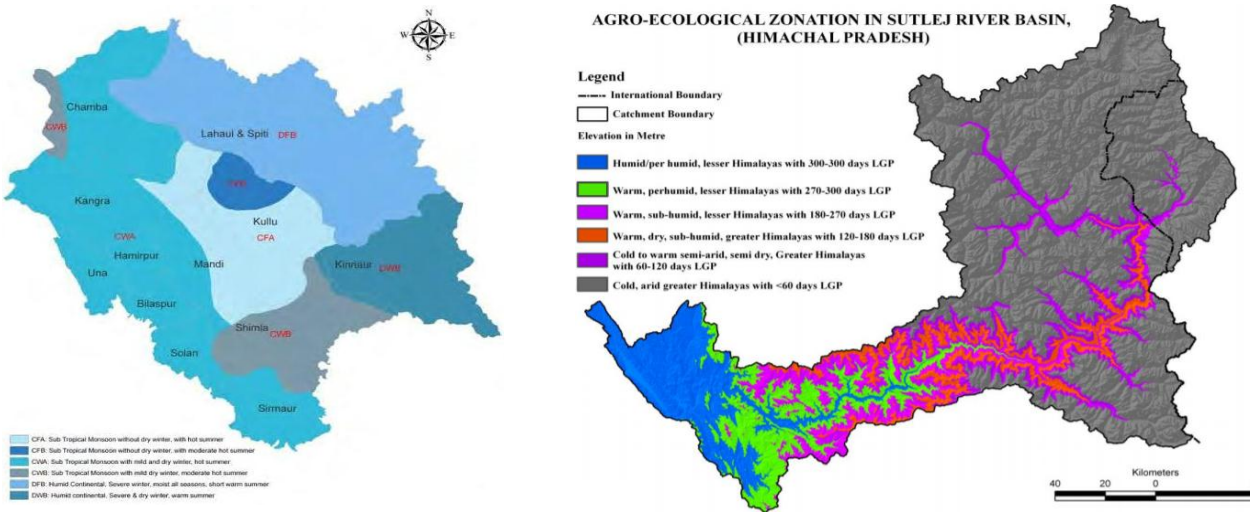


Figure 7 Climate Zones of Himachal Pradesh (left) Agro Ecological Zones in Sutlej basin (right)

Temperature

The climate of basin varies from hot and sub-humid tropical in the southern part and while the glacier and alpine are seen in the eastern and northern part of the basin. In the region, the temperature generally starts rising from the beginning of March till June, which is the hottest month of the year. The mean minimum and maximum temperature generally fall between 15.6^{o}C to 24^{o}C in the region. With the onset of monsoons by the end of June, temperature begins to fall. The rate of drop in day temperature is considerable than the rate of drop in night temperature. After the withdrawal of monsoons by the mid-September, the night temperature falls rapidly. The month of January is the coldest month when the mean maximum and minimum temperatures seen in usually between 8.9^{o}C and 1.7^{o}C. During winters, under the influence of the western disturbances, the temperature falls considerably and it may go even below 0^{o}C. Downstream of upper Kinnaur, the catchment experienced the three seasons (summer, rainy, and winter season).

Table 2 Month wise maximum and minimum temperature at selected Stations of Himachal Pradesh

Maximum Temperature (in Celsius)													
Sl. No	**Centres**	**Months**											
		Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
1	Kalpa	3.60	1.90	9.70	16.60	21.70	22.30	23.60	22.50	21.30	19.20	14.00	10.20
2	Shimla	12.20	12.50	19.00	21.40	26.40	24.40	23.50	22.70	23.10	20.90	18.40	15.50
3	Solan	117.70	18.00	24.20	26.90	32.20	28.80	28.30	28.30	28.00	26.20	23.50	19.90
Minimum Temperature- (in Celsius)													
		Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
3	Kalpa	-5.30	-4.80	0.70	3.50	8.30	12.00	14.60	13.90	9.60	6.40	0.90	-1.70
7	Shimla	2.80	3.80	9.10	11.70	17.10	16.50	17.20	16.60	14.70	12.20	7.60	4.80
9	Solan	1.10	4.60	8.30	11.50	15.50	18.50	19.70	19.50	15.70	12.40	4.70	2.00

Source: Statistical Year Book of Himachal Pradesh 2013-2014, Department Of Economics

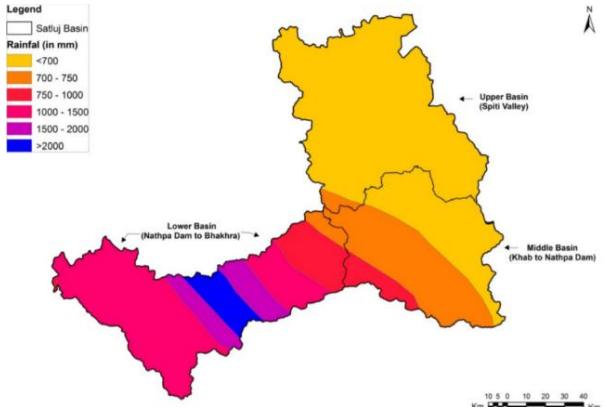
Precipitation

Sutlej basin receives precipitation from western disturbances. The western disturbance passes over the northwestern part during the winter. Sutlej valley faced the heavy monsoon of the outer Himalayas and heavy snowfall of the arid Tibetan. The monsoons from the Indo India, first hits the outer ranges of the Indian Himalayas, become the reason of heavy monsoon rains. When crosses the outer Himalayas and enter into the inner Himalayas, it receives some clouds, with low precipitation. altitudes due to the western disturbances, the valley experiences

The zone within which the part of present study region falls also receives heavy snowfall i.e. Kinnaur district. The total annual rainfall is observed about 766 mm in Kinnaur and 800 mm at Rampur. The maximum rainfall is received from January to March. About 55% of the total rainfall is received during winter season. A part of the precipitation received during winter months is in the form of snow. The average humidity observed during winter in the study area is about 50%. Overall, humidity ranges during winter from 35 to 54.2% which is very low. While in monsoon months, humidity is observed more than 90%.

Table 3 Rainfall pattern in Different districts of Himachal Pradesh District (in mm)

Sl. No.	District	2010	2011	2012	2013
1	Kinnaur	1107.8	573.5	477.1	1055
2	Kullu	1732.5	1292.8	1351.1	1286.4
3	Mandi	1495.4	1470.5	1462.9	1616
4	Shimla	1272.3	912.1	1057.4	1236.9
5	Solan	1377.3	911.1	1057.4	1236.9



Climate Change

It is clear from the available research that climate change is affecting ecosystems and vegetation in the state. Vegetation in Himachal Pradesh especially in upper altitudes is more vulnerable because of its sensitivity to higher temperatures. Analysis of temperature trends in the Himalayan region shows that temperature increases are greater in the uplands than that in the lowlands (Shrestha et al., 1999). Observed impacts of historical trends include movement of apple orchards to higher altitudes, loss of certain tree species, drying of traditional water sources, changes in bird types and populations, reduction in crop yields, and increased vulnerability of winter cropping due to changes in rainfall patterns and planting dates (ADB, 2010).

Himachal Pradesh is likely to experience an increase in temperature by 3oC by 2100 in a most probable scenario (DoEST, 2012). It has been reported that even under a moderate climate change scenario forests in 56% of the grids in the state are vulnerable to climate change (ibid). The forest types and

species composition is likely to change as early as by 2030 in these areas. In the long term, i.e. by 2080, more than 80% of the state forests are vulnerable to change. These changes might affect forest composition and productivity.

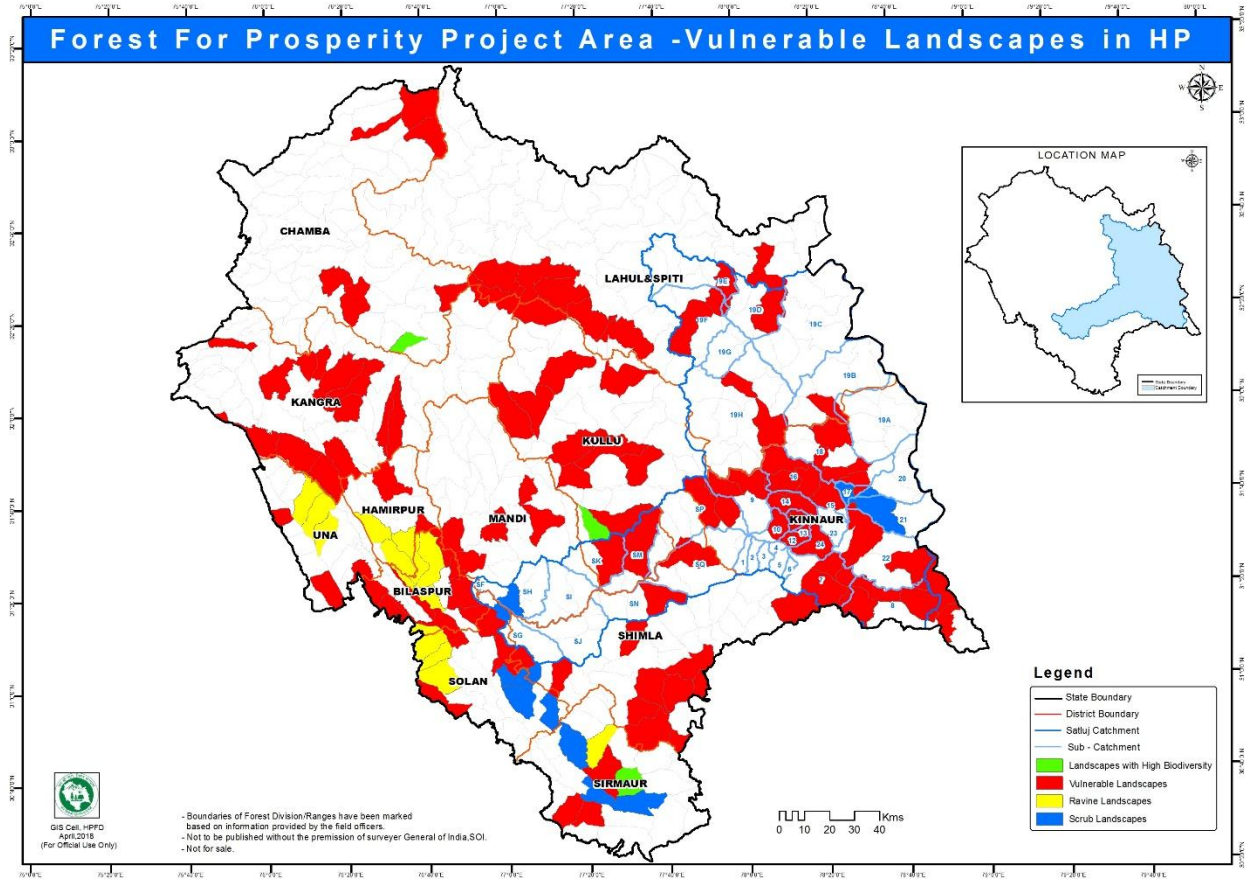


Figure 8 Map of Vulnerable, Ravine and Scrub Areas

Many forest species are migrating to higher altitudes and some species even face extinction (Dubey et al., 2003; Rana et al., 2009). It has been reported that species such as *Pinus logifolia*, *Lilium polyphyclum* , *Aconitum heterophyllum* and *Woodfordia fructifose* have migrated to 400 to 500 m higher altitude in a span of 100 years (Rana et al., 2009). High altitude species have become more vulnerable. It has been widely reported that *Pinus roxburghii* is invading the habitat of *Quercus leucotrichophora*. Other economic species such as *Cedrus deodar* and *Dalbergia sissoo* are declining sharply due to a mix of anthropogenic and climatic factors in the State (DoEST, 2012).

Besides these impacts, climate change is also likely to increase incidences of forest fire and pest attack due to increase in temperature affecting survival and growth of forest vegetation (DoEST, 2012).

District level mapping of Himachal Pradesh using a composite of biophysical, social and technological indicators (1960–1990) showed lowest adaptive capacity for Chamba and Kullu and highest adaptive capacity for Kangra, Hamirpur, Una, Solan and Sirmour districts (O'Brien et al., 2004). The districts of Hamirpur, Una, Solan, Bilaspur and Sirmour have been categorised as highly exposed and vulnerable

towards climate change whereas, Kullu and Shimla have medium level of vulnerability (O'Brien et al., 2004).

2.3.2 Land Use Pattern

Himachal Pradesh is a hilly state, one third area remain snow covered for about seven months in a year. Like other parts of the Himalayan region, human settlements are scattered but largely concentrated in the low and mid hill areas while highlands are sparsely populated. The dominant features of hill farming in Himachal Pradesh are largely rainfed farming on sloping marginal farmlands and small land holdings.

Table 4 Land Use pattern of Himachal Pradesh

Land Use	Area in '000 ha	Percentage
Total geographical area	5,567	
Reporting area for land utilization	4,549	100.00
Forests	1,101	24.21
Not available for cultivation	1,129	24.82
Permanent pastures and other grazing lands	1,496	32.89
Land under misc. tree crops and groves	65	1.43
Culturable wasteland	138	3.03
Fallow lands other than current fallows	15	0.33
Current fallows	64	1.41
Net area sown	541	11.90

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2008-09.

The land use of the study area is varying according to the altitude. The maximum area falls under the snow cover and forest class, and the main occupation is agriculture and horticulture sector. The agricultural crops which are sown and harvested mainly include wheat, seed-potato, paddy, maize, barley, pulses, vegetables, etc. The main horticulture fruits are in the study region is apple, pear, almond, apricot, and dry fruits. The Kinnaur district is known as for the production of nuts and dry fruits. Chilgoza, medicinal and brewing herbs, and other minor forest produce support the tribal economy. The Kalpa, Ribba, and Rampur are known for the horticulture producing areas. The Solan is famous for tomato production. Bilaspur area under Sutlej catchment is related to the production in the agriculture sector.

Table 5 District wise land use patterns (In hectare) of Himachal Pradesh

Year/District	Geographical area by village papers	Forest Land	Misc. tree crops & Groves (Not included in net area sown)	Permanent pastures & other grazing lands	Culturable waste land	Land put to non-agricultural uses	Barren and unculturable land	Current Fallow	Other Fallow	Net area sown	Area sown more than once	Total cropped area
1	2	3	4	5	6	7	8	9	10	11	12	13
2009-10	4559010	1105997	68391	1503833	128224	348649	783404	59991	22109	538412	402185	940597
2010-11	4575638	1125742	64905	1507522	124121	352667	778525	57497	21294	543365	395260	938625
District – wise												
Bilaspur	111776	14013	151	39583	6061	15845	4437	1535	964	29187	27714	56901
Chamba	692419	272008	225	348869	6871	15380	4748	1942	733	41643	26132	67775
Hamirpur	110224	18232	1	11511	11199	13257	13854	5335	1540	35295	32415	67710
Kangra	577681	232520	8274	87865	28204	77669	14848	11456	1097	115748	97535	213283
Kinnaur	624216	38590	101	322043	3254	117878	132444	1513	83	8310	2336	10646
Kullu	64224	2520	3804	3911	1300	7931	3207	2604	462	38485	21112	59597
L&S	911206	137376	111	211474	568	16857	541314	108	2	3396	121	3517
Mandi	397948	175289	352	96250	4505	16567	8590	6558	1062	88775	71835	160610
Shimla	525386	149692	8898	235206	13078	19867	11521	16089	5091	65944	20524	86468
Sirmaur	224760	48682	35790	59583	11481	10548	8520	4666	5183	40307	35331	75638
Solan	180923	20271	553	77695	14980	13293	10903	2586	2896	37746	24709	62455
Una	154875	16549	6645	13532	22620	27575	24139	3105	2181	38529	35496	74025

2.3.3 Forest Area

The total area of Himachal Pradesh is 55,673 km^2, out of this 66.52% of the area of the state is legally defined as forestland. but forest and tree cover constitutes only 27.63% of the total geographical area (FSI, 2013). It has been reported that only 30.5% of the recorded forest area can support vegetation, as rest of the area is uncultivable because of terrain and snow (HPFD, 2005). State has 14683 sq km of forest cover and 697 sq. km of tree cover constituting a total of 15380 sq. km of forest and tree cover (ibid). Forests are distributed across four zones in the State- viz sub-tropical forests, sub-temperate forests, wet-temperate and dry temperate forests (GoHP, 2002).

Forest types

The forests of the state can be classified on ecological basis broadly into coniferous forests and broad-leaved forests. As laid down by Champion and Seth the forest types of the state are shown in Table 13.

Sub-tropical forests occur at an elevation up to 915 meters above mean sea level (msl) with annual rainfall between 700 to 1000 mm. These comprise of dry deciduous Sal, Chir Pine and other miscellaneous species (ibid).

Sub temperate forests are found at an elevation between 916 to 1523 MSL with an annual rainfall of 900 to 1200 mm. These include Oaks and various broad leaved species.

Wet temperate forests are found at an elevation ranging from 1524 to 2472 meters above msl with annual rainfall of 1000 to 2500 mm. The forest vegetation includes conifers, oaks, firs and rhododendron species.

Dry temperate forests are found above 2472 meters where mean annual temperature is around 10oC. Annual precipitation is about 2500 mm, most of which is received in form of snow. Species include willow, Robinia and Chilgoza (ibid).

Table 6 Forest types in Himachal Pradesh (as per Champion and Seth)

Sr. No.	Major Forest Group	Classification Code	Forest type
1	Tropical Moist Deciduous Forests	3C	Moist Shiwalik Sal forest, Moist Bhabar Sal forest
2	Tropical Dry Deciduous Forests	5B	Dry Shiwalik Sal forest, Northern Dry Mixed Deciduous forest, Dry Deciduous Scrub, Dry Bamboo Brakes, Khair Sissoo Forests
3	Subtropical Pine Forests	9C1	Himalayan subtropical Pine forests
		9DS1	Himalayan subtropical scrub
		9DS2	Subtropical Euphorbia scrub
4	Subtropical Dry Evergreen Forest	10C1	Subtropical dry evergreen forest
		10DS1	Dodona scrub
5	Himalayan Moist Temperate Forests	12	Lower Western Himalayan Ban Oak forests, Lower Western Himalayan Mohru Oak forests, Lower Western Himalayan moist Deodar forests, Lower Western Himalayan Mixed Coniferous forests, Lower Western Himalayan moist temperate deciduous forests, Upper Western Himalayan Kharsu Oak forests, West Himalayan upper Oak/ Fir forest Montane bamboo brakes, Himalayan temperate parklands
6	Himalayan Dry Temperate Forest	13/C	Dry broad leaved and coniferous forest (*Q. ilex- P.*

			gerardiana), Dry temperate coniferous – Neoza pine forests, Dry temperate coniferous – dry deodar forests, West Himalayan high-level dry blue pine forest, West Himalayan dry Juniper forest
7	Sub-alpine Forest	14/C	West Himalayan sub-alpine Fir forest, West Himalayan subalpine Birch/ Fir forest
		14/DS1	Sub-alpine pastures
8	Moist Alpine Scrub	15/C	Birch/ Rhododendron scrub forest, Deciduous alpine scrub, Alpine pastures
		15/E1	Dwarf Rhododendron scrub
9	Dry Alpine Scrub	16/C1	Dry alpine scrub
		16/E1	Dwarf Juniper scrub

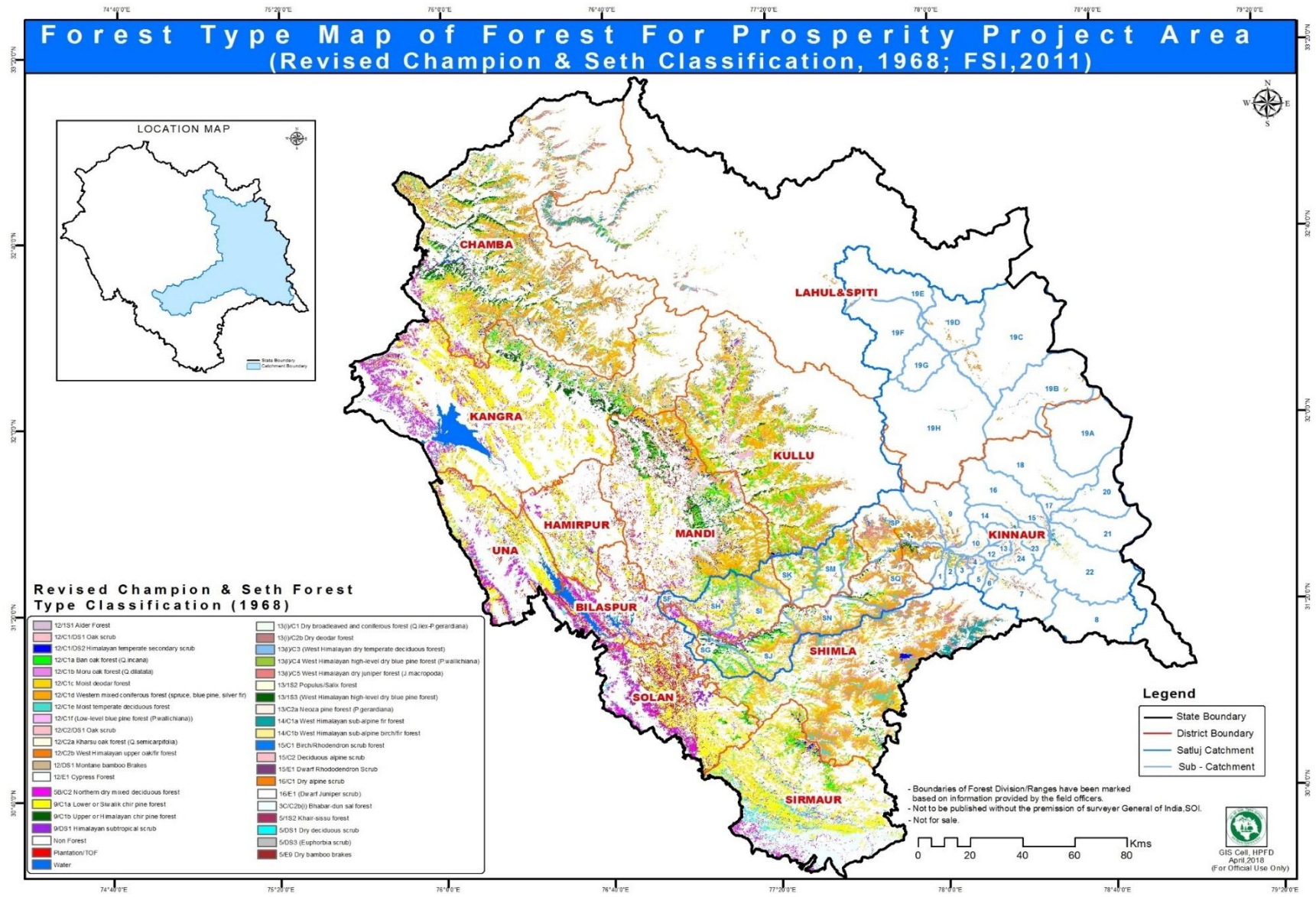


Figure 9 Forest Types of Himachal Pradesh

Forest Types in the Sutlej Basin

The Sutlej basin is known for variation in its biodiversity due to the extreme elevation variation. In the upper reaches (Spiti and Kinnaur) of Sutlej basin have the less vegetation. The major forest type of cold desert area has the Dry Alpine Scrubs especially in the elevation from 3600 to 5500 m. This region is famous for the high medicine shrubs.

The Moist Alpine Forests: Above the 3600-m elevation, these types of forest found. In this region, the dominant forest herbs are Berberies, Corydalis, Geranium, Astragalus and Cotoneaster.

The Himalayan dry Temperate Forests: The Himalayan dry Temperate Forest found in the Kinnaur district. The dominanttree species are Picea smithiana, Juniperus, Populus ciliata, Salixviminalis and Alnus India.

The Sub-tropical broad Forests: In middle basin, sub-tropical broad forest is found. The major forest is Deodar MixedConiferous Forest (1800 to 2400 m), Cedrus Deodara and mixed Coniferous Forests include pure Spruce and Kail. The sub-tropical Pine Forests: This type of forest is fund in Solan, Shimla and Bilaspur district, especially between 600 to 1700 m. the major forest types are pinus Roxburghii, Lyonia ovalifolia, Acacia catechu and Emblica officinalis, dominant shrubs as Carissa opaca, Carissa spinarum, Dodonea viscosa, Indigofera heterantha, and Rhamnus virgata.

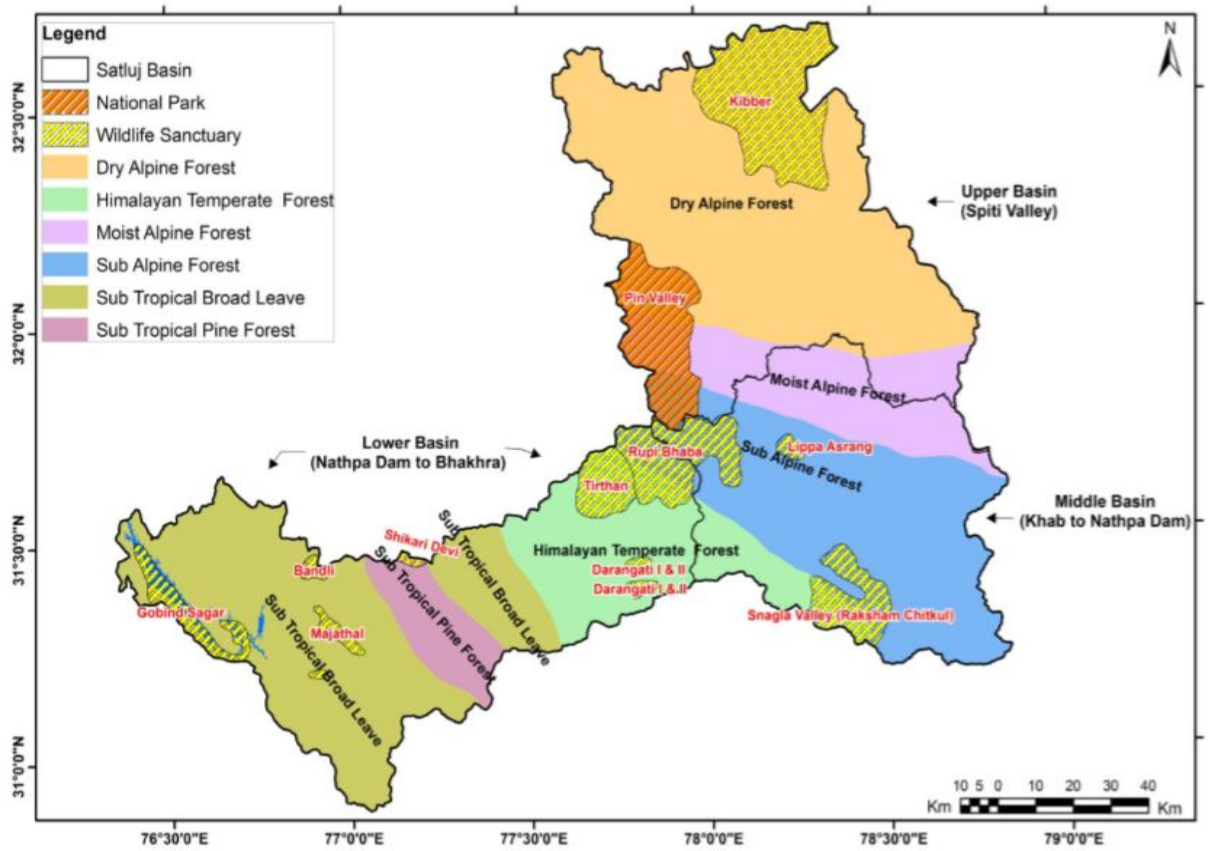


Figure 10 Forest Types in the Sutlej Basin

Forest Classification

Forests fall under three legal categories of reserve, protected and unclassed forests. The reserve forests offer minimum rights of use for local people. These are managed for environmental protection and

biodiversity conservation. The protected areas such as national parks and wildlife sanctuaries come under this category of forests. The protected forests recognize many rights including timber, grazing and non-timber forest produce for local people. Almost 90% of the state forests fall under this category, 57% of the protected forest areas have not been demarcated i.e. their limits have not been set through legislative orders. The unclassed is a category of forest in transition i.e. after surveys and settlement of rights, these could be either shifted to reserve or protected forest category (Vasan, 2001).

Table 7 Legal Status of Forests in Himachal Pradesh

Forest Classification	Area (Km^2)	Percentage
1. Reserved Forests	1896	5.12
2. Demarcated protected Forests	11387	30.75
3. Un-demarcated Protected Forests	21656	58.48
4. Unclassed Forests	976	2.63
5. Others (managed by Forest Department	370	1.00
6. Not managed by Forest Department.	748	2.02
Total	37033	100.00

Table 8 Legal Classification of Forests in Project Districts

District	Geographical Area	Total Forest Area	%age of the total area	Reserved Forests	Protected Forests	Unclassified forest
Kinnaur	6,401	5093	79.57	-	5092.61	-
Kullu	5,503	4952	89.99	160.52	4791.17	-
Mandi	3,950	1860	47.09	1,575.57	284.45	-
Shimla	5,131	3418	66.61	53.46	3310.38	-
Solan	1,936	728	37.60	53.55	502.05	165.77

Forest Density

Comparable data on forest density categories is available from 2005 to 2013 in India, hence this is the best period to study such change. In case of Himachal Pradesh, the area under very dense forest cover has been stable from 2005 to 2013. Area under the category of moderately dense forests has slightly declined during this period. The open and scrub forest area constitute 35% of the total forest cover. The open forest area has slightly increased whereas area under scrub vegetation has decreased for the period. Overall open and scrub forest area has slightly declined, which could be attributed to the plantations in the State. Some of the key factors behind the forest degradation are demand and supply gap of forest products, shifting cultivation and forest fires, which have been discussed in detail in the report.

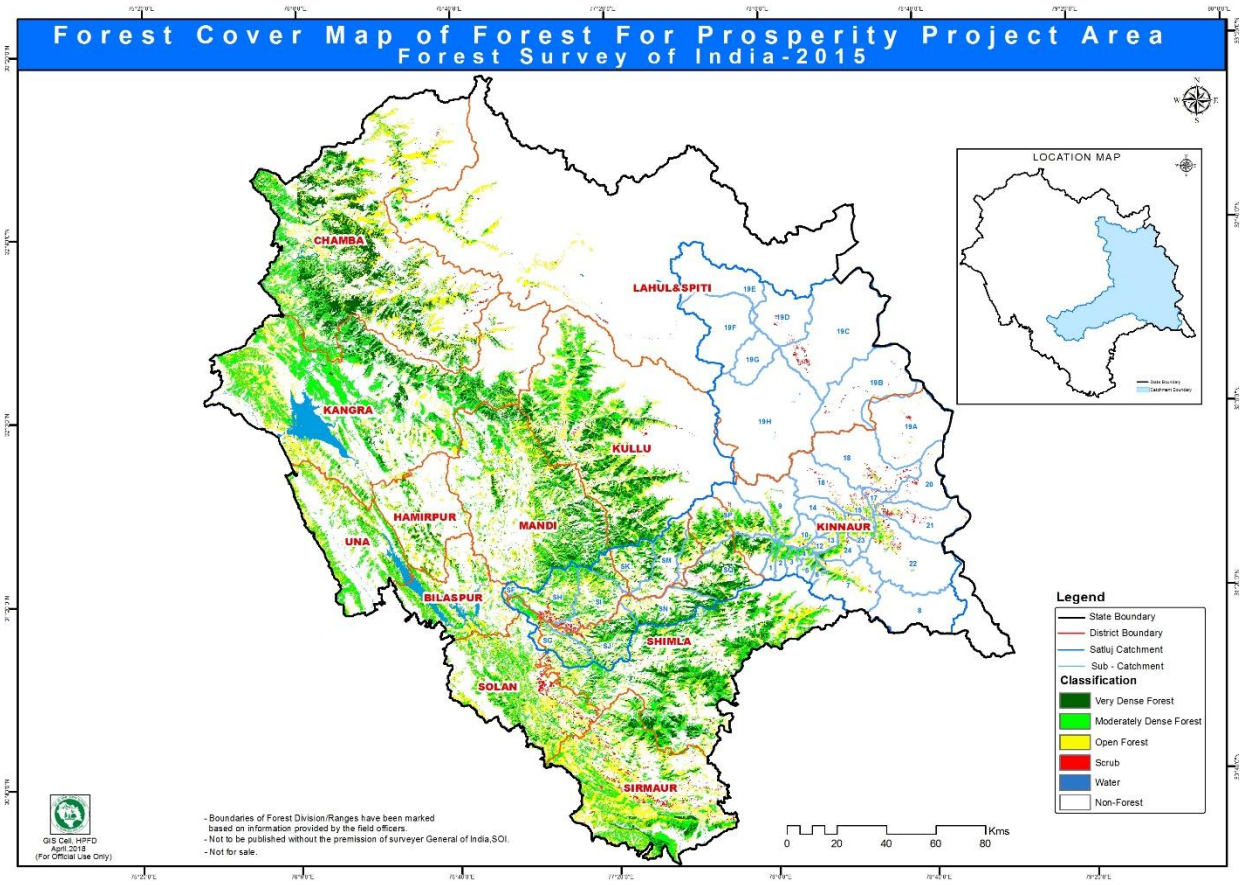


Figure 11 Forest/ Canopy Density Map of HP

Table 9 Geographical Distribution of Forest Density (As per FSI Report 2015)			
	Area (sq.km)	% geographical area	% of forest area
Very Dense Forest	3224	5.79	8.7
Moderate Dense Forest	6381	11.46	17.23
Open Forest	5091	9.14	13.74

Table 10: Project District Forest Density 2015

Table 10 Project District Forest Density 2015 (Area in Km^2)							
District	Geographical Area	Very Dense Forest	Mod. Dense Forest	Open Forest	Total	% Geographical area	Change compared to 2015 FRA assessment
Kinnaur	6401	82	262	260	604	9.73	14
Kullu	5503	79	266	278	623	33.11	22
Solan	1936	46	426	394	866	44.73	16
Shimla	5131	736	1039	624	2399	46.76	9
Mandi	3950	368	722	671	1761	44.58	84

	Table 11 Change in Forest Cover 2005-2017 (ISFR 2017)						
	Category	*2005*	*2007*	*2009*	*2011*	*2013*	*2017*
1	Very Dense	3224	3224	3224	3224	3224	3110
2	Moderately Dense	6386	6383	6383	6381	6381	6705
3	Open Forest	5056	5061	5061	5074	5078	5285
4	Scrub	331	327	327	328	298	308

Flora

The hills contain western Himalayan broadleaf forests and Himalayan subtropical pine forests. Various deciduous and evergreen oaks live in the broadleaf forests, while chir pine dominates the pine forests. Western Himalayan subalpine conifer forests grow near tree line, with species that include East Himalayan fir, West Himalayan spruce, deodar (the state tree), and blue pine.

The higher elevations have western Himalayan alpine shrub and meadows in the northeast and north western Himalayan alpine shrub and meadows in the northwest. Trees are sturdy with a vast network of roots. Alders, birches, rhododendrons and moist alpine shrubs are there as the regional vegetation. The rhododendrons can be seen along the hillsides around Shimla from March to May. The shrub lands and meadows give way to rock and ice around the highest peaks. The southern part of the state, at lower elevations has both tropical and subtropical dry broadleaf forests and tropical and subtropical moist broadleaf forests.

Table 12 Flora in different zones (Altitude) of H		
Classification based on latitudinal Zones		**Flora of Himachal Pradesh**
1. Lower Motane Zone (up to 1,000 m)	A. Trees B. Shrubs C. Grasses	Khair, Siris, Kachnar, Semal, Tun, Mango, Behul, Shisham, Ritha, Tut, Behera,Chil, Vitex, Munj, Ber, Ipomea, Dodonea, Bamboo, Vetiver, Saccharum, Munj.
2. Middle Motane Zone (From 1,000 m to 2000 m)	A. Trees B. Shrubs C. Grasses	Kunish, Poplar, Willow, Ohi, Robinia, Drek, Kail, Chil, Toon, Behmi, Chulli, Walnut, Khirik. Vitex, Berberis, Carissa. Lolium, Dactylis, Phleum & Phalaris.
3. Temperate Zone (From 2,000 m to 3,000 m)	A. Trees B. Shrubs C. Grasses	Deodar, Fir, Spruce, Maple, Ash, Bhoj Patra, Horse Chestnut, Alder, Robinia, Poplar, Walnut. Berberis, Festuca, Dactylis, Bromus, Lucaerna, white Clover, Red Clover & Dioscorea.
4. Alpine Zone (Above 3,000 m)	A. Trees B. Shrubs C. Grasses	Birch, Juniper, Cypress, Willow, *Saussurea costus, Cotoneaster microphylla, Artemisia* spp., *Festuca arundinacea* & *Dactylis glomerata*.

Natural Habitats

Protected Areas

Himachal Pradesh supports 463 bird and 359 animal species, including the leopard, snow leopard (the state animal), ghoral, musk deer and western tragopan. Himachal Pradesh has two National Parks, (Great Himalayan National Park and Pin Valley National Park, (The Great Himalayan National Park in Kullu district was created to conserve the flora and fauna of the main Himalayan range, while the Pin Valley National Park to conserve the flora and fauna of the cold desert), 30 Wildlife Sanctuaries, and 3 conservation reserves. Of which two wildlife sanctuaries fall within the project area. Detailed baselines are provided in Annexure 9 & 10. The Majthal Sanctuary is situated in Solan District and has steep and rugged terrain. The sanctuary is about 10 km on the kacha road Kararaghat (Shimla-Bilaspur Highway) to Kashlog. The sanctuary is said to have a large population of endangered cheer pheasant, and there is also a large goral population. Rupi-Bhaba Wildlife Sanctuary is locally well known for its vast and extensive alpine pastures above 3500m.

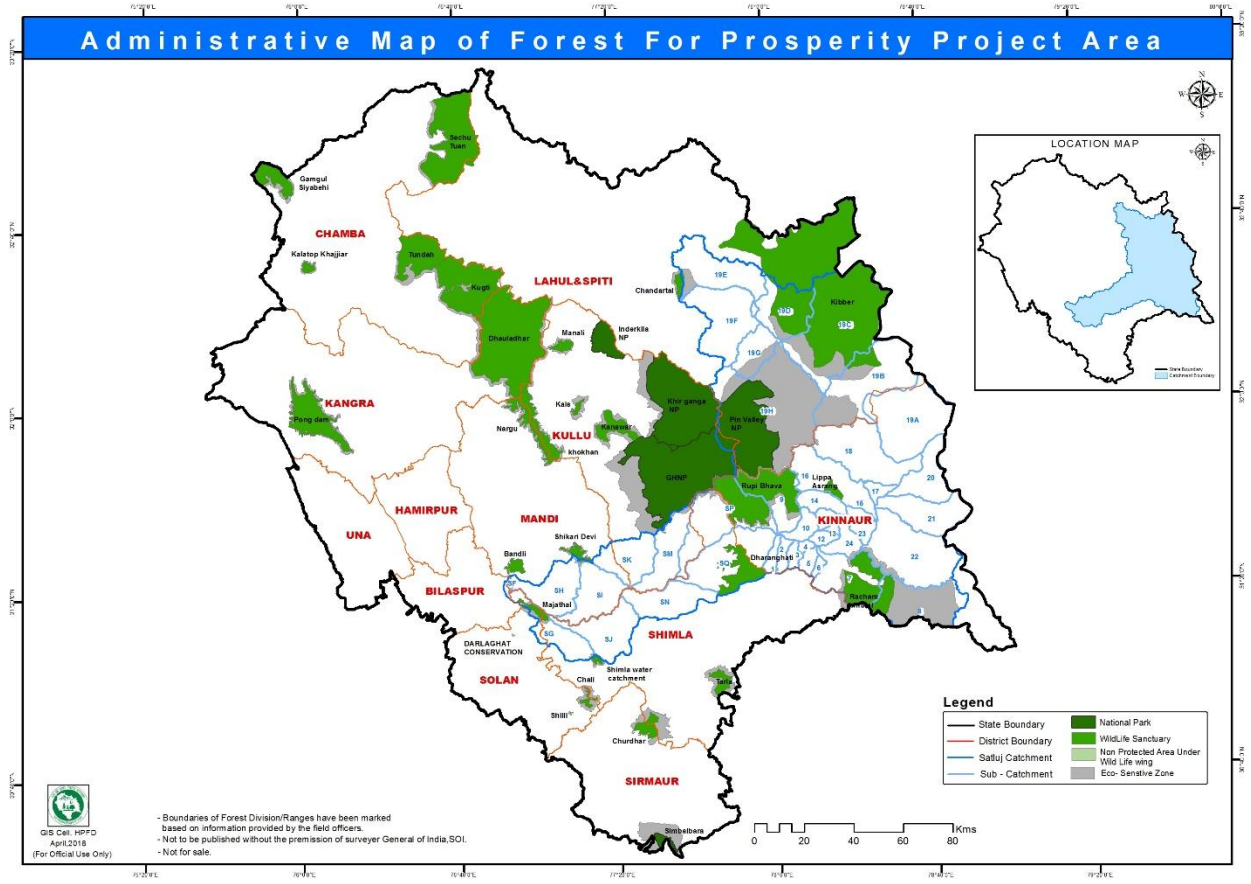


Figure 12 Protected Areas in HP and Project Area

Table 13 List of Protected Areas in FFP project area

Sl. No.	Protected Areas	Area (sq km)	District (s)	Fauna
1	Majathal WLS	57.55	Solan	Deer, Bear, Cheer pheasant
2	Rupi Bhaba WLS	738.00	Kinnaur	Serow, blue Sheep, red Fox, musk deer, Goral, ibex, Leopard, snow Leopard, brown Bear, Himalayan black Bear

Important Bird Areas (IBAS)

Himachal Pradesh lies in the Western Himalayas Endemic Bird Area (EBA 128) has an area of 0.71 million ha (12.87%) under the protected area network, that comprises two national parks and 32 wildlife sanctuaries, covering 0.14 million ha and 0.57 million ha respectively. The Great Himalayan National Park and the PinValley National Park have been identified as IBAs, and of the 32 wildlife sanctuaries, 24 are IBAs. Two non-protected areas are also considered as IBAs (Table 17).

Eleven species are confined EBA: 128, out of which ten are known to occur in this State with confirmed records. They are: Western Tragopan, Cheer Pheasant, Brook's Leaf Warber *Phylloscopus subviridis*, Tytler's Leaf Warbler *Phylloscopus tytleri*, Kashmir Flycatcher *Ficedula subrubra* (vagrant), Whitecheeked Tit *Aegithalos leucogenys*, White-throated Tit *Aegithalos niveogularis*, Kashmir Nuthatch *Sitta cashmirensis*, Spectacled Finch *Callacanthis burtoni* and Orange Bullfinch *Pyrrhula aurantiaca*. Ten globally threatened bird species are found in the different IBA of Himachal Pradesh State representing the West Himalayan Endemic Bird Area: 128. Out of these 02 species are placed under Critically Endangered, 05 species are Vulnerable and 03 Species are Near Threatened.

Table 14 Important Bird Areas of Himachal Pradesh

IBA site codes	**IBA sites names**	**IBA criteria**
IN-HP-15	Majathal Wildlife Sanctuary	A1
IN-HP-20	Rupi Bhaba Wildlife Sanctuary	A1, A2

Fauna

Out of the total 527 faunal species recorded in the Sutlej basin, 26 species are listed under „Critical Faunal Species" category of IUCN including 1 amphibians, 12 birds and 13 mammalian species. Of these, 5 species are Critically Endangered (4 birds and 1 mammal), 4 species are endangered (1 bird and 3 mammals) and 17 species are Vulnerable species (1 amphibian, 7 birds and 9 mammals). Among the 19 species of reptiles recorded, 8 species fall under the various appendices of the Indian Wildlife Protection Act (1972). Of the 368 species of bird species documented from the study area, 11 birds fall under "Schedule-I" category of the Indian Wildlife Protection Act (1972). Among the 64 mammals recorded, 55 species fall under various schedules of Indian Wildlife (Protection) Act, 1972. Of the total 55 species, 22 species fall under Schedule-I. Out of the total 527 faunal species of different taxonomic groups recorded, one species of amphibian, 5 species of reptiles, 32 species of birds and 29 species of mammals are listed in various appendices of CITES. An analysis of Sutlej basin fauna based on the National Red data Book (1994) showed that among the 64-mammalian species, 21 mammals were enlisted under

various categories. Of the 21 species, only one species falls under "Critically Endangered Category", 7 species fall under the category "Endangered" and 13 species under "Vulnerable" category.

2.3.4 Pastures and Grazing Areas

The permanent pastures including alpine meadows form a very important and stable ecosystem, and cover more than 12,000km^2 and constitute 21% of state geographical area. Various natural scrub forests cover an area of 566km^2 and constitute another 1% of the state geographical area. Both alpine and scrub pastures provide important habitats to medicinal and aromatic plants in the state. HP land use estimates indicate the area under permanent pastures and grazing lands was 1,163,402 Ha (11,634 km^2) in 1966, 1,193,602 (11,936 km^3) in 1995 and 1,471,536 (15,190km^2) in 2000. The increase in alpine pasture are recorded in 4 districts (Shimla, Kinnaur, Lahaul and Spiti, Una, and Hamirpur) where settlement operations have been fully or partially completed, otherwise all other districts show a decrease.

Table 15 Pasture Areas in Project Districts

	Area in Year 1994-1995	Area in year 1999-2000	Area in Year 2001-2002	Change
Kinnaur	160,619	318,352	318,131	*Increase*
Kullu	-	-	-	-
Mandi	97151	96624	96383	*Decrease*
Shimla	200803	203047	248660	*Increase*
Solan	78711	77496	78572	

Source: SOER Himachal Pradesh

Pastures are typically grazed throughout the summer, in contrast to meadow which is ungrazed or used for grazing only after being mown to make hay for animal fodder. Pasture in a wider sense additionally includes rangelands, other unenclosed pastoral systems, and land types used by wild animals for grazing or browsing. The main grasses found in sub alpine pastures include *Agropyron longeristatum*, A. Semicostatum, Bracypodium syvaticum, Bromus asper, B, Japonicus, Dactylus sp., Danthonia sp, Festuca sp, Milium effucsum. Alping pastures are composed of mesophytic herbs and little grasses such as Primula, Anemone, Fritillaria, Iris and Gentiana spp. At higher altitudes herbs, such as edum crassipes, Primula minutissiuma, Saxifraga imbricate, Potentilla Fruticoca. Alpine scrub, which ajoins the dry tempertate forests come under heavy grazing pressure. Continuous grazing in forest areas, with lack of green fodder in agricultural fields diminished the productivity and gives rise to bushes and weeds such as Lantana and Ageratum.

Pastures can be kept in good health conditions by controlling weeds, controlled burning, and most importantly, managing livestock. Implementing pasture management and grazing principles will increase forage yield and quality, provide a healthier place for livestock.

Issues associates with pasture management are:

a. *Excessive exploitation:* Excessive grazing by domestic animals and stray cattle beyond the carrying capacity of pastures; untimely grass cutting before their seeding affecting their regeneration capacity result into invasion of alien species in grasslands; giving rise to loss of vegetative cover and soil erosion. Conflicts of villages with trans-human pastoral tribes who digress from their traditional paths (where they hold grazing rights) to other areas in search of grass

b. *Harvesting practices:* communities not only harvest fodder for their own use but also for selling it within their village or in other villages nearby. Villages situated near dense forest areas with limited fodder supply or on northern slopes with less fodder production capacity are at a disadvantage.
c. *Burning of pastures*: Traditionally, communities resort to controlled burning of pastures for getting fresh blades of grass during summer, just before the rains. Sometimes, these fires go beyond control thereby damaging forest areas. These fires not only destroy forest ecosystems but also affect the supply of NTFPs thus decreasing livelihood resources of forest-dependent communities. Forest fires, especially in pine areas, are a matter of conflict and concern both for communities and the Forest Department. While the Forest Department is ill-equipped to tackle, and extinguish forest fires, the affected communities lose important forest resources forever for a temporary gain of some green pastures after the rain.

2.3.4.1 Weeds and invasive species

Himachal's landscape and pastures are under threat by invasive species and weeds , and this has become a cause of serious concern from the ecological, biodiversity, socio-economic and health point of view. Key species of concerns are ***Lantana camara*** L. ; ***Parthenium hysterophorus*** L.; ***Ageratum conyzoides*** L; ***Eupatorium adenophorum*** Sp. These invasives are a major issue in the subtropical and lower temperate areas in the State, and affect the quality of forests and the pasture lands, and availability of fodder.

Lantana alone has invaded 150,000 hectares of forest lands, it is the major invasive/noxious species of forest habitats under the administrative control of HP Forest Department. Parthenium, Ageratum and Eupatorium occur over 50,000 hectares of forests, and are the major exotic weed species along road sides and on lands classified as barren, culturable wastes and fallow. Whereas the incidence of Parthenium is largely restricted to degraded and newly opened drier sites along roads and forest fringes, the other three invasive alien species tend to occupy all possible vacant places even under tree canopy.

Table 16 Description of Weed Infestation in Forest Areas

Table 17 Description of Weed Infestation in Forest Areas

Description of land	Estimated Infestation of Invasive Alien Species (Area ha.)		Total (Area ha.)
	Lantana	**Others** (*Parthenium*, *Ageratum*, *Eupatorium*)	
Forest land	1,50,000	50,000	2,00,000
Road sides	2,000	8,000	10,000
Lands classified as barren; culturable wastes & fallow	25,000	1,25,000	1,50,000
Total (Area in ha.):	**1,77,000**	**1,83,000**	**3,60,000**

Management methods involve mainly mechanical removal of the exotic weeds, past efforts have not yielded desired results due to lack of focus on long-term follow up system. Chemical methods (involving mainly application of glyphosate) at control of Lantana/ Parthenium were abandoned after initial trials due to concerns about their adverse environmental implications. Associating Lantana removal to use has also not found favour with the local communities, the outputs/ returns from using cut Lantana for

furniture, briquetting or composting being not considered commensurate with the effort required for its use.

2.3.5 Fuel Wood and Fodder

Forests play an important role in social, cultural and economic life of the people in the state (DoEST undated). Approximately 90% of the population in the state live in rural areas, most of which depend on the forests for their livelihoods (ibid). Hence, a large forest area in the state has to be surveyed and legally settled. More important, forests have long been a major natural resource available to people living in their vicinity, being a significant source of wood and other non-wood products, such as edible items, fodder, fuelwood, medicinal plants, roofing materials, fiber for ropes, and so forth. Historically, this dependence has been for both consumption and a source of income. Barring a few NTFPs of high commercial values, a substantial amount of such dependence provided by both cultivated and natural forests is often not included in national accounts. On the other hand, many nonmarket services are wrongly attributed to other sectors of the economy.

There is a substantial demand and supply gap in fuel wood and fodder in Himachal Pradesh. This leads to a vicious circle where the unsustainable exploitation of forests contributes to their degradation which in turn reduces the supply of products and services.

It has been reported that 93% of the population of Himachal Pradesh use fuel wood as a source of energy (Parikh, 2009). 94% of the fuel wood users in the state collect it from forests. As per official estimates, 46 MT of fuel wood was extracted from the forests in Himachal Pradesh in 2008-09, Actual fuelwood extraction is much higher and is harvested far beyond the sustainable levels.

Various studies underscore the relation between unsustainable extraction of fuel wood and degradation of forests (for example Bhattacharya and Joshi 2000; Heltberg et al. 2000). Unsustainable extraction is a consequence of both demand factors- increasing population, inefficient use of fuel wood, and lack of energy alternatives for poor households- and supply side issues, which include low productivity of forests (MoEF 2006).

Fodder in the form of grasses and hay/ tree leaves and young stems etc. are collected for animal feed. The fodder statistics vary in different altitude zone and season. There are 5.23 million cattle with highly inadequate pasture area in Himachal Pradesh (FSI 2011; DoEST undated-b). It makes more than 90% of the forest area in the state open for grazing, which arguably has put pressure on its quality (DoEST undated). The lowest amount of fodder 41.25 kg household^{-1} day^{-1} is collected during winter season in the middle altitude and the highest amount of fodder 83.27 kg household^{-1} day^{-1} is collected during summer season in the high-altitude villages). The variation of fodder collection due to high altitude villages are in close vicinity of the forest and thus collect more fodder as compared to lower and middle altitude villages. The peoples of middle and lower altitude collect maximum fodder from their farmland and on farm trees. During rainy season the fodder consumption was found highest and during winter the lowest. Fodder consumption (animal^{-1} day^{-1}) is highest 21.77 kg in the higher altitude zone followed by 16.96 kg in middle altitude and 16.65 kg in lower altitude zone . The total annual consumption of fodder was found highest (7946.05 kg) at the high altitude and lowest (6077.25 kg) at the lower altitude villages (Table 22) (Dhanai et al. 2014). The details on the district wise livestock data in presented in Table 23.

Table 18 Fodder Collection (Kg) household^{-1} day^{-1} from different altitudinal zones in Himalaya

Season	Altitudinal Zone (m, amsl)								
	500-1000			1000-1500			1500-2000		
	Dry	Green	**Total**	Dry	Green	**Total**	Dry	Green	**Total**
Winter	20.95	28.08	**49.03**	22.00	19.25	**41.25**	22.45	20.05	**42.50**
Summer	22.00	43.50	**65.50**	30.30	64.19	**94.49**	28.00	55.27	**83.27**
Rainy	00.00	55.40	**55.40**	00.00	81.70	**81.70**	00.00	65.10	**65.10**
(Mean)	**21.47**	**42.32**	**56.64**	**26.15**	**55.04**	**72.48**	**25.22**	**46.80**	**63.62**

Table 19 Fodder Consumption (Kg) animal^{-1} day^{-1} in different seasons at different altitudinal zones in Himalaya

Altitudinal Zone (m, amsl)	Seasons			Average Consumption Animal^{-1} Day^{-1} (Kg)	Annual Consumption Animal^{-1} (Kg)
	Winter	Summer	Rainy		
605-1000	12.37	15.43	22.16	16.65	6077.25
1000-1500	16.40	17.12	17.38	16.96	6190.40
1500-2301	18.33	20.96	26.04	21.77	7946.05
Mean	**15.70**	**17.83**	**21.86**	**18.46**	**6737.90**

2.3.6 Non-Timer Forest Products and Medicinal Plants

Non-Timber Forest Products (NTFPs) are, in broadest sense, any biological resources collected from wild by rural people for direct consumption/income generation on a small scale. They include such as wild edible foods; **medicinal plants;** floral greenery; horticultural stock; fibre of plants; fungi; resins; fuel wood; small diameter wood used for poles, carvings, etc. Interests in NTFPs were predicated upon a few assumptions which includes commercial exploitation of NTFPs is less ecologically destructive than timber harvesting and thus has greater potential for sustainable forest management; local forest users exploit forest resources wisely and sustainably and NTFPs will more directly benefit people living near forest compared to timber harvesting.

There has been increasing recognition of NTFPs contribution to household and national economies and environmental objectives including biodiversity conservation. For example, a study by MEA (2005) estimated that up to 96% of the values of forest are derived from NTFPs and services. Also, they have been recognized internationally as an important element in sustainable forestry. The United Nations Conference on Environment and Development in 1992 identified sustainable forest management as a key element in sustainable economic development and set out nonbinding guidelines for sustainable forest management with specific inclusion of NTFPs.

By valuing the NTFPs the ecologists tried to answer how to make forest resource economically attractive to local people to reduce deforestation. NTFPs were among options considered best strategies to raise

income for local people from forest while addressing conservation objectives. Since then, sustainability of NTFPs extraction has been topic of debate due to the underlying objective of development and conservation are basically linked. International Plant Genetic Resources Institute (2004) argued that contribution of NTFPs to livelihoods of rural communities is likely to persist as long as the resources are exploited on sustainable basis. This has led in a global move towards developing management of natural forest for the benefits of local communities (Table 28 & 29).

Many species have high prices/high value, but collected in relatively small quantities. The market is highly unregulated with much raw materials extracted and exported out of HP State unreported and unrecorded. Market demand outstrips supply as Ayurveda / natural and organically produced herbs for health and medicinal purposes is rapidly growing. Supply is dwindling with some species collected close to extinction and are now rare in the wild, through both over extraction and unscientific collection.

Village level processing and value addition is limited using simple and often old technologies for oil extraction. Grading is often poor due to incorrect picking. Little grading is carried out at the village level due to 1) lack of knowledge of grades and 2) no price incentives to grade produce correctly. Drying is often done in the open air in un-sanitary environments and packaging materials are basic. Collectors gain some 20-25% of annual income from seasonal collection of MAPs with involvement of women and children close by and men usually collecting far from the village. Wholesale markets are very competitive with many buyers and sellers and margins tight once raw materials are exported out of the State.

Table 20 Value of major forest produce of Himachal Pradesh

Major Forest Produce	**Unit**	**Year wise Out-turn and value of major forest produce**			
		2013-14		**2014-15**	
		Out turn	Value (in Rs '000)	Out turn	Value (in Rs '000)
1.Teak	Cubic meter	0	0	0	0
2. Shisham	-do-	1006	23853	1044	24754
3. Sal	-do-	14122	211223	9296	139040
4. Deodar	-do-	14818	705692	47855	2675286
5. Chil	-do-	104455	1945997	82723	1746862
6. Kail	-do-	26001	989182	27232	1036526
7. Fir/ Spruce	-do-	48748	1093759	55111	1236526
8. Other BL	-do-	35933	139492	19627	76192
Total Industrial Wood	-do-	245083	5109198	242288	6934674
Fuel wood	-do-	253	404	1454	6668

Source: Forest department H.P.

Table 21 Out-turn and value of major forest produce[4]

Major Forest Produce	Unit	Year wise Out-turn and value of major forest produce			
		2013-14		2014-15	
		Out turn	Value (in '000)	Out turn	Value (in '000)
1. Bamboo	Ha	-	-	-	-
2. Resin	Ton	5389	85451	5258	83262
3. Bhabbar Grass	-do-	-	112	-	350
4. Medicinal Herb	-do-	1243	118386	1558	159444
5. Khair	-do-	2131	92092	1586	68580
6. Other minor products	-do-	-	903	-	1981
Total	-do-	-	296944	8402	313577

Source: Forest department H.P

It is clear that transport systems are reaching further into remote areas, catalyzing forest and woodland clearing for different purposes and this result in the loss of supplies of wild harvested species as habitat declines. Since the 1960's, growing demand from urban areas has catalyzed NTFPs trade, drawing resources from rural areas to towns and cities, for fuel wood, building materials, medicinal or edible wild fruit species (SCBD, 2001). Local communities in Himachal Pradesh have the right to harvest NTFPs from the wild (except those that are nationalized such as Resin and Bamboo). Apart from time spent to walking long distances and collect NTFPs, the income gained is considered net profit to the collector. This is because there has been no major investment in terms of seed, inputs, labour in crop cultivation, that has to be deducted from gross sales that would occur if the crop was cultivated.

However, this collection is often unsustainable and impacts livelihoods in the long run. When market demand and prices offered are high, certain medicinal plants have been over harvested to the point of being threatened with extinction. A boom cycle of high demand and high prices results in a depletion of medicinal plants to the extent that they disappear entirely from certain areas. Further, local communities have been unable to take advantage of the high value and high demand for certain medicinal plant species as they collect and sell the produce individually at the price offered by the local agent who, in turn, gets this price dictated to him by larger traders and companies operating in the national and international market.

According to Chamberlain et al. (2002) three major institutional weaknesses were important to have impact on sustainable forest management efforts. First, staff levels and expertise were inadequate to

[4] Quantity and value shown does not include the information of medicinal herbs extracted/ sold through panchayats and value is estimated.

deal with non-timber forest products. Second, institutional impediment to sustainable management of NTFPs was that the biological materials from which these products originate are not recognized nor treated as other natural resources (such as timber, and minerals) and third, lack of funding to support sustainable forest management activities.

Forest based small-scale industries are most useful for women because they can be undertaken as an extension of household activities. These activities can potentially empower women by giving them flexibility and control over their livelihood with the household as the economic base (Campbell, 1991). In Kullu district the *bartandars* (the right-holders for collection of forest resources) are free to collect any volume of medicinal plants without informing the forest department. Whereas in Chamba district the right holders seek for the permission of collection from the concerned Forest Range Office, thorough a written application forwarded by panchayat. In some parts of Shimla and Kinnaur district, the extraction of medicinal plants by employing wage labourers are often done by the contractors. In Kinnaur district large areas of private forest-lands are leased out to the contractors, who in turn extracts various forest produces from the forest by employing wage labourers.

The important medicinal plants are Gucchi (morchella esculenta), Mushakbala (valerina wallichii), Belladona (Atropa spp.), Chora (Angelica glauca), Bichhu buti (Geradiana heterophyllus) and kapoor kachri (Hedychium acuminatum) The most important species collected from High hills/ dry temperate zone are dhoop (Jurinea macrocephela), Patish (Aconitum spp.), Rewand chini (Rheum emodi), Dorigrass (Potentilla nepalensis), Salampanja (Orchis latifolia), salam mishri (Polygenatum vertiuilliem), sathjalori (Ainaliaea aptra), karoo (Picorhiza kuroo), bankakri (Podophyllum emodi), kashmiri patta (Rhododendron compannlatum), kuth (Saussurea lappa), Seski (Artemesia spp.) and Thuth (Polygenatum vertiuilliem).

(Zone 1 & 2)

Herbs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Bach			*****	*****	*****							
Banafsha				*****	*****	*****	*****					
Brahmi				*****	*****	*****			*****	*****	*****	*****
Dioscorea							*****	*****	*****	*****		
Harar, Bahera, Amla	*****									*****	*****	*****
Kakar singhi									*****	*****	*****	
Neelkanthi								*****	*****			
Patela							*****	*****	*****	*****		
Tejpatta	*****	*****	*****									*****

(Zone 3 & 4)

Herbs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Dhoop, Ratan Jot								*****	*****	*****		
Gucchi, Kashmiri Patta				*****	*****	*****	*****					
Panja, Karoo, Patis								*****	*****	*****		
Kuth, Thuth, Mathosar,								*****	*****	*****		
Salam mishri, Van kakri							*****	*****	*****	*****		
Mushakbala						*****	*****	*****	*****			
Rakhal									*****	*****	*****	
Sapdotri							*****	*****	*****	*****		
Mehandi							*****	*****				
Chora								*****	*****	*****		

Source: ISST Survey 1998 and Navrachna

Figure 13 Collection calendar for important NTFPs/ MAPs

2.3.7 Forest Nurseries

Nurseries are the backbone of any forestry activity for ensuring adequate and timely supply of quality seedlings. Nurseries can also be used for ex-situ raising and conservation of genetic resources of desired and threatened plant species. Besides, it is a training ground for the communities and other stakeholders about forest activities. Typically, nurseries operate using traditional method for producing seedlings in polybags of different sizes filled with heavy soil mixes. Recently, tall seedlings /2-3 ft. plants are being raised to be transplanted in the field as they have a better survival rate. Due to recent project funded by KfW, modern nursery technologies are being proposed, such using root trainers, elevated production and light growing media with high portion of air-filled-porosity is a necessity.

Himalayan Forest Research Institute, Shimla has initiated studies on the assessment and related management practices in Alpine pastures of Sutlej basin including morphological parameters of assessing quality nursery stock for getting higher survival in the field. Shoot length is widely used parameter for determining the quality of the stock in the nursery. On the basis of height; nursery stock is graded into different categories. In case of Deodar nursery stock with height more than 9" is considered fit for planting out. As per H.P. Forest Manual, Volume –IV (1986) the size and age of the stock for planting varies with the site and the species. No plant with less than 20 cm in length should ordinarily be used. Exposed areas and sites subject to drought and excessive weed growth must be planted up with large plants. Ordinarily Deodar seedlings should be planted out when 1½ years old, but in difficult and weedy areas, 2½ years old transplants pricked out once should be used. However, Luna (1996) reported that Deodar nursery stock of 1½ Years old should be of 20-25 cm and that of 2½ Years old should be of 30-45 cm height at the time of out-planting. According to Forest Department Manual IV, all planting material (seedlings/stumps) should meet the following criteria. Seedlings should (i) have straight, undamaged and unforked stems (ii) have the stem well lignified for at least half their length (iii) have healthy green leaves (iv) from insect pest and diseases. The transportation of seedlings in polythene bags from nursery to the plantation site is an important factor in deciding the site of the nursery. To reduce the transportation cost, chir pine seedlings are mostly raised in temporary nurseries located near the plantation sites. Other factors to be considered in deciding the nursery site are (i) availability of sufficient water for seedling irrigation particularly during dry months of May and June (ii) sites should be open and sunny. Nurseries for 25000-35000 seedlings requiring an area of about 0.05 ha are more economical than smaller ones. To produce 1000 seedlings an effective nursery area of ten square metres is needed. The HP forest department has also issued an SOP document for raising tall plants in forest nurseries. The status of the HP Forest nursery and species grown are given below.

The following table gives the months in which seed of important species are collected and sown in the nurseries.

Table 22 Species and Sowing Time

Species	Month of Seed collection	Sowing Time
Abies pindrow	Sep - Oct	Preferably early in December otherwise on melting of snow
Acacia catechu	Jan - Mar	End of June
Aesculus indica	Sep – Oct	Early in December
Bauhinia variegata	May	As soon as seed is collected
Cedrela toona	May - July	As soon as seed is collected
Cedrus deodara	Sep - Oct	Preferably early in December otherwise on melting of snow
Dalbergia sissoo	Nov - Mar	Early in March
Dendrocalamus strictus	May - June	As soon as the seed is collected
Juglans regia	Oct - Nov	December to February
Melia azedarach	Jan - Feb	Soon after the seed is gathered
Picea smithiana	Oct - Nov	Preferably early in December otherwise on melting of snow
Pinus wallichiana	Sep - Nov	Preferably in early December otherwise on melting of snow
Quercus	Dec - Feb	Early spring
Terminalia belerica	Feb	Early spring
Terminalia chebula	Jan - Mar	Early spring

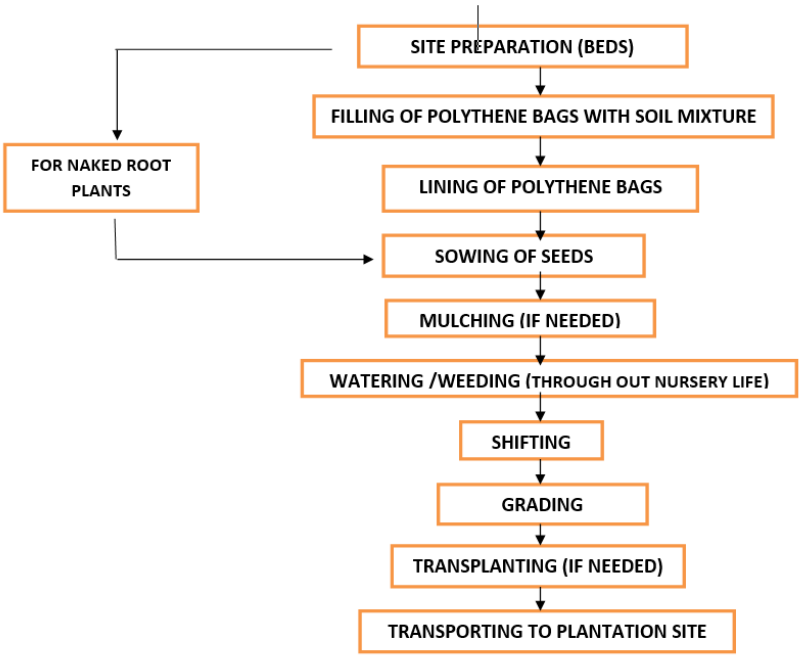


Figure 14 Step Wise Seedling Development Practice in Current Nursuries

The figure above depicts the typical process of raising plants in exiting forest nurseries, overall, nursery management can be improved through (i) integrated pest and disease control techniques (ii) selection of only healthy seedlings to be transported to the planting site (ii) Sowing of seeds sterilized/fumigated, clean beds and adequate watering (iv) Using sterilized budding knife, secateurs, and scissors during budding and grafting (v) keeping planting material under proper sunlight, watering and clean environment (vi) Providing Mycorrhizal inoculums (soil health) for raising quality stock of forestry species in high tech and central nurseries. Common Pests include White grubs, Cutworms, Termites, Crickets and Grasshoppers, Defoliators. Common Diseases include Damping-off (pre-and post-emergence), Collar rot, Root rot, Foliage diseases.

Table 23 Details regarding nurseries in the different ranges of Rampur and Kinnaur

Name of Division	Name of Range	Name of Block	Name of Beat	Name of Nursery	Area in ha.	Stock of Nursery		Infrastructure of Nursery							
						Name of species	No. of plants	Mali Hut	Vermi compost Unit	Water storage Tank	Poly house	Root trainer	Approach road	Store	Fencing
Rampur	Rampur	Deothi	Deothi	Deothi	0.60	Robinia, Deodar & Khanoor.	29000						√		
		Rampur	Jakhari	Jhakri	0.60	Ban, Daru, Kainth, Jamun, Amla Paza, Ritha, Chil Behmi Tun & Dreak	55610							√	
		Nogli	Nogli	Talai	1.20	Chil, Robinia, Ritha, Daru, Dreak, Kainth, Jakrinda, Amaltash, Tikoma & Chulli.	50049		√	√	√		√	√	
		Rampur	Pashada	Pashada	0.60	Ritha, Paza, Kainth, Robinia, Deodar & Chulli.	21840		√					√	
Rampur	Nankhari	Gahan	Addu	Addu	0.25	Behmi, Rai, Chulli & HC Nut.	16260						√		
		Nankhari	Bagalti	Bhadral	0.25	Deodar, HC Nut, Walnut & Rai.	12115			√			√		
		Sholi	Delath	Sharan	1.00	Dreak, Robinia, Shisham, Ritha, Chulli, Jakranda & Amaltash	20389	√		√			√		
		Gahan	Gahan	Gahan	1.00	Deodar, Tosh, Behmi, Chulli, HC Nut & Ban.	45400			√			√		
		Nankhari	Kungal-Mundar	Kungal	0.50	Deodar Poplar, Ban, Jamun, Robinia, Tosh & HC Nut.	16230						√	√	
Rampur	Bahli	Surad	Beunthal	Beaunthal	0.50	Deodar, Robinia, Dreak, Kainth, Ritha & Chulli.	17200		√						
		Bahli	Jarashi	Jarashi	1.00	Deodar, Rai, Tosh, Khanoor, Chulli & Diascoria.	113970			√			√		
		Surad	Surd	Surad	0.50	Deodar, Chil, Robinia, Dreak, Ban & Chulli.	19910		√	√					
		Taklech	Taklech	Kuban	0.50	Robinia, Chulli, Kainth, Dreak, Paza, Khanoor.	9684								
Kinnaur	Kalpa	Kalpa	Reckongpeo	Reckong peo	0.25	Deodar, Neoza, Chulli, Bhemi	-			√			√	√	

2.3.7 Forest Fires

Forests in HP have a high degree of susceptibility to forest-fires and these forest fires have destroyed precious forest wealth and caused harms to the flora and fauna. However, spatial coverage in real time is not available. It was made clear from the interview of forest officers that forest fire incidences are mainly human induced and are common during the summer season. Local people believe that the burning of forest areas improves the fodder resources by getting a fresh grass and tender herbs in the following season. Some of the common measures to mitigate this is controlled burning, and maintenance of fire lines.

The frequency, size, intensity, seasonality, and type of fires depend on weather and climate in addition to forest structure and composition. The Chil belt fires are primarily due to negligence by communities, fires are also common in November and Early December in the blue pine forests dry weather and delay of winter rains. Following fires, soils are exposed to wind and rain leading to higher rates of erosion, recharging of groundwater and flow of springs is also severely affected. The damage due to forest fires varies from just burning of leaf litter and dry grass in case of ground fires to extensive damage to the trees, biodiversity, and ecology in case the fires turn into crown fires. The forest fires also carry the risk of getting out of control and extending to habitations.

Fires affect 3.73 million ha of forests area annually in the country causing loss to forest products and services (Bahuguna and Upadhyay, 2002). Most of these fires are man-made, created to facilitate the extraction of NTFPs, ensure a good yield of grass, or to clear forests for shifting cultivation. In some parts of the country, fires are set up for socio cultural and religious purposes as well. The traditional system of fire control through fire lines has serious limitations.

The forest fire data for Himachal presented in table below indicates an increasing trend of the number of forest fire incidents and resulting loss. Though latest data for forest fires in the state is not available however, the table indicates that more than 10000 ha of forest area is affected due to forest fires in the state (DoEST, undated). Most of the forest fires are man-made either due to negligence or intention. Chil (Pinus roxburghii) forests are prone to forest fires during summer months while fires are very common in the high Blue Pine (Pinus wallichiana) forests during November and early December when winter rains are delayed (ibid).

Table 24 Circle wise forest fire incidences of last two years

Name of circle	Year									
	2015-16					2016-17				
	No. of cases	Affected by fire (in hectare)			Total area	No. of cases	Affected by fire (in hectare)			Total area
		Natural	Plantation	Other			Natural	Plantation	Other	
Kullu	44	501	187.4	0	688.4	7	23.1	0	27	50.1
Mandi	93	172.4	24	90	286.4	270	651.75	176.55	620.8	1449.1
Rampur	89	287	299.3	204	790.3	72	410.5	122.65	110.5	643.65
Shimla	109	581.7	147.18	1	729.88	121	693	46.5	4	743.5
WL Shimla	3	0	28	500	528	9	95	0	77	172

Source: Forest department of Himachal Pradesh

Fires also impact the health and species composition of fires. Repeated burning reduces the coppicing power. In the case of moisture loving species like Oaks and Deodar, they tend to give way to species that can come up in dried situations, or infested by exotic weeds smothering the regeneration of native species. Some species like Sal have good coppicing power, and the seedling coppices emerge after burning.

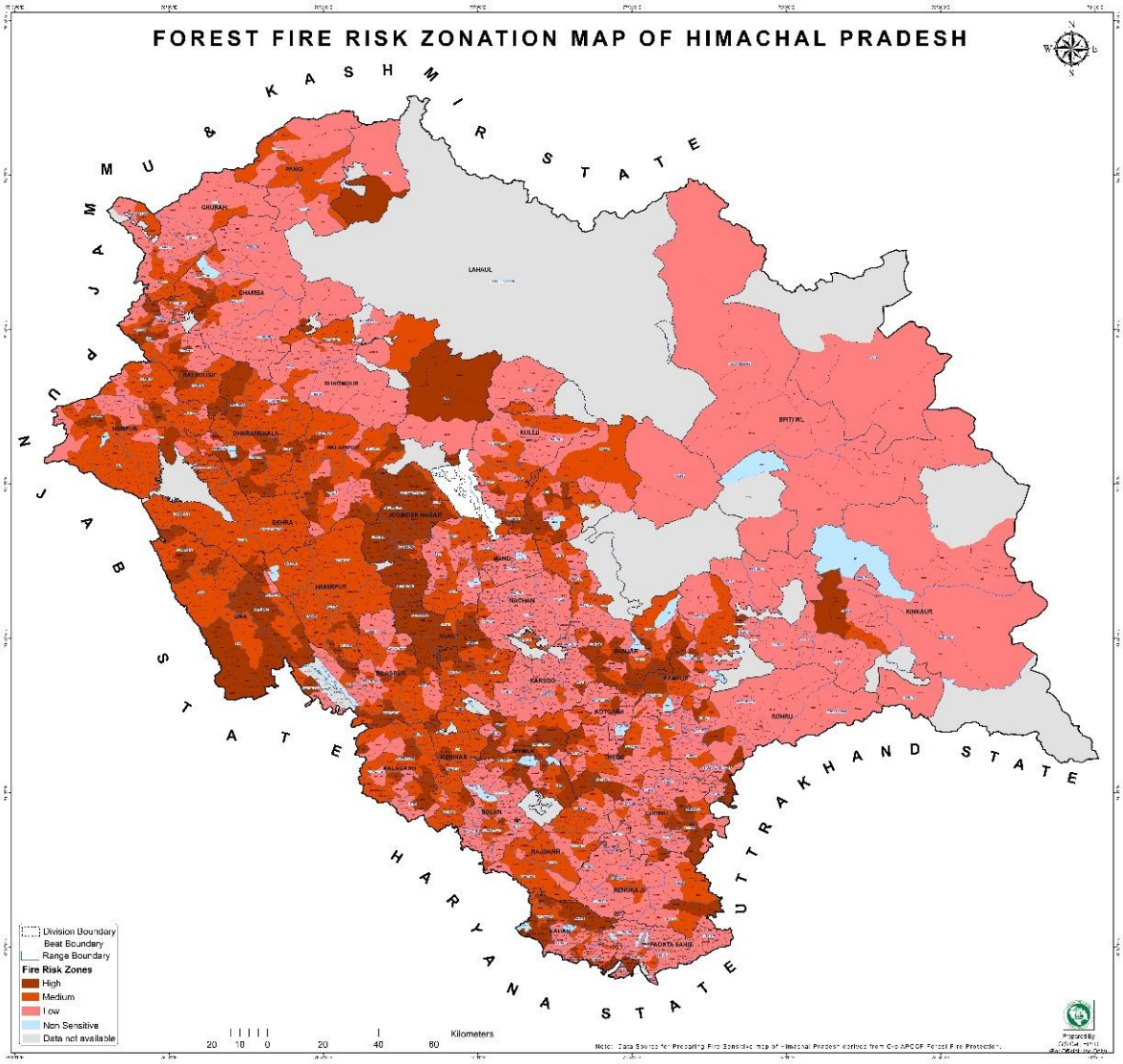


Figure 15 Forest fire risk zonal map of Himachal Pradesh.

Fires are a common feature in Chil forests area and in grasslands specially during summer season. Forest fires affect the natural understory of the forests which often get invaded by alien species. Fires also adversely affect the regeneration capacity of young crop, destroy ecosystems, and also affect the supply of NTFPs. The fires in Himachal Pradesh are predominantly ground fires, causes vary amongst accumulation of dry pine needles, thick under growth, dry grass, felling debris, drought, defective resin tapping etc. Often, fires are set on purpose to obtain fresh grass (fodder) growth or drive away wild

animals or to encroach upon forest land. Local-scale fire management in which traditional or indigenous knowledge plays the major role in informing and undertaking fire management, is conducted and controlled by local communities.

Absence of controlled burning and other sylvicultural operations like pruning, cleaning and thinning in regenerating areas have also result in wiping out large tract of Chil forests by forest fires. The HP government has notified Forest Fire Rules, 1999, the department also has a forest fire manual which sets forward the various roles and responsibilities in fire prevention and control.

Award Money of Rs. 5000/- to 10000/- to communities who co-operate in the Forest Fire Prevention [Gram Panchyat and Village Forest Development Committee (VFDC) or Self Help Group (SHG) and Joint Forest Management Committee (JFMCs)]. The Forest Fire Watchers and Forest Officials who have done commendable job in the prevention of Forest Fires, awarded during Van Mahotsav Programme of Forest Department.

2.3.8 Community Based Forest Institutions

Joint Forest Management (JFM) was initiated in 1990 as a collaborative arrangement between Forest Department (FD) and local communities to regenerate and manage degraded forests. It has been reported that there are 1,18,213 JFM committees across 29 states managing 22.94 mHa of forest area, which constitutes 29.80% of recorded forest area of the country (FRI, 2011). These committees are receiving benefits in form of fuel wood, fodder and various other non-timber forest products (NTFP).

There is a long tradition of participatory forest management in Himachal Pradesh. Cooperative Forest Societies (CFS) envisaging the role of local people in the management of forest were constituted in district Kangra as early as in 1940 (DoEST, undated). There were other areas where sacred forests or Deo Van were being managed by the people. Based on these community traditions, various participatory programmes such as Indo German Dhauladhar Farm Forestry project and *Van Lagao Rozi Kamao* scheme were launched in the state prior to JFM (ibid). JFM was strengthened through Sanji Van Yojana or participatory forest management scheme in 1998. Various community institutions have been created under different projects and programmes such as Village Development Committees under Kandi project and Indo German Eco development project; Village Forest Development Committees under HP (HPFD, 2014). There are 1023 committees managing 205000 ha of forests constituting 11% of the forest area in the State (FRI, 2011). It has been estimated that JFM generates 2.7 lakh person days of annual employment in the state.

The appropriate relationship between village forest institutions and local government in the form of *Panchayat Raj* Institutions (PRIs) emerge as a potential common point of intervention, due to their presence throughout HP and their constitutional nature, where the possibility of convergence of all local village level institutions including forest ones is strongest. In January 2000, with a view to strengthening the role of PRIs in the management of local resources and promotion of participatory forest management, the HP Forest Department notified the constitution of *panchayat*, block and district level forest committees. The notification states the composition and functions of the forest committees at the different levels; they are to be in congruence with the three-tier standing committees – *Panchayat, Panchayat Samiti* and *Zila Parishad.*

The draft Himachal Pradesh Participatory Forest Management Rules ('PFM Rules') (1999) and the notification of January 2000 have clearly reflected the futuristic vision of HPFD to integrate its institutions with PRIs. They include descriptions of the powers, responsibilities and duties of the VFDS, as well as the benefits due to them; and state that the role of the HPFD is to 'essentially provide a supportive role to facilitate the process of Joint Forest Planning and Management through VFDS' (through provision of technical guidance, training, and funds). As a first step towards providing organic linkages between the two, this may help the HPFD in defining active and meaningful participation in PRIs in forest-related activities.

Table 25 Status of Community Based Forest Institutions

S.No	Name of Projects/Schemes	Year	Name of Village Institution	No. of Village Institutions	Registered under
1	HP Forestry Project (HPFP)	1994-2001	Village Forest Development Committees (VFDCs)	154	JFM Notification dated 12.5.1993
2	Indo-German Eco-Development Project	1994-2005	Village Development Committees (VDCs)	294	JFM Notification dated 12.5.1993
3	IWD (Kandi) Project	1993-2005	Village Development Committees (VDCs)	137	Societies of Registration Act 1860
4	Sanjhi Van Yojana (SVY)	1998	Village Forest Development Societies (VFDS)	360	Societies of Registration Act 1860
5	Great Himalayan National Park	1993 Ongoing	Village Eco-Development Committee (VEDCs)	18	Director , GHNP
6	Mid Himalayan Watershed Dev Project	2005	Gram Panchayats	602	---
7	National Afforestation Project (NAP)	2010	Joint Forest Management Committees (JFMC)	963 JFMCs	Registered by CFs/DFOs as per the provision laid down in Revised Operational Guidelines, 2009 of NAEB.
8	Integrated Watershed Management Swan River Project	2006	Project Development Committees	Not available	Societies of Registration Act 1860

2.3.3 Water Resources

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. Statistics regarding the water sources of the state are presented in the table below. The state is drained by nine river systems. The Satluj, Beas, Ravi, Chenab, Spiti, Parbati, Pabbar, Tons and Giri are the main rivers of Himachal Pradesh. Of these, the Satluj, is the largest river system in the state with a total catchment area of 20,398 km^2, spread over the districts of Lahaul and Spiti, Kinnaur, Shimla, Solan, and Bilaspur before entering Punjab, it enters the large Bhakra dam.

A recent study in 2004 has documented 2,554 glaciers in the state, which are the source of fresh water to the rivers of North India. Bara Shigri is the largest glacier in the State, which is in the Chandra valley of Lahaul and feeds the Chenab River. The glacier is more than 25 km long and about 3 km wide. Chandra Nahan, Bhadal, Bhaga, the Lady of Keylong, Mukkila and Hamata are other major glaciers in the state.

Table 26 District wise detail of Water Resources of Himachal Pradesh

District	Ground Water	Surface Water	Rain Water	Traditional Source	Other Conventional Sources
Bilaspur	827	786	0	461	0
Chamba	1717	2433	3	2598	836
Lahul & Spiti	1	290	0	57	0
Sirmour	644	2249	0	535	9
Hamirpur	1057	485	0	231	1
Kangra	1602	1317	11	1369	466
Kullu	0	3392	0	0	0
Kinnaur	76	217	0	24	2
Mandi	833	3924	0	1483	840
Shimla	233	3917	5	2518	9
Solan	344	1090	0	1215	316
Una	832	123	1	21	116

Source: SoER, Himachal Pradesh

Table 27 The status of development of groundwater resources in the state

S. No.	Components	Resources
1.	Total replenishable groundwater resources	0.036 m
2.	Provision for domestic, industrial and other uses	0.007 m ham/yr
3.	Available net groundwater resources for irrigation	0.029 m ham/yr
4.	Net draft	0.005 m ham/yr
5.	Balance groundwater resources for future use	0.024 m ham/yr
6.	Level of groundwater development	18.18 %
7.	Utilizable irrigation potential by groundwater development	65,500 ha

Source: Central Ground Water Board, State Profile

Table 28 Catchment details of river system of Himachal Pradesh

Sr. No	Name of the river system	Catchment Area (km)	Percentage (%)
1	Sutlej	20,398	30.69
2	Beas	13,663	24.50
3	Chenab	7850	14.2
4	Yamuna	5872	10.6
5	Ravi	5528	9.9
6	Indus	1450	2.6
7	Markanda	360	0.6
8	Ganga	290	0.5
9	Pabbar	262	0.5
	Total	**55673**	**100**

There are a number of small and large lakes in Himachal Pradesh. These are in Kullu (Bhrigu, Dashair, Seruvalsar, and Mantalai), Mandi (Rewalsar, Prashar), Kangra (Dal, Kareri, and Pong Dam), Nako in Kinnaur, Surajtal and Chandertal in Lahul-Spiti, Chamba (Khajiar, Mani Mahesh, Gadhasaru, Gauri Kund, Lam Dal Lake, Mahakali, and Khundi Maral), Renuka in Sirmaur and Chandernaun in Shimla. Water storage in Himachal Pradesh is estimated at around 14,000 million m^3. The Chandra Tal, Suraj Tal, Yonam Tso and Nako Lake are the lakes formed due to damming of glaciers, while the Riwalsar and Renuka lakes are due to damming of river/stream courses. The two major storages located on the borders of the state are The Gobindsagar reservoir (Bhakra Dam) in the Satluj with 6,900 million m^3 live storage, the Pong Dam located on the border with Punjab in the Beas river with 7,300 million m^3 live storage and The Pandoh Dam, a hydroelectric dam on the river Beas upstream of Mandi, has live storage of 18 million m^3.

2.3.3.1 River Sutlej

River Satluj is the largest river among the five rivers basing of Himachal Pradesh. Water Quality is generally good (CPCB Class A, B) but is untreated sewage towards Rampur and Bilaspur contribute to deteriorating water quality. [5] It is estimated that more than 50 percent of the run-off in the Sutlej Rivers is from the snowmelt. The average annual total run-off of river Sutlej is about 16,000 MCM. It traverses a course of 320 km area within Himachal Pradesh. The total catchment area of River Satluj is highest exists around 38 % area (20,398 km^2) among the five major rivers of Himachal Pradesh.

The River Satluj basin divided into 11 sub basins. It is joined by various right bank tributaries such as Spiti, Ropa, Rupi, Kashang, Taiti (Kiran), Mulgaon, Yul, Kerang, Wanger and Throng in Kinnaur. The Tirung, Gayanthing, Duling, Baspa, Solding, Manglad and Nogli streams belong from the left bank tributaries. The Major Tributari River are River Baspa, River Spiti, Nogli Khad and River Soan.

Tributaries in the Project Area

Kalpa block, Kinnaur

Kashang Khad: It originates at the foothill of Chikim and Mukim dhar that divided the Kalpa and Nichar block. The Rogle Khad on the left bank tributary drains the water from the Sankarishul glacier. It joins the River Satluj on left bank just below the Rarang village.

Pangi Nala: It is originated from Sankarishul glacier. Where the two tributaries Mebar Khad and Kojang Khad meet, downward that point it is called as Pangi Nala. It joins the River Satluj just above the Pawari village.

Rampur Block

Kut Khad: It originates just above the Kot Dogri near to the Nichar block boundary. The Kut Khad joins the River Satluj at the bottom of Suru village.

Ganwi Khad: Ganwi Khad originated from the Sirikhand Mhadev. Its left bank tributaries are Daduwa Khad, Ghartr Khad and right bank tributaries are Sagori, Kapni and Saran Khad.

Nogli Khad: It has joined River Satluj just south to the Rampur Bushahar at Nogli. It is known as a Sageti Gad on its origin place. The Nogli Khad come to exist where the Suket Khad and Devpani Khad meets.

Karsog and Ani block

[5] HPPCB, 2007

Baihna Khad: The Khudhi Khad and Kunir Khad confluence in Shawad village from that point it is known as Baihna Khad. It joins the River Satluj in Phirnu village. One of the major tributaries of this river is Ani Khad that joins the Baina Khad at Rorha village. The Baihna Khad also demarks the natural boundary between Kullu (Ani block) and Mandi districts (Karsog Block).

Tangling Khad: It originates at the boundary of Pooh and Kalpa block of Kinnaur district. The main source of water for this Khad is glaciers. It joins by the Kangrang Khad on right bank at the Kangrang Dogri. It joins the River Satluj at Tangling village. The major settlements on the bank are Kangrang Dogri and Tangling. Shyang / Shongtong Khad: It is left bank tributaries of the River Satluj that join the River Satluj at Shongtong.

River Baspa: River Baspa is an important tributary of the River Satluj in its upper course. It is 70 km long and second largest tributaries of Satluj. The river starts in the Baspa hills and joins River Satluj near the left bank of Karcham at the lower end of Kinner Kailash. The Singan Khad and Hurba Khad join River Baspa at Batseri village, Rokti Khad join Baspa at the Sangla and Baturi Khad join the Baspa at Chunang village.

Kunihar Block

Ali Khad: The catchment of this Khad is in the Kunihar and Bilaspur blocks. The Ali Khad comes to an exit where the Badar Khad and Jor Khad meet. The Ali Khad joins the Gobind Sagar lake at Korwarni.

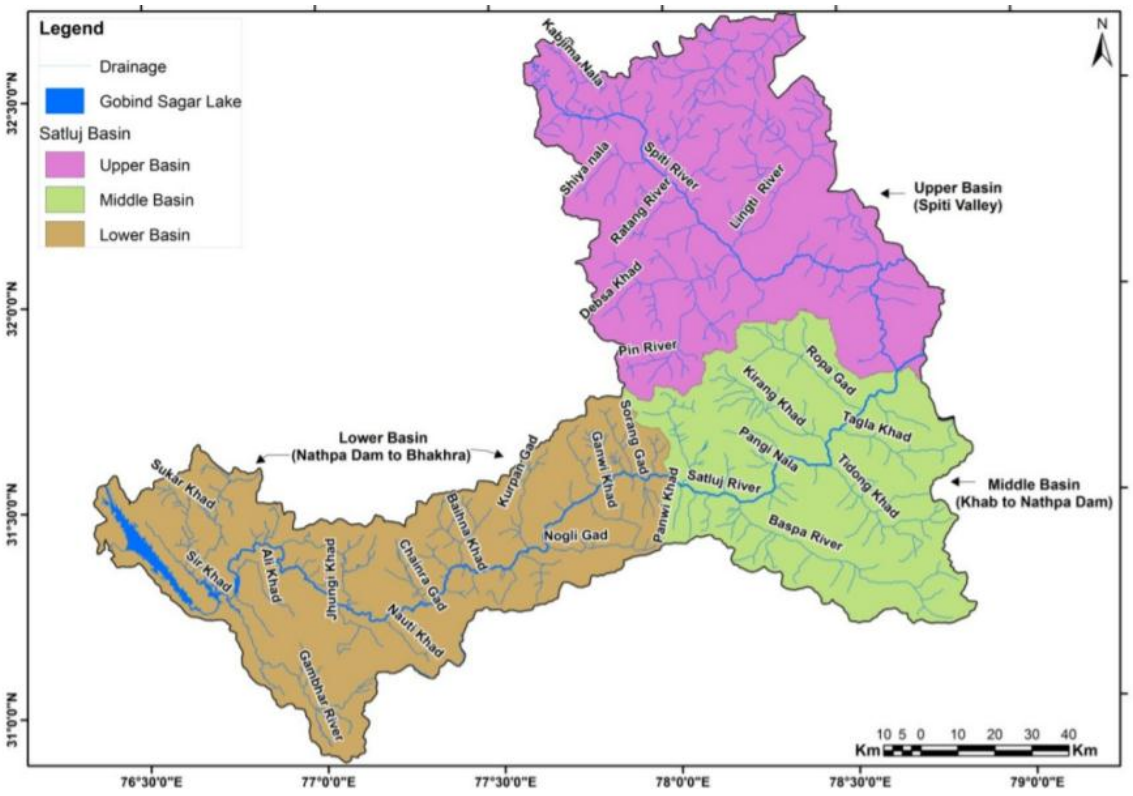


Figure 16 Sutlej River Tributaries and Classification

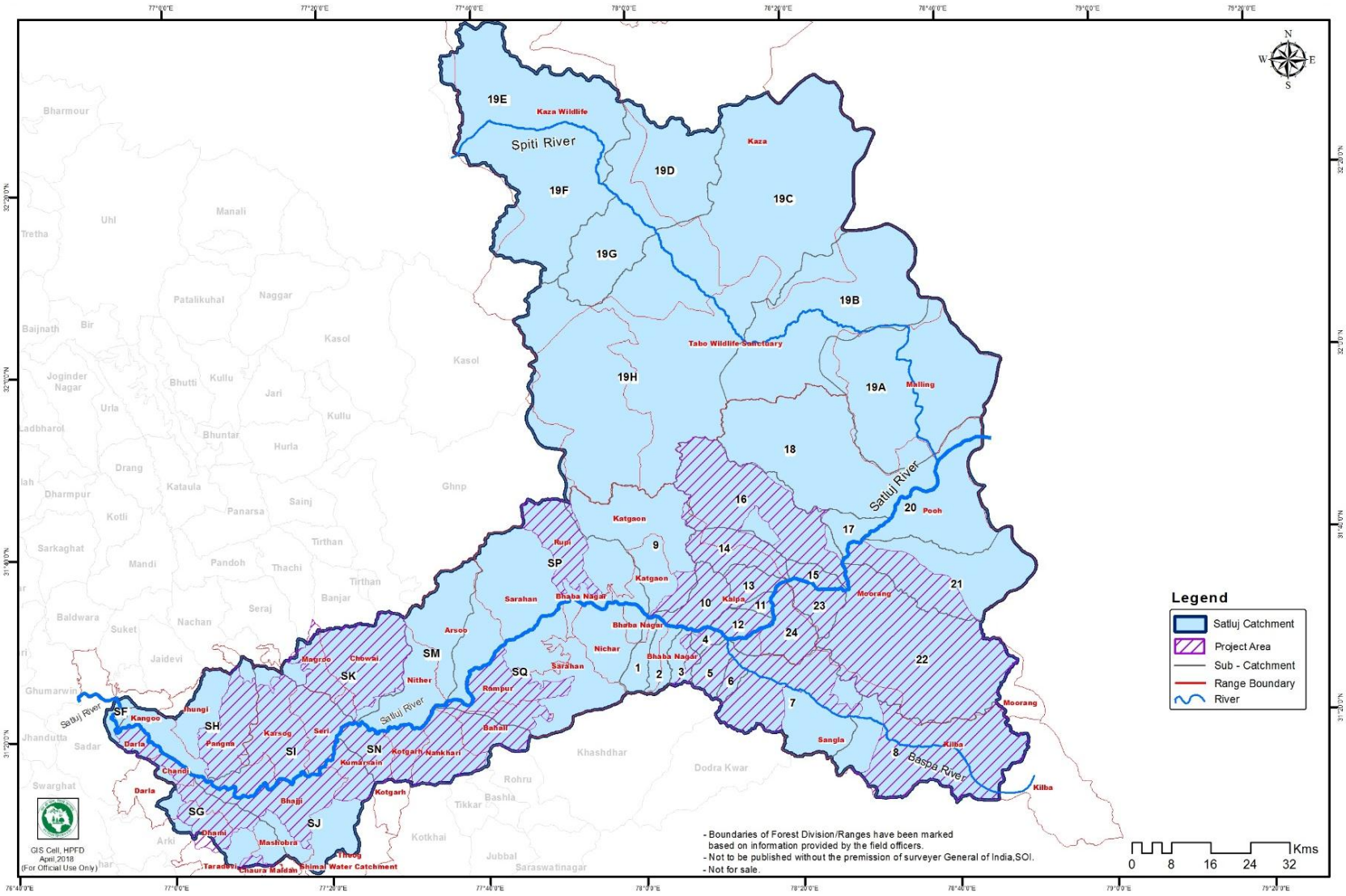


Figure 17 Project area in Sutlej Catchment

Table 29 Critical Environmental Resources in Project Area Forest Ranges

CERS	Location	CER	Implications for project design
Protected sites/ monuments/Cultural properties	**Kinnaur**	Kinner Kailash mountain Parvati Kund Shrikhand Mahadev mountain Monasteries Local Deities Temple in every village	As no protected area falls in HP FPP measures should be taken to implement the interventions along the cultural/religious places in the project area in consultation with locals, only.
	Solan	Harsang temple Badu Bara temple	
	Shimla	Bhajji Fort Narsingh Temple Koteshwar Mahadev Temple Local Deities Temple	
	Mandi	Mahunag Temple Kamashka Devi Temple Bhimakali Temple Yogini Mata Temple Baan Bhagwati Dev Mahasu Temple Chindi Mata Temple Mahamaya Temple Nag Dhamuni Temple Mamleshwar Temple	
	Kullu	Devi Pachala Temple Nag Gadumbi Temple Natli Nag Temple Local Deities Temple	
Protected areas-WLS, NPs, IBAs	**Kinnaur**	Rupi Bhava WLS, IBA	Local's movement inside the forest and collection of NTFP from protected area will be limited.
	Solan	Majathal WLS, IBA	
	Shimla	NIL	NIL
	Mandi	NIL	NIL
	Kullu	NIL	NIL
Schedule 1 species	**Rupi Bhava WLS, IBA**	•Leopard Cat (Felis bengalensis) •Snow Leopard (Panthera uncia) •Himalayan Brown bear (Ursus Arctos) •Musk Deer (Moschusoschiferus) •Serow (Capricornis sumatraensis) •Himalayan Tahr (Hemitragus jemlahicus) •Himalayan Ibex (Capra ibex) •Western Tragopan Pheasant	Since the project is being implemented by HPFD and in field by the Range Officer and its ancillary staff who are well aware of these species status and are doing the protection work even before the project.

		(Tragopan melanocephalus,) •Monal Pheasants (Lophophorus impeyanus, Lophophorus Sclateri) •Cheer Pheasant (Catreuswallichii) •Kalij pheasant (Lophurs leucomelana) •Lammergeier (Gypaetus barbatus) •Bharal (Ovisnahura) •Swiftlets (Collocalia unicolor and Collocalia fusiphaga •Blue Sheep (Pseudois nayaur)	
	Majathal WLS, IBA	•Cheer Pheasant (Catreus wallichii) •Common Leopard (Panthera pardus) •Leopard Cat (Felis bengalensis) •Indian Peafowl (*Pavo cristatus*) •Oriental White-backed Vulture (*Gyps bengalensis)* •White-rumped Vulture (Indian White-backed Vulture)- Gyps bengalensis •Lammergeier (Gypaetus barbatus) •Kalij pheasant (Lophurs leucomelana)	Since the project is being implemented by HPFD and in field by the Range Officer and its ancillary staff who are well aware of these species status and are doing the protection work even before the project.

Table 30 Baseline of economic activities in the project areas

Activity	**Location/types**	**Issues impacting forests**	**Implications for project design**
Hydropower	• Nathpa Khakri HEP (1500MW) • Karchham Wangtoo HEP (1000 MW) • Shongtong Karchham (450 MW) • Rampur HEP (412 MW) • Baspa-II HEP (300 MW) • Bhabha HEP (120 MW) • Kashang –I HEP (65 MW) • Tidong HEP (60 MW)	•Tree felling • Blasting • Muck Disposal •Influx of labour from outside leading to pressure on forest resources.	• Degradation / deterioration of forest area where the interventions have been implemented due to construction activities of the hydro power projects.

Activity	Location/types	Issues impacting forests	Implications for project design
	• Shorang HEP (100 MW) • Ghanvi-I HEP (23 MW)		
Horticulture	The main cash crops grown in the region are the horticulture trees like apple, plum, almond, apricot, walnut, peaches, cherry, lemon etc. These are solely harvested for Cash and the demand for these fruits all over the country fetches good price. On an average, an apple tree can fetch between Rs. 5000 to Rs. 7000 per season, while plum tree can fetch Rs.2500 to Rs. 4000 per season	• Illegal encroachment of forest land for plantation of cash crops like apple.	• Illegal clearing of the forest area where the interventions have been implemented.
Agriculture	The agricultural crops which are sown and harvested mainly include wheat, seed-potato, paddy, maize, barley, pulses, vegetables, etc.	• Illegal encroachment of forest land for agriculture by individuals.	• Illegal clearing of the forest area where the interventions have been implemented.
Ecotourism	Local tourist inflow is prevalent in Kinnaur and Shimla Districts with may tourist destinations like Chitkul, Rakcham, Sangla, Kalpa, Nako, Sarahan, Tatapani, Mahu Nag Temple, Kamashka Devi Temple, Jalodi Pass, Kinnar Kailash, Srikhand Mahadev etc. Also, trekking routes to Spiti, Kullu, Manali, Rohru, Niti Valley (Uttrakhand) etc.	• Pressure on forest resources • Pollution like plastic waste, solid waste disposal	• Degradation / deterioration of forest area in project due to pressure on forest resources or generation of plastic waste, solid waste etc.
Mining	Mining operations are being done in the project area either by approved agencies/individuals for extraction of river bed material (RBM) for construction activities like hydro power projects, road construction, infrastructure development etc. However, illegal mining is being done by individuals in forest area for sand/clay who are being penalised/ booked by administration or State Mining Department or HPFD	• Change in flow regime of river • This result in increased turbidity of the water in the river stretch making it less usable and aesthetically appealing.	• Degradation / deterioration of project area where the interventions have been implemented due to illegal mining activities.
Fishing	Fish catching is not very prevalent in the area. Only a few fishermen do fishing at lower reaches of project area for selling purpose. For commercial purpose, the fish is mainly	• None	• None

Activity	Location/types	Issues impacting forests	Implications for project design
	brought from downstream areas like Bilaspur. At upstream, few sites have been identified for sport fishing i.e. Sangla		
Industry	As such no key industries are located in the area along rive Satluj. Only one dairy plant is at Bithal. Fewer packaging set-ups at smaller level could be located in upper reaches, where in apple production is in abundance.	• None	• Not envisaged. However, in future if any new industry is being set up in the project area where intervention are being planned care must be taken so that it does not impact the objective of the project interventions.
Road construction	Transport sector infrastructure investments are critical to improve mobility of goods and people, and to facilitate trade and commerce. Road being the lifeline of any region for development is a necessity. However, due to hilly terrain the disposal of debris during road construction is a major cause of concern for increasing sediment flow in Sutlej River.	• Muck/debris disposal • Tree felling • Influx of labour from outside leading to pressure on forest resources. •	• Degradation / deterioration of forest area where the interventions have been implemented due to road construction activities. • The direct impacts (such as the direct footprint or clearing land for road or other transport infrastructure construction) can be easily identified and mitigated (through compensation plantations).

Table 31 Analysis of Key Environmental Issues from Baseline Study

Issues /Sector	Baseline conditions and Issues of concern	Possible FFP/ EMF interventions
HEALTH AND QUALITY OF FORESTS	• Demand- Supply Gap for fuel and fodder • Illegal extraction • Choice of the afforestation species needs to match the planting site • Regulation of minor forest produce and TD rights. • No Collective management of natural resources. • Grassland and pasture management practices unsustainable	• Better community participation in grassland management • Scientific grassland management practices • Creation of enterprises around fuel and fodder for steady supply • Fodder and fuel (dead wood) harvesting and management through community managed depots • Critical evaluation and appraisal of existing programmes of afforestation and deriving meaningful path finders from such evaluation. • Development of plantation models that meet the needs of the planting site, and the communities • Training of forest officials at for nursery development • Assessment of forest fire damage and inventory of the appropriate technology/methodology for prevention and

		control. • Popularization and expansion of the programme on the use of non-conventional energy sources, improved chullahs, use of Solar Energy Systems, biogas, use of LPG and Kerosene oil as a special drive in villages falling in five km. belt around the forest. • Encourage people participation for high rate survival success of afforestation programmes. • Check on the indiscriminate removal/harvesting of MAPs • Improvement in the technology of road construction, mining and other developmental technologies in the forest areas.
GRAZING LANDS AND PASTURES:	• Excessive grazing resulting in disappearance of protective cover • development of cattle tracts into channels; compaction of soil resulting in lower infiltration rates. • Growth of invasive species, weeds • Low productivity of pasture. • Less area under cultivated fodder/ grasses/ stall feeding • Lack of desirable composition of grasses and legume in grazing lands. • Lack of people participation in grazing land management. • The livestock population of the state is three times the carrying capacity of grazing lands • Continuous grazing reduces the productivity and gives rise to weeds such as Lantana and Parthenium.	• Cattle need to be reared in villages throughout the year, encourage growth of fodder crops and stall feeding • Nomad cattle grazing could be put into rotation mode • Fencing cost can be high which the project can support • Need Soil and Water conservation measures to reduce dryness in summer • Need location-specific grassland species development for ensuring adequate fodder supply, integrate management of vegetation with other NRM programs to achieve multiple use objectives contained in Forest land. • Pastures need to be managed so that they provide for livestock forage, wildlife food and habitat and contribute to economic and social wellbeing of communities by providing stability for communities that depend on pasture resources for their livelihood • Grazing land management through deferred and rotational grazing. • Need to develop close coordination between the State Forest Development and Animal Husbandry Dept. for management and development of pasture lands. • Introduction of desirable composition of grasses, legumes and fodder trees which are palatable and high in protein content. • Enhancement and restoration of soil fertility with the application for organic manure and bio fertilizers. • Fodder development through People's Participation in grazing land and livestock management.

FOREST FIRE	• Burning for fodder • Accidental occurrences	• Introduction of forest fire assessment, ranking, and management system (danger ranking, forecasting) • Increasing public awareness on forest fires, and the associated impacts • Demarcation of fire line • Focus on incentives (economic- NTFP, ecotourism) for the communities to draw from these areas so they help in mitigating fires. • Need better management of controlled burning for fodder • Need management systems for pine-needle collection (earmark areas for collection) • Build incentives/industry around reside management (weeds, pine needles) so communities can support their collection.
CLIMATE CHANGE	• Short duration rains, higher intensity • Quality of forest ecosystems depleting, drying up of springs, loss of soil cover	• Treatment of the most vulnerable forest areas with scientific and sylvicultural operations and removal of alien species •
QUALITY OF PLANTING STOCK	• Current seed stands are old, and expertise amongst local communities to identify good quality seeds is low. • Current forest nurseries are low-tech and use polybags • Infrastcrture gaps such as (i) Seed storage facilities are inadequate (ii) No seed orchards • Use of Insectices and fungicides in nurseries is not scientific.	• Need to develop good small planting stick to be planted with tall plants • Silviculture spacing should be maintained per plant size • Promote best management practices on silviculture thinning • Initiate intensive training on nursery management • Defined protocols for a nursery manual • Introduction of raised platforms, root thinning, better compost production • Seed storage should be at known temperature and humidity before distribution to seed nursery.
SPECIES SELECTION	• Better systems for procurement of seeds is required- origin of the seed has to be recognized • Quality of planting material needs to be enhanced • Modernization of nurseries is needed • High altitude MAPs still have low productivity, low survival • Communities providing preference for fuel, fodder species •	• Site specific species needs to be selected for specific sites. This can be done through better planning for the forest nurseries in terms of species selection. • Zonation of species according to agro-climatic zones needs to be considered. • Seed handling, collection, pre-sowing management capacity building is needed • FD needs coordination for multiple projects to measure impacts • Site selection of species can be prioritized where there is least development • Species selection should be vetted by an expert and yearly requirements for seedlings should be made.

		• Tall/ Sturdy plants have 90% survival rate in first year. • If adopting root trainers, need enriched potting media with 60% organic matter [3:2:1] of FYM: Sand: Soil. Species such as deodar needs to be kept for 1.5-2 years in Root Trainers.
FOREST MANAGEMENT SYSTEMS	• Need upgradation in technology • FD is implementing and monitoring • No silviculture management (challenges in clearing fire lines, no thinning carried out) • Poor availability of data on silt load • New Management plans need to be prepared in view of the new approach to PA management and biodiversity conservation	• Need institutional assessment of the forest department and Forest development corporation to understand the roles in sustainable forest management. • Geo-referencing of all forest management plans in FMIS • Identification of interventions that have been implemented under NERIL CAT plan, and pending measures so project can prioritize hot- spots for future investments. • Introduction of sustainable harvesting, processing, storage and marketing • NTFP marketing can be explored through e-NAM if guaranteed stock is provided. • Soil and water conservation works should be carried out before the planting takes place, not simultaneously. • Research and documentation. Expansion of the data base of protected areas. Preparation of species inventories and vegetation maps for the PA Network in Himachal Pradesh. • Participation of the local people and other stake holders in PA management planning, mainly eco development and benefit sharing. • Integration of PA concerns into eco development and establish mechanisms to integrate PA concerns into regional development plans.
UNSCIENTIFIC EXTRACTION OF NTFPs, MAPs AND FOREST PRODUCE	• Unscientific extraction /exploitation of minor forest resources beyond the point of regeneration • Species of MAPs/ NTFPs becoming critical or endangered species	• Regulatory control over privator sector harvesting NTFPs for comerical use • Monitoring by Village committes at the time of harvesting of MAPs • Promote biotechnology in propagating minor forest produce/ MAPs • Promote Marketing, value addition, training, development of nurseries for quality planting material and inter linage with other departments

Chapter 3 Relevant Laws, Regulations and Development Programmes

3.1. Introduction

There is widespread agreement that legal frameworks are a critical strategic tool for enforcing or regulating the implementation of policy provisions, helping judicial proceedings, courts and regulatory authorities to fix the liabilities and give judgment on penalty, relief or compensation, etc. Environmental laws include provisions and regulations related to environment and its constituents, protection and management of natural resources, water, land, agriculture, forests, wildlife; habitats-procedures and planning to safeguard environment; resources and ecosystems.

Whilst these initiatives may be seen as enabling, one of the most limiting factors in HP's forest sector – at least to the private sector and the Forest Corporation - is the *ban on green felling* for commercial harvest, in force since 1987. This was partly a national initiative, derived from a Supreme Court ruling, but was adopted in HP and reflects the general desire within HP to use its forests for conservation rather than commercial production. Timber extraction is restricted to the felling of trees under TD rights, salvage fellings, and removals of green trees damaged by fire, wind or snow (however no precise definition of 'damaged' trees is given). In addition, past experience has shown that fellings in higher altitude forests have failed to regenerate, leading to serious disturbances in moisture regimes, local ecology, etc. In February 2016, the Supreme Court has allowed green felling, also called silviculture felling, in three forest ranges of Kangra, Bilaspur and Sirmaur districts, on an experimental basis. Only three varieties of trees viz Khair, a commercially exploitable variety grown in lower areas of Himachal, Sal and Chil would be allowed.

The Water Policy of 2005 provides a good basis for sustainable water resources management. The Government of Himachal Pradesh has undertaken a series of initiatives designed to address environmental concerns such as:

a. The establishment of a Directorate of Environment
b. Establishing a Special Area Development Authority for carrying out approved development plans and
c. Commitments to make Himachal Pradesh a carbon-free state.

3.2. Applicable World Bank Policies

To minimize and manage environmental and social impacts, the Bank's Operational Policies (OPs) and Bank Procedures (BPs) have to be complied with as part of due diligence. The WB safeguards policies require integrating environmental impacts and risks into the planning and implementation of financed projects such as the HP FFPP**.** Additionally, HP FFPP will adhere to the World Bank Group Environmental, Health and Safety Standards as presented at www.ifc.org/ehsguidelines.

Likewise, all WB EHS Guidelines apply all the time, but the most relevant guidelines for this Project include the General Guidelines (which contain environmental, construction, occupational and community health and safety guidance relevant to small works and building refurbishment), and Forest Harvesting Operations. Since the project finances harvesting activities conducted by local communities under community or even possibly joint forest management, such communities will adhere to a time-bound phased action plan to

achieved a standard of forest management developed with the meaningful participation of locally affected communities, consistent with the principles and criteria of responsible forest management including the following as outlined in paragraph 10 of OP 4.36. The policies, applicability and rationale have been given in Table 1

Table 31 World Bank Safeguard policies

	Policy	Applicability	Rationale
1	Environmental Assessment OP/ BP 4.01.	Applicable	The project will engage in a number of activities that The positive impacts of the project will be: a reduction in greenhouse gas emissions with improved forest cover, reduction in silt loads, soil and moisture regulation and rural livelihood improvement. The potential negative environmental impacts will be known with more specificity as project activities and areas of influence are identified during project preparation but are expected to be limited, localized, small-scale and not significant given that many of the on the ground. These activities may have environmental impacts on a limited scale. An EMF will be disclosed before appraisal.
2	Natural Habitats OP/BP 4.04	Applicable	The Project area contains two protected areas/ wildlife sanctuaries (Rupi Bhabha and Chandi). The project will only implement activities as per the approved management plans of the protected areas. No activity which is contrary to the management plan will be supported under the project.
3	Forests OP/BP 4.36.	Applicable	Forest management is a primary focus of this project, in addition to pastures in the landscape. The project's long-term environmental impacts are expected to be highly positive overall, with reduced deforestation and forest degradation and increased benefits-sharing from forest resources. The EMF will include guidance on managing forestry issues.
4	Pest Management OP/BP 4/.09	Applicable	The Bank's safeguards policy on Pest Management is triggered as the Project supports strengthening of forest nurseries, supplies and equipment which may include use pesticides if there is pest/ disease outbreak. While a stand-alone Pest Management Plan (PMP) is not required for this Project, the EMF contains measures to avoid usage of restricted pesticides, promote use of personal protective equipment (PPE), use of bio-pesticides, and promote use of biological and mechanical control of pests and diseases.
5	Physical and Cultural Resources OP/BP 4.11	Applicable	The policy on Physical Cultures Resources is triggered as a preventative measure in the event of potential impacts on the known and as of yet unknown cultural resources of the area. The EMF contains measures for avoiding and managing impacts on known PCR in the project area as well as chance-finds procedures in case new resources are discovered in the course of the Project. Further, communities within the geographical area would recognize various physical cultural resources, including sacred forest areas as well as individual

			sacred trees and bushes.
6	World Bank EHS Guidelines	Applicable	The WB (EHS) guidelines contain performance level and measures on environmental, occupational health and safety for construction, community health and safety to be followed during forestry works.

3.3. Policy and Regulatory Framework of Government of India (GoI) and Government of Himachal Pradesh (GoHP)

Table 32 Analysis of National and State Level Regulation applicable under the project

	Act/Policy	Year	Objective	Applicability	Authority
	Environment and Forests				
1	Environment (Protection) Act and amendments	1986	The Environment Protection Act, 1986 (the "Environment Act") provides for the protection and improvement of environment. The term "environment" is understood in a very wide term under s 2(a) of the Environment Act. It includes water, air and land as well as the interrelationship which exists between water, air and land, and human beings, other living creatures, plants, micro-organisms and property. Under the Environment Act, the Central Government issues notifications under the Environment Act for the protection of ecologically-sensitive areas or issues guidelines for matters under the Environment Act	Applicable for studying, planning and implementing long-term requirements of environmental management.	MoEFCC, CPCB
2	National Forest Policy	1988	Keeping the forest area intact in the Himalayan states- This policy implies to maintain the 66.7% of land under forest area in HP.	Applicable as project financed activities will be implemented/carried out on forest land. This policy needs to be complied with.	MoEFCC
3	Indian Forest Act	1927	Consolidates the law relating to forests, the transit of forest-produce and the duty livable on timber and other forest-produce.The Indian Forest Policy of 1988 (MoEF, 1988) and the subsequent government resolution on participatory forest management (MoEF,1990) emphasize the need for people's participation in natural forest management.	Applicable if sub-projects involve felling of trees. The requisite permissions for tree felling will be taken prior to the activity taking place.	MoEFCC
4	Forest (Conservation) Act	1980	Any non-forest activity undertaken on forest land with the objective of providing benefits to individuals, communities, villages, Panchayats will require clearance under the Forest Conservation Act (1980).	Applicable as all project financed activities will be carried out in forest areas, and sustainability	MoEFCC, and State Forest Dept

	Act/Policy	Year	Objective	Applicability	Authority
			GOI has also issued guidelines (F. No. 11- 9/98-FC dated 03 January 2005) for diversion of forestland for non-forest purposes under the Forest (Conservation) Act, 1980 – General Approval under Section 2 of Forest (Conservation) Act, 1980 for diversion of forest land to Government Departments for certain developmental activities.	of project financed investments should not be impacted due to diversion of forest land.	
5	H.P. State Forest Policy	1980	Forest Policy is to be an integral part of land use policy and is to consider the available land resources to meet the conflicting demands of different segments of the society for land. a. Felling to be carried out strictly in accordance with the prescriptions of sanctioned working plans. b. Rationalization of timber distribution rights for bonfire domestic use. c. Demarcation of all un-demarcated and (un classed) forests and completion of forest settlements in ext.10 years.	Applicable as all interventions planned under the project that seeks to improve forest cover and increase the benefits from forests.	HP Forest Department
6	H.P Forest Sector Policy and Strategy	2005	This policy takes into account changes in the social, economic and environmental context of the state and the country (HPFD, 2005). It promotes the concept of forestry as 'Sector', which includes various biophysical and environmental components such as land and biological resources in a comprehensive manner. It bases the management of forests on the principles of multiple stakeholders and multiple forest values, which could fulfil livelihood needs of local people and contribute to their welfare.	This is applicable as it provides comprehensive guidelines for forestland use and planning, distribution of rights and concessions, grazing, timber distribution, non-timber forest produce and various ecosystem services	HP Forest Department
7	Payment for Ecosystem Services (PES) policy 2013	2013	This policy recognizes the role of forests in providing various ecological services such as watershed management, climate regulation and biodiversity conservation. It aims to 'institutionalize Payments for Ecosystem Services and ecosystems approach as instruments of sustainable development.	Applicable as Payment for ecosystem services (PES) is one of the approaches that can be considered for the management of forests.	HP Forest Department
8	HP State Strategy and Action Plan on Climate Change	2012	This strategy and action plan aims to analyse climate vulnerabilities in the state especially related to sectors like agriculture, water, forests and biodiversity (DoEST, 2012). It collects the available information on the vulnerabilities and impacts carried out by various national and international studies and present a comprehensive strategy to mitigate these impacts	The Environment assessment will incorporate the climate change strategy into designing various mitigations and guidelines for the project.	HP Forest Department
9	Eco-Tourism Policy	2016-2017	The Revised Eco-Tourism Policy 2016 aims at bringing the wilderness and virgin ecosystems of Himachal Pradesh closer to visitors and at the same time ensure adequate safeguards and systems for the	Any ecotourism scheme designed as part of the project will need to comply with the	HP Forest Department

	Act/Policy	Year	Objective	Applicability	Authority
			protection and conservation of these natural resources. By involving local community, the policy would help in increased livelihood opportunities as well as their involvement in awareness building, protection and conservation. It also envisages generation of financial returns which can be ploughed back into proper up keep and maintenance of the environment. It shall also promote greater understanding and appreciation for natural and cultural heritage.	overall objectives of the ecotourism policy.	
10	Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act	2006	The law concerns the rights of forest-dwelling communities to land and other resources, denied to them over decades as a result of the continuance of colonial forest laws in India. Right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe or other traditional forest dwellers	Right of ownership, access to collect, use, and dispose of minor forest produce (includes all non-timber forest produce of plant origin) which has been traditionally collected within or outside village boundaries.	Ministry of Tribal Affairs
11	Sanjhi Van Yojna Scheme 2001	2001	The objective of the policy is to streamline participatory forest management efforts in the state. It envisaged a greater role of local institutions such as Village Forest Development Societies and Gram Panchayats in management of forest resources. It gave 100% income from plantations and use of rights to people through local institutions including involvement of women and other marginalised sections in management decisions.	Applicable for project financed activities which will be dependent/ involve community participation.	HP Forest Department
12	The Biological Diversity Act	2002	The Act aims at the conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner. The Act was enacted to meet the obligations under Convention on Biological Diversity (CBD), to which India is a party	State Biodiversity Board should be consulted in the project preparation phase.	National Biodiversity Authority and State Biodiversity Boards
13	Wildlife (Protection) Act,	1972	The objective is to provide protection to the listed endangered flora and fauna and ecologically important protected areas. If the project extends to PA, then the relevant clearances under the Wildlife Protection Act (1972) will be needed. The project is not going to be implemented in PAs so provisions will not apply.	Applicable as there are two wildlife sanctuaries as part of the project area Project financed activities will be carried out as per the Management plan of the WLS.	MoEFCC
14	Eco-sensitive Zone Notifications 2015	2015	The activities in areas around Wildlife Sanctuaries and National Parks are regulated from the perspective of conservation of wildlife	Applicable only if the urban area being developed is located in the	Monitoring Committee for

	Act/Policy	Year	Objective	Applicability	Authority
				ESZ.	ESZ in the State
15	Himachal Pradesh Forest Produce Transit (Land Routes) Rules.	2013	To ensure that the forest produce/species for which transit pass is to be issued are not banned for export and that the species are extracted from the prescribed area in the approved extraction cycle and that the extraction has been done in a sustainable manner and has not caused any ecological or environmental damage. Transport of forest produce by land routes other than fuel wood, khair wood, bamboos, charcoal, medicinal plants and seeds shall register at the office of the Divisional Forest officer.	Applicable when designing NTFP value chain for registration.	HP Forest Department
16	State Compensatory Afforestation Fund Management and Planning AuthorityForest (Conservation) Amendment Rules, 2014	2014	It seeks to establish the National Compensatory Afforestation Fund under the Public Account of India, and a State Compensatory Afforestation Fund under the Public Account of each state. The collected funds will be utilized for afforestation, regeneration of forest ecosystem, wildlife protection and infrastructure development.	Applicable to the project, as it can leverage CAMPA funds for afforestation activities.	HP Forest Department
17	Himachal Pradesh Forest (Timber Distribution to the Right Holders) Amendment Rules	2016	Government of Himachal Pradesh vide Notification No. FFE-B-E (3)-43/2006-Vol-II dated 28-09-2013 has notified the Himachal Pradesh Forest (Timber Distribution to the Right Holders) Rules, 2013.	Sets in place rules and regulations for timber granted to rights holders.	HP Forest Department
18	Himachal Pradesh Participatory Forest Management Regulations	2001	They shall apply to such Government forests and such Government land including the common land, which shall be selected jointly for participatory forest management by the Society and the Department. The HP Govt. issued JFM Notification on 12.5.1993 for constitution of Village Forest Development Committees (VFDCs) and made HP Participatory Forest Management Rules 2001 for registration of VFDCs under Societies of Registration Act, 1860.	Rules and guidelines applicable for all participatory forest management activities. Applicable for institutions set up for PFM activities under the project.	HP Forest Department
19	Biological Diversity Act 2002 And Biological Diversity Rules 2004	2002 2004	The Biological Diversity Act, aims to promote conservation, sustainable use and equitable sharing of benefits of India's biodiversity resources. It provides for establishment of a National Biodiversity Authority at national level, State Biodiversity Boards at state level and Biodiversity Management Committees at the level of Panchayats and Municipalities	To be ascertained for each sub-project during screening/ preparation process. For the known sub-projects- none are located in proximity of any ecologically sensitive areas.	Forest Department, State Government and MoEFCC
20	Rules Governing the felling of trees on various types of land in HP	2017	Felling of Trees of Private, non- Private and forest lands is governed by various acts and rules:	Applicable in the case any trees need to be felled for construction activities and approach roads.	HP Forest Department
21	HP Forest Fire Rules Transit Rules- Notifications MFP	1999	These rules may be called the Himachal Pradesh Forests (Protection from Fire) Rules, 1999. The objective is to set in place rules for	Applicable to storing/ stacking of inflammable forest produce,	HP Forest Department

	Act/Policy	Year	Objective	Applicability	Authority
			precautionary measures to prevent fires, and also set forth prohibitions on activities which may lead to forest fires	kindling of fire within one hundred meters from a forest without permission of the Divisional Forest Officer, and Precautions to be taken in burning agriculture residue near forest.	
22	National Water Policy	2012	To ensure that planning, development, and management of water resources are governed by national perspectives	As project financed investments will involve development of new minor community irrigation systems and remodeling, improvement and strengthening of existing systems.	MoWRRDGR
23	Himachal Pradesh State Water Policy	2013	The objective of the State Water Policy is to take cognizance of the existing situation, to propose a framework for creation of a system of laws and institutions and for a plan of action with a unified national perspective. According to the policy, public policies on water resources need to be governed by certain basic principles, so that there is some commonality in approaches in dealing with planning, development and management of water resources. It also emphasizes the need to evolve a State Water Framework Law as an umbrella statement of general principles governing the exercise of legislative and/or executive powers by the States and the local governing bodies..	Applicable for planning all project financed activities as the policy advises that the use of water should be optimized. The policy emphasizes on the pricing of water, which should ensure its efficient use and reward conservation. It says that the conservation of rivers, river corridors, water bodies and infrastructure should be undertaken in a scientifically planned manner through community participation	HP Department of Irrigation and Public Health.
24	Himachal Hydropower Policy	2006	HP is the only state in India to have mandated environmental flows for all hydropower projects. This ensures that hydropower projects release a specified minimum amount of water in the river at all times, safeguarding the aquatic health of the river's eco-systems and meeting the needs of downstream communities. The policy also states that in case of RoR schemes, a minimum flow of 15% water immediately downstream has to be maintained including guaranteed provisions of water requirement during the lean season.	Project financed activities should be designed so as to support hydropower projects achieve the minimum environmental flow rates.	DoE

	Act/Policy	Year	Objective	Applicability	Authority
25	Insecticide Act 1968; Insecticide Rules 1971; Insecticide (Control) Order 1985;	1968 1985	The GOI has notified various Acts for the control and prevention of pollution due to pesticides and fertilizers. The Act to regulate the import, manufacture, sale, transport, distribution and use of insecticides with a view to prevent risk to human beings or animal	As project investments are likely to involve use of pesticides, fertilizers and insecticides, provisions of some of these would be relevant.	Central Insecticides Board, GoI
26	Fertilizer Control Order 1985; Fertilizer Movement Control Order 1973; Essential Commodities Act (Amended - 1986)	1985 1973 1986	The GOI has notified various Acts for the control and prevention of pollution due to pesticides and fertilizers.	As project investments are likely to involve use of pesticides, fertilizers and insecticides, provisions of some of these would be relevant.	Ministry of Agriculture and Rural Development (Department of Agriculture and Cooperation)
27	Himachal Pradesh Forestry Sector Medicinal Plants Policy, 2006 (Notified vide No. FFE-B-C (16)-8/2005 dated 27 Nov 2006)	2006	The Policy visualizes Himachal Pradesh to become a major herbal state in the country by 2025 with - i. Recognition of the medicinal plant resources of the state as very important forest produce. ii. Sizeable rural and urban populations deriving their livelihoods from this sector and significant contribution made by this sector to the State's economy. iii. Enabling legislation and institutional mechanisms to develop this sector firmly in place. iv. The germplasm of medicinal plant diversity of the state conserved in its natural habitat.	The policy has implications for FFP design as it specifies that management of Medicinal plant in their Natural Habitat should be maintained.	Department of Forests
28	Policy for managing lantana in Himachal Pradesh (lantana camara)		Policy document to specify methods for managing invasive species lantana	The document specifies the tested methods for lantana eradication, and should serve as a guiding document, when designing pasture re-generation interventions.	Department of Forests
29	APMB Department Notification agr F (150-26/2004 dated 11.3.2010. Amendment to The Schedule section 2 (a) of Himachal Pradesh Agricultural and Horticultural Produce Marketing (Development and Regulation) Act, 2005	2010	HPSAMB to provide for improved regulation in marketing of agricultural produce, development of efficient marketing system, promotion of agri- processing and agricultural exports, establishment and proper administration of markets for agricultural produce in the State of Himachal Pradesh.	APMB provides marketing support o 37 Medicinal and Aromatic plants. APMB mandis can be used to auction this produce	Dept. of Agriculture (APMB)

	Act/Policy	Year	Objective	Applicability	Authority
	(Amendment to the Schedule)				
30	Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011 and subsequent amendment.	2011	The Food Safety and Standards Authority of India (FSSAI) has been established under the Food Safety and Standards Act, 2006 as a statutory body for laying down science based standards for articles of food and regulating manufacturing, processing, distribution, sale and import of food to ensure it is safe to consume.	FSSAI standards would apply if NTFPs supported under the project are processed for consumption.	FSSAI

	Construction and Pollution Management				
	Act/Policy	**Year**	**Objective**	**Applicability**	**Authority**
1	Water (Prevention and Control of Pollution) Act (and subsequent amendments)	1974	To provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.	The project will have Investments on supply chain that may increase wastewater flow Proper measures as per the requirement of the Act will have to be incorporated.	CPCB, and HPPCB
2	Air (Prevention and Control of Pollution) Act (and subsequent amendments)	1981	To provide for the prevention, control and abatement of air pollution, and for the establishment of Boards to carry out these purposes.	The project will involve construction of infrastructure and their clearance may be required by the Project.	CPCB, HPPCB, and Transport Department
3	The Municipal Solid Waste (Management and Handling) Rules,	2000	The rule facilitates and provides methods to manage the Municipal Solid Wastes in an efficient and reusable manner.	As project investments, will involve construction/up gradation of buildings/nurseries, supply chain infrastructure, generation and disposal of solid waste under different components will need to be managed in line with the rules.	MoEFCC, CPCB, and HPPCB
4	The Noise Pollution (Regulation and Control) Rules, and amendments	2000	Work place noise is covered under Indian factories Act, 1948 but this rule provides safety against noise in ambient condition with generation of noise by certain point and area source.	Project activities may lead to generation of Noise due to construction activity, and operation of DG sets for power backup.	MoEFCC, CPCB, and HPPCB
5	Central Motor Vehicle Act Central Motor Vehicle Rules	1988 1989	To control vehicular air and noise pollution. To regulate development of the transport sector, check and control vehicular air and noise pollution.	Operation of vehicles in carriage and construction activities in the project. Also, applicable to	Motor Vehicle Department

				vehicles used under forest fire control / patrol and management	
6	Roof-top Rain Water Harvesting	1999	Rain water harvesting in the state	Any infrastructure facility more than 1000m plinth area	HP State Council for Science, Technology & Environment
7	Himachal Pradesh Non-Biodegradable Garbage (Control) Act, 1995	1995	Ban on non-biodegradable garbage including plastics	The project may use non-biodegradable material for crates and packing material, however these will be reused in its life cycle and their applicability for use will also be assessed during project implementation phase.	HP State Council for Science, Technology & Environment
8	Construction and Demolition Waste Management Rules	2016	Every waste generator shall prima-facie be responsible for collection, segregation of concrete, soil, storage of construction/demolition waste generated and deposition to collection centre or handover to authorized processing facilities	Applicable as construction waste will be generated during the construction phase. Some of the projects involve dismantling / demolition of existing infrastructure such as intake wells, etc.)	HPPCB
Labour Welfare & Occupational health and Safety					
	Act/Policy	**Year**	**Objective**	**Applicability**	**Authority**
1	Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	1966	It regulates the employment and conditions of service of building and other construction workers and provides for their safety, health and welfare.	This will be applicable if any building or other constructions works and employ 10 or more workers.	District Labour Commissioner and Buildings Inspector
2	FAO Guidance on Occupational Health and Safety in Forestry		Provides guidelines on safety in forest operations including harvesting, NTFP collection and forest fire management	This can be utilised as good practice for communities and labour hired under the project	PMU
3	Workmen Compensation Act, 1923	1923	It provides for payment of compensation by employers to their employees for injury by accident i.e. personal injury or occupational disease.	Construction workers will be involved in the sub-projects.	District Labour Commissioner
4	Inter-state Migrant Workers Act, 1979	1979	It protects workers whose services are requisitioned outside their native states in India. A contractor who	Construction workers will be involved in the sub-projects	District Labour Commissioner

			employs or who employed five or more Inter-State migrant workmen need to obtain registration under this act		
5	The Child Labour (Prohibition & Regulation) Amendment Act, 2016	2016	It prohibits employment of children in specified hazardous occupations and processes and regulates the working conditions in others.	There should not be any child labour in any project activity.	District Labour Commissioner
6	Minimum Wages Act, 1948	1948	Payment of minimum rate of wages as fixed and periodically revised by the State Government	Construction/daily wage workers will be involved in the sub-projects	District Labour Commissioner
7	Building and Other Construction Workers Welfare Cess Act, 1996	1996	An Act to provide for the levy and collection of a Cess on the cost of construction incurred by employers.	Sub-projects will involve construction workers	District Labour Commissioner

3.4. List of Statutory Clearances and Authorizations

Table 33 List of Statutory Clearances and Authorizations which may be required

Sr. No.	Activity	Statutory	Requirement	Competent Authority	Responsible Agency for Obtaining Clearance	Time Required
1	Tree cutting from Private land classified as 'Forests'	Forest Conservation Act 1980	Permission for tree cutting shall be processed under Forest Conservation Act 1980. Felling under this category will be granted by DFO after processing the case under FC Act and getting approval	DFO	HP forest department	3-5 months
2	Tree cutting from government land not classified as forests	GoHP leteer no FFE-(b) F 913)53/2 006-1 dated 20.08.2011	Felling of trees except for Ban/Oak from non-forest land in rural areas for development activities not forming compact wooded block of above 5 Ha and land is not classified as van, Bani, and Jungle etc. in revenue record.	Chief Conservator of Forests/ CCF of the circle will grant permission, DFO shall inspect the trees after obtaining approval from CCF. Felling to be done through HP SFDC	HP forest department	0-6 months

Sr. No.	Activity	Statutory	Requirement	Competent Authority	Responsible Agency for Obtaining Clearance	Time Required
2	Tree cutting from Government Land classified as forests	Forest Conservation Act 1980	Felling of trees from diverted forests land where final approval has been granted by GoI u/s 2 of FCA, 1980	DFO, of the concerned circle Felling to be done through HP SFDC	HP forest department	0-6 months
3	Extraction of ground water	Ground Water Rules of 2002	Permission for extraction of ground water for use in road/other construction activities	State Ground Water Authority	HP-Forest Department	2-3 months
4	Engagement of labour	Labour Act	Labour license	Labour Commissioner	HP-Forest Contractor	2-3 months

3.5 Government and Donor Programmes and Synergies with HPFFP

Table 34 ***Government Development Programmes with similar elements to HPFFP***

#	Project	Stage	Objective and Key Activities	Complementarities
1	Mid Himalayan Watershed Development Project	**Closed- 2017**	The primary objective of the proposed project was to reverse the process of degradation of the natural resource base and improve the productive potential of natural resources and incomes of the rural households in the project area. The secondary objective was to support policy and institutional development to harmonize watershed development projects and policies across the State in accordance with best practices. Project Components: Component 1: Institutional Strengthening Component 2: Watershed Development and Management Component 3: Enhancing Mountain Livelihood	HP FPP will be implemented with watershed as unit of implementation and since the MHWDP project was implemented by HP Forest Department the success stories regarding community mobilization and participation in project activities can be replicated in FPP also.
2	Himachal Pradesh Reforestation Project Improving Livelihoods and Watersheds	**2015 ongoing**	The project has been developed through a series of consultations with MHWDP and its stakeholder constituents namely, Forest Department, Government of Himachal Pradesh, local Gram Panchayat's (GPs) and the World Bank. The project seeks to implement A/R CDM activities on 10,000 ha of degraded lands in the watersheds of Mid-Himalayan region. The four guiding principles of the project are: • Adoption of native and locally preferred tree species for reforestation,	The process adopted for enhancing community participation can be adopted in FPP. Also model for direct sharing of tangible benefits have been developed which can be adopted with modifications.

#	Project	Stage	Objective and Key Activities	Complementarities
			• Involvement of the local GP and small and marginal farmers in reforestation activities that will strengthen the ongoing watershed interventions, • Facilitation of technical, financial and capacity development support from MHWDP to reforestation activities, and • Distribution of carbon revenue to the village community (GP and farmers). The project is expected to bring value addition to the ongoing physical catchment/drainage treatment activities undertaken in MHWDP. It seeks to restore degraded lands through reforestation activities.	
3	Himachal Pradesh Forest Ecosystems Management and Livelihoods Improvement Project-JICA Project	**Yet to start**	The objective of the Project is to conserve the forest ecosystems and improve livelihoods of the forest dependent communities in Himachal Pradesh. Project Components: 1. Sustainable forests ecosystem management 2. Biodiversity conservation 3. Livelihoods improvement support 4. Institutional capacity strengthening**.**	HPFPP is being implemented in the Sutlej basin alongside this project. The interventions proposed in both the project will help in holistic treatment of Sutlej basin. Also, the villages in JICA project will act as control villages for HPFPP.
4	Himachal Pradesh Horticulture Development Project	**2016 ongoing**	Project Objective is "to support small farmers and agro entrepreneurs in Himachal Pradesh, to increase the productivity, quality, and market access of selected horticulture commodities." The Project Indicators are: (a) Productivity: Productivity (in ton/ha) (i) of rejuvenated apple orchards; and (ii) of new plantations of selected horticulture crops. (b) Quality: Percentage of Grade A, B and C Apples produced in HP. (c) Market Access: Share of selected horticulture commodities sold through new marketing channels8 for (i) Apple, and (ii) Tomato. (d) Direct project beneficiaries (number), of which female beneficiaries (%).	This project is more oriented towards horticulture. However, few of the species like wild apricot (local name *Behmi*), walnut etc. which are classified under forests species can be a good source of NTFP. The infrastructure developed under the project as regards to storage, processing and marketing channels created for produce can be utilized for NTFPs under FPP.
5	Infrastructure Development Investment Program for Tourism -HP (financed by	**Ongoing**	The program is for tapping the tourism sector's potential to contribute to sustainable and inclusive economic growth. It will	HP FPP do have component on Eco tourism however, the same will be taken up after the

#	Project	Stage	Objective and Key Activities	Complementarities
	Asian Development Bank):		be implemented in the four participating states - Himachal Pradesh, Punjab, Uttarakhand and Tamil Nadu - to promote the economic potential of the tourism sector within a planned framework and address weaknesses in management capacity. Project Components: Component 1: Urban Infrastructure and Service Improvement Component 2: Connectivity Improvement Component 3: Quality Enhancement of Natural and Cultural Attractions Component 4: Community-based Activities Component 5: Capacity Development, Community Participation and Project Management	review of eco-tourism policy and its roll out in pilot locations all over the State.

Table 35 Government Schemes with implications on Project Design

#	Scheme	Year	Objective and Key Activities	Complementarities / Implications on Project Design
1	Green India Mission This mission has been launched under the National Action Plan on Climate Change (NAPCC)	**2008**	It aims at protecting; restoring and enhancing India's diminishing forest cover and responding to climate change by a combination of adaptation and mitigation measures. It envisages a holistic view of greening and focuses on multiple ecosystem services, especially, biodiversity, water, biomass, preserving mangroves, wetlands, critical habitats etc. along with carbon sequestration as a co-benefit. This mission has adopted an integrated cross-sectoral approach as it will be implemented on both public as well as private lands with a key role of the local communities in planning, decision making, implementation and monitoring. **Mission Goals** • To increase forest/tree cover to the extent of 5 million hectares (mha) and improve quality of forest/tree cover on another 5 mha of forest/non-forest lands; • To improve/enhance eco-system services like carbon sequestration and storage (in forests and other ecosystems), hydrological services and biodiversity; along with provisioning services like fuel, fodder, and	The lessons learnt with regards to improved management practices can be adopted.

#	Scheme	Year	Objective and Key Activities	Complementarities / Implications on Project Design
			timber and non-timber forest produces (NTFPs); and • To increase forest based livelihood income of about 3 million households.	
2	Compensatory Afforestation Management and Planning Authority (CAMPA) Program- GoI	**2009**	Compensatory Afforestation Fund Management and Planning Authority (CAMPA) are meant to promote afforestation and regeneration activities as a way of compensating for forest land diverted to non-forest uses. National CAMPA Advisory Council has been established as per orders of The Hon'ble Supreme Court of India with the following mandate: • Lay down broad guidelines for State CAMPA. • Facilitate scientific, technological and other assistance that may be required by State CAMPA. • Make recommendations to State CAMPA based on a review of their plans and programmes. • Provide a mechanism to State CAMPA to resolve issues of an inter-state or Centre-State character. <u>State CAMPA</u> The Hon'ble Supreme Court of India also approved the guidelines prepared by the MoEF for utilizing CAMPA funds by an agency to be constituted in the states and to be known as The State CAMPA. Some of the important points in the guidelines are highlighted here: • The State CAMPA would presently receive funds collected from user agencies towards compensatory afforestation, additional compensatory afforestation, penal compensatory afforestation, Net Present Value (NPV) and all other amounts recovered from such agencies under the Forest (Conservation) Act, 1980 and presently lying with the Adhoc CAMPA. • The State CAMPA would administer the amount received from the Adhoc CAMPA and utilize the funds collected for undertaking compensatory afforestation, assisted natural regeneration, conservation and protection of forests, infrastructure development,	The activities under CAMPA are similar to the interventions proposed under HP FPP i.e. afforestation, Soil and moisture conservation, catchment area treatment, assisted natural regeneration (eradication of lantana) etc. which will complement the project in achieving holistic treatment of Sutlej basin.

#	Scheme	Year	Objective and Key Activities	Complementarities / Implications on Project Design
			wildlife conservation and protection and other related activities and for matters connected therewith or incidental thereto. • State CAMPA would provide an integrated framework for utilizing multiple sources of funding and activities relating to protection and management of forests and wildlife. Its prime task would be regenerating natural forests and building up the institution engaged in this work in the State Forest Department including training of the forest officials of various levels with an emphasis on training of the staff at cutting edge level (forest range level). In short, the department would be modernized to protect and regenerate the forests and wildlife habitat.	
3	National Afforestation Programme	Under 10th Five Year Plan of GOI (2002-2007)	Since 2002-03, the National Afforestation Programme continues to be the flagship scheme of NAEB, in so much as it provides support, both in physical and capacity building terms, to the Forest Development Agencies (FDAs) which in turn are the main organs to move forward institutionalization of Joint Forest Management under participatory mode by involving two-tire set up as FDAs (Divisional level) and JFMC (at village level).	The HPFD staff with enhanced capacity to deliver program objectives will be better equipped to deliver in FPP also.
4	National Mission for sustaining the Himalayan Ecosystem (NMSHE). This mission has been launched under the National Action Plan on Climate Change (NAPCC)	**2008**	The primary objective is to develop a sustainable national capacity to continuously access the health status of the Himalayan Ecosystem and enable policy bodies in their policy-formulation functions. The mission will also assist states in the India n Himalayan Region with implementation of actions selected for sustainable development. **The NMSHE address a variety of important issues like** a) Himalayan glaciers and associated hydrological consequences b) Prediction and management of natural hazards c) Biodiversity conservation and protection d) Wild life conservation and protection e) Traditional knowledge societies and their livelihood	The bio-geo data base for Himalayan ecosystems created during this project and lessons learnt regarding, traditional knowledge systems for community participation in adaptation, mitigation and coping mechanisms can be used in FPP also.

#	Scheme	Year	Objective and Key Activities	Complementarities / Implications on Project Design
			f) Capacity in regulation of science and critical peer evaluation to help governance issues related to sustenance of the Himalayan Ecosystem **Other important aims of the Mission** • To build and support capacities at central and state levels to assess climate change and formulation of response measures to challenges in the Himalayan region • Safeguard the communities in the Himalayas from the impacts of climate change through evidence based policy formulation and enhanced research and capacity (major beneficiaries marginalized and vulnerable communities).	
5	National Water Mission. This mission has been launched under the National Action Plan on Climate Change (NAPCC)	**2008**	Objective 1: **Comprehensive water data base in public domain and assessment of the impact of climate change on water resource** Objective 2: Citizen & State Action Objective 3: Focus on Vulnerable Areas Objective 4: Improving Water Use Efficiency by 20% Objective 5: Promotion of basin level integrated water resources management	The monitoring systems developed for assessing rivers and other water channels can be utilized for providing data for project activities as well as facilitate project monitoring.
6	Partnership for Land Use Science (FOREST-PLUS) Program The project is part of bilateral agreement signed by MoEF with USAID to promote scientific and technical collaboration between India and US	**2014**	This is a five year project. Plus in this nomenclature is the abbreviation for "partnership for land use science". The project's focuses on reducing emissions and enhance carbon sequestration through India's forests by taking REDD+ actions. It includes capacity building and designing of techniques and verifying the same in field as part of preparatory activities of REDD+ Project which will also support Green India Mission.	The lessons learnt from the study pertain to the project area and hence can be replicated very effectively in FPP.

Chapter 4: Stakeholder Assessment and Consultation

4.1 Background and Summary of the Consultation Process

Consultation and communication in forest sector projects are important to build coalitions, manage risk, create transparency, and formalize mechanisms for participation and responses to stakeholder concerns. Consultation enables the involvement of indigenous groups and other marginalized and women, youth, and old people. A well-designed Stakeholder consultation strategy facilitates transparency while contributing to the long-term sustainability of a project. The consultations outlined below were undertaken as part of the preparation of the safeguards documents, to identify the concerns of people which were duly addressed through appropriate mitigation measures.

Consultation with stakeholders in forest sector projects is not just a requirement, it is a strategic tool to help project teams, donors, government agencies, and project beneficiaries elaborate on and understand realities at the site. Consultations are the opportunities for project designers to capture and build upon local knowledge by involving stakeholders in the design of the project.

Forest sector projects have to address issues as local access to the resource, the rights of indigenous groups, and other related livelihood issues. In such cases, consultation offers a means to manage these risks by creating transparency and clearly representing the approach and objectives of a project. Through proper consultation, stakeholders can be involved in project design, generating local commitment to the process and project. The stakeholders have a opportunity to express concerns constructively, and help to design solutions.

Meaningful public consultation typically takes place at three different levels i.e., conveying information to the public, listening to the opinions and preferences of the public, and involving the public in making decisions. The nature and size of the project, combined with both the nature and number of stakeholders and the status of national legislation, will largely define when, where, and what level of public consultation is required for an Environmental Assessment (EA) and its Environmental Management Plan. Site-specific factors, such as a history of local opposition to similar projects in the area, will be important in determining the level of consultations.

Engaging stakeholders involves establishing good lines of communication between an agency/company and its various stakeholders and then maintaining a constructive relationship with them. Through this relationship, stakeholders can have their say and the agency/company can listen and respond, they are primarily

a. People living in and around the forests and dependent on forest produce for various aspects of their lives
b. Forest department of the Government which own and controls the resources of forests

c. The small and big industrialists who use forest produce but are not dependent on a forest in any one area
d. Wildlife and nature enthusiasts who want to conserve nature in its pristine form

Key considerations and tools for stakeholder engagement are discussed under the following headings:

a. deciding on the level and type of stakeholder engagement- formal, informal, one to one meetings
b. drawing up clear rules of procedure- Stakeholder questionnaire
c. identifying stakeholder groups- Stakeholder identification matrix
d. informing people and finding out what people think
e. working with stakeholders to agree monitoring procedures; and
f. practicing good conflict resolution if this becomes necessary.

For developing the Environment Management Framework, consultation meetings with different stakeholders namely forest officers, NTFP collecters and sellers, Gram Pradhans and Members from different panchayats, Members of JFMCs, Farmers and Villagers, consultants, NGOs, research scholars and scientists were conducted. The relevant information gathered has been given in Tables 1, 2 & 3.

Stakeholder's view and perception was assessed through informal and formal public consultation meetings were informed about the project components and likely environmental impacts before seeking their views. In each consultation, all efforts were made to have adequate participation from women as well. The community members, Government officials and NGO members voiced that the proposed project will contribute in environment and economic development of the areas. The proposed project shall contribute to increase employment opportunities for the local people during and after project implementation. The communities welcomed the project and all were in favour of the project. Major issues highlighted during consultation were

- The locals are dependent on forests for Fuel, fodder, Timber, NTFP collection.
- The forest resources have decreased due to overexploitation of forest resources to fulfill the demand for increasing population in the area, forest fire and encroachment of forest lands by local inhabitants and development of infrastructure like roads and dams.
- Eco tourism should be taken up but firstly on pilot basis as it will be good source of income generation however, can lead to pollution, plastic waste generation etc.
- The pastures have decreased due to over grazing and no rotation mechanism for grazing.
- JFM Committees should be constituted at Panchayat level and should be involved in plantation and selection of planting species and closing of area for plantation and pasture treatment.
- In past projects local's participation in work plan formulation was not much. Also, not much focuses on our needs. The activities should be planned and implemented with local's consultation instead of the planning being done elsewhere. This way their needs will be addressed better.
- Forest Fires are leading to decrease in biodiversity of the forests and risk to human/ livestock lives also.

An executive summary of consolidated EMF report would be made available for public view in local language (Hindi) versions at HP Forest Department website as per provisions of World Bank disclosure policies.

4.2 Key Stakeholders and Institutions (Mapping & Roles)

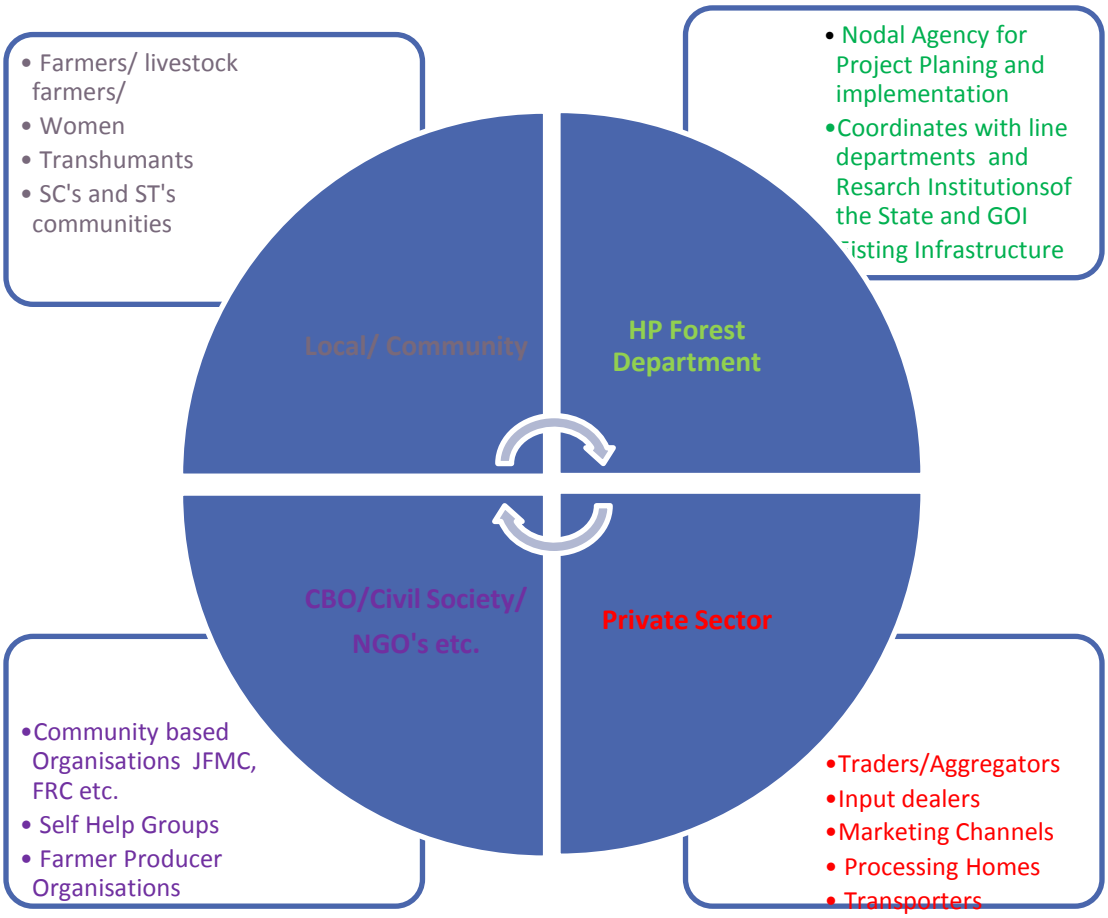
Stakeholder analysis is important in ensuring that all the relevant people and groups are involved in the process. Transparency in the process was critically important. It is important to set clear rules and guidelines for the process and to stick to the scope of the stakeholder process. New communication techniques, including the web, can be useful in facilitating broad access to the process. All stakeholders share a responsibility in making such processes work efficiently and effectively.

Table 36 ***Stakeholder Information Matrix***

Level/ Type	**Stakeholder**	**Stake in the project**	**Importance (High/ medium/ low)**	**FFP needs**	**Perceived attitude**
A)	HP Forest Department, GoHP	Nodal Agency	High	Project Planning and Implementation	Interested
B)	Department of Energy, GoHP	Line Department	Medium	technical support	Interested
C)	Himachal Pradesh State Agriculture and Marketing Board, GoHP	Line Department	Medium	NTFP marketing	Moderate
D)	Department of Environment Science and Technology (DST), GoHP	Line Department	Medium	technical support	Interested
E)	ICAR-Indian Grassland and Fodder Research Institute, GOI	Line Department	Medium	Pasture Management technical support	Interested in participating in project planning and implementation
F)	Himalayan Forest Research Institute, HFRI , GOI	Line Department	Medium	Silviculture operations and Pest Management	Interested in participating in project planning and implementation
G)	HP State Forest Development Corporation Ltd. (HPFDC), GoHP	Line Department	High	NTFP harnessing and marketing	Interested
A)	Circle (Conservator of Forests)	Nodal Implementer	High	Existing channel for submission of APOs/ approval of APOs/ sanctioning power of works/ supervise performance of divisions / co-ordination with all Divisions/ grievance redressal / procurement of goods, works etc beyond competence of DFO	Interested
B)	Division (Divisional Forests Officer)	Nodal Implementer	High	Prepare APOs/ Sanction works within his competency/ supervise performance of staff up to range offices/ grievance redressal/ drawing and disbursing officer from government treasury/ co-	Interested

Level/ Type	Stakeholder	Stake in the project	Importance (High/ medium/ low)	FFP needs	Perceived attitude
				ordination between all Range Officers and with other Departments/ procurement of goods, works etc within his competence	
C)	Range (Range Officer) And his frontline staff	Nodal Implementer	High	Implementing activities as per approved APOs/ Inputting data in FMIS/ Sub-disburser of government funds/ liaising with public/ Attending to Forest offences/ fires	Interested
A)	Local Farmers	Direct dependency on forests	High	More responsible stakeholder in forest management and particularly NTFP management, extraction and marketing	Interested
B)	Transhumant	Direct dependency on forests	High	Play an important role in Pasture management and NTFP management	Interested
C)	Women	Direct dependency on forests	High	More responsible stakeholder in forest management and particularly NTFP management, extraction and marketing	Interested
D)	SC's and ST's communities	Direct dependency on forests	High	More responsible stakeholder in forest management and particularly NTFP management, extraction and marketing	Interested
A)	Joint Forests Management Committees (JFMC)	Direct Dependency on forests and NTFP's	High	Main body entrusted for preparing individual management plan and its implementation	Interested
B)	Forests Right Committees (FRC)	Constitutional body framed under Forests Right Act, 2006 for ensuring the rights of ST's and Other traditional Forests Dwellers	Moderate	Existing structure of addressing forests right of locals inhabitants	Interested
C)	Self Help Groups like mahila mandals etc.	Dependency on forests and NTFP's	Moderate	Play important part in implementation of government	Interested

Level/ Type	Stakeholder	Stake in the project	Importance (High/ medium/ low)	FFP needs	Perceived attitude
				schemes.	
A)	Traders /Aggregators /marketing channels	Direct dependency on NTFP market value chain	High	Play a critical role in value chain, provide informal financing to small farmers and take working capital risk.	Like to keep the tricks of trade secret and not share the details for fear of losing the monopoly.
B)	Transporters	Direct dependency on NTFP market value chain	High	Critical for the fresh produce to reach market on time, for loss in transit and in providing market access.	Would be willing to co-operate subject to conflict with other perishable commodities like apple .
C)	Processing homes	Direct dependency on NTFP market value chain	High	Processes NTFP produce to various forms for end-use and play as the major rooter for production	Would be willing to help if capacity unutilized.



4.3 Summary of Stakeholder Consultations and implications for project/EMF design

In accordance with the World Bank Safeguard policies, stakeholder consultations were conducted with local farmers and other stakeholders (officials of project administration, Forest Department and line department officials/staff). Their opinions and concerns have been taken into account in preparing the EA safeguard documents with the following objectives:

a. To create awareness and generate understanding about the project among stakeholders, and to collect their opinion, suggestions for planning and designing of the project
b. To find out whether the communities are likely to accept the measures suggested under the HPFPP and to find out whether these measures have no or little environmental impacts on the communities.
c. To assess positive as well as adverse environmental impacts in the area through participatory methods such as walk through and focus group discussions.

d. To identify the need and concern of the stakeholders
e. To assess cultural patterns and behavior of local communities towards the project
f. To understand the environmental issues associated with the project through discussions
g. To understand suggestions and opinions of the community, Government officials and NGOs on mitigation measures to counter and check the adverse and negative impact that threaten the environment in the area.
h. To understand the satisfaction level of people with proposed mitigation and management measures proposed for the project

Table 37 Institutional Consultations

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
1	Sh. Rahul Sharma, Silviculture Subject Matter Specialist	Silviculture Subject Matter Specialist	HP Forest Department (HPFD)	24/04/2018, 11.00 am	• Seed Storage (controlled temperature environment) is required at each nursery. • Proper collection of seeds required. • Trained and dedicated nursery staff required. • Seed orchard management required. • Schedule of Rates prescribed by department does not match up with present scenario/market rates. • Plus trees not marked for seed orchards. • Seed testing, processing and treatment lab required (centralized or as per agro climatic zones of HP). • Fire control equipment insufficient. • Budget allocation for fire control is insufficient. • Awareness and training of staff required. • Reassessment of fire lines. • Long term planning required for seed orchard management with sufficient funds. • Counter fire management is not done due to lack of training and insufficient staff. • For lantana eradication, the cut root stock method is not implemented as per the guidelines. • Solid waste management for nursery waste is not done.
2	Mrs. Anita Bhardwaj, Assistant Conservator of Forests (Wild Life), O/o DFO(W/L), Shimla	Wildlife and Silviculture	HP Forest Department	24/04/2018, 11.45 pm	• Public participation is minimal due to Supreme Court of India orders on no extraction from Protected Area (PA). • Illegal extraction and poaching of mammals and pheasants is a cause of concern. • Eco tourism can be promoted as each PA has its own USP. But synergy between the two has to be maintained. • PA has very small geographical area with pressure from human population residing in the vicinity of the PA. • Fire management is a cause of concern as its endanger the wildlife in PA.

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					• Staff mobility for fire prevention/control/illegal extraction and poaching is required. • Control burning in forest is advisable but is not done due to lack of trained field staff and insufficient funds. • The cur root stock method for lantana eradication should be implemented as per guidelines. The example of proper implementation is at Rajaji, Jim Corbet and Kanha National Parks. • Fire prevention and suppression should be taken up on priority. • Grading of plants has to be done at nursery level.
3	S. Hitender Sharma, Joint Director, Forest Training Institute Chail (HP)	Training, Community participation and Silviculture	HPFD	24/04/2018, 12.30 pm	• Forest Training is provided by the institute in Chail, and branch in Sundernagar. Typical courses include 6-month training to forest guard (provided bi-annually). Refresher training courses in fire management and GIS. • Forest Fire management is a major challenge. • Dumping of debris and solid waste in forest areas from human settlements and construction activities is a major concern. • Wildlife conflict due to construction activities in the forest area, in many cases wildlife habitats have been fragmented by roads and accessibility to water sources in a problem. • PWD used to reuse polybags in road construction activities but the practice has been abandoned • Bioengineering on hill slopes needs to be scale dup • Regular training of forest staff on FMIS, GIS,IFMS,GPS,HRD etc. is required. • Trained and dedicated staff for nurseries is required for plants to be graded, identification of healthiest plants. Good programme for nursery supervision should be supported • There is an infrastructure up gradation of training schools (hostel facility, exposure visits, equipment's such as

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					laptops, LED screens conference halls etc.) is required. • Faculty shortage at training schools. Some key environmental challenges include (i) Depletion of bio diversity due to invasive alien species and forest fires (ii) Weed management within nurseries, and (iii) management of stray cattle
4	i. Sh. Raghav Sood, Secretary APMB (Bilaspur & Shimla) and ii. Mr. Solanki, State Coordinator , E National Agriculture Market (eNAM)	Agriculture, Medicinal and Aromatic produce marketing (NTFP & MAP)	Himachal Pradesh State Agriculture and Marketing Board, GoHP	25/04/2018, 3.30 pm	• There is a network of 60 markets across the state. However, these market are dealing with agriculture and horticulture produce mainly. • The window for NTFP's is only from November to April where the mandis are not fully operational/busy • Kullu, Chamba, kangra, Shimla are major APMB mandis • No dedicated platforms or storage areas for NTFP. Rented area for whole sale traders is provided. • Out of 131 schedule items 37 are NTFP's/MAPs as notified by the GoHP which can be marketed/sold through APMB • The framers and traders negotiate directly with no role of APMB. • 1% of market fee is charged from trader (i.e. 1% of total value of stock). • No dedicated check on under value of product stock. • Farmer interest groups can be mobilized with access to financial resources. The Govt of India has started eNAM (http://www.enam.gov.in), wherein grading, sorting and auction is being done online as per Directorate of Marketing Inspection (DMI),GOI guidelines. 19 markets of Himachal have been enrolled at the portal. • Till date 90 commodities have been added. • NTFP can be added to e-NAM subject to its availability and quantity. eNAM can be later expanded to logistics and warehousing • the project can support with a single market earmarked for NTFP/MAPs The said market should be at main NTFP

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					production area or at state exit point. • Sector is 'organic' by nature and its value needs to capture this aspect. • Before going for expansion, a strong buyer base to be created. • NTFP/MAPs need support for sorting, grading and storage facilities. Currently there are no major private players in this space. • NTFP transit rule may be liberalized.
4	Dr. Suresh C Atri, Principal Scientific Officer (Environment),	Environment, Natural Resource Management and Climate Change	Department of Environment Science and Technology (DST), GoHP	26/04/2018 10.30 am	• DST has developed Environment Master Plan of State. • The DST is main coordinating department with every other sector department of the State for natural resource management. • DST gives policy input to other line departments. • DST is the nodal office for climate change action plan of the state. • DST gives sectorial guidelines for all departments regarding environment. • The reason for climate change is due to rise in temperature. • The change in forest dependence of people is due to options available for alternate fuel. • Due to green felling ban in the state the forests are not being used as resource and are just being conserved. • Planning process to be reformed for forest being used as resources. • Pine needle clearance from forest is not planned as there is no online monitoring system. • No awareness in people and low capacity of forest department about pine needle collection. • Wherever there is forest fire incidence the invasive species/weed problem is more due to sprouting of seeds. • Community is not oriented about livelihood practices from

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					forests. • Lack of awareness about bio diversity conservation. • Rise in temperature and less rainy days has led to shifting of plant species towards N/W direction. • The spring sources are drying due to extraction of ground water, storage in water tanks, high temperature and less rainy days. • HP water table is going down due to excessive harnessing of water especially in low lying area. • Check on ground water extraction is a necessity. • Application of knowledge and capacity of nodal agencies (key stake holders) is missing. • No subject specific trainers in concerned sector. • Cadre of different field in HPFD. Dedicated cadre is required. • Limitation of resources, manpower. • To build the capacity of the manpower its domain should be fixed. • Assign some economic value to the weed and then only people will take interest in its eradication. • Install two industries for re-use of weed residue/ demonstration for weed management.
5	i. Dr. Sandeep Sharma, Scientist G ii. Dr. P.S.Negi, Scientist C iii. Sh. Sanjeev Kumar, DCF iv. Dr. Ashwani v. Dr. Ranjeet Singh, Scientist E	i. Nursery and Medicinal Plants. ii. Seed and Nursery Technology iii. Silviculture iv. Pathologist v. Entomology	Himalayan Forest Research Institute , HFRI (body of Indian Council for Forest Research and Education, ICFRE under Ministry of Environment, Forests and Climate Change, GOI)	26/04/2018 3.00pm	• Most of the Joint Forest Management committees (JFMC) are nonfunctional. • Forest productivity in HP is less. • Better collection of seeds through seed orchards is required. • Model nurseries to be constructed so that good saplings can be grown and planted. • Skill up gradation of line staff for seed collection is required e.g. choice of species as per agro climatic zones of state, seed quality, seed handling, processing, nursery management, site selection for plantation etc.

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					• Low productivity of forest due to low survival of species which are not from same agro climatic zone. • Local community input should be taken for selection of species. • The selected specie has to be vetted from some research institute or university to technical aspect. • Too many project in a single zone leads to difficulty in assessment of impacts. • Area to be selected where least activities has been undertaken. • A fringe forest i.e. around the vicinity of the village area where dependency of community is high has to be taken up on priority. • Afforestation has to be done on properly marked sites. • GPS coordinates of the area where interventions are planned has to be taken and maps be taken before hand. • FSI, DST is good tool for site selection. • In nurseries civil works to be completed by 1st year. Plantations to be done by 2nd or 3rd year. • Tall and sturdy (root shoot ratio, diameter, height) plants to be planted. • Root trainers can be used as per the species. • Vermin compost or organic media should be used in nurseries instead of soil mixture. • Nursery selection has to be done by expert technically and administratively. Then inception plan as how to improve the individual nursery has to be prepared. • The staff to be trained and be retained at same nursery for at least 5 years. • Provision of consultancy has to be there in the project. • 19 nurseries selected in the project should have 19 individual plans for up gradation. • Planning of activities with expert has to be done.

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					• Culling in nurseries has to be done periodically i.e. inferior stock should be disposed. • Damping of disease, cut worms, white grubs, and aphid attacks are common in nurseries. • Solar sterilization unit is a must in every nursery. • Bio pesticide/ fungicide should be prescribed in nursery plan. • Hardening of stock should be done in nursery i.e. restriction of water 2-3 months before plantation in field. • In district Kinnaur months of May to June should be selected for plantation and soil should be transported from outside. • Planning and sequencing of activities in nurseries and plantation is lacking. • Nauni Panchayat in District Solan is an example of water and moisture conservation. • Success stories of community driven activities of similar nature or project be replicated in Satluj Basin. • NGO's in the Satluj basin should be taken on board for community participation. • 20-25% area should be era marked for NTFP plantations. • Value addition of community resources of NTFP to increase income should be undertaken. • Chilgoza harvesting training is being imparted by the institute with the necessary tools. • Good practices from agriculture and horticulture nurseries should be replicated in forest nurseries. • Microriza fungi in soil are used in nurseries instead artificial microriza fungi can be used which act as fertilizer and also for bio control. This will lead to more sturdy plants. • Till date adoch method are used in nurseries for pest attack. • Depending on pest the control measures should be

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					recommended. • The nurseries should have ornamental shrubs, trees etc. which act as natural biological barrier against pest attack. • Due to change in temperature the insect's species in nurseries are also evolving and new species are proliferating. • Trichoderma can be used for root rot or collar rot. • Neem cake can be used to reduce the use of pesticide or fungicide. • Modern method should be used for pest management. • Trap crop or inter cropping can act as pest control. • Excess watering of plants in nurseries. • Seed stands identified by HFRI and converted in seed production area. Deodar seed stand in Cheog. • Seed stands are for only two species i.e. deodar and Chid in HP. • Seed stands converted to seed production area will be of great benefit. • Identifying new seed stands will require 5-6 years. • Modern techniques can be used in nurseries for germination of seeds, raising of saplings, sprinklers, mixing media, drill marker, bed marker etc.
6	Sh. Jamaldin, Astt. Manager (Una & Amb) , O/o District Manager, HPFDC (Hamirpur)	Timber salvage, auction and Resin collection	HP State Forest Development Corporation Ltd. (HPFDC)	01/05/2018 2.30pm	• HPFDC is working on Timber salvage and Resin collection only. • Other major NTFP in forest and private land in low lying area of HP is Kher (***Senegalia catechu).*** It is used for extraction of catechu which is extensively used in India as food product and medicine. • The Kher are extensively planted by persons in their private land holding and sold directly to private contractors to fetch good money. • HPFDC has no arrangement to buy these trees as private contractors give cash whereas there is no provision of such

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					in HPFDC. • Local people are engaged for resin collection as it saves money as they know the forest and doesn't require lodging • There is scope of market if the resin collection is opened for private contractors. • Rate of resin per quintal or Kilogram should be notified before giving the contract to private party. This will fetch more income to the state. • Schedule of Rates for hiring labour is very less with respect to prevailing market rates. • Acute shortage of staff. • Pine needle collection is being done by private contractors and is used for fuel only. • Earlier HPFDC had paper pulp factory near Baijnath for processing pine needle. The same is closed. • The pine needle collection is very labour intensive and is prone to termite attacks as there is no storage facility available. • NTFP's in state are harnessed across a wide area and in small quantity. • Getting the NTFP to a single market will be un- economical for the community. • There are no such NTFP in low lying areas of the state. Few NTFP's are harnessed in small quantity. • Earlier the forest cover around the village or habitation was dense thus labour cost was less. However, due to change in density of forest cover around the habitation the resin collection has to be done in far flung forest which is costing more. • Economic value to be assigned to lantana for its eradication from forest e.g. fire wood, furniture making etc. • The forest productivity is getting lower in state.

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
7	Dr. Sudesh Randotra , Principal Scientist & In charge	Himachal Pasturelands	ICAR-Indian Grassland and Fodder Research Institute, Palampur	03/05/2018, 10.30am	• The institute is part of Eco system climate proofing project in HP being funded by kfw. • There is lack of communication between research institutes and HP Forest Department. • Quality of pastures i.e. yield/biomass is low in HP due to lack of management, people interest and weed infestation. • The good pastures are being used but the low quality pastures are not being treated to enhance their quality. • The treatment of pastures by HPFD is not very useful as to eradicate weed infestation the pastures have to be cleared for 3-4 years. • New improved varieties of local seeds or other seeds can be grown in pastures. • Pastures treated to be properly marked and closed. • Community should be trained and mobilized for pastures management and protection as they are the direct beneficiaries. • Private sector participation in pastures is very difficult as the revenue generation is very low and the areas are remote. • Lantana is proliferating to higher pastures i.e. Alpine with evidence are being found in Keylong in Lahaul&Spiti. • Field Staff for pasture management to be properly trained. • Community participation can yield maximum benefit in pasture management. • Wasteland increasing due to climate change with earlier small pasture being turning to waste lands. • Forest fire mainly due to burning of pasture with people's perception that by burning pasture the next year yield will increase. • Due to HPFD main focus on planting pine species the biodiversity of forests have fallen.

S. No.	Name and Designation	Field of Expertise	Department/ Organization/ Corporation/ Agency/ Institute	Time and Date	Suggestions/ Key input
					• Pine needle collection should be done to prepare brickets which can be used as alternate source for fuel. • Private sector to be involved in pine needle collection as HPFD does not have the resources and also HPFD is not too keen on competitive market. • HPFD field staff's has less technical knowledge in pasture management which has further led to degradation of pastures. • Long term planning for pasture management is a must. • Technical assistance of research institutes to be taken. • Recommendations of experts to be implemented. • HPFD gave permanent pastures to transhumant instead of rotation of pastures leading to degradation. • Low lying area pastures need more treatment.

4.4 Field Level Consultations

The stakeholders' consultation has been organized to ascertain the environmental benefits and risks associated with the subproject implementation for various activities (including Seed collection, Nursery, Pasture management, NTFPs and plantation protection).

The sample subproject locations at four districts have been visited by the consultants and a formal interaction has been carried out with the stakeholder's, including forest officers, NTFP collecters and sellers, Gram Pradhans and Members from different panchayats, Members of JFMCs, Farmers and Villagers, consultants, NGOs, research scholars and scientists participated and discussed the different environmental problems related to forest resources and their sustainable management focusing mainly on the Sutlej catchment. Details of meetings, issues discussed and stakeholder's responses during the meetings are listed below.

The summary of the consultation outcome has been depicted in the following Table.

Table 3: Details of Stakeholder Consultations meetings at district level

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
1	Kinnaur	24/04/2018	Forest Rest house, Reckong Peo	Total number of participants were 60 including • Concerned Forest Range Officers, Deputy Ragers and Forest Gaurds of Three Ranges of Kinnaur. • Sh. R.S Negi President Him lok Jagriti Manch • Gram Praddhans and members of villages Moorang, Kalpa, Kilba, Ribba, Rispa & Lippa	• The locals are dependent on forests for Fuel, fodder, Timber, NTFP collection (Chilgoza, Guchii etc.) • There has been substantial decrease in natural resources mainly around the areas where large construction projects like hydropower projects, road construction are being implemented. • Traditionally the forest area in and around the sacred groves are protected by locals. • The area prone to forest fires should be properly marked and cut off from the adjacent forest to prevent forest fire from spreading to nearby areas. • Soil instead of water to be used for extinguishing forest fires. • The forest resources have decreased due to forest fires, deforestation, lopping of cilgoza pines, increased population pressure, over grazing. • Cutting of *Cedrus deodara* trees for funeral and other purposes has dereased *Cedrus deodara* species in the region. • Fuelwood depot should be there at Panchayat level and they should provide the woods to locals in case of	• Forest Fire lines reassessment is being done under the project. • Proper management of Chilgoza pines will be undertaken in the project. • The Forest rights are being settled by the concerned Deputy Commissioner/ Divisional Commissioner of the area. • Eco tourism sites are being selected on pilot basis by GoHP and in future when this component is taken up by the project the community views will be taken. • JFMC's will be constituted if not already done and will be consulted for preparation of range level plans and its implementation and monitoring. • Pasture management plans will also be prepared in consultation with concerned JFMC's. • Awareness programmes, trainings, field visits will be conducted for capacity building of community of the project area. • The plant species will be raised in nurseries in consultation with JFMC • The project will encourage conservation of natural resources through participatory management practices. • The project will Involve local users in monitoring of natural resources • Will ensure sufficient area for grazing to avoid excess biotic pressure. • Will take on board research institutes for improving the yield of pastures. • Will take community in confidence

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
					emmergencies • Forest fires in the region is hampering the regeneration processes of different tree species • Harvesting of chilgoza has been commerselisated in Kinnaur region. • Participants from the Ribba and Rispa Panchayat stated that the lopping of chilgoza has been reduced in their area by Panchayat • During forest fires community do participate in extinguishing fire. • People's participation in the Forest Right Act should be encouraged in the region • Eco tourism should be taken up but firstly on pilot basis as it will be good source of income generation however, can lead to pollution, plastic waster generation etc. • The pastures have decreased due to over grazing and no particular rotation mechanism for grazing. • JFM Committees should be constituted at Panchayat level and should be involved in plantation and selection of planting species.	before closing areas and include these arrangements in the range level plans • Develop and maintain marketing tieups for NTFP's • Regular monitoring of construction companies for proper muck dumping during the developmental activities, if they don't follow the environment protection rules, take action against them by the concerned DFO's. • For the success of conservation programmes, Forest Department can provide the incentive to local inhabitatnts • Regular monitoring of over harvesting of forest resources. • Inhabitants promote agroforestry system to fulfill the demand of fuel and fodder.

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
  **Stakeholder Consultation meeting at forest rest house Reckong Peo, Kinnaur**						
2	Shimla & Kullu	25/04/2018	Forest Rest house, Nogli, Rampur	Total number of participants were 120 including • Chief Conservator of Forests (Rampur Circle-includes District Kinnaur) • Shri Ashok Negi (DFO Rampur) • Shri V. K. Agarwal (DFO Luhri) • Concerned ACF, Forest Range Officers, Deputy Ragers and Forest Gaurds from Bahli, Rampur, Nankhari, Sarahan, Nithar, Nirmand, Chauwi,	• There has been substantial decrease in natural resources due to drought, deforestion road construction, landslides, unscientific muck dumping during road construction • The locals are dependent on forests for Fuel, fodder, Timber, NTFP collection (Chilgoza, Guchii etc.) • Demarcation around the fire prone area to prevent the spread of fire • The forest resources decreased due to overexploitation of	• muck will be utilized on site for project activities • Forest Fire lines reassessment will be done under the project. • JFMC's will be constituted if not already done and will be consulted for preparation of range level plans and its implementation and monitoring. • Pasture management plans will also be prepared in consultation with concerned JFMC's. • Awareness programs, trainings, field visits will be conducted for capacity building of community of the project area.

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
				Kotgarh. • Gram Sabha , JFMC members from Rampur, Nogli, Taklech	forest resources to fulfill the demand for increasing population in the area, forest fire and encroachment of forest lands by local inhabitants • Wastage of forest woods/timber in the area as dried and fallen trees are not collected and managed properly by forest department • Forest nurseries should be increased in the area and locals should get plants for free of cost • Community do participate in plantation through MANREGA and forest department, forest fire prevention • Joint committees should be constituted involving the local inhabitants for the management and monitoring of plants • Conflicts on choices of plant species during plantation (Like Deodar, Populus instead of Pine) • Awarerness programms are being conducted at panchayat and school level and at public places by forest department during different occasions • awareness programmes should be conducted at villege/ Panchayat levels more	• The plant species will be raised in nurseries in consultation with JFMC's • The timber collection of HPFDC will be strengthened • Regular monitoring of construction companies for proper muck dumping during the developmental activities, if they don't follow the environment protection rules, take action against them by the concerned DFO's. • For the success of conservation programmes, Forest Department can provide the incentive to local inhabitatnts • Regular monitoring of over harvesting of forest resources. • Inhabitants promote agroforestry system to fulfill the demand of fuel and fodder. • Will implement proper monitoring plan for performance of assets by involving local people • Will ensure sufficient area for grazing to avoid excess biotic pressure. • Will take community in confidence before closing areas and will include these arrangements in the range level plans

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
					frequently • The pasture have decreased due to overgrazing, increasing demand for fodder • Only one JFMC is active from last 22 years while, rest are non fonctional and the majority of the Panchayat members arenot aware about the existance of such committees	
  **Stakeholder Consultation meeting at forest rest house Nogli, Rampur, Shimla**						
3	Solan	29/05/2018	Forest Rest House Chandi, Chandi Wildlife	Total number of participants were 50 including • Concerned, Forest Range	• The locals are dependent on forests for Fuel, fodder, Timber, NTFP collection	• The restriction in WLS area is as per Hon'ble Supreme Court of India directions. This project has to follow the

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
			Range	Officers, Deputy Ragers and Forest Gaurds from Chandi WLS. • NTFPs collecters and sellers, • Gram Pradhans • and Villagers	• Due to WLS restriction are more as compared to open areas. • The project is going to address the fuelwood & fodder availability in the area which will be very helpful. • Also, it will help in increasing the income from NTFPs which is nice step by the govt • The activities should be planned and implemented with our consultation instead of the planning being done elsewhere. This way our needs will be addressed better • In past projects our participation in work plan formulation was not much. Also not much focuses on our needs. • Forest fires/ land degradation/ construction of roads/ encroachments are the main issues impacting health and quality of forests • Erratic rainfall, flash floods ,forest fires , spread of lantana and weeds, Use of pesticides/chemical fertilizers in agriculture /horticulture fields are the key vulnerability factors affecting forests- pests, diseases, soils etc • Convergence with other government departments should be there to supplement	directions. • The proposed activities under the project will be prepared and implemented after consultation with locals. • A range level plan will be prepared in consultation with concerned JFMC's under Range area. • Since the forest fires are major concern in WLS area forest fire lines reassessment and fire rating index will be implemented through this project. • Regular monitoring of construction companies for proper muck dumping during the developmental activities, if they don't follow the environment protection rules, take action against them by the concerned DFO's. • For the success of conservation programmes, Forest Department can provide the incentive to local inhabitatnts • Regular monitoring of over harvesting of forest resources. • Inhabitants promote agroforestry system to fulfill the demand of fuel and fodder. • Eradication of invasive alien species mainly lantana is a part of the project component and will be taken up either by cut root method or by using Class-III chemical (Glyphosate) • It will be ensured that the project components and schemes from other government department are in convergence with each other • Awareness programs, trainings, field visits will be conducted for capacity

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
					the efforts and not work against each other • Increase awareness of community to the harmful effects adversely affecting the health of forests , their causes and remedial measures that are locally acceptable/ feasible • Our association in all aspects right from planning to implementation should be taken only, then the \sense of ownership will increase and locals will take interest in monitoring and evaluation.	building of community of the project area.

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
						
Stakeholder Consultation meeting at forest rest house Chandi, Chandi WL Range, Solan						
4	Kinnaur	30.05.2018	Forest Rest House Chotakamba, Rupi Wildlife Range	Total number of participants were 50 including • Concerned, Forest Range Officers, Deputy Ragers and Forest Gaurds from Chandi WLS. • NTFPs collecters and sellers, • Gram Pradhans • and Villagers	• There has been substantial decrease in natural resources due to drought, deforestion road construction, landslides, unscientific muck dumping during road construction • Due to development of hydropower projects water level in satluj river has reduced and affecting the catchment	• The restriction in WLS area is as per Hon'ble Supreme Court of India directions. This project has to follow the directions. • Eco tourism sites are being selected on pilot basis by GoHP and in future when this component is taken up by the project the community views will be taken. • JFMC's will be constituted if not already done and will be consulted for

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
				• Selfhelp gorups members	area and nearby villages which is directly and indirectly affecting these resources. • Decrease in natural resources, Water scarcity Landslides etc due to developmental activities. • Use of soil to blow out forest fire. • Forest resources decreased due overexploitation of forest resources to fulfill the demand for increasing population in the area. • Forest fire and encroachment of forest lands by local inhabitants is prevelant. • Increased demand of forest products such as timber, fuel, fodder, etc. • Lack of monitoring of planted plantlets • Locals are dependent on forests for fuel, fodder, Timber, medicinal plants, etc. • After the formation of Wildlife Sanctuary dependency decreased due to stringent laws. • Locals participate in forest acitivities mainly Plantation and blow out forest fire. • Local peoples demands some rights to use the forest resources. • There is lack of awarerness	preparation of range level plans and its implementation and monitoring. • Pasture management plans will also be prepared in consultation with concerned JFMC's. • Awareness programmes, trainings, field visits will be conducted for capacity building of community of the project area. • Regular monitoring of construction companies for proper muck dumping during the developmental activities, if they don't follow the environment protection rules, take action against them by the concerned DFO's. • For the success of conservation programmes, Forest Department can provide the incentive to local inhabitatnts • Regular monitoring of over harvesting of forest resources. • Inhabitants promote agroforestry system to fulfill the demand of fuel and fodder.

# No.	District	Date	Location	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
					programms. • No tourism activities in this area. • Psture have decreased due to overgrazing. • Maximum JFM committees are non fonctional and the majority of the Panchayat members were not aware about the existance of such committees	

Stakeholder Consultation meeting at Forest rest house Chotta Kamba, Rupi WL Range, Kinaur

Table 4: Details of Stakeholder Consultations meetings at village level

# No.	District	Villages	Date	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
1	Kullu	Poshna, Anni, Bayal, Chowai	25.04.2018	Gram Pradhan & Panchayat members Self Help Group (Chowai)	• The locals are dependent on forests for fuelwood, fodder, Timber, NTFP collection (Chilgoza, Guchii etc.) • Decrease in forest resources due to drought, deforestion, road construction, landslides, unscientific muck dumping during road construction, hydropower projects construction activities, overexploitation of forest resources to fulfill the demand for increasing population in the area, forest fire and encroachment of forest lands by local inhabitants • Joint committees should be constituted involving the local inhabitants for plantation and selection of planting species , management and monitoring of planting sites • Joint committees should be constituted involving the local inhabitants for forest fire prevention and control • Conflicts on choices of plant species during plantation (Like Deodar, Populus instead of Pine) • Awarerness programms are being conducted at panchayat and school level and at public	• The components of the projects have been designed to increase the forest resources and help the locals for getting maximum benefits from the forests. • The proposed activities under the project will be prepared and implemented after consultation with locals. • JFMC's will be constituted if not already done and will be consulted for preparation of range level plans and its implementation and monitoring. • Pasture management plans will also be prepared in consultation with concerned JFMC's. • Awareness programmes, trainings, field visits will be conducted for capacity building of community of the project area. • The plant species will be raised in nurseries in consultation with JFMC • The project will encourage conservation of natural resources through participatory management practices. • The project will involve local users in monitoring of natural resources. • Eco tourism sites are being selected on pilot basis by GoHP and in future when this component is taken up by the project the community views will be taken • Will ensure sufficient area for grazing to avoid excess biotic pressure. • Will take on board research institutes
2	Shimla	Tacklesh, Sunni, Sakrodi Jandrehad Tattapani Malgi	26.04.2018	Gram Pradhan & Panchayat members Mahila Mandal (Malgi)		
3	Kinnaur	Khwangi Kalpa Rogi Kilba, Ribba Skibba Moorang	24.04.2018	Gram Pradhan & Panchayat members Self Help Group (Khawangi) Mahila Mandal (Moorang)		

# No.	District	Villages	Date	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed
					places by forest department during different occasions • The pasture have decreased due to overgrazing, increasing demand for fodder • Eco tourism should be taken up but firstly on pilot basis as it will be good source of income generation however, can lead to pollution, plastic waster generation etc	for improving the yield of pastures. • Will take community in confidence before closing areas and include these arrangements in the range level plans

Meeting with Mahila Mandal Group at Malgi village,

Meeting with SHG and Panchayat members at Chowai, Kullu

# No.	District	Villages	Date	Stakeholders participated in meetings	Stakeholder's Views/ Concerns	Implications for project design / How these issued will be addressed

Meeting with Pradhan and Panchayat embers at Sakrodi, Shimla

Meeting with Farmers at Jandehard village, Shimla

Meeting with Mahila Mandal Group at Moorang village, Kinnaur

Meeting with SHG at Khawangi village, Kinnaur

Chapter 5 Environment Assessment

As discussed, the process of scoping the environmental impacts of the FFP has included consultation with a range of key stakeholders and government at the state level, and in three districts of Sutlej basin (Kinnaur, Shimla& Solan) and the collection and review of a range of background information and data. Details of individuals and organisations consulted are provided in Annex 3, and a list of reference materials is provided in Annex 1.

The forests of Himachal Pradesh are a storehouse of rich biodiversity, in addition to providing forest cover, they feed perennial rivers that are the source of drinking water, irrigation, and hydropower and provide ecosystem services such as carbon sequestration, soil moisture regulation, erosion control, support pollination and water and climate regulation. The forests currently face challenges of degradation, including (i) irregular and diminished flow of natural springs, (ii) loss of soil fertility due to erosion (iii) widening gap between demand and supply of fuel wood and fodder, and (iv) increase incidences of forest fires, and invasive weeds leading to deterioration in habitat quality and pastures. The project interventions themselves are designed to mitigate these issues as discussed in the table below:

Table 38 Assessment of current threats on Forests in HP

Forest Resources	Impacts/Threats	Without project/ Impacts on the project	Project intervention positive impacts
DENSITY/ QUALITY OF FORESTS	No scientific/ silviculture management of forests	• Thinning of forests, reduction in dense forest, reduced capacity for holding soil water, changes in micro-climatic conditions, impact on biodiversity • Low survival rates of small/ young species in first year • Quality of planting stock is low	Support forest sector reform process Implement scientific silviculture practices (nursery, for example plant size, spacing, maintenance techniques etc.) Implementation of innovative methods of planting and maintenance with new planting models The investments in seed and nursery development and planting and maintenance will incorporate specific features to ensure resilience to climatic change conditions.
WATER FLOW REGULATION	Road construction, lasting and various infrastcrture activities	• Increased soil erosion, reduced land productivity, high runoff, increased silt load in streams	Strengthening of integrated forest management system, design and implement water flow and sediment monitoring network. Afforestation and reforestation activities, with soil and water conservation works based on identification of key hotspots and intervention activities to maximize the silt retention and surface water absorption (including
	Additional increase in silt load of streams and water bodies	• Increased incidences of flooding, stream bank erosion, reduced life of hydropower plants in downstream, reduced drinking water supply • Reduced potential of riverbanks to act as buffers against floods, implications on fisheries, damage to habitat	

	Increased evaporation / high run off	• Reduced the amount of water holding capacity of soils in root zone • Steep slopes without adequate protection lead to high runoff and associated soil erosion leading to deteriorating water availability	climate change scenarios).
PASTURES	Proliferation of exotic and noxious weeds	Threats to indigenous species, reduced productivity of pastures, loss of grazing areas, fodder, forest cover, reduced production of NTFP	Create enabling conditions for community participation in pasture management Introduction of rotational grazing Implementation of scientific interventions for invasive weed control Regulatory standards for management of pastures will be developed, including its piloting by women user groups and SHGs.
	Grazing and livestock pressure	Poor quality of pastures, depletion of ground flora, added pressures of nomadic communities and grazing rights.	
	Reduced fertility of soil in pastures	Allowing of overgrazing and not following rotational grazing, most pastures are facing depletion of soil phosphorus due to overgrazing, thus legumes are unable to form nodules and are depleting	
EXPANSION OF HORTICULTURE	Illegal encroachment on sensitive ecosystems	Forests converted into apple orchards, and there is increased debris, deposition of wastes.	Establishment and operationalization of the Forest Management Information System
FUEL WOOD AND FODDER	Demand and supply gap for fuel wood and fodder is increasing.	Thinning of forests, removal of deadwood from forests impacting detritus and other decomposers, reduced habitat quality, carrying of head loads of fuel wood by community members, especially women.	Community involvement a part of project design to check impacts Plan for controlled burning for regeneration of new fodder.
FOREST FIRE	Increasing rates of fires particularly in lower altitudes / Chil pine areas	Loss of biodiversity, increased soil Erosion, impacts on biodiversity, especially birds. Danger to communities living in the vicinity	Development of fire danger system, equipment and infrastructure for fire suppression. Reassessment of fire lines and development of new fires lines.
	No collection system for pine needles	Pine needles from Chil pine areas are cause spread of forest fires.	Training for communities on controlled burning and developing van-sarovars to douse fire and collection and use of pine-needles
NTFP AND MAP	Reduced natural regeneration / Loss of species	Reduction in natural regeneration of species, as some areas are harvested beyond carrying capacity	The project will support a favourable eco-system for responsible and sustainable trade in high-value forest products in the state with the aim to enhance the economic benefit to communities. The three key areas supported by the project will be the
	Unsustainable harvesting of medicinal plants and herbs	Removal of medicinal herbs, reduced population sizes and restricted distribution, loss of forestland, exploitation of labour.	

	Habitat disruption	Habitat degradation, reduced productivity of habitats, low natural regeneration, changes in species community structure and composition, impacts on ecosystem processes	conservation and responsible collection of NTFP raw material, promotion of cultivation of NTFPs and improving processing facilities and market linkages to strengthen NTFP value chains in the state.

Table 39 Summary of Project Interventions

Component	Sub Component	Activities	Year/Timing of Implementation	Stakeholder/ Implementer	Anticipated output
COMPONENT 1 **IMPROVING THE PROVISION OF FOREST SECTOR GOODS AND SERVICES BY HPFD**	Sub-component 1A: Institutional strengthening and development of the Himachal Pradesh Forest Department (HPFD)	Institutional assessment of forest department	Year 1	HPFD, HPFDC	Institutional change-identification of institutional strengthening aspects within HPFD, building technical capacity for more effective model of forest management including community and private sector involvement
		IT strategy for forest department MIS, GIS, M&E[6]	Year 1-5	HPFD	Effective monitoring of forestry activities, IT strategy across FD
		Performance monitoring of FD[7]	Year 1-5	HPFD	Better performance assessment and improvement of the department.
		Training and capacity building within HPFD including development of a training plans for nursery, seed collection[8]	Year 1-5	HPFD, Forest Training institute, HFRI, HPAU, YS Parmar University at Nauni. Etc.	Training will be imparted on a wide range of subjects seed stands, nursery management fire protection etc.
		Strengthening the training infrastructure at the State Forest Training Institute at Chail	Year 1-5	HPFD, Training Institute, Chail	Infrastcrture upgradation for training institute in Chail.

[6] This will include the strengthening of a GIS and MIS center at Shimla for integrated monitoring of forestry activities. This will include the use of modern technology such as mobile platforms to be used by communities and other users.

[7] This activity will be connected to the IT Strategy and will involve work planning, work recording and monitoring records. Based on data and monitoring, a quality assurance process for task standardization and performance assessment/improvement will be developed. This includes performance management of staff using physical targets, quality measures and 'smart' monitoring targets.

[8] Trainings will cover a wide range of subjects relevant to the project including management of seed stands, nursery management, range management, forest protection and institutional development.

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	Sub-component 1B: Investing in Seed and Nursery Development and Planting and Maintenance	Seed collection system from 'plus' trees[9]	Year 1-3	HPFD-Divisional Forest Officer (DFO) HPFD -Forest Ranger (FR) and his staff JFMC	Good quality of seeds selected,
		Design and implementation of a seed certification[10] and distribution system	Year 1-5	HPFD -Divisional Forest Officer (DFO) HPFD -Forest Ranger (FR) and his staff JFMC	System in place for tracking quality
		Seed back/ Seed storage in controlled conditions	Year 1-5	HPFD	Maintain quality of seeds under controlled temperature and humidity.
		Nursery development and raising of seedlings in nurseries[11]	Year 1-5	HPFD-PMU HPFD-Divisional Forest Officer (DFO) HPFD-Forest Ranger (FR) and his staff	Nurseries upgraded for production capacity of 200,000 seedlings/ year. 19 nurseries will be selected in total, per range under the project. The project will generate employment through

[9] A plus tree is a tree of superior shape, form and growth rate.

[10] Seed certification relates to the origin and provenance of the seed as well as the tested germination rates. Certified seeds can then be sold onto both HPFD field nurseries and the private sector.

[11] It is estimated that 19 nurseries across the project area, one in each range, will be selected from amongst the existing nurseries for raising of seedlings. Each nursery will have a production capacity of around 200,000 seedlings a year. This extra production will create job opportunities for rural based local communities, especially women.

					silvicultural activities such as nursery raising, site preparation, seedling transportation, planting, fencing and maintenance of plantations
		Planting activities, including the provision of machinery and equipment in identified nurseries[12]	Year 1-5	HPFD -Divisional Forest Officer (DFO) HPFD -Forest Ranger (FR) and his staff JFMC	More sturdy and robust stock in planted in the field.
		Plantation trials at selected sites[13]	Year 1-5	HPFD -PMU External Agency (Research Institute) HPFD -DFOs/ FR	Raising good quality planting stock with good maintenance – weeding, fire control, and survival monitoring.
		Centralized seed center to process, treat, store and test the seed	Year 1-5	HPFD	Good Quality seeds are supplied to nurseries Better planning of nursery

[12] Selection of techniques will be based on recommendations of an international nursery specialist towards enhancing CCAT plan effectiveness and through community consultations that take into consideration community needs and enhance the supply of NTFPs.

[13] Planting and maintenance will involve afforestation and reforestation (aligned to CCAT plan priorities) in open and medium density forests and slopes vulnerable to soil erosion and protection of plantations. Based on the success of these trials the project will adapt the program to follow the most successful options and the new techniques will be adopted as standard practice.

					requirements and seeds.
	1 C Improving effectiveness of CAT Plans	Silt monitoring network and equipment	During 1st and 2nd year of implementation of project	HPFD External Agency (Research Institute)	Availability of authenticated sediment load data
		Review of status of implementation of NERIL plan include Bilaspur and una	During 1st and 2nd year of implementation of project	HPFD	Updating of list of priority areas for working
	Consultancies, Training and Capacity Building	Design of plantation trials and monitoring protocols	During 1st and 2nd year of implementation of project	HPFD	Better plantation models in place
		Baseline survey (for information)	During 1st year of implementation of project	HPFD	Authentic pre-project data
		IT Strategy	During 1st year of implementation of project	HPFD	Better IT enabled HPFD
		Design of silt monitoring network and hydrological monitoring	During 1st year of implementation of project	HPFD	Action plan
		Feasibility study for seed stands	During 1st year of implementation of project	HPFD	Action plan
		Institutional analysis of Forest Department	During 1st year of implementation of project	HPFD	Road map for future
		Review of CAT plan to measure effectiveness	During 1st year of implementation of project	HPFD	Action Plan
		Identification of key hotspots and intervention activities to maximize the silt retention and surface water absorption	During 1st year of implementation of project	HPFD	Action plan outputs will be used to refine the interventions proposed by the CCAT plan
		Development of Training material	During 1st year of	HPFD	Better training material/aids

			implementation of project		
1. Facilitating better and more sustainable community and private sector forest and pasture use	Sub-component 2A: Creating an enabling environment for the sustainable trade of NTFPs	Preparation of a calendar of NTFP collection in targeted locations on annual basis	During 1st of implementation of project	HPFD, JFMCs	Sustainable harvesting and collection of NTFPs and MAPs
		Strengthening of community institutions or clusters around responsible NTFP collection	During 1st year to 3rd year of implementation of project	HPFD	Enhanced community ownership, skills, environmental management and entrepreneurship
		Preparation of a package of practices for scientific harvesting of NTFPs	Throughout the five years of project implementation	HPFD	Better cultivation and harvesting techniques
		Design and implementation of a system for traceability and certification of the raw material collected.	Throughout the five years of project implementation	HPFD	Better price realization, quality control
		Training, extension services, and demonstration plots for priority species	Throughout the five years of project implementation	HPFD, JFMCs, farmer Federations	Support communities/ JFMC in cultivation of high quality NTFPs
		Support to farmer federation, and market linkages	Throughout the five years of project implementation	HPFD, JFMCs, farmer Federations	Increased sustained yield and better price realization
		Provision of access to laboratory facilities for testing and certification of cultivated NTFPs.	Throughout the five years of project implementation	HPFD, JFMCs, farmer Federations	Increased sustained yield and better price realization
		Contract farming, and NTFP cultivation on private lands	Throughout the five years of project implementation	HPFD, JFMCs, farmer Federations, private sector	Increased sustained yield and better price realization
		Promotion of organic and sustainably harvested products based on established standards such as Organic and Fair Wild	Throughout the five years of project implementation	HPFD, JFMCs, farmer Federations, private sector	Better product visibility and acceptance
		Laboratory services for quality control	Throughout the five years of project implementation	HPFD	Better product quality
		Mobile application and online portal for issue and tracking of permits	Throughout the five years of project	HPFD	Better product visibility and acceptance

			implementation		
		Common infrastructure facilities centers with infrastructure for storing, grading, packaging and primary processing of NTFP	Throughout the five years of project implementation	HPFD, JFMCs, farmer Federations, private sector	Maintaining better product quality and less losses from poor storage facilities.
		Capacity building for establishment of NTFP enterprises	During 1st year of implementation of project	HPFD, JFMCs, farmer Federations, private sector	Establishment of NTFP enterprises
		Development of marketing systems (buyer-seller's fairs, auction system, herbal mandis (local market) and e-commerce platforms	Throughout the five years of project implementation	HPFD, JFMCs, farmer Federations, private sector	Better product visibility, pricing and acceptance
	Sub-component 2B: Support community participation in forest fire and pasture land management	Introduction of rotational grazing by altering the grazing routes after 3 years	Throughout the five years of project implementation	HPFD -PMU HPFD -DFO/FR JFMC	Maintain regeneration capacity of pastures
		Delineation of forest areas for the supply of fodder through sustainable pasture management practices	Throughout the five years of project implementation	HPFD -PMU HPFD -DFO/FR JFMC	Better fodder availability
		Control of exotic weed species	Throughout the five years of project implementation	HPFD -PMU HPFD -DFO/FR JFMC	Effective control of weeds
		Regulatory standards for management of pastures will be developed	Year 1 of the project and onwards	HPFD -PMU HPFD -DFO/FR JFMC	Quality of pastures improved
		Organizing and incentivizing communities as fire protection groups	Year 1 of the project and onwards	HPFD -PMU	Quality of pastures, plantations and forests improved

				HPFD -DFO/FR JFMC	
		Provision of firefighting equipment and mobility to HPFD and communities responsible for firefighting	Year 1 of the project and onwards	HPFD -PMU HPFD -DFO/FR JFMC	Control of fires, less carbon emissions
		Design and implementation of forest fire danger rating and early warning system	Year 1 of the project and onwards	HPPFD	Better Fire control and response mechanisms
		Assessment of fire lines and development of new fires lines	Year 1 of the project and onwards	HPFD -PMU HPFD -DFO/FR JFMC	Better Fire control and response mechanisms
		Training for communities on controlled burning and developing van-sarovars to douse fire and collection and use of pine-needles.	Year 1 of the project and onwards	HPFD -PMU HPFD -DFO/FR JFMC	Better Fire control and response mechanisms
	Consultancies, Training / Exposure / Events	Assessment and value chain Study of prominent NTFPs in HP	During 1st year of implementation of project	HPFD	To prepare detailed guidelines regarding future action plans.
		A review of community level collection practices of NTFPs and			
		Review of community institutions dependent on forests	During 1st year of implementation of project	HPFD	
		Development of NTFP management plans in potential areas	During 1st year of implementation of project	HPFD	
		Development/ compilation of package of practices for selected NTFP (MAP) cultivation	During 1st year of implementation of project	HPFD	
		Guidelines for financing through research and innovations fund	During 1st year of implementation of	HPFD	

			project		
		Trainings for private sector entrepreneurs and companies on relevant national and international laws and best practices applicable to the sustainable harvesting and production of NTFPs.			
		Compilation of schemes and support for NTFP business development from various sources	During 1st year of implementation of project	HPFD	
Component 3 Institutional Coordination and Project Management	Sub-component 3A: Institutional coordination	Institutional coordination will support multi-sectoral coordination and participation among the HPFD and other relevant sectors including exposure visits.	Throughout the five years of project implementation	HPFD, Project Steering Committee	Effectively implement project interventions
	Sub-component 3B: Project management	Project Management activities	During all years of implementation of project	HPFD	PMU in place and functional

5.1 Assessment of Environmental Impacts Associated with Project Activities

The potential environmental impacts (both positive and negative) of the various physical interventions, envisaged under the FFP are summarised in the Table below. Proposed environmental mitigation, and in some cases good practice/measures, to be incorporated within the EMF are discussed in the next section

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
COMPONENT 1 **IMPROVING THE PROVISION OF FOREST SECTOR GOODS AND SERVICES BY HPFD** Sub-component 1A: Institutional strengthening and development of the Himachal Pradesh Forest Department (HPFD) Sub-component 1B: Investing in Seed and Nursery Development and Planting and Maintenance	1. **Seed Development and management** (i) Seed collection system from 'plus' trees[14] (ii) Design and implementation of a seed certification[15] and distribution system (iii) Seed back/ Seed storage in controlled conditions (iv) Nursery development and raising of seedlings in nurseries	This intervention will have positive impacts on afforestation and reforestation schemes. Selecting appropriate seed sources for the site will improve overall growth rate of the plantation since the trees are planted into an environment in which they are adapted. Appropriate seed certification and distribution to the nurseries will also reduce plantation losses due to maladapted genetic material/ incorrect species which may continue to thrive. Storage under controlled conditions of temperature and humidity will allow seeds to be stored over extended period, this will also allow nursery managers to have a reserve stock in case of additional plantation requirements (failure of seedlings due to pest and diseases)	Transportation of seedlings to planting site is dependent on site accessibility Impacts relating to small civil works- impacts on air, water, noise, and site drainage The potential environmental impacts (on drainage, water, aesthetics) under nursery upgradation (raising of seedlings, irrigation facility, storage area and staff quarters) this activity will be minimal. It is expected that physical works will be small-scale and – in some cases – will not require mitigation measures (for installation of water tank, compost pit etc. In nurseries, use of pesticides against pests and diseases could impact human health, air quality, groundwater, surface water and soil.	All activities carried out in protected areas, Eco wildlife sanctuaries, sensitive zones, will be carried out consistent to the management plan of those areas. Only High quality seeds will be selected from the forest and plantation sources for raising seedlings. Plus, trees should be demarcated so labour/community are able to decipher which tree is known plus tree The seeds selected from good plus trees identified for seed collection. The seeds collected should be tested for their germination ability and growth. Floating seeds in water is good method for separating quality from damaged or immature seeds. Sound, mature acorns sink in water. Defective acorns will generally float. Water flotation also facilitates the removal of leaves, and other debris

[14] A plus tree is a tree of superior shape, form and growth rate.

[15] Seed certification relates to the origin and provenance of the seed as well as the tested germination rates. Certified seeds can then be sold onto both HPFD field nurseries and the private sector.

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				making sowing of the seeds easier. For small works (on construction of green-houses or rehabilitation of space for installation of planting or storage equipment), it is proposed to use an EMP checklist on an as needed basis. The checklist for specific project site will be prepared by SPMU in collaboration with the respective staff of the participating in the activity. Project will utilize bio-pesticides, and strategy as prescribed under Annex 6 No procurement or use of banned Class I and II pesticides The selection of species is based on the suitability for the altitude, slope or topography and site quality. Focus should be on native species or species that are highly adapted to the location. Further, among the suitable species, those with high to moderate growth rate of biomass and ability to provide multiple benefits to the community should be selected. All plastic root trainers and polybags will be disposed at designated sites, recycled as appropriate. No plastic will be burned in the open that impacts air quality.

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				To ensure better survival of plants, nursery techniques to be used for production of healthy nursery stock include: (i) Root trainers to prevent coiling of seedling root system (ii) Better medium for growth of seedlings (iii) Use of organic manure / Vermi Compost in appropriate proportions (v) Use of bio pesticides for pest and disease management Follow Annex 6 for guidance on pest management Follow Annex 5 for guidance on EMP checklist and standalone EMP for civil works Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines
	2. Planting and plantation management (i) Planting activities, including the provision of machinery and equipment in identified nurseries[16]	Plantation areas will increase and prolong the low flow because of the water retention function of forest soil and exchange with ground water. Rehabilitation of open forest areas will	Reforested areas could be at risk for grazing, and should be fenced and protected Low Survival of young plantations due to fire risk, natural disasters, wildlife	All activities carried out in protected areas, Eco wildlife sanctuaries, sensitive zones, will be carried out consistent to the management plan of those areas.

[16] Selection of techniques will be based on recommendations of an international nursery specialist towards enhancing CCAT plan effectiveness and through community consultations that take into consideration community needs and enhance the supply of NTFPs.

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
	(ii) Plantation trials at selected sites[17]	reduce soil erosion and global environmental benefits from carbon sequestration	conflict/grazing, steep slopes (low soil depth) Activities initiated by the project cease soon after it terminates, or the benefits from the project's activities are no longer available to the intended beneficiaries, because the resources needed to continue the project initiatives are not available. Use of exotic and non-native species for plantation/restoration of forests and protected areas should not be permitted Activities / good practice developed in the project area are not adopted elsewhere, so that it fails to become more than a pilot exercise, because it was too narrowly focused or was located in a situation that was not representative of the population as a whole. There is a risk that seedlings will not be successful, though many of these cases can be attributed to improper planning. Losses of seeds and small seedlings	Intensive site preparation is often necessary and follow up weed control is critical. Plantation maintenance with community should involve (i) Incentives. Without benefits to be gained by improving regeneration performance monitoring becomes inconsequential and inefficient. (ii) Records. Keep clear, concise, and current records. (iii) - to deal with the risk of fire keep vegetative debris to a minimum and see that a ready supply of water for fire suppression is available (van sarovars) The presence of firebreaks and access roads will allow fire trucks to reach fires and will make it more difficult for flames to spread Only use indigenous and native species with multi-purpose benefits List available exotics and non-natives and issue notification disallowing their use in plantation/restoration New plantation sites need to be adequate fences and protected. Natural barriers of scrubs should be

[17] Planting and maintenance will involve afforestation and reforestation (aligned to CCAT plan priorities) in open and medium density forests and slopes vulnerable to soil erosion and protection of plantations. Based on the success of these trials the project will adapt the program to follow the most successful options and the new techniques will be adopted as standard practice.

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
			can be high. There is a risk that Land selected for plantations is eroded and has shallow soils.	used. Use of non-threatening measures to ward off wildlife (signs/sounds/barriers) Restoration of OF areas should be done through diverse set of local indigenous species If encountering archaeological findings during works, the community should stop operations and notify competent authorities Use youth for monitoring key species/indicators and survival rates Ensure regular use and reporting of species monitoring protocols JFMC experience in plantation - If experienced planters are not available provisions for training and supervision should be made by forest department so that quality of the plantation is not compromised Factors that should be considered when selecting species include: growth rate, site requirements, climatic suitability, genetic variability, wood properties, aesthetics, wildlife value, biological diversity, erosion control and potential insect and disease problems. The use of tree species not native to

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				HP should be contingent on credible evidence confirming that the species in question is not invasive, will not create significant risk to forest health, and is from appropriate provenances that are well adapted to the site and their ecological effects monitored. Sites to be avoided when considering seeding plantation are areas where seeding has already failed. Avoid sites prone to frost or frost heaving. Avoid sites where grazing could occur, and highly erodible soils or steep slopes where young plants could be washed away. Always use seed of appropriate seed sources that has been properly stored, stratified, and treated. Harmonization with measures proposed in EMP (accessibility, development planning, vegetation removal, construction practices, environmentally friendly construction materials, etc.) Discouraging monoculture and promoting mixed species plantations. All recognized natural habitats, wetlands and protected areas in the immediate vicinity of the activity will not be damaged or exploited, all staff

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				will be strictly prohibited from damaging activities. All mitigation measures should eventually be built into the working plan prescriptions of state forest departments Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines
	3. Soil and Water Conservation works (activities as defined as part of CCAT plan)	The impacts of soil and water conservation works are mainly positive as they seek to recharge springs, prevent run off and erosion, and increase soil moisture levels for favorable raising of plantations. They also control silt load in streams. When soil erosion is controlled, water pollution is also controlled. Thereby reducing the main water pollution risk in forests - movement of fine soil particles /silt into water, causing turbidity-runoff where the fine particles of soil are suspended in water. turbid runoff can lead to silting up of drainage features. This reduces the quality of water for agriculture and domestic use and can harm aquatic life. S&W conservation activities couples with forest vegetation can impact the total volume of the surface flow; reduce the peak flow discharge and increase the base flow and thus increase the availability of water use efficiency.	Civil works (check dams, fully plus etc.) may bring localized changes in soil structure, eliminate certain soil biota and may impact soil productivity. Enhanced water storage could modify flow peaks and affect downstream water availability, changes in slope and natural drainage patter may further alter tertiary drainage line. Failure of structures due to poor construction techniques	All activities carried out in protected areas, Eco wildlife sanctuaries, sensitive zones, will be carried out consistent to the management plan of those areas. The following suggestions will help with soil and water conservation measures and erosion control: Undertake all S&W activities as per the CCAT plan treatment prescriptions. Ensure strong apron, deep toe wall and sufficient foundations for safety of erosion control structures. Locate structures on stable sites. Spurs or other stream bank protection measures must not cause drainage congestion. In areas where high/steep slopes and

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				poor and thin soil layer, soil erosion control is difficult. The design can consider bio-engineering methods for gully erosion control, sand filtering, and construction methods of multi-layer forest stands in stony mountain area. S&W activities should be carried out before plantation so that soil moisture conditions are optimal (especially in OF areas, steep slopes etc.) (i) leave buffer zones near streams to prevent siltation (ii) don't use site preparation techniques that might increase erosion (iii) concentrate trees in trouble areas (iv) keep drainage pathways covered with grass If encountering archaeological findings during works, the community should stop operations and notify competent authorities
	4. Strengthening the training infrastructure at the State Forest Training Institute at Chail 5. Centralized seed center to process, treat, store and	Activities under will largely benefit the quality and health of forests. Activities such as silt monitors will help measure the performance of the catchment area treatment activities. This also helps to predict impacts on downstream water	Impacts relating to small civil works- impacts on air, water, noise, and site drainage. The potential environmental impacts (on drainage, water, aesthetics) of this activity will be minimal. It is expected that physical	All activities carried out in protected areas, Eco wildlife sanctuaries, sensitive zones, will be carried out consistent to the management plan of those areas.

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
	test the seed 6. Installation of a silt monitoring network and equipment	quality	works will be small-scale however, any impacts should be avoided, if not minimized on the environment and surrounding sensitive ecosystems.	All construction activity in the vicinity of important temples, monasteries, local CPRs, sacred trees and water sources should be avoided to maintain the aesthetic and pristine quality of the area. For small works (rehabilitation of space for installation of planting or storage equipment), it is proposed to use an EMP checklist on an as needed basis. The checklist for specific project site will be prepared by SPMU in collaboration with the respective staff of the participating in the activity. All recognized natural habitats, wetlands and protected areas in the immediate vicinity of the activity will not be damaged or exploited, all staff will be strictly prohibited from damaging activities. A survey and an inventory shall be made of large trees in the vicinity of the construction activity, large trees shall be marked and cordoned off with fencing, their root system protected, and any damage to the trees avoided Adjacent wetlands and streams shall be protected from construction site run-off with appropriate erosion and sediment control feature to include

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				by not limited to hay bales and silt fences Apply OHS management techniques in Annex 7 Apply EMP checklist, or formulation of site specific EMP, based on checklist in Annex 7 If encountering archaeological findings during works, the community should stop operations and notify competent authorities Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines
COMPONENT 2B FACILITATING BETTER AND MORE SUSTAINABLE COMMUNITY AND PRIVATE SECTOR FOREST AND PASTURE USE	Sub-component 2A: Creating an enabling environment for the sustainable trade of NTFPs Preparation of a calendar of NTFP collection in targeted locations on annual basis Strengthening of community institutions or clusters around responsible NTFP collection Preparation of a package of practices for scientific harvesting of NTFPs Design and implementation of	Supply of NTFPs from project areas on a sustainable basis may create new processing industries these could be located outside the project area and create new jobs There are several bottlenecks for establishment of NTFP/forestry enterprises which the project will address through its design, these include (i) government control over profitable forest produce, (ii) constraining regulations, (iii) lack of credit availability, (iv) poor technologies and low value addition. And (v) Requirement of transit permits and felling regulations for nationalized species discourages private	With increase support to community enterprises, the threat of local extinction of metapopulations of some rare, vulnerable and endangered species important MAP species. Linkages with markets may increase number of JFMC involved in MAP trading and increase chances of illegal trade, and demand for rural feeder roads to support marketing. The project should begin with trainings and awareness on sustainable harvesting of NTFPs, if enterprise facilitation or value chain	Farmer federation should be linked to other natural resource management and livelihood schemes such as National Rural Employment Guarantee scheme (NREGA) and other rural development programmes being implemented through panchayats. Impart training to communities on how to collect harvest MAPs and NTFPs so its regeneration capacity is maintained HPFD needs to ensure steady supply of seeds to the NTFP and MAPs nurseries so that the pressure of

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
	a system for traceability and certification of the raw material collected. Training, extension services, and demonstration plots for priority species Support to farmer federation, and market linkages Provision of access to laboratory facilities for testing and certification of cultivated NTFPs. Capacity building for establishment of NTFP enterprises Contract farming, and NTFP cultivation on private lands Promotion of organic and sustainably harvested products based on established standards such as Organic and Fair Wild Laboratory services for quality control Mobile application and online portal for issue and tracking of permits Common infrastructure	enterprise	infrastructure is provided before there may be a risk of indiscriminate collection of MAP from wild in initial period (before nursery development) both for meeting demand and for planting in nursery. The seasonal pattern of collection varies considerably with the bulk of collection concentrated between March and November. Premature and destructive extraction also takes place due to the open access to all collecting villages as also a competition for resources within the collectors of a village. Unscientific Extraction of non-timber plant parts may alter biological processes at many levels. For instance, harvest may affect the physiology and vital rates of individuals, change demographic and genetic patterns of populations, and alter community- and ecosystem-level processes NTFPs, MAP items have both commercial value as well as some home uses, some portions are kept for household purpose. In addition, Wild plants are an important source of edible fruits, leafy vegetables, and herbs, and are particularly important in ensuring food security and maintaining the nutritional balance in	harvesting from the wild is reduced. A two-pronged strategy needs to be adopted with the conservation of wild gene pool and promoting agro techniques of cultivable medicinal plants. Minimize inventory storage time for raw materials to reduce losses from putrefaction; In case of cold storage, Monitor and regulate refrigeration and cooling systems during storage and processing activities to minimize product loss, optimize energy consumption, and prevent odors; Consider use of enclosure techniques to minimize damage to raw materials stored/ dried outdoors; Monitor and optimize process yields, e.g. during manual grading or cutting activities, and encourage the most productive employees to train others in efficient processing. Clean, sort, and grade raw NTFPs, MAPs where possible at an early stage (e.g. at the harvest site), in order to reduce organic waste and at the processing facility Contain solid waste in dry form and

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
	facilities centers with infrastructure for storing, grading, packaging and primary processing of NTFP Development of marketing systems (buyer- seller's fairs, auction system, herbal mandis (local market) and e-commerce platforms		peoples' diets Enhanced value of NTFPs may impact domestic use, and most would be made available for markets. If improperly handled, debris, muck, gravel, sand, and soil brought out due to construction activities might be disposed of nearby streams, agricultural fields, and low-lying areas. This can cause siltation and sedimentation in downslope regions further blocking natural water flows, degrading habitats and diminishing aquatic flora and fauna. Establishment of NTFP infrastcrture (storages, marketing links, primary processing) will involve minor civil works, equipment and machinery. This may impact environment (air and water quality, noise, and local drainage) if not implemented properly. Similarly in the operational phase, these facilities may generate waste, and wastewater As some NTFPs are consumed as food items, maintaining hygienic processes in their collection, storage and processing is important to prevent contamination .	consider disposal through composting and / or use for soil amendment; Organic and non-organic debris / soil, solid organic matter, and liquid effluents, should be recycled as a soil amendment (based on an assessment of potential impacts to soil and water resources) or other beneficial uses such as energy production; Provide leak-proof containers for storage of NTFPs/ MAPs Segregating individual by-products from each other and from waste to maximize their use and minimize waste Follow appropriate food codes relevant in India to prevent impacts from contamination and adulteration. All NTFP processing,, storage grading facilities should have adequate Sanitation facilities for workers, ensure Pest control (no procurement of WHO class I &II pesticides Maintain Staff hygiene and education and clean and safe water quality. Forest-based communities should be trained as processing and value

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				addition entrepreneurs Farmer federations brought into NTFP value chains will have opportunities to green their business plans through more environmental friendly procurement, raw materials, and waste re-use. Follow Annex 5 for guidance on EMP checklist and standalone EMP for civil works Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines
	Sub-component 2B: Support community participation in forest fire and pasture land management Introduction of rotational grazing by altering the grazing routes after 3 years Delineation of forest areas for the supply of fodder through sustainable pasture management practices Control of exotic and noxious weed species Regulatory standards for management of pastures will	Enhanced fodder availability Increase in biodiversity Less loss of forest resources and wildlife due to forest fire	Increased grazing pressure in other areas due to displacement of cattle/livestock from pastures undergoing restoration/ rotation. Mechanical Methods adopted for exotic weed management such as 'cut root stock' may not be effective in the long term unless (i) comprehensive treatment and rehabilitation of the area is applied, else weeds will proliferate again (ii) labour/ communities are adequately trained in the method of cutting, depth of cutting and disposal of dead shrubs/ weeds. Loss of forestland by converting them	All activities carried out in protected areas, Eco wildlife sanctuaries, sensitive zones, will be carried out consistent to the management plan of those areas. Identify alternative areas before restoration of existing ones in use Form agreements on herd sizes with participating communities, and monitor livestock numbers Promote cultivation of Napier and elephant grasses on agriculture or wasteland, on-farm, along with stall feeding practices to reduce pressure on forests and pastures, sensitive

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
	be developed Organizing and incentivizing communities as fire protection groups Provision of firefighting equipment and mobility to HPFD and communities responsible for firefighting Design and implementation of forest fire danger rating and early warning system Assessment of fire lines and development of new fires lines Training for communities on controlled burning and developing van-sarovars to douse fire and collection and use of pine-needles.		to pastures. Livestock population may increase by assuring enhanced fodder availability, which may be a potential threat to natural areas. Shifting of grazing pressure in other areas after closing selected areas for grazing may speed up the degradation of remaining pastures nearby. Conflict with people when areas are closed for grazing. No incentives to collect pine needles which are the main causes for spread of ground fires. Firefighting staff need to be adequately trained in use of equipment, else occupational hazards can occur. Fire management being community-based does not simply mean they carry out paid work / rewarded for fire-control. They will need to be incentives to participate and monitor fires. Towns/ villages/ Communities living in the vicinity of high hazard areas are often not directly protected	areas. Efficiency in the use of fodder can be enhanced through a number of technological and management options like chopping, grinding, wetting and soaking of fodder and enrichment of crop residues mineral supplements to dry fodder. This will not only result in efficient use of available fodder but also improve its nutritional value. Similarly, there are large areas of common pastureland, which can be used for cultivation of fodder trees and grasses in Himachal Pradesh. Eradication of invasive alien plant species need to be integrated with rehabilitation of cleared areas Shift from the present methods of 'one time removal of weeds' to 'complete rehabilitation' of the treated areas. In view of their environmental/ ecological concerns, the rehabilitation measures will should not employ any Chemicals methods of exotic weed control. The natural regeneration of indigenous plant species on treated sites should be encouraged and

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				facilitated to establish towards better environmental and ecological services, including fodder, fuel, water recharge, etc. No potentially invasive exotic species – (viz. Leucaena leucocephala, Prosopis juliflora, Teak, Darek, Silver Oak, Jatropha curcus, Tecoma stans, etc.) – will be used for plantations in the areas under weed management, because of their deleterious effect on the native flora. Controlled burning activities should keep in mind the key breeding and nesting grounds/ timings of birds and important schedule 1 species. New opportunities such as ecotourism, carbon revenues and payment for ecosystem services should be studied for the benefit of local communities for pasture management Improved cook stoves which save fuel wood should be promoted. The promotion of clean fuels will not only reduce pressure on forests but will provide health related benefits as well. Organise community enterprise and zonation around collection of pine needles, build an industry that can

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				utilize pine needles as raw material. Communities need to be sensitized that involvement fire management and associated activities will improve their livelihood, health and security Integrating all activities and actors related to fire management, such as prevention, preparedness, suppression and restoration, into one coordinated process of fire management, planning and implementation Communities should monitor (i) burning of agriculture residue near forest areas and (ii) stacking of inflammable forest material outside the boundary of or in the forest (dried leaves and pine needles, firewood, timber, bamboo and resin, on a land adjoining a forest) Vehicles supported under this component should comply with PUC standards. fire-fighting vehicles should be placed at designated parking lots or existing garages/sheds. Standard environmental safety requirements such as safe storage of fuel, other substances for fire fighting vehicles should be applied. Long-term forecasts are also

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
				possible, but fire danger rating on the base of meteorological data is more precise when it is expressed on the base of weather forecast of the previous evening or on the very same day. The project can also consider vegetative firebreak to protect habitations- it is a management practice that is designed to create a fuel break (herbaceous and woody vegetation) are used to break up the flammable fuels. By using a combination of short grasses Follow Annex 5 for guidance on EMP checklist and standalone EMP for civil works Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines

Component	Activities	Positive impacts	Adverse impacts/ risks	Proposed Mitigations
Sub-component 3A: Institutional coordination Sub-component 3B: Project management	Project Management activities Institutional coordination will support multi-sectoral coordination and participation among the HPFD and other relevant sectors including exposure visits.		No environmental impacts, institutional coordination will support effective management of project activities thereby improving the health and quality of pastures and forest areas. No environmental impacts, institutional coordination will support effective management of project activities thereby improving the health and quality of pastures and forest areas. Through project implementation there is need to safeguard effective project management for budget and personnel to ensure that resources are not spread too thinly; and no new sub-projects/activities are started at the expense of completing or maintaining existing sub/projects/ activities.	The department should ensure continuity of officers in the PMU, The environment specialists/ nodal officers trained in the PMU, at DFO level should be provided continuity so that environment good practices/ management measures can be maintained beyond the lifetime of the project.

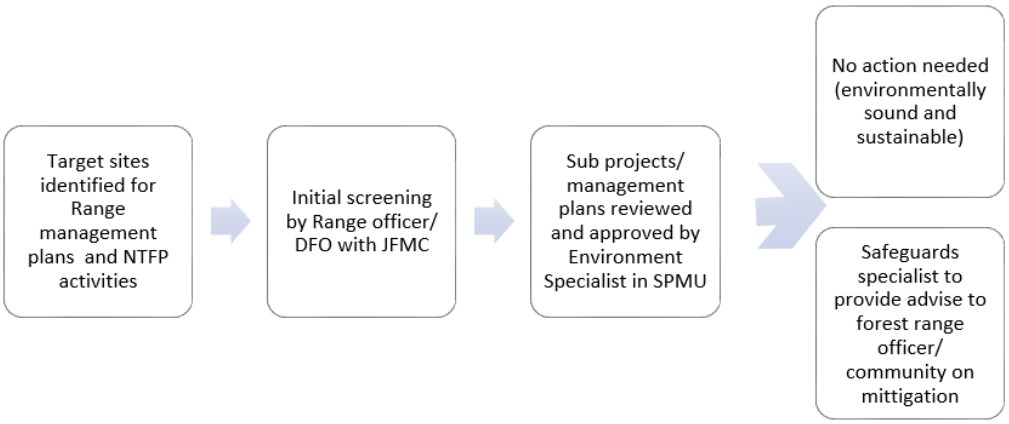
Chapter 6 Environment Management Framework

This section sets out the Environmental Management Framework (EMF) for the project and provides details of the reporting system and responsibilities of the various project stakeholders in respect to EMF implementation. The focus of the EMF will be to introduce and strengthen environmental management by forest department, and community level institutions to contribute to the sustainability of the project interventions.

Overall, this section describes the framework via which these activities will be implemented, and includes:

- → Environmental Data Sheets and Eligibility Screening Formats
- → Environmental Impact Identification and Mitigation Guidelines
- → Environmental Monitoring, Reporting and Workflow
- → An associated capacity-building and training programme (discussed in chapter 7)
- → Estimated incremental costs for EMF implementation. (discussed in chapter 7)

Each of these elements will be incorporated and where necessary (e.g. in the case of the environmental screening procedures, elaborated in more detail within the Project Operational Manual.



The sections below summarize the various environmental management/ mitigation activities that are to be mainstreamed within the FFP, as identified and discussed in chapter 5 and includes project stakeholder roles and responsibilities in relation to these activities.

6.1 Screening of Project Activities

A range management plan will be formulated for each range with guidance from the DFO, Range officer and summarization of individual plan approved by JFMC's of all panchayat's under each range. The range management plan will form part of the APOs of Forest Working Plans. Activities on NTFP will decided after an assessment is undertaken as to which NTFPs would be selected to augment the supply demanded by the market and subsequently reduce pressure on wild stocks of rare species. All activities/ subprojects which form part of the range management plan and NTFP would need to be screened based on site specific factors. For this purpose, an environment data sheet and screening checklist based on eligibility of project activities would need to be completed to assess if the activities can go forward with planning. These are attached in Annex 8.

Screening for impacts

All activities will be screened basis of their site-specific impacts, and impacts assessed in chapter 5. For low-risk topologies, such as small scale civil works, building or local road rehabilitation activities, the EMP format/checklist in Annex 7 should be utilized to provide a more streamlined approach to environmental management in minor rehabilitation or small-scale works as for field investigations and related small scale temporary works.

The screening process has three sections:

Part A Includes preparation of the environment data sheet which is the descriptive part that characterizes the activities in the management plan, and the sites where they will be implemented. (including the technical project content). This format is included in Annex 8. Attachments for additional information can be supplemented when needed.

Part B Includes eligibility criteria environmental screening checklist, where activities and potential environmental issues can be checked in a simple Yes/No format, and for each "yes" the activity is ineligible to be financed under the project because it is not consistent with safeguards requirements. This format is included in Annex 8.

Part C Provides standard checklist for mitigation measures for the activities to be financed under the sub-project/range management/NTFP plan. All relevant mitigation measures should be taken to comprise the Environmental Mitigation Plan for the sub-project/range management/NTFP plan. Project-specific mitigation measures can also be added if appropriate.

6.2 Application of Mitigation measures

The table below attempts to cover typical core mitigation approaches to the proposed activities under the project. This format provides the key elements of an Environmental Management Plan (EMP) or Environmental Management Framework (EMF) to meet World Bank Environmental Assessment requirements under OP 4.01.

Table 40 Environmental Impact and Mitigation Guidelines

	Activity	Status	Triggered Actions
Will the site activity include/involve any of the following??	A. Seed Collection and Management	[ ] Yes [ ] No	See Section **A** below
	B. Nursery Upgradation	[ ] Yes [ ] No	See Section **B** below
	C. Soil and water conservation activities	[ ] Yes [ ] No	See Section **C** below
	D. Afforestation/reforestation and Plantation trials	[ ] Yes [ ] No	See Section **D** below
	E. Building rehabilitation / General construction/ small scale civil works	[ ] Yes [ ] No	See Section **0** and **E** below
	F. Activities in Natural Habitats / Protected areas / Eco sensitive zones	[ ] Yes [ ] No	See Section **F** below
	G. Pasture Regeneration/fodder cultivation	[ ] Yes [ ] No	See Section **0** and **G** below
	H. Forest Fire control	[ ] Yes [ ] No	See Section H below
	I. NTFP Collection and Harvesting	[ ] Yes [ ] No	See Section **I** below
	J: NTFP value chain set-up	[ ] Yes [ ] No	See Section **0** and J below

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
0 General Conditions	Community worker / Labour Safety	a. World Bank EHS guidelines will be applicable b. Project will also follow OHS management practices listed in Annex 7. c. All legally required permits have been acquired for construction and/or rehabilitation d. Community Workers' PPE will comply with international good practice (always hardhats, as needed masks and safety glasses, harnesses and safety boots) e. Appropriate signposting of the sites will inform workers of key rules and regulations to follow.
	Protection of natural environment and biodiversity	a. Undertaking all activities in protected areas as per the management plans b. Minimizing staff presence and vehicle traffic c. Sticking to existing roads and tracks as much as possible d. Protecting surface and groundwater resources e. Preventing any harvesting of plants or poaching of wildlife by site personnel f. Restoring surface and vegetation where it has been significantly disturbed g. Taking out all waste after completion of the assignment h. Adjacent wetlands and streams shall be protected from construction site run-off with appropriate erosion and sediment control features.
	PCR Chance Finds	a. Ensure that provisions are put in place so that any cultural artifacts or other possible "chance finds" encountered during field works are noted and registered, secured, responsible officials contacted, and further activities delayed or modified to account for such finds.
A. Seed Collection and Management		a. Only High quality seeds will be selected from the forest and plantation sources for raising seedlings. Plus, trees should be demarcated so labour/community are able to decipher which tree is known plus tree. b. The seeds collected should be tested for their germination ability and growth. Floating seeds in water is good method for separating quality from damaged or immature seeds. Sound, mature acorns sink in water. Defective acorns will generally float. Water flotation also facilitates the removal of leaves, and other debris making sowing of the seeds easier. c. Keep appropriate records that permit identification of sources of production material, and where it is grown and planted out d. Sowing of seeds in sterilized/fumigated and clean beds e. Locate the nursery producing the seedlings away from commercial stands to prevent contamination and the subsequent spread of pests
B. Nursery Upgradation		a. For small works (on construction of green-houses or rehabilitation of space for installation of planting or storage equipment), it is proposed to use an EMP checklist on an as needed basis. The checklist for specific project site will be prepared by SPMU in collaboration with the respective staff of the participating in the activity. Project will utilize bio-pesticides, and strategy as prescribed under Annex 6 b. No procurement/use or use of banned Class I and II pesticides c. The selection of species is based on the suitability for the altitude, slope or topography and site quality. Focus should be on native species or species that are highly adapted to the location. d. Within selected suitable species, those with high to moderate growth

		rate of biomass and ability to provide multiple benefits to the community should be selected. e. All waste plastic generated through root trainers, and poly bags should be disposed appropriately. No plastic will be burned. f. To ensure better survival of plants, nursery techniques to be used for production of healthy nursery stock include: i. Root trainers to prevent coiling of seedling root system ii. Better medium for growth of seedlings (FYM, soil and sand mix) iii. Use of organic manure / Vermi Compost in appropriate proportions iv. Temperature in compost pit should not exceed 50 deg to guard against thermophilic bacteria v. Solarization of soil to kill pests/ bacteria before planting pathogens. vi. Application of Mycorrhiza for root rot diseases vii. Application of Neem cake in the soil is also a good bio control method g. Follow Annex 6 for guidance on pest management and nursery good practices. h. Follow Annex 5 for guidance on EMP checklist and standalone EMP for civil works i. Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines
C. Soil and water conservation activities		a. All activities carried out in protected areas, Eco wildlife sanctuaries, sensitive zones, will be carried out consistent to the management plan of those areas. b. Undertake all S&W activities as per the CCAT plan treatment prescriptions. c. Ensure strong apron, deep toe wall and sufficient foundations for safety of erosion control structures. Locate structures on stable sites. d. Spurs or other stream bank protection measures must not cause drainage congestion. e. In areas where high/steep slopes and poor and thin soil layer, soil erosion control is difficult. The design can consider bio-engineering methods for gully erosion control, sand filtering, and construction methods of multi-layer forest stands in stony mountain area. f. S&W activities should be carried out before plantation so that soil moisture conditions are optimal (especially in OF areas, steep slopes etc.) • leave buffer zones near streams to prevent siltation • don't use site preparation techniques that might increase erosion • concentrate trees in trouble areas • keep drainage pathways covered with grass
D. Afforestation/reforestation and Plantation trials		a. Fire control keep vegetative debris to a minimum and see that a ready supply of water for fire suppression is available (van sarovars) b. Only use indigenous and native species with multi-purpose benefits c. List available exotics and non-natives and issue notification disallowing their use in plantation/restoration d. New plantation sites need to be adequate fences and protected. Natural barriers of scrubs should be used. Use of non-threatening measures to ward off wildlife (sounds/barriers) e. JFMC experience in plantation - If experienced planters are not

		available provisions for training and supervision should be made by forest department so that quality of the plantation is not compromised f. Factors that should be considered when selecting species include: growth rate, site requirements, climatic suitability, genetic variability, wood properties, aesthetics, wildlife value, biological diversity, erosion control and potential insect and disease problems. g. Sites to be avoided when considering seeding plantation are areas where seeding has already failed. Avoid sites prone to frost or frost heaving. Avoid sites where grazing could occur, and highly erodible soils or steep slopes where young plants could be washed away. h. Always use seed of appropriate seed sources that has been properly stored, stratified, and treated. i. Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines
E. Building rehabilitation / General construction/ small scale civil works	Standalone EMP	Case by case Environmental Assessment by ES, PMU- use of EMP checklist, and where required preparation of Standalone EMP for construction and operation. (format provided in Annex 7)
	Air Quality	a. Any dust, shall be suppressed by ongoing water spraying and/or installing dust screen enclosures at site b. The surrounding environment shall be kept free of garbage and solid waste to minimize dust. c. There will be no open burning of construction / waste material at the site
	Noise	a. Any drilling noise will be limited to restricted times agreed to in the permit b. Engine covers of generators, air compressors and other powered mechanical equipment shall be closed, and equipment placed as far away from any sensitive natural habitat or nesting/ breeding sites areas.
	Water Quality	a. The site will establish appropriate erosion and sediment control measures such as e.g. hay bales and / or silt fences to prevent sediment from moving off site and causing excessive turbidity in nearby water runoffs b. Site vehicles/vans will be washed only in designated areas where runoff will not pollute natural surface water bodies.
	Waste management	a. Waste collection and disposal pathways and sites will be identified for all major waste types expected from all activities. b. Solid waste will be collected and disposed properly in accordance with Environmental Legislation of RA c. The records of waste disposal will be maintained as proof for proper management as designed. d. Whenever feasible reuse and recycle appropriate and viable materials.
F. Activities in Natural Habitats / Protected areas / Eco sensitive zones		All activities carried out in protected areas, Eco wildlife sanctuaries, sensitive zones, will be carried out consistent to the management plan of those areas.
G. Pasture Regeneration/fodder cultivation		a. Identify alternative pasture areas before restoration of existing pastures in use is carried out. b. Promote cultivation of Napier and elephant grasses on agriculture or wasteland, on-farm, along with stall feeding practices to reduce pressure on forests and pastures, sensitive areas. c. Efficiency in the use of fodder can be enhanced through a number of

		technological and management options like chopping, grinding, wetting and soaking of fodder and enrichment of crop residues mineral supplements to dry fodder. This will not only result in efficient use of available fodder but also improve its nutritional value. d. Similarly, there are large areas of common pastureland, which can be used for cultivation of fodder trees and grasses in Himachal Pradesh. e. Eradication of invasive alien plant species need to be integrated with rehabilitation of pasture areas for it to be sustainable. f. Shift from the present methods of 'one time removal of weeds' to 'complete rehabilitation' of the treated areas. g. In view of their environmental/ ecological concerns, the rehabilitation measures will should not employ any chemicals methods of exotic weed control. h. The natural regeneration of indigenous plant species on treated sites should be encouraged and facilitated to establish towards better environmental and ecological services, including fodder, fuel, water recharge, etc. i. New opportunities such as ecotourism, carbon revenues and payment for ecosystem services should be studied for the benefit of local communities for pasture management
H. Forest Fire control		a. Controlled burning activities should keep in mind the key breeding and nesting grounds/ timings of birds and important schedule 1 species. b. Improved cook stoves which save fuel wood should be promoted. The promotion of clean fuels will not only reduce pressure on forests but will provide health related benefits as well. c. Organise community enterprise and zonation around collection of pine needles, build an industry that can utilize pine needles as raw material. d. Communities need to be sensitized that involvement fire management and associated activities will improve their livelihood, health and security e. Integrating all activities and actors related to fire management, such as prevention, preparedness, suppression and restoration, into one coordinated process of fire management, planning and implementation f. Communities should monitor (i) burning of agriculture residue near forest areas and (ii) stacking of inflammable forest material outside the boundary of or in the forest (dried leaves and pine needles, firewood, timber, bamboo and resin, on a land adjoining a forest) g. Vehicles supported under this component should comply with PUC standards. fire-fighting vehicles should be placed at designated parking lots or existing garages/sheds. Standard environmental safety requirements such as safe storage of fuel, other substances for fire fighting vehicles should be applied. h. Long-term forecasts are also possible, but fire danger rating on the base of meteorological data is more precise when it is expressed on the base of weather forecast of the previous evening or on the very same day. i. The project can also consider vegetative firebreak to protect habitations- it is a management practice that is designed to create a fuel break (herbaceous and woody vegetation) are used to break up the flammable fuels. By using a combination of short grasses

		j. Follow Annex 5 for guidance on EMP checklist and standalone EMP for civil works k. Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines
I. NTFP Collection and Harvesting		a. Farmer federation should be linked to other natural resource management and livelihood schemes such as National Rural Employment Guarantee scheme (NREGA) and other rural development programmes being implemented through panchayats. b. Impart training to communities on how to collect harvest MAPs and NTFPs so its regeneration capacity is maintained c. HPFD needs to ensure steady supply of seeds to the NTFP and MAPs nurseries so that the pressure of harvesting from the wild is reduced. d. A two-pronged strategy needs to be adopted with the conservation of wild gene pool and promoting agro techniques of cultivable medicinal plants.
J. NTFP value chain set-up		a. Minimize inventory storage time for raw materials to reduce losses from putrefaction. b. Consider use of enclosure techniques to minimize damage to raw materials stored/ dried outdoors; c. Monitor and optimize process yields, e.g. during manual grading or cutting activities, and encourage the most productive employees to train others in efficient processing. d. Clean, sort, and grade raw NTFPs, MAPs where possible at an early stage (e.g. at the harvest site), to reduce organic waste and at the processing facility e. Contain solid waste in dry form and consider disposal through composting and / or use for soil amendment f. Organic and non-organic debris / soil, solid organic matter, and liquid effluents, should be recycled as a soil amendment (based on an assessment of potential impacts to soil and water resources) or other beneficial uses such as energy production; g. Provide leak-proof containers for storage of NTFPs/ MAPs h. Segregating individual by-products from each other and from waste to maximize their use and minimize waste i. Farmer federations brought into NTFP value chains will have opportunities to green their business plans through more environmental friendly procurement, raw materials, and waste re-use. j. Organic and non-organic debris / soil, solid organic matter, and liquid effluents, should be recycled as a soil amendment (based on an assessment of potential impacts to soil and water resources) or other beneficial uses such as energy production; k. Follow appropriate food codes relevant in India to prevent impacts from contamination and adulteration. All NTFP processing, storage grading facilities should have adequate Sanitation facilities for workers, ensure Pest control (no procurement of WHO class I &II pesticides Maintain Staff hygiene and education and clean and safe water quality. l. Farmer federations brought into NTFP value chains will have opportunities to green their business plans through more environmental friendly procurement, raw materials, and waste re-use. m. Follow Annex 5 for guidance on EMP checklist and standalone EMP for

		civil works n. Follow Annex 7 for guidelines on occupational health and safety for community labour. The project will also follow WBG EHS guidelines

The Table below represents the monitoring plan for activities during project construction and implementation.

Phase	EMF Activity	Objectives	Process	Responsibility	Outcome
Pre-planning	**Adequate dissemination of EMF awareness to DFO, RO and JFMC**	To sensitize the various stakeholders about the possible negative impacts of the project activities and mitigation measures	Disseminate through website/copy with HPFD offices/JFMC's	SPMU, DPMU (Block, Range, Division & Circle Level), JFMCs	Increased awareness of the possible negative impacts of project activities and the ways to mitigate them.
	Capacity building and training programmes	To enhance capacity of field staff/ communities to understand the need of safeguards during identification and implementation of sub project activities and effect in not followed.	Identify key personnel/ community members and depute for capacity building programme and conduct the said programme.	SPMU, DPMU (Division & Circle Level) & FTI (Chail)	Target group better equipped to understand the need of safeguards during identification and implementation of sub project activities.
	Identification of subproject/intervention and Screening of activities against Checklists	To ensure that sub-projects with potentially significant environmental issues are identified at an early stage and avoided.	DPMU (Division and Range level) / Village facilitators to support communities in incorporation of environment safeguards in sub project activities.	SPMU, DPMU (Range, Division & Circle Level) & JFMCs	Plan selected/ rejected Based on screening; ascertain if any mitigation is required. Less negative impact on environment. Selection of Range Level Plan activities to be taken up for planning and design and finalizing procedures to ensure Environmental compliance
Planning	**Preparation of Range Level plan, application of EGs**	To ensure that relevant environmental issues have been identified and appropriate mitigation measures have been designed to address them.	Range Level plans with, environmental guidelines and mitigation measures detailed in the EMF shall be approved by environment manager in SPMU	DPMU (Block, Range, Division & Circle Level) & JFMCs	Costs of EMF mitigation measures and monitoring incorporated into the Range Level Plan.
Implementation	**Implementation of Environmental Guidelines and mitigation measures.**	To ensure that the prescribed environmental mitigation measures are implemented.	Environment: The prescribed environmental mitigation measures as identified through the EMF are adequately implemented, indicators are monitored.	DPMUs (Block, Range, Division & Circle Level) and JFMCs.	Semi-annual safeguards progress report will indicate that EGs have been incorporated into the implementation phase of low impact subprojects.
	Compliance with EMF provisions and monitoring measures	To monitor that the prescribed environmental mitigation measures are complied with.	Environment: The prescribed environmental mitigation measures suggested in EMF are compiled with and regularly are monitored	SPMU, DPMUs (Range, Division & Circle Level)	Semi-annual safeguards progress report will indicate monitoring as per list of indicators.

Phase	EMF Activity	Objectives	Process	Responsibility	Outcome
O&M	**Environmental Supervision, Monitoring and Evaluation**	To ensure that environmental guidelines are integrated into the sub-projects	Environment: Monitoring of indicators will be conducted as per project monitoring protocol.	SPMU, DPMUs (Division Level & Circle Level)	PMU will submit bi annual reports to The World Bank on Safeguards Implementation.

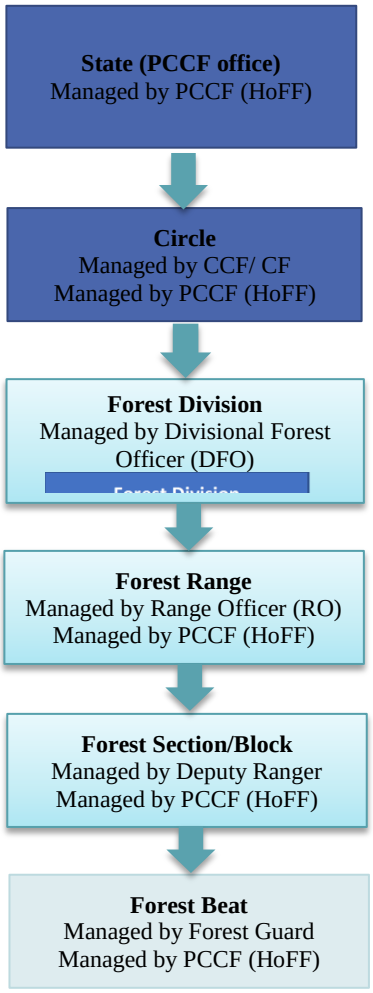
Chapter 7 Institutional and Implementation Arrangement

7.1 Project Implementation through HPFD

The Himachal Pradesh Forest Department (HPFD) operates through wing/ office formations and autonomous bodies within the umbrella of the HP State Government. HPFD is headed by the Principal Chief Conservator of Forest (Head of Forest Force: PCCF(HoFF) and comprised of the forest (territorial) wing, wildlife wing and direction (functional) offices. The Himachal Pradesh State Forest Development Corporation Limited (HPSFCDL) acts as the commercial wing of the Department and discharges the function of disposing various forest produces like timber, bamboo, resin, NTFPs etc.

The State has 9 forest circles and 37 territorial forest divisions under the PCCF(HoFF), and 3 forest circles and 7 wildlife divisions with under the PCCF (Wildlife), also the chief wildlife warden. In total, 44 divisions (37 territorial divisions and 7 wildlife divisions), 197 ranges (167 territorial ranges and 30 wildlife ranges), 560 blocks (493 territorial blocks and 67 wildlife blocks) and 2,033 beats (1,840 Territorial Beats and 193 Wildlife Beats) exist within HPFD as of July, 2017.

Table 41 Break Up of Forest administration unit



State Level: Project implementation will be done directly by HPFD. The project will be implemented by the State Project Management Unit (SPMU) headed by a Chief Project Director (CPD).

Circle Level: A Nodal Officer of the level of Divisional Forest Officer (DFO) will be appointed to coordinate and plan project activities at the Circle level and supervise the performance of divisions with the respective circles.

Division level: DFOs will plan and supervise project operations. The range will be the basic unit of project planning and implementation, and all activities under components 1 and 2 will be planned through a Range Management Plan. The project area comprises of 10 divisions and 19 ranges.

Range Level: The RO's will implement all the activities under component 1& 2 in the field and will also be in constant touch with local communities in his range for preparing and implementing their individual management plans.

Block/Beat Level will have a community facilitator hired from the local community to mobilize communities for project activities. Where relevant, project activities will involve JFMCs/Forest User

Groups, and members of JFMCs will be trained in various aspects of sustainable forest management.

7.2 Project Level Institutional Structures

(a) **The Steering Committee (SLSC)** will provide overall supervision to HPFD and will meet on a six-monthly basis to approve and review the work plans and budget. It will assess the physical and financial progress of the project and provide corrective measures. For some Project activities HPFD will coordinate with Industry, Rural Development, Environment, Energy and Pollution Control Board. The State Level Steering Committee (SLSC) has the mandate to coordinate all EAPs. The SLSC will meet on a six-monthly basis to approve and review the work plans and budget. It will assess the physical and financial progress of the project and provide corrective measures.

(b) **State Project Management Unit (SPMU)** The project will be implemented by the State Project Management Unit headed by a Chief Project Director (CPD) who would have day-to-day executive control of the Project. The core personnel of the SPMU are 3 Deputy Project Directors one each for a) General Administration, b) Operations and c) Liaison, Coordination and Training (LCT) ; Project will have Subject Matter Specialists (SMS) one each for Social and Community Institution Development, **Environment Management**, Forest Based Livelihood, Communications and Knowledge Management, IT, Procurement, Monitoring and Evaluation)**.** These subject matter specialists will be hired from the market. Besides, activities such as Finance and Accounts, Administration and Staff Matters will be handled by the superintendent staff deputed from the HPFD to the project.

Technical Support Services: All the activities will be implemented through H.P. Forest Department with Technical support from institutions like Himalayan Forest Research Institute(HFRI), HP University of Horticulture and Forestry, Nauni, Indian Grassland and Fodder Research Institute, Palampur and Institute of Himalayan Bio Resource Technology, CSIR Palampur. Consultancy services will be hired as per the requirement/need of the project.

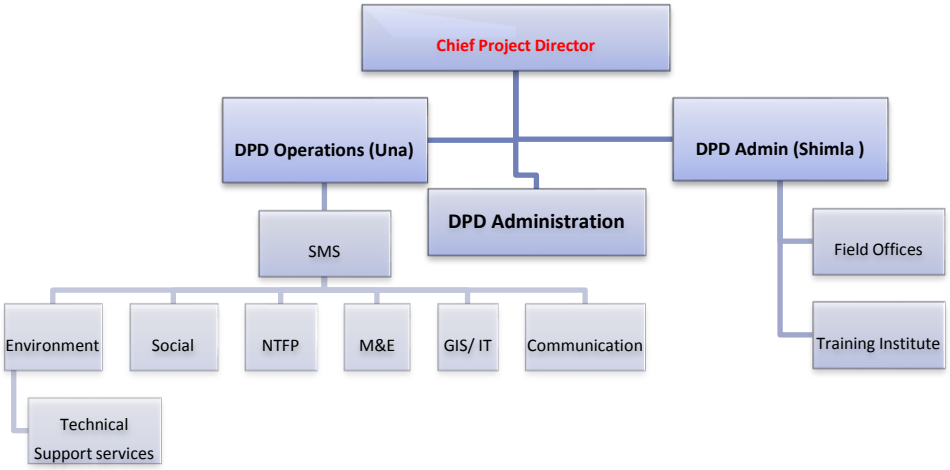


Figure 18 Organogram of SPMU

(c) Circle Office Level: The administrative control of all forest divisions rests with respective Circles Offices headed by the Conservator of Forests. Since the project at the field level will be executed by forest department staff it is essential to synergize operations of the Department with that of the project. A Nodal Officer of the level of DFO will be appointed to coordinate and plan project activities at the Circle level and also supervise performance of divisions with respective circles. The nodal officer will be supported by a Superintendent (Grade 1), Junior Engineer and an Office Assistant. The JE will be responsible for preparing site designs for drainage line treatment measures and conducting monitoring to ensure quality of engineering works.

(d) Division Office Level: The project operations at the division will be planned and supervised by respective Division Forest Officers. He will be supported by an Assistant Conservator of Forests, Senior Assistance and Office Assistant.

7.3 Implementation Plans

The SPMU will undertake overall planning and implementation of the project. It will be responsible for reviewing and finalizing fund flow mechanisms, procurement management, reporting and monitoring, policy advocacy and awareness generation. It will prepare guidelines and technical manual for programme activities, including the community operational manual. Moreover, it will provide infrastructural and institutional support to district, block and village level units. Specifically, the DPD – *Operations* will be responsible for planning and implementation of field operations such as development of range-plans, NTFP management plans, nursery management, plantations, fire management, community mobilization and commercial projects under PPP, and forest based livelihood promotion.

The Range will be the basic unit of project planning and implementation. All activities of component 1 and 2 will be planned through a Range Management Plan. Each Range Officer will be supported by their respective Dy. Rangers, Office Assistants and Beat Managers (Forest Guards). Each beat will have community facilitator, hired from the local community, to mobilize communities for project activities. Since the project is community-driven, all operations will be conducted through JFMCs / Forest User Groups as per the provision of PFM regulations 2001. Members of JFMCs will be trained in various aspects of sustainable forest management.

7.4 Environment management under HPFD

The SPMU, specifically the Environment Specialist will serve as the lead for safeguards implementation through the Forest Department and ensure linkages and coordination with other ranges/ divisions under the project. The Environment specialist will oversee the implementation of all actions at the field level to prepare assessment reports and oversee the implementation of mitigation actions for adverse environmental impacts, within FFP operational areas to the community level.

Roles and Responsibilities of Environment Specialist in SPMU

The State PMU will have an Environmental Specialist as a core team member in the PMU who will be supported, as required, by technical consultants. In addition, focal points may be identified at the range level for site based monitoring of project interventions and facilitating and reviewing the implementation of EMPs. Monitoring and supervision of the EMF would include bi-annual monitoring reports by the PMU.

Supervision of Project Activities

(i) The Environmental Manager will provide inputs relating to EMF activities for all FFP project plans
(ii) Review and Approve Range management plan, NTFP Value chain plans and associated Safeguards screening forms
(iii) Prepare EMPs for all civil works undertaken in the project
(iv) Organise and Provide orientation, training to concerned personnel at the division and beat level on EMF
(v) Ensure that environment management activities are mainstreamed into the design and plan at the subproject level. The safeguards specialist will review and endorse all sub-project preparation documents to ensure the incorporation of environmental and social issues.
(vi) The safeguards specialist in the PMU is responsible for the dissemination of project information at various stages, including good practices and lessons learned from the field to all implementing partners of the project
(vii) Support the project staff to implement surveys/trainings/plan according to the EMF/EMP requirements and monitor the incorporation of community inputs into sub-project designs.
(viii) Assist the state to identify and address implementation challenges (environment safeguards management) of all sub-projects and advise on appropriate solutions and/or preventive mitigation measures.

Monitoring and Reporting

(i) Undertake field visits to the selected sub-projects hold discussions with the village institutions, NGOs, Project Staff, and contractors and guide them in addressing safeguards issues with particular reference to environmental issues.
(ii) Prepare progress reports, briefs, and periodical reports and produce data as required.
(iii) Participate as team member in all preparation/technical support or supervision missions of the World bank;

maintaining regular dialog with the Bank on compliance with on environmental policies.

(iv) Participate in the progress review meetings of the project and GoHP and provide update on environmental aspects, documents of the respective sub-projects/schemes.

(v) Coordinate all environmental safeguards activities within and between the PMU, share information with Project Director and Task Team Leader of the World Bank, and project team members.

Figure 19 Responsibilities of Environment Specialist in SPMU

7.5 Monitoring and Reporting

The environment manager based in the SPMU will prepare monitoring plans to assist in determining the progress of implementation of the safeguard provisions, and overall outcome of implementing the environmental guidelines/good practices. The project is monitoring a variety of indicators linked to area brought under afforestation, regeneration of pastures, adoption of soil and water conservation and improved fire management practices, however, specifically for EMF, the following paraments should be monitored, as these pertain to the adoption of the environmental guidelines and mitigation measures. This will be linked to the overall project monitoring and evaluation systems.

Institutional

(i) Number of trainings organized by type of training (6 monthly basis)

Application of EMF

(i) Number of range management plans prepared following environmental screening checklists, and mitigation guidelines

(ii) Survival of plantations (%) – and highlight causes of low survival rates

(iii) Any instances where archeological chance finds have been identified, and the procedure followed.

(iv) Pest and disease attacks in nurseries and application of bi- pesticides as per the prescribed PMP

(v) Number of communities taking up conservation activities – such as setting up of nurseries for rare, endemic/ medicinal plants;

(vi) Community training and participation in sustainable extraction of NTFPs, and application of OHS guidelines.

(vii) Any induced impacts/activities arising from undertaking the project financed investments such as demand for (a) rural/feeder roads, (b) tourism infrastcrture (c) change in agriculture crops, due to increase availability of water.

In addition, environment manager may undertake inspection field visits to the community sites to check on implementation of the range management plans. Having screened the activities in the preparation phase, managers will check the effectiveness/adoption of mitigation measures, any other issues in implementing the mitigation measures, and if cases where there are residual environmental impacts. This reporting format should cover (i) Environmental Impacts which were identified at screening and (ii) Environmental Impacts observed during the field visit against the predicted impacts and level of undertaking mitigations.

The environment manager at SPMU will be responsible for approval of the range management plans, NTFP management plans and associated site plans based upon the final consideration and screening of impacts of the selected activities.

The figure below outlines the range of roles and responsibilities in relation to implementation and monitoring of the various environmental safeguards activities envisaged under HP FFP. These responsibilities have been assigned considering the overall implementation arrangements for the project, as described in Chapter 1 and are designed to take place within the EMF reporting and responsibility framework shown below:

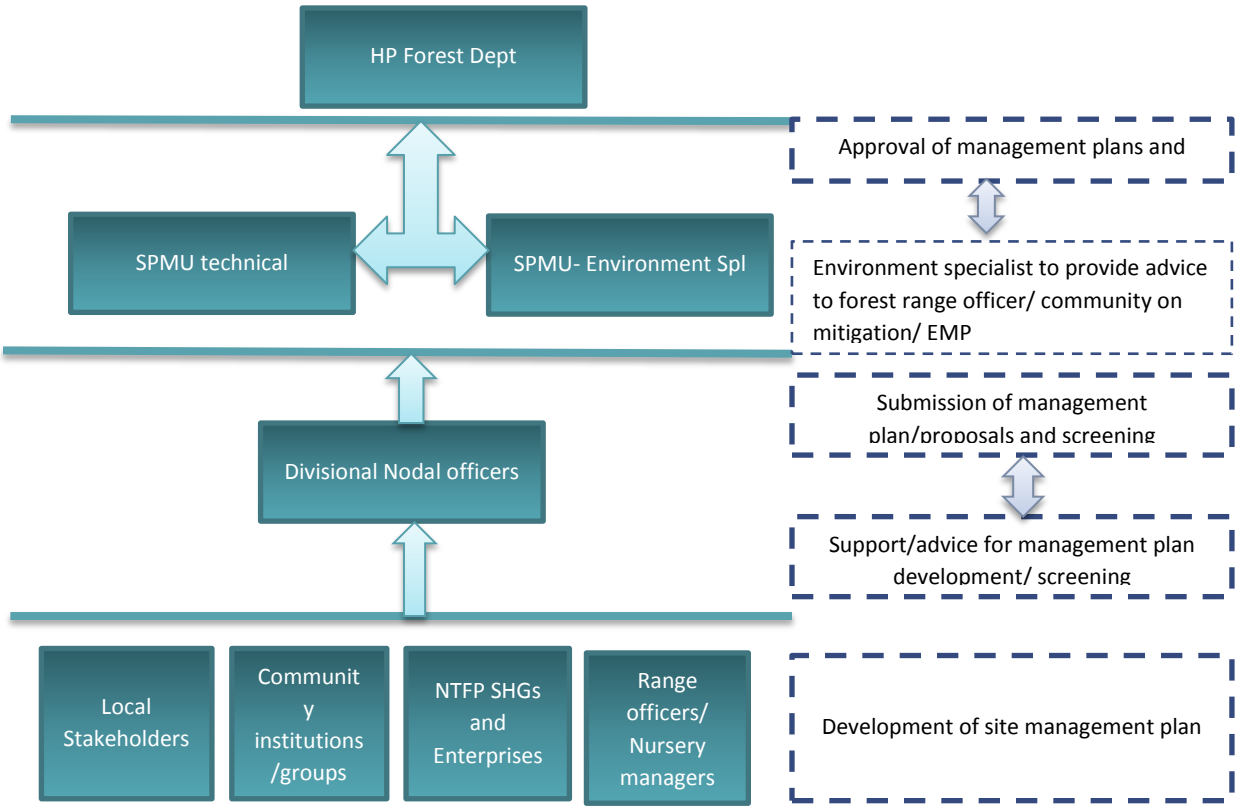


Figure 20 reporting framework for environmental management

7.6 Capacity Building under Environment Management

The training and awareness creation will be annual/ bi annual events and the primary targets will be the technical staff at SPMU, DFOs, and Range officers. The first step in pursuing capacity building will be to identify the capacity needs of the various project functionaries, as depicted in table below. The capacity building will include training workshops and production of guidance reports and tools on the following areas.

Identification of Capacity Needs

The capacity building will include training workshops and production of guidance reports and tools.

The following training programmes are recommended:

Training programme 1:

Content: World Bank Safeguard policies of OP 4.10 and OP 4.36 and WBG Environmental Health and Safety Guidelines for Forestry Operations

Participants: Environment Specialist (SPMU), Divisional Forest Officers, Nodal Environmental Officers and Range Officers, Forest Guards, Nursery Managers.

Training programme 2

Content: Filling out Screening Checklists, Environment Mitigation and Guidelines

Participants: Environment Specialist (SPMU), Divisional Forest Officers, Nodal Environmental Officers and Range Officers, Forest Guards/ Nursery Managers

Training programme 3

Content: EMP checklists for civil works

Participants: Environment Specialist (SPMU), Divisional Forest Officers, Nodal Environmental Officers, NTFP enterprises (under the project)

Training programme 4

Content: Pest and Disease Management in Nurseries

Participants: Environment Specialist (SPMU), Forest Guards/ Nursery Managers

7.7 Budgetary Provisions

Under the Project Implementation Plan (PIP), the cost for EMF implementation comprises of staffing arrangements at SPMU level, and associated trainings. The EMF will also support application of environmental best practices in preparation and implementation of the range management plans, trainings, capacity building workshops, action/innovation research, monitoring, tools etc. Most of the mitigation actions are already mainstreamed into the project design and do not require activities such as special constructions. The initial budget lines and estimate of lump sum amount necessary to cover the EMF. The cost of implementing some of the provisions of the EMF, over 5 years of the project, is up to 1% of the total project cost, for ensuring implementation of all activities proposed under the EMF.

Annexure 1: List of References and Sources of Secondary Data

Sr. No.	Data	Source of Data
1.	**Socioeconomic Environment**	
	Human settlements (Occupational pattern, demographic profile, economic profile, agricultural practices and others)	Directorate of Economics and Statistics Revenue Department Himachal Pradesh Public Works Department State Agricultural Department State Horticulture Department State Agricultural University State Horticulture University
	Public Health	Irrigation and Public Health Department
	Tourism	District/State Tourism Department Directorate of Tourism, Shimla HP Forest Department
	Dependence on water system	Irrigation and Public Health Department Directorate of Agriculture Directorate of Horticulture
	Sources of water pollution	Irrigation and Public Health Department State Pollution Control Board Central Water Commission Central Ground Water Board
	Archaeological, cultural and religious locations and places of worship	State Archaeological Department Directorate of Archaeology Archaeological Survey of India Department of Language, Art and Culture
	Ward, Villages, Taluka and Districts and Watershed boundaries	Survey of India Directorate of Economics and Statistics Revenue Department Urban Development Department Town and Country Planning Department District Rural Development Authority HP Forest Department
2.	**Air Environment**	
	Climatology and rain fall for hydrological consideration	State Meteorological Department State Pollution Control Board State Energy Department Department of Environment, Science and Technology Himachal Pradesh Council for Science, Technology and Environment
	Meteorology for dispersion of air pollutant during construction activities	State Meteorological Department State Pollution Control Board
	Air Quality	State Pollution Control Board
	Noise	State Pollution Control Board
3.	**Water Environment**	
	Hydro-geological aspect (siltation)	State Energy Department Central Water Commission Central Ground Water Board BBMB HP Power Producers Forum
	Hydrological cycle	State Energy Department Central Water Commission Central Ground Water Board

		State Meteorological Department
	Surface Water Quality and Quantity including nutrient levels	State Energy Department Irrigation and Public Health Department Central Water Commission State Pollution Control Board
	Ground water regime (ground water table, aquifers)	Central Ground Water Board
	Ground water quality	Central Ground Water Board Irrigation and Public Health Department
4	**Land Environment**	
	Land use and land cover	Survey of India National Bureau of Soil Survey and Land Use Planning State Forest Department Revenue Department Department of Environment, Science and Technology Himachal Pradesh Council for Science, Technology and Environment
	Mineral resources	Geological Survey of India
	Water use	Irrigation and Public Health Department State Agricultural Department Directorate of Horticulture
	Water logging	Irrigation and Public Health Department Urban Development Department Town and Country Planning Department
	Developmental Projects	Urban Development Department Directorate of Industries HP Power Producers Forum Himurja Irrigation and Public Health Department State Energy Department HP Public Works Department District Rural Development Authority Town and Country Planning Department
	Solid Waste generation	State Pollution Control Board Municipal Council Nagar Panchayats
	Soil	National Bureau of Soil Survey and Land Use Planning
	Agriculture System	Directorate of Agriculture HPSAMB Directorate of Horticulture State Agricultural University State Horticulture University
	Economic activities such as, agriculture, tourism, horticulture, hydropower, industries, etc.	Department of Tourism & Civil Aviation State Department of Horticulture & Agriculture Himachal Pradesh Energy Development Agency Department of Industries
5	**Biological Environment**	
	a. Forest cover and Type	Survey of India State Forest Department
	b. Rare and endangered species	State Forest Department State Biodiversity Board Ministry of Environment, Forests and Climate Change
	c. Species which require management	State Forest Department State Biodiversity Board State Medicinal Plant Board

		Ministry of Environment, Forests and Climate Change
	d. Species of economic significance including NTFPs	State Forest Department State Biodiversity Board State Medicinal Plant Board
	e. Species of special interest to local population or tourists	State Forest Department State Biodiversity Board State Tourism Department
	f. Aquatic fauna of commercial/recreational value and migratory fish species along with their spawning ground	State Biodiversity Board State Fisheries Department Zoological Survey of India CEIA for Sutlej Basin
	g. All Natural habitat including protected – unprotected including important breeding and nesting grounds and areas where schedule 1 species are present.	State Forest Department Ministry of Environment, Forests and Climate Change
	g. Habitat including breeding ground and access corridor for food and shelter	State Forest Department Ministry of Environment, Forests and Climate Change
	h. Biodiversity	State Biodiversity Board State Forest Department Ministry of Environment, Forests and Climate Change
6	**Policy Environment**	
	a. State Policies (Policies on Forest, Water and Air, Social welfare schemes and others)	All concern State Departments/Directorate
	b. Centre Policies (Policies on Forest, Water and Air, Social welfare schemes and others)	All concern Central Govt. Departments/Ministries

* Additionally Reports/publication/Previous CAT plans/Academic and R & D Institutes' records and other materials will be referred for datasets.

Annexure 2: Baseline Data Questionnaire (sampled villages)

Name of village:	**Latitude:**	**Date:**
Altitude(m):	**Longitude:**	**Aspect:**

Details of the Respondents:

Name:	**Age:**
Address:	

Resident of the village:

Family members:

Members	**< 15 years**	**16 to 30 years**	**31 to 60 years**	**>60 years**
Male				
Female				

Education:

Members	**Illiterate**	**10^{th} Pass**	**12^{th} Pass**	**Graduate**	**Post-Graduate**
Male					
Female					

Occupation of the family members:

Gender	**Government**	**Agriculture**	**Business**
Male			
Female			

Main income sources:

Occupation	**Products**	**Rate/Unit**	**Annual income**

Land Use Pattern

Land use	**Current Status (bigha/ha/ %)**	**Change in land use pattern (increase/decrease)**	**Factors affecting the change in land use pattern**
Agriculture land			
Forest			
Area under settlements			

Area under paths & roads			
Fallow land a) Current fallow (upto 1 yr) b) Other fallow (above 1 yr)			
Grassland			
Barren land /Waste land			
Orchards			
Others			

Agriculture/ Horticulture

Crops and Area under cultivation

Name of the Crop	**Area under cultivation (Bigha /ha) Category (Kharif/Rabi)**	**Total production (Quintal /year)**	**Income generation (Rs/yr)**	**Factors affecting the crops**	**Doses of Pesticides/ insecticides and other chemicals (kg/Bigha)**

Migration

Emigration of people from the village during the last 10 years				
Family	Male	Female	Emigrated to	Reason for Emigration
Immigration of people in the village during the last 10 years :				
Family	Male	Female	Immigrated to	Reason for immigration

Water Resource

Source	Availability Status	Change in volume (increase/decrease)	Factors responsible for the loss of water resource
Glacier			
Water bodies			
Rivers/ Lakes/ Ponds			
Ground water (Hand pump or well)			
Potable Water (Streams, springs, hand pumps, Tap water, etc.)			
Irrigation facilities (Channel, Rain fed, Hydram, Tank etc.)			

Risks and disasters/hazards management

Disaster/hazards types: -	Mitigation measures
Net annual water available	
Floods and drainage	
Cloud burst	
Cold wave	
Snow avalanches	
Droughts	
Erosion due to road construction and other activities	
Wastewater discharges	
A. Water and climate disasters	
Floods and drainage	
Cloud burst	
Cold wave	
Snow avalanches	
Droughts	
6.Erosion	
B. Geological disasters	
Landslides	
Mudflows	
Earthquakes	
Dam bursts	
Mining/squaring	
C. Accidental disasters	
Forest fires	
Village fire	
Building collapse	
Electrical disasters and fires	
Road accidents	
D. Biological disasters	

Epidemics	
Pest attacks	
Cattle epidemics and food poisoning	
Man-made	
E. Natural disasters	
Flood	
Droughts	
Earthquakes	
Landslides	
Avalanches	
Man-made	
F. Solid waste management	
Collection	
Segregation	
Disposal	
G. Climate Change	
Temperature	
Precipitation	

Tourism

Type of tourists	No. of Tourists Visited (in last 10 years)	Impacts on forest Resources (Positive/ Negative)	Mitigation Measures
Eco-tourism			
Cultural tourism (Religious and Spiritual)			
Adventure tourism			
Rural tourism			
Wildlife tourism			
Sports tourism			
Medical tourism			

Forest Resources

Questions	Yes	No	Can't say
Is forest resources have increased over the year?			
Have you noticed any change in the health and quality of forests?			
Has felling of trees increased over the year?			
If yes, number? Rough value			
Have you noticed any change in the richness of plant and animals?			
If Yes, please specify?			
Is there any impact of climate change on forests?			
If yes, in what ways do you think the climate change and other factors have impacted the forests?			
Is there any impact of developmental activities (Hydropower, mining, road construction, urbanization, etc.) on forests?			
If yes, please specify the impacts and magnitude?			
Did you find any change in forest area?			

Is there any forest diseases and pest infection?			
Is there any shifting of forest types?			
Is there any change in species composition?			
Are you aware of forest management policies / rights in your area?			
Are you deriving direct benefits from the forest areas and other ecosystem services?			
If yes, to what extent you are dependent on the forest areas like food, building material, nutrition, medicinal plants, etc.			
Is the Livelihood pattern in the village has affected natural resources?			
If yes, please specify the changes?			
Is there any interest in building value added to the Non-Timber Forest Products (NTFP) product locally?			
If yes, what are these products?			
Do you think community participation in forest management is essential?			
Do you participate in the management of the forests?			
If Yes / No, why?			
Do you have any traditional management practices for forests?			
If yes, what are these practices?			
Are there any conflicts between management and the communities?			
If yes, what types of conflicts exist?			
Are there any conflicts between Human and wildlife?			
If yes, what types of conflicts exist?			
Is there any step taken by Government for creating mass awareness among the local people about the biodiversity components?			
Is there any network of relevant departments/ organizations for information sharing?			
If yes, please indicate the departments/ organizations involved.			

Mobile/Telephone No.	**Signature**

Annexure 3: List of Stakeholders Met

Key points: (I) introduce the project, and (ii) seek stakeholder views on the project, (iii) understand Stake or interest in the project, and the stakeholders' potential support or opposition to the project and (iv) facilitate their cooperation and seek their inputs on the following:

1. Views, feedback on project design, whether the proposed project is aligned with the interests of the concerned stakeholders
2. How can the project be designed as to target key benefits to the stakeholder (being consulted)?
3. Kinds of issues (technical, admin etc.) seen from other externally aided forest projects in the state, and lessons learned.
4. Priority environment issues impacting health and quality of forests
5. What are the key vulnerability factors affecting forests- pests, diseases, soils etc.
6. How and which stakeholder concerns and recommendations be addressed in project decision-making.
7. Seeks inputs on (i) identifying appropriate forest quality management measures, managing protected areas and other natural habitats, and (ii) monitoring and evaluating specific plans prepared under the project.

	Key Departments/ organisations	**Role/ responsibility and linkage to the project**
1	HP Forest Department Subject matter Specialists Wildlife ACF (Majathal Sanctuary)	Responsible for afforestation, timber distribution, grazing, fuel wood production, watershed management, forest harvesting, supporting community needs and conservation of protected areas.
2	HP Forest Development Corporation Ltd.	The Corporation deals mainly with marketing of timber, fuel wood, pulpwood, bamboo, khair and resin.
3	Forest Training Institute	FTI conducts training induction as well as In-service training of Forest officers. The Institute is currently conducting regular Induction training courses for Range Forest Officers and Forest Guards. Besides this the Institute also conducts refresher courses for the Front-Line Staff of the HP Forest Department. Tailor made training courses for other Departments/ Projects/ HPSFDC/ Agencies/ Community Members/ Eco-Tourism are also conducted in this Institute.
4	Department of Environment and Science and Technology (includes the State Pollution Control Board)	Responsibility is to improve effectiveness of environmental management, protect vulnerable ecosystems and enhance sustainable development
5	Department of Agriculture- HPSAMB	APSAMB provides mandis for marketing of NTFP products
6	Himalayan Forest Research Institute	Provides technical support to forest department for nursery and silviculture practices.
7	Indian Institute of Grassland and Fodder Research	Provides technical support to forest department for pasture management practices.

Annexure 4: Baseline Data from Field Surveys

Description of sample GPs

Baseline surveys were conducted in13 Gram Panchayat (255 households) in the study area during 19-30th April 2018. The questionnaire for Environmental Management Framework for Forest for Prosperity Project was covered both 'qualitative' as well as 'quantitative' data in relation to their present conditions. The panchayats selected were close to the forest area or respective village boundary touches with the forest boundary. During field survey, it was observed that various forest produce plants were collected by local people i.e. Gucchi *(Morchella esculenta)* Apricot *(Prunus armeniaca, Prunus* sp.*),* Banko Akhrot (*Juglans regia),* Gallu (*Taxus wallichiana) Chilgoza* (*Pinus gerardiana*) Dhoop, Bankakri (*Podophyllum hexandrum*), Kala zira (*Bunium persicum*), Karu (*Picrorhiza kurrooa*), Cedar cone (*Cedrus deodara*), Kashmal (*Berberis* spp.), oak (*Quercus* spp.), Shishm (*Dalbergia sissoo*), etc.

Details of the sampled Gram Panchayats in the Satluj Basin.

Sr. No	Panchayat	Respondents	Latitude	Longitude	Altitude(m)	District
1	Kalpa	29	31.532	78.250	2777	Kinnaur
2	Kilba	29	31.513	78.148	1889	Kinnaur
3	Moorang	43	31.598	78.449	2593	Kinnaur
4	Ribba	13	31.582	78.367	2543	Kinnaur
5	Roghi	14	31.514	78.231	2756	Kinnaur
6	Khwangi	16	31.543	78.273	2245	Kinnaur
7	Bandali	14	31.331	77.026	1786	Mandi
8	Koel	16	31.480	77.500	985	Kullu
9	Chowai	20	31.446	77.443	1860	Kullu
10	Ogli	12	31.264	77.294	720	Shimla
11	Shakrori	14	31.226	77.145	706	Shimla
12	Juini	15	31.248	77.069	953	Shimla
13	Taklech	20	31.376	77.732	960	Shimla

Key issues highlighted with land, water and forest management:

- **Status of water resources**

  Majority of respondents believe that natural water sources drying up over the year due to decrease in precipitation, construction works, landslide and growing demand with increase population (Fig. 10).

- **Status of Forest Resources**

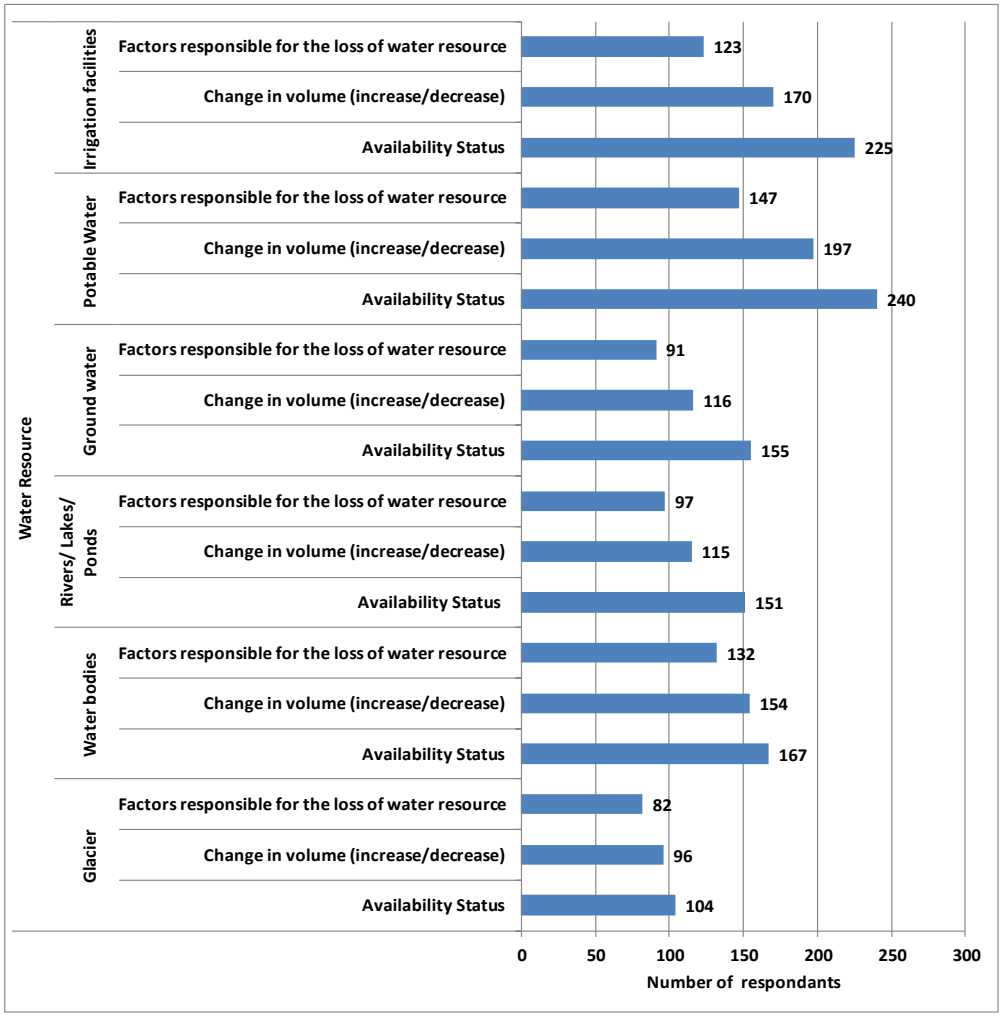
  Majority of respondents believe that forest area decreased and forest resources over the year due to over-exploitation, habitat destruction, landslides, invasion of exotic species and forest fires incidences (Fig. 11 A-C).

- **Land use pattern**

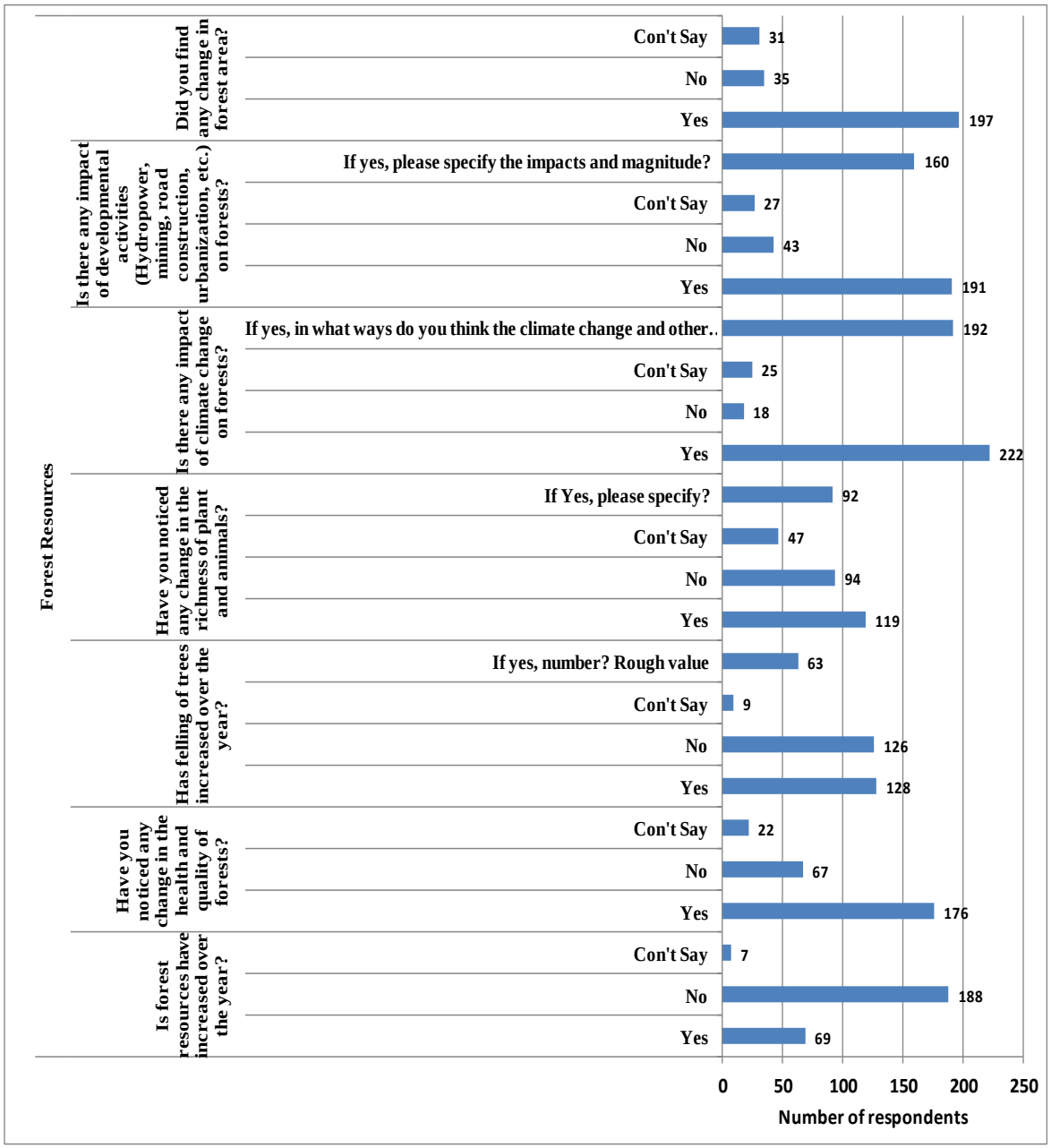
Majority of people responded that their 'cropping pattern' has changed because of the changing rain & snowfall pattern. Over the year peoples moved towards cash crops because of high earnings, changing pattern of precipitation, invasion of exotic species, lack of irrigation system.

- **Climate change perception**

From the perception survey, it is made clear that majority of respondents were aware of the climate change and its impacts on their surrounding environment, that 'weather pattern' is changing in terms of rainfall, temperature, snowfall, etc. Respondents were of the view that 'rainfall pattern' has changed. The rainfall variability has been at a great pace for quite some years. The variable nature of rain has its adverse impacts on crop, thus risks to drought were perceived by the interviewees. Majority of the respondents also felt that rainfall has declined in amount and they could no longer rely on timely onset of the monsoon. According to the villagers, snowfall is found to be reduced but precipitation increased which has its direct adverse impacts on apple orchard cultivation. During group discussion with the households of the panchayat stated that the rainfall was found to be increased in sub-temperate region of the Sutlej basin. However, the snowed areas have been converting into rainfed areas.



Respondent's response on Status of water resources



Respondent's response on Status of Forest resources

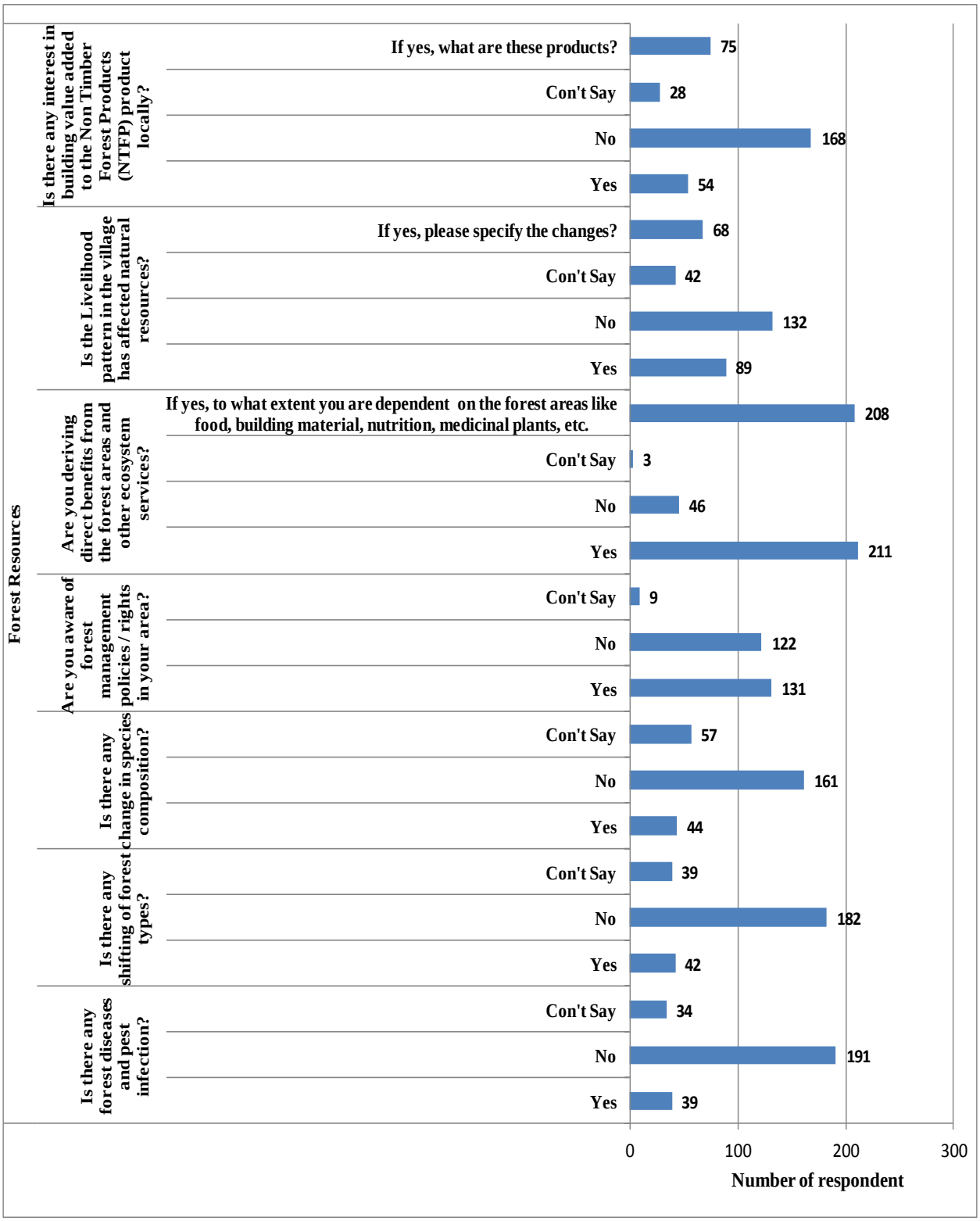


Fig. 4. Respondent's response on Status of Forest resources

Annexure 5: Environmental Management Plan Format/ checklist

EMP for Small Civil works - A model format to be used for Buildings and Value Chain infrastructure

Environmental Aspect	Impact	Mitigation Measure	Responsibility for Implementation	Applicability
Site Selection	Improper location can have multiple impacts on sustainability, biodiversity, disaster proofing, etc.	The site selected for the activity will not be in areas that are: wildlife conflict areas, waste dumpsites, highly polluted/ contaminated land or water areas, natural drainage courses, areas prone to floods.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Legal and Regulatory Compliance	Activities that do not comply with the relevant laws and regulations cannot be supported under the project.	Refer to the Screening Checklist – B and confirm the following: The proposed construction is not on the 'list of non-permissible activities' given in Section 2 of the Screening Checklist-B. The proposed construction complies with the legal and regulatory requirements including those listed in Section 3 of the Screening Checklist-B.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Felling of trees and clearing of vegetation	Loss of green cover including trees	Compensatory plantation will be undertaken in accordance with the conditions prescribed in the tree felling permission. Not less than 5 trees of diverse, local species will be planted for every tree that is felled. Provision for tree guard and not less than 5 years of plantation aftercare will be provisioned.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Construction materials	Unregulated quarrying can result in over-extraction, impact on natural drainage, soil erosion, loss of aesthetic appeal of the land scape, etc.	All construction material including sand, stone, brick, timber, etc., will be sourced from authorized quarries/sources. All borrow pits will be suitably rehabilitated.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Pits and boreholes	Risk of falls into unsecured pits, boreholes, etc.	All boreholes will be properly secured in accordance with the Supreme Court guidelines[18]. All pits (including borrow pits) will be properly secured and will	HP FD Oversight by District Technical Specialist and Forest Ranger of the	☐ Applicable ☐ Not Applicable If Applicable,

[18] Refer to: http://www.cgwb.gov.in/CGWA/Documents/Guidelines%20Supreme%20Court%20fatal%20Accident.pdf

		not exceed 2 meters in depth.	circle	include in Construction Contract Clauses
Health & Safety	Risk of accidents at worksite.	Cautionary signage and protective barriers will be used to warn public and prevent unauthorized access. All workers will be provided adequate PPE. The use of PPE at the construction site will be mandatory. A fully-provisioned first-aid box will be available at the construction site. An accident register will be maintained at the construction site.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Air Quality	Dust emissions from excavation. Emissions from vehicles and machinery, dust, etc., may lead to air pollution. High noise levels from construction activities may lead to noise pollution.	All vehicles will have a valid Pollution Under Control certification. All generator sets (diesel, petrol, kerosene, LPG, CNG) will meet the 'CPCB noise and emission control standards for Generator Sets'. Noise generating activities and machinery will meet the CPCB prescribed 'Ambient Air Quality Standards in Respect of Noise'. Construction activity will be restricted to daylight hours.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Water Quality	Runoff and release of untreated wastewater may pollute nearby water bodies.	Release of waste water into water bodies, streams, etc., without any treatment will be avoided. All waste water will meet the 'CPCB General Standards' prior to disposal.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Waste Management	Pollution and health impacts due to improper disposal of wastes such as open dumping, burning, unauthorized recycling, etc.	Dispose biodegradable and non-biodegradable wastes, including wastes from construction activity and labour camp, in a manner and at locations specified by the local government body. All construction and demolition waste will be cleared from the site and disposed at authorized locations in accordance with the	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses

		Construction and Demolition Waste Management Rules, 2016[19]. Any hazardous waste generated during construction/demolition activity will be handled in accordance with the Hazardous Waste Management Rules, 2016[20].		
Physical Cultural Resources	Loss of cultural artifacts.	In case of chance finds of archaeological significance (such as coins, utensils, artefacts, structures, etc.) are found during the excavation works, the Department of Archeology will be notified.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	☐ Applicable ☐ Not Applicable If Applicable, include in Construction Contract Clauses
Human Resource Capacity of contractor/ labour	Poor capacity for environmental management.	Capacity building activities through orientation, training and use of IEC (information, education, communication) for construction contractors, labour, etc.	HP FD Oversight by District Technical Specialist and Forest Ranger of the circle	
Compliance Monitoring	Weak compliance of the environmental management plan will lead to aggravated impacts and undermine sustainability.	Periodic monitoring and reporting (quarterly) on implementation of the EMP.	HP FD Environment Specialist In accordance with the M&E system of the project.	

Note: Ensure that the activity budget provides adequate finances for implementation of the mitigation measures identified in the EMP.

[19] Refer to: http://www.moef.gov.in/sites/default/files/C%20&D%20rules%202016.pdf

[20] Refer to: http://www.moef.gov.in/sites/default/files/Final%20HWM%20Rules%202016%20(English)_0.pdf

Part 2: EMP Format for Operation Phase- Small Civil Works			
Environmental Aspect	**Impact**	**Mitigation Measure**	**Responsibility for Implementation**
Air and Water Pollution	Air and water pollution from processing units	Al equipment's installed will comply with Air quality standards prescribed by CPCB and Water quality standards will be maintained in case waste water is being discharged from the units.	Environment Specialist in the PMU. Division Level nodal officer
Health & Safety	Equipment, machinery, vehicles, etc., that do not comply with relevant safety and environmental standards may pose risk to human and environmental health and safety.	All procured equipment and machinery will comply with relevant BIS standards. All vehicles (carriers, reefer vans, etc.) will comply with the relevant Bharat Stage (BS) emission norms.	Environment Specialist in the PMU. Division Level nodal officer
	Risk of accidents (use of agri-machinery, in the processing unit, etc.). .	Safety instructions will be provided to users of agri-machinery in the local language. Adequate PPE will be provided to users of agri-machinery and workers in processing units. The use of PPE will be mandatory. A fully-provisioned first-aid box will be available at the processing unit. Adequate number of functional fire extinguishers will be available at the processing units and warehouses. An accident register will be maintained at the processing unit.	
	Risk of use of hazardous chemicals.	Un-authorized chemical ripening agents (e.g., calcium carbide) will not be used.	
Pest Management	Risk to human and environmental health from use of hazardous pesticides, and from improper use of pesticides.	Pest management in godowns, warehouses, etc., will be as per the Pest Management Plan (Refer to 'Volume 2: Integrated Pest and Nutrient Management Plan').	Environment Specialist in the PMU. Division Level nodal officer
Waste Management	Pollution and health impacts due to improper disposal of organic wastes such as open dumping, burning, etc.	All organic/biodegradable wastes (from sorting-grading units, from processing units, from go-downs, etc.) will be segregated and disposed through reuse as animal feed, composting, etc., as appropriate. Any residual waste material will be disposed in a manner and at locations specified by the local government body. All work sites will have adequate sanitation facilities.	Environment Specialist in the PMU. Division Level nodal officer
Energy Consumption	Equipment and machinery that is not efficient will lead to	All procured equipment and machinery (e.g., pump sets, refrigeration units) will be BEE 4 or 5 star rated.	Environment Specialist in the PMU. Division Level nodal

	energy wastage and higher operating costs.	Use of solar energy based equipment/machinery will be considered.	officer
Water Consumption	Processes that are not water efficient will lead to over-consumption and impact other water users.	Processing and storage centers will optimize water use. Waste water will be recycled or used for recharge after appropriate treatment (filtration, sedimentation).	Environment Specialist in the PMU. Division Level nodal officer
Human Resource Capacity	Poor capacity for environmental management.	Capacity building activities through orientation, training and use of IEC (information, education, communication) for NTFP groups, , etc.	Environment Specialist in the PMU. Division Level nodal officer
Compliance Monitoring	Weak compliance of the environmental management plan will lead to aggravated impacts and undermine sustainability.	Periodic monitoring and reporting (quarterly) on implementation of the EMP.	Environment Specialist in the PMU. Division Level nodal officer

Note: Ensure that the activity budget provides adequate finances for implementation of the mitigation measures identified in the EMP.

Annexure 6: Annex Pest Management Strategy for Forest Nurseries

Since each forest nursery can supply plants for planting to many geographic areas, keeping pests out of nurseries is especially important. Buying healthy stock and carefully monitoring the condition of seedlings and cuttings are important practices. The controlled environment of the nursery, such as planting density, species or clone choice, and monoculture, can be favorable to pest development. During Baseline data collection, consultations with forest department and research institute it was identified that pest and disease outbreak in forest nurseries is an issue, though occurrences are few. There are several guidelines in place for pest control in nurseries that have been developed by ICFRE, HFRI, and Forest Department though, with the lack of trained forest nursery managers, the techniques adopted to control pests are ad-hoc and application is unscientific.

Given that FPP will be investing in up gradation of forest nurseries, and beginning state of the art infrastructure, it is essential that clear and easy to follow guidelines are put in place with regards to pest management in nurseries. An analysis of the key pests and diseases affecting seedling stock in nurseries was analyzed, and bio-control strategies were developed such that they can be easily adopted in the field. In some cases, chemical control[21] has been prescribed if biological methods are ineffective, these are chemicals which have negligible adverse human health and the environment (WHO class III), but at the same time shown to be effective against the target species. A training programme will also be implemented with Forest Rangers in the application of the prescribed practices below.

Table 42 Typical Pests and Bio Control

Pest	**Control Methods**
1. White grub	Metarhyzium anisopliae - (Bio Pesticide)
2. Cutworms	Metarhyzium anisopliae (Bio Pesticide)
3. Termites	Metarhyzium anisopliae, Beauveria bassiana (Bio Pesticide)
4. Crickets and Grasshoppers	Beauveria bassiana, Trichogramma chilonis (Bio Pesticide) Application of Malathion (0.25%) water emulsion spray is also effective in controlling the pests.
5. Defoliators	Trichogramma chilonis (Bio Pesticide)

Table 43 Typical Diseases and their control			
#	**Diseases**	**Control Methods**	**Application**
6	Damping-off (pre- and post-emergence)	Improve soil drainage by leveling soil, by installing subsurface drainage tiles, and by adjusting the frequency of irrigation. Irrigation must also be carefully controlled	*Trichoderma Viride or Trichoderma harzianum* (bio fungicide -It is used for seed and soil treatment for suppression of various diseases caused by fungal

[21] The procurement of any pesticide in a Bank financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users. With respect to the classification of pesticides and their specific formulations, in reference to the World Health Organization's Recommended Classification of Pesticides by Hazard and Guidelines to Classification. It is required that any pesticides be manufactured, packaged, labeled, handled, stored, disposed of, and applied per standards acceptable to the WHO and health and safety standards [21]as prescribed in the WBG Environment Health and Safety Standards. The project will not promote, procure or utilize formulated products that fall in WHO classes IA and IB, or formulations of products in Class II.

		in container nurseries. Minimize exposure of seeds to soil pathogens by delaying sowing until the soil temperature has risen to near optimum for rapid seed germination.	pathogens) Systemic infection can be controlled by dip treatment of seeds in 0.1% water solution of Emisan (bio-pesticide) for 15 minutes and keeping the seeds for 24 hours before sowing. Pre-emergence damping off can be controlled by treatment of seeds with slurry of 140 gm of Captan in one liter of water.
7	Collar rot	Fungi which cause damping-off can also be responsible for root and collar rot.	*Application of Trichoderma Viride* (bio fungicide). The options available for the control of root and collar rot are the same as those described for "Damping-off".
8	Root rot	Root rot differs from damping-off in that it attacks the root tips of older seedlings.	*Trichoderma Viride* (bio- fungicide) The options available for the control of root and collar rot are the same as those described for "Damping-off". *Fusarium* root rot diseases are controlled by drenching the soil with 0.2 % water suspension of Captan. *Rhizoctonia* root rot is controlled by drenching the soil with 0.2% solution of Brassicol.
9	Foliage diseases		Foliage pathogens are controlled by spray of 0.2% water solution of Bavistin.

Table 44 Pest Control Strategies for Key Forest Species

No#	Species	Key pests/ diseases and prescribed chemical treatment	Bio Control and Chemical Agents to be used in HPFD
1	***Pinus roxburghii* (Chir Pine / Chil)**	Mostly cut worms and grubs do considerable damage to the growth of nursery seedlings Mostly species of *Pythium, Phytophthora, Fusarium* and *Rhizoctonia* cause damping off in the nursery seedlings before or after emergence from the soil. *Cryptothelia crameri* a defoliator of *Pinus roxburghii*	*Metarhyzium anisopliae (Bio Pesticide) & Trichoderma Viride* (biofungicide) Nursery fumigation with 5 per cent Formalin/Methyl bromide, 15 to 20 days prior to sowing and soil drenching with Carbendazin (0.1%) should be done when initial disease symptoms appears.
2	***Cedrus deodara* (Deodar / Himalayan cedar)**	Damping off due to poor drainage in nursery often results in huge mortality of deodar seedlings.	*Metarhyzium anisopliae (Bio Pesticide) & Trichoderma Viride* (biofungicide) For damping off drenching with Indofil[22] M-45 (0.25%) or Bavistin[23] (0.1%) is recommended.
3	***Pinus***	Damping off of young seedlings in	*Use of Trichoderma Viride* (biofungicide)

[22] Indofil (Mancozeb)- Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use.
[23] Bavistin contains 500 g/kg carbendazim in the form of a water dispersible granule. Carbendazim- Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use.

	***gerardiana* (Neoza / Chilgoza)**	nursery	In nursery bed. Application of neem cake and FYM before treatment increases the efficacy of treatment. Damping off of young seedlings in nursery can be avoided by drenching the polybag soil with Bavistin (0.1%).
4	***Quercus leucotrichophora* (Ban oak)**	Caterpillars of Indian gypsy moth (*Lymantria obfuscata*) defoliate the trees.	*Beauveria bassiana, Trichogramma chilonis (Bio Pesticides)*

Table 45 Good Nursery Management Practices Effective for Control of Pests

#	Phase/ Frequency	Practices/ Guidelines
1	Seed Selection and Sowing	1. Nursery sites should be on south and south west in the higher hills (beyond 1500 m) and in the eastern and south eastern aspects in the lower hills. 2. Local collection of seeds should be verified from selected *plus* trees. 3. Provide the best possible growth conditions (e.g. nutrients, water, light, appropriate spacing and weed control) to raise healthy, vigorous and resistant plants. 4. Collect or obtain seed from good quality genetically superior trees; use multiple sources of planting material to increase genetic diversity; use certified seed if possible and store seed in conditions that limit pest attack; test seed prior to planting to ensure good germination and seed health; and apply seed treatments, if needed. 5. Locate the nursery producing the seedlings away from commercial stands to prevent contamination and the subsequent spread of pests
2	Infrastcrture	1. Vermi-compost/ compost pit(Bio-fertilizer) 2. Root trainer/Poly bags. 3. Water supply, Water tank, Pipes, sprinkles. 4. Nursery Sheds-Agro Net, Bamboo Net, Poly Sheds. 5. Hardening Shed- Green House. 6. Soil Testing equipment 7. Make available selective bio-pesticides, as per nursery requirements.
3	Treatments	1. Surround the nurseries with shrubs, ornamental trees and associated bushes as natural/biological barriers for pests 2. Treating seeds with water drowning softens seed coat 3. Infected pine cones should be discarded 4. Seed storage should be in controlled environment 5. Seed dressing with 0.2% Carbendazim/Methyl Carbendazim 6. Planting in poly bags in 3:2:1 ratio of FYM, sand and Soil 7. Temperature in compost pit should not exceed 50 deg to guard against thermophilic bacteria 8. Solarization of soil to kill pests/ bacteria before planting pathogens. 9. Application of Mycorrhiza for root rot diseases 10. Application of Neem cake in the soil is also a good bio control method
4	Nursery management techniques	1. Keep appropriate records that permit identification of sources of production material, and where it is grown and planted out, so that any source of any infestation/infection may be traced. 2. Sowing of seeds in sterilized/fumigated and clean beds 3. Using sterilized budding knife, secateurs, and scissors during budding and grafting 4. Transplanting seedling after root dip for 3-5 min in 0.02% Carbendazim solution

		5. Ensure irrigation water is free of pathogens and other contaminants such as pesticides, particularly if the water source is a pond where water accumulates from infected or treated fields or is suspected to be contaminated. 6. Avoid leaving leaves wet, especially when watering at night, as this can allow pathogens to infect plants. 7. Install screens or nets in plant production facilities to prevent insect entry or spread.
5	Control of Pests and Diseases	1. Frequent examination of seedling health and removal of diseased stock 2. Foliar spray of 0.2% Carbendazim/ M-45 at regular interval 3. Nursery managers should notify the Forest Department or other appropriate officials if an unknown, important or regulated pest is found 4. In affected areas, entry of animals and birds, which may spread pests, should also 5. Clean (thoroughly remove all soil and plant materials from all surfaces, disinfect all tools, footwear and equipment before entering and before leaving the nursery area, especially if a pest is present. 6. Dispose of infested soil or growing media carefully so as not to contaminate new plants or soil 7. Collect and remove dead plants and debris every week to decrease the probability of infestation 8. Destroy or sanitize infested plant waste by burning, composting or treating with heat to kill the pest. If composting, make sure that a high enough temperature is reached to kill the pest. 9. Use deep burial (2 m) to dispose of plant waste that cannot be destroyed or sanitized.
6	Reduce mortality	1. To reduce the mortality one of the nursery methods adopted is to harden the seedlings before lifting them. Hardening consists gradual reduction of watering (say, to once in 4 days) for the last two months of the seedlings life in the nursery and shoot and or side branch pruning, keeping one-third of crown intact. 2. Grading and Culling before transfer to the field so less developed ones can be given extra attention through larger dose of fertilizer to bring them up to the desired specification. 3. Seedlings that do not come up to the acceptable standard and should be rejected/culled at the nursery stage.

Annexure 7: Occupational Health and Safety Guidelines for Forestry Operations

Risk	Target Group	Guidelines
Pesticide Application	Nursery Managers Forest Guards	1. If pesticide application is warranted, forest nursery managers should follow PMP in Annex 6, and take the following precautions to reduce the likelihood of environmental impacts: 2. Apply pesticides based on criteria such as field observations of the target pest, weather data, time of treatment, and dosage, and maintain a pesticide logbook to record such information. 3. Avoid the use of pesticides that fall under the World Health Organization Recommended Classification of Pesticides by Hazard Classes 1a and 1b and 2.
Forest staff Quarters/ Accommodation and Welfare	Forest Guards Forest Rangers Nursery Managers	1. Forest workers may live in camps in remote areas, which should meet certain minimum standards of sanitation, comfort and services, and an adequate supply of safe drinking water. 2. Biological hazards include allergic reactions to plants, pollen, wood products and insect bites, as well as snakebite and diseases that can be contracted from, for example, mosquitos and ticks. The risks posed by many biological hazards can be reduced through adequate training, effective management (e.g. by reducing mosquito breeding grounds near accommodation and the use of mosquito nets and first aid kits)
Machinery and vehicles	Nursery Van Drivers Forest guards/ rangers (fire management. NTFP groups	1. Machinery and Vehicles Accidents may occur about the use of machines and vehicles, including tractors and harvesting machinery, and during the transport of workers along poorly maintained roads. 2. Occupational safety and health impacts and controls relating to equipment and vehicle operation and repair are discussed in the WBG General EHS Guidelines. All vehicles used should follow provisions in Central Motor Vehicles Act. 3. All drivers should be suitably trained
Isolated workers	Forest Guards Forest Rangers NTFP collectors/ SHG groups	1. The collection of the herbs from the alpine pastures and distant forests is a specialized task undertaken by physically stronger and young members. It is a tough journey home with the heavy load of the collected herbs. 2. Collection of forest products in remote locations may expose individuals to range of biological hazards as well as to extreme weather and accidents in hilly and remote terrain. 3. Lone and Isolated Workers Forestry operations may necessitate that workers are isolated and out of communication with a other workers, or other persons capable of providing aid and assistance. The worker is therefore at increased risk should an accident or injury occur. Recommendations to manage situations where workers are isolated are discussed in the WBG General EHS Guidelines which are referred to as part of the project framework and will be followed.
Exposure to extreme temperatures	Forest Guards Forest Rangers Range officers DFOs	1. Workers may be subject to extreme heat and cold. High temperatures reduce work capacity and may lead to heat stress and dehydration. 2. The risk can be reduced by, for example, the provision of sun

	JFMCs NTFP collectors/ SHG groups	shelters, the regular intake of water and the judicious use of rest periods, and by undertaking the heaviest work in the coolest work hours. 3. Regular food intake, adequate clothing and sufficient facilities for drying clothes can reduce the risk to human health posed by cold weather
Terrain and Site factors	Forest Guards Forest Rangers Range officers DFOs JFMCs NTFP collectors/ SHG groups Community Labour engaged in plantation activity	1. Terrain and site factors, such as slope and soil type, influence work safety. Forestry activities often occur on steep slopes, with a consequent high risk of machinery accidents and rock falls. 2. Finely textured soils (e.g. clays) are slippery when wet, increasing the risk of accidents involving heavy machinery. 3. Workers should be provided with adequate PPE, training on safety and accident management.
Forest Fire Management	Forest Guards Forest Rangers Range officers DFOs JFMCs	1. Risks include exposure to excessive heat from the fire, the inhalation of toxic fumes (e.g. carbon monoxide), eye irritation from particulates, and burning. 2. Factors that can increase the risks posed by fire include poor visibility, difficult terrain, difficult logistics, night work, changes in wind direction, stress and fatigue. 3. All controlled burning operations should be planned, burning operations should not be undertaken when people and property are within the burn area without adequate protection. 4. An effective organizational structure, equipment, vehicles, PPE for fire suppression can help avoid fatalities and the loss of property.
NTFP and MAP Harvesting operations	NTFP/ MAP collectors Community Labour	1. For community workers, potential for allergic reactions to plants, pollen and insect bites could be an occupational hazard. 2. A wide range of personal protective equipment is available to help minimize the risk of injury to these workers. 3. Boots and shoes should also be designed to reduce the risk of slipping and falling.
Community Health and Safety	Communities residing within and in the vicinity of forest areas.	1. Fires originating in forests may endanger nearby communities. Fire response and management plans should be prepared with the participation of local authorities and potentially affected communities 2. Forest officials need to ensure that all pesticide containers used should be cleaned and disposes of through crushing, shredding, or return to suppliers- pesticide packaging and containers to ensure that they are not subsequently used as containers for food or drinking water.

Annex 8: Screening Checklists

Environmental Data Sheet:

	Date of Screening	
	Name of Range/Identified Landscape	
1	Location	District _____ Block_____
2	Range area (ha)	
3	Forest Area Status Protected Area / natural habitat Flora and Fauna Status Any protected area Current use of forest for any livelihood activity Area infested by exotic/noxious weeds	_____ Ha ☐ Degraded ☐ VDF ☐ MDF ☐ Scrub _____ (name) _____ (name key flora and fauna species, and presence of any schedule 1) _____ _____ Ha
4	Pasture Land Season when fodder is available Livestock numbers	_____ Ha _____ No # _____ No #
5	Forest Fire Vulnerability Forest fire incidences	_____ _____ No #/ year
6	Availability of NTFPs, MAPs and minor forest produce	
7	Number of open wells Number of rivers, canals, streams Period of water availability	_____ No # _____ No # _____ No # months
8	Presence of Forest nursery, or nearest nursery site	_____ No # and area (ha)
9	Existing management plan for the selected range	_____ (name of working plans/ management plans etc.)

Eligibility Screening

The Purpose of the eligibility screening is to avoid environmental impacts that cannot be adequately mitigated by project. The principle of avoidance usually applies for interventions that can create significant loss or damage to nationally important physical cultural resources, critical natural habitats, and critical natural forests. Such interventions would not likely be eligible for financing under the project.

Sl. No	**Activities/Subprojects with any of the attributes listed below will be ineligible for support under the proposed project due to environmental implications.**
1	Subproject/activities that are not consistent with the protected area management plan (in the case of WLS and associate eco-sensitive zones) or forest working plans (forest ranges).
2	Activity that involves construction of check dam >3m height
3	Subprojects/activities that promote or require pesticides that falls in WHO classes IA, IB, or II
4	Subprojects/activities will not support large- scale clearing of land, dredging of water bodies, undercutting of slopes, replacement of natural vegetation that may cause permanent, irreversible impacts.
5	Any activity that has a significant potential of causing forest fires
6	Any activity that promotes or involves incidence of child labour.
7	Sub project/Activities that would adversely affect cultural sites, places of significance importance and protected historical assets (both living and built)
8	Sub project/Activities that involves the felling of trees without a permit
9	Sub project/Activities that seeks to promote NTFP/MAP harvesting without approvals/permits.
10	Any project that is not consistent with the project description at time of project negotiations, unless subsequently agreed to with the Bank along with the appropriate level of environmental safeguards management

Annexure 9: Baseline of Rupi Bhabha WLS

Rupi Bhaba Wildlife Sanctuary lies in Nichar subdivision of Kinnaur district, Himachal Pradesh along the Upper Sutlej Valley, spreading between 31° 35' and 31° 45' N and 77° 49' and 78° 07' E. The main forest types are deodar (2300-2600m), oak-pine forests (2400- 2600m), fir-spruce-blue pine dominant mixed coniferous forests between 2400-3200, moist temperate broad leaved forests (2300-2800m), and sub-alpine birch-fir forests (3000m and below tree line).

The sanctuary is known for several streams and rivers which cut through it, as well as it's alpine pastures above 3500m, where thousands of livestock are taken for grazing every summer. In particular, Phuphal Ghad areas and alpine pastures of Upper Bhaba Valley that connect to Pin Valley in the north are notable sites for the nomadic shepherds putting huge pressure on the fragile alpine ecosystem, with carrying capacity under severe stress.

Local communities are dependent on the Sanctuary for a variety of resources, such as medicinal herbs, particularly dhup (*Jurinea macrocephalla*), karu (*Gentiana kurroo*), mohra or patish (*Aconitum heterophyllum*), and kuth (*Saussurea lappa*). Gucchi (*Morchella esculenta*) a commercially valuable fungus is grown on the forest floor during monsoon is also a valuable commercial resource. The PA also supports ecotourism activities such as trekking through the mountain-passes that connect the Sanctuary to neighbouring parts of Great Himalayan National Park. Though seasonal fires are a major management issue in Rupi Bhaba Sanctuary, there are no fire-lines in the Sanctuary. There are only two watchtowers, and no trained fire-fighting squad in its field staff. During forest fires, Forest Rangers an Beat Guards would gather workforce locally to fight the fires.

Some of the dominant and characteristic temperate woody plants are listed in the following table along with their distribution in Rupi Bhaba Sanctuary (Jishtu, 2007).

Table 1: List of Trees

Scientific name	Local/common name	Elevation range
Pinus roxburghii	Chir pine	1400-2300 m
Pinus wallichiana	Blue pine, kail	2100-3000 m
Abies pindrow	Silver fir, tosh, sapan	2100-3300 m
Abies spectabilis	Silver fir, tosh, sapan	2800-3600 m
Cedrus deodara	Deodar	1800-3000 m
Picea smithiana	Spruce, rai	2100-3600 m
Taxus baccata	Common yew, rakhal, nyamdal	2100-3200 m
Quercus leucotrichophora	Ban oak	1200-2400 m
Quercus glauca	Bani oak	1500-2500 m
Quercus floribunda	Moru oak	1800-2700 m
Quercus semecarpifolia	Kharsu oak	2100-3500 m
Alnus nitida	Alder, kunees, kosh	1200-2700 m
Betula alnoides	Kathbhoj	1500-2700 m
Betula utilis	Birch, bhoj	2700-3800 m
Juglans regia	Walnut, akhrot	1500-3000 m
Ulmus wallichiana	Him. elm, maldung	1800-3000 m
Symplocos paniculata	Lodh	2000-3000 m
Prunus cerasoides	Panja	1500-2400 m
Prunus armeniaca	Chuli	1500-2500 m
Prunus persica	Reg, baimi	1800-3300 m
Prunus cornuta	Him.bird-cherry, jamun	2100-3500 m
Pyrus pashia	Shagal	1400-2700 m
Acer acuminatum	Manderang, unn	1800-3000 m
Acer caesium	Him. maple, chirandru, manderang	2000-3000 m
Acer sterculiaceum	Unn, kanjal	2000-3000 m
Acer cappadocicum	Unn, kanjal	2500-3000 m
Aesculus indica	Him. horse chestnut, jungli khanor	1800-2800 m
Rhododendron arboreum	Baras	2200-3000 m
Rhododendron campanulatum	Shyargal	2800-3800 m

Table 2: List of Pastures

Sl. No.	Catchment	Name of pastures
1.	Wanger (Bhaba)	Chundia, Choi, Chorangang, Chotagarang, Dalering, Dea, Dulmanka, Goldas, Gyare, Humset, Jaktoyachul, Kangarang, Kanguman, Kara, Khak, Khasoling, Khasyari, Lanak, Mulling, Mustang, Namayachul, Nigul, Padal Thatch, Palasnud, Pandoswar, Posha, Rana Shaktung, Ratpordi, Rhustirang, Sakkanda, Selti, Sokacho Dhar, Solrang, Talung, Tander, Thotaring, Tisyo, Waja Thacharang, Wastich, & Yanger
2.	Salaring	Choring Cho, Dea, Kyalan, Phupal, & Washling
3.	Shorang	Barkhayo, Dampal, Dumti, Kumrang, Palit, & Skamdal

Table 3: List of Mammals

Mammal taxa	No. of species	Notable species
Insectivores	6	Himalayan Water Shrew & Horsefield's Shrew
Bats	12	Greater Horseshoe Bat & Hutton's Tube-nosed Bat
Primates	2	Rhesus Macaque & Common Langur
Felids	4	Leopard Cat, Common Leopard, & Snow Leopard
Viverrids	3	Large Indian Civet & Himalayan Palm Civet
Herpestids	1	Common Indian Mongoose
Mustelids	7	Yellow-throated Marten, Stone Marten, Himalayan Weasel, & Yellow-bellied Weasel
Canids	2	Red Fox
Bears	2	Asiatic Black Bear & Himalayan Brown Bear
Ungulates	7	Himalayan Musk Deer, Goral, Serow, Himalayan Tahr, Asiatic Ibex, & Blue Sheep
Rodents	16	Red Giant Flying Squirrel, Royle's Mountain Vole, Turkestan Rat, White-bellied Rat, & Indian Crested Porcupine
Lagomorphs	3	Indian hare, Royle's Pika, & Large-eared Pika

Table 4: List of Birds & Insects

Major avian taxa	No. of species	Notable species
Pheasants	9	Himalayan Snowcock, Western Tragopan, Koklass, Himalayan Monal, Cheer, & Kalij Pheasant
Raptors	16	Eurasian Hobby, Lammergeier, Himalayan Griffon Vulture, Himalayan Buzzard, Golden Eagle, & Booted Eagle
Snipes	3	Eurasian Woodcock, Solitary Snipe, & Wood Snipe
Pigeons & doves	5	Snow Pigeon, Speckled Wood Pigeon, & Wedge-tailed Green Pigeon
Owls	6	Mountain Scops Owl, Himalayan Wood Owl, & Collared Owlet
Swifts	5	Himalayan Swiftlet, White-throated Needletail, & Fork-tailed Swift
Woodpeckers	4	Speckled Piculet & Himalayan Pied Woodpecker
Corvids	8	Blue Magpies, Spotted Nutcracker, & Choughs
Tits	6	Spot-winged Tit, Green-backed Tit, & White-throated Tit
Warblers	16	Brownish-flanked Bush Warbler, Large-billed Reed Warbler, Lemon-rumped Warbler, Hume's Warbler, Large-billed Leaf Warbler, Western Crowned Warbler, & Grey-hooded Warbler, & Whistler's Warbler
Laughingthrushes	5	Striated Laughingthrush, Streaked Laughingthrush, & Variegated Laughingthrush
Thrushes	11	Blue Whistling Thrush, Long-billed Thrush, Mistle Thrush, & Grey-winged Blackbird
Chats & robins	18	White-tailed Rubythroat, Indian Blue Robin, White-browed Bush Robin, Blue-capped Redstart, Blue-fronted Redstart, & Spotted Forktail
Flycatchers	10	Dark-sided Flycatcher, Rusty-tailed Flycatcher, Ultramarine Flycatcher, Slaty-blue Flycatcher, & Grey-headed Canary Flycatcher
Wagtails & pipits	6	Grey Wagtail, Olive-backed Pipit, & Rosy Pipit
Finches	17	Fire-fronted Serin, Yellow-breasted Greenfinch, Plain Mountain Finch, Pink-browed Rosefinch, Red-headed Bullfinch, Black-and-yellow Grosbeak, & Spot-winged Grosbeak
Buntings	3	Rock Bunting & Chestnut-eared Bunting

Annexure 10: Majathal WLS Baseline

Majathal Wildlife Sanctuary is named after one of its major Demarcated Protected Forest *viz.* Majathal DPF**.** Apart from DPF Majathal, the area of the Sanctuary also includes Harsang Baghal Demarcated Protected Forest of Baghal area and Harsang Bhajji Demarcated Protected Forest of Bhajji area alongwith numerous small UPFs. Major Part of the Sanctuary falls in Arki -Sub Division of Solan District and remaining part falls under Shimla Rural Sub- Division (Sunni Tehsil) of Shimla District.The location co-ordinates and altitudinal range are as under. The total area of the sanctuary is 37.71 Sq Km which includes privately owned *ghasnis* also.

Latitude: **31°-15'-00" to 31°-18''-45" North**
Longitude: **76°-56'-45" to 77°-02' -18" East**
Altitude Range: **575 to 1975 m**

Forests and Vegetation

The sanctuary has a subtropical monsoon climate. Himalayan Chir Pine (*Pinus roxburghii*), Ban Oak (*Quercus leucotrichophora)* forests and sub tropical *Euphorbia* scrub are the major vegetation types (**Champion and Seth, 1968**). The slopes are sparsely forested with Chir Pine and Ban Oak, and mostly dominated by grassy tracts, often extending continuously from the ridge-tops down to about 1,000 m (**Garson 1983**). The sanctuary has rich flora and fauna. Deodar is the dominant species of Harsang Baghal and DPF Majathal. Other species include Ban-oak, Kail, Chir, Kainth, Khair, Kachnar, Daroo, Paja, Shisham, Sanan, Jamun, Tor, Fegra, Amaltas, Trimble, Mango, and Bihul etc. Shrubs include Berberis, Rosa, Rubus, Karonda, Indigofera etc. Ground flora includes various grass species, variety of ferns and vascular herbs.

The whole area of the sanctuary has very good vegetation in the form of mixed forests, while the open wasteland is covered with grass along with shrubs. Wild animals get enough food in the various types of vegetation found in the sanctuary. The cultivated crops near the main habitat are also sometimes predated by Sambar, Barking Deer and Gorals.

According to H.G. Champion and Seth's classification, the following forest types are found with this Sanctuary:

Type 5B/C2 Northern dry mixed deciduous forests
Type 9/C1 Himalayan Sub Tropical Pine forests
Sub Type 12/C1a Ban Oak Forests.

Key Features:

Local people do not have any rights over forest produce in the sanctuary. No NTFP is collected from the sanctuary by villagers of the surrounding villages.

There are two nurseries in Kyari (0.15) and Bombely (0.2 ha)

Weeds pose a serious problem of fodder availability for herbivores. Weeds are removed physically. No weedicide should be used since they adversely affect several food chains. Many spots are manifested with *Lantana* while others have spread of *Parthenium*.

Sanctuary has 40 km long fire-lines. Fire watchers should be deployed during the fire season.

Table 1: List of Fire-incidences

Year	Area Affected (ha)	Location
2012-13	51	D-12 Harsang Baghal
	1	UPF Pajina
	30	D-12 C-6 Harsang Baghal
	8	D-11 C-1&2 Majathal
2013-14	1749.50	D-11 Majathal, D-12 harsang Baghal, UPF- Kiari, Saryali, D-13 Harsang Bhajji, UPF Chilla & Madrech
2016-17	528	UPF madrech and D-13 Harsang Bhajji, D-11 Majathal,D-12 Harsang Baghal

Table2: Forest Classification of the Majathal Wildlife Sanctuary

Legal Status of the Area	Area (Ha)
Reserved Forests	0
Demarcated Forests	2603.6
Undemarcated Protected Forests	1009.8
Govt. Shamlat	0
Private land (Ghasnis)	157.24
Total	3770.64

Table 3: List of Demarcated

Sr.No.	Name of Forest	Area (ha)
1.	D-11 Majathal	1491.60
2.	D-12 Harsang Baghal	768
3.	D-13 Haskar(Harsang Bhajji)	402
	Total	2661.60

Table 4: Un-demarcated Protected Forests

S. No.	Name of Forest	Area in hac
1.	Sohra Brahmana	6.90
2.	Kyari	160
3.	Chilla	49
4.	Mandrech	37
5.	Darwakot	7
	Total	259.90

Table 5: List of Flora found in Majhathal Wildlife Sanctuary

Sr. No.	Botanical Name	Common Name
1	*Abies pindrow*	Rai
2	*Acacia catechu*	Khair
3	*Bauhinia variegata*	Kachnar
4	*Bombex ceiba*	Semal
5	*Cedrus deodara*	Deodar
6	*Erythrina suberosa*	Koral
7	*Ficus spp*	Pheguda
8	*Hordeum spp*	
9	*Hypericum oblongifolium*	
10	*Lagerstroemia spp*	
11	*Lantana camera*	Pardesi buti

12	*Lonicera quinquelocularis*	Bakhru, Kantias
13	*Myrsine africana*	Kafal
14	*Ougenia oojeinenis*	Sandan, Sanan
15	*Picea smithiana*	Tosh
16	*Pinus rouxburghii*	Chil
17	*Pinus wallichiana*	Kail
18	*Populus ciliata*	Pahari peepal
19	*Prunus spp*	Pajja
20	*Pyrus pashia*	Kainth
21	*Quercus leuchotrichophora*	Ban
22	*Rhododendron arboreum*	Burash,Baras
23	*Rosa moschata*	Jangli gulab
24	*Salix spp*	
25	*Sapindus spp*	
26	*Terminala spp*	
27	*Toona ciliata*	Tooni
28	*Trifolium repense*	
29	*Viburnum cotinifolium*	Rajal
30	*Viola canescense*	Vanksha
31	*Zizyphus mauritiana*	Ber

Table 6: List of Birds of Majhathal Wildlife Sanctuary

Sr No	Scientific Name	Common Name	Family	Status
1	*Elanus caeruleus*	Black-shouldered Kite(Black-winged Kite)	Accipitridae	R
2	*Milvus migrans*	Black Kite (Pariah Kite)	Accipitridae	R
3	*Gypaetus barbatus*	Lammergeier	Accipitridae	R
4	*Neophron percnopterus*	Egyptian Vulture	Accipitridae	R
5	*Gyps bengalensis*	White-rumped Vulture (Indian White-backed Vulture)	Accipitridae	R
6	Gyps himalayensis	Himalayan Griffon Vulture	Accipitridae	R
7	Sarcogyps calvus	Red-headed Vulture (King Vulture)	Accipitridae	nT R
8	Circaetus gallicus	Short - toed Snake Eagle	Accipitridae	R
9	Spilornis cheela	Crested Serpent Eagle	Accipitridae	R
10	Spizaetus cirrhatus	Changeable Hawk - Eagle	Accipitridae	R
11	Aegithalos concinnus	Black-throated Tit (Red-headed Tit)	Aegithalidae	r
12	Tachymarptis melba	Alpine Swift	Apodidae	R
13	Vanellus indicus	Red-wattled Lapwing	Charadriidae	R
14	Prinia criniger	Striated prinia (Brown Hill Warbler)	Cisticolidae	r
15	Columba livia	Rock Pigeon (Blue Rock Pigeon)	Columbidae	R
16	Streptopelia orientalis	Oriental Turtle Dove (Rufous Turtle)	Columbidae	RW
17	Streptopelia chinensis	Spotted Dove	Columbidae	R
18	Streptopelia decaocto	Eurasian Collared Dove (Indian Ring)	Columbidae	R
19	Treron phoenicoptera	Yellow-footed Green Pigeon (Yellowlegged Green or Bengal)	Columbidae	R
20	Garrulus lanceolatus	Black-headed Jay	Corvidae	r
21	Urocissa erythrorhyncha	Red-billed Blue Magpie	Corvidae	R
22	Dendrocitta vagabunda	Rufous Treepie (Indian Treepie)	Corvidae	R
23	Dendrocitta formosae	Grey Treepie (Himalayan Treepie)	Corvidae	r
24	Corvus splendens	House Crow	Corvidae	R
25	Corvus macrorhynchos	Large-billed Crow (Jungle Crow)	Corvidae	W
26	Pericrocotus flammeus	Scarlet Minivet	Corvidae	R
27	Rhipidura hypoxantha	Yellow-bellied Fantail (Flycatcher)	Corvidae	r
28	Rhipidura albicollis	White-throated Fantail (Flycatcher)	Corvidae	R
29	Dicrurus macrocercus	Black Drongo	Corvidae	R
30	Terpsiphone paradisi	Asian Paradise- Flycatcher	Corvidae	R
31	Hierococcyx varius	Common Hawk Cuckoo	Cuculidae	R
32	Cuculus micropterus	Indian Cuckoo	Cuculidae	R
33	Cuculus canorus	Cuckoo,Common Cuckoo	Cuculidae	r
34	Surniculus lugubris	Drongo-Cuckoo	Cuculidae	r
35	Falco tinnunculus	Common Kestrel	Falconidae	RW
36	Serinus pusillus	Fire-fronted Serin (Gold-fronted serin)	Fingillidae	r
37	*Cardueulis spinoides*	Yellow-breasted Greenfinch (Himalayan Greenfinch)	Fingillidae	r
38	Emberiza cia	Rock Bunting	Fingillidae	r
39	Emberiza stewarti	White-capped Bunting (Chestnut-breasted Bunting)	Fingillidae	rW
40	Halcyon smyrnensis	White-throated Kingfisher (Whitebreasted Kingfisher)	Halcyonidae	R
41	Hirundo smithii	Wire-tailed Swallow	Hirundinidae	R
42	Hirundo daurica	Red-rumped Swallow	Hirundinidae	RW

43	Lanius schach	Long-tailed Shrike (Rufous-backed)	Laniidae	R
44	Megalaima virens	Great Barbet	Megalaimidae	r
45	Megalaima asiatica	Blue-throated Barbet	Megalaimidae	R
46	Merops orientalis	Green Bee-eater	Meropidae	R
47	Myophonus caeruleus	Blue Whistling Thrush	Muscicapidae	R
48	Zoothera dauma	Scaly Thrush (Smallbilled Mountain Thrush)	Muscicapidae	R
49	Turdus ruficollis	Dark-throated Thrush	Muscicapidae	W
50	Ficedula strophiata	Rufous-gorgeted Flycatcher	Muscicapidae	r
51	*Eumyias thalassina*	Verditer Flycatcher	Muscicapidae	R
52	*Culicicapa ceylonensis*	Grey-headed Canary Flycatcher	Muscicapidae	r
53	*Tarsiger cyanurus*	Orange-flanked Bush Robin	Muscicapidae	r
54	*Copsychus saularis*	Oriental Magpie- Robin	Muscicapidae	R
55	*Saxicoloides fulicata*	Indian Robin	Muscicapidae	R
56	*Phoenicurus caeruleocephalus*	Blue-capped Redstart (Blue-headed Redstart)	Muscicapidae	r
57	*Chaimarrornis leucocephalus*	White-capped water Redstart	Muscicapidae	r
58	*Rhyacornis fuliginosus*	Plumbeous Water Redstart	Muscicapidae	r
59	*Enicurus maculatus*	Spotted Forktail	Muscicapidae	r
60	*Saxicola torquata*	Common Stonechat (Collared Bushchat)	Muscicapidae	R
61	*Saxicola caprata*	Pied Bushchat	Muscicapidae	R
62	*Saxicola ferrea*	Grey Bushchat (Dark-grey Bushchat)	Muscicapidae	R
63	*Dicaeum ignipectus*	Fire-breasted Flowerpecker	Nectariniidae	r
64	*Nectarinia asiatica*	Purple Sunbird	Nectariniidae	R
65	*Parus major*	Great Tit (Grey Tit)	Paridae	R
66	*Parus xanthogenys*	Black-Iored Tit (Yellow-cheeked Tit)	Paridae	r
67	*Passer montanus*	Eurasian Tree Sparrow	Passeridae	R
68	*Motacilla cinerea*	Grey Wagtail	Passeridae	rW
69	*Prunella strophiata*	Rufous-breasted Accentor	Passeridae	r
70	*Alectoris chukar*	Chukor	Phasianidae	R
71	*Francolinus pondicerianus*	Grey Francolin (Grey Partridge)	Phasianidae	R
72	*Francolinus francolinus*	Black Francolin (Black Francolin)	Phasianidae	R
73	*Perdicula asiatica*	Jungle Bush Quail	Phasianidae	R
74	*Pucrasia macrolopha*	Koklas Pheasant	Phasianidae	r
75	*Gallus gallus*	Red Junglefowl	Phasianidae	R
76	*Lophura leucomelana*	Kaleej Pheasant	Phasianidae	r
77	*Catreus wallichii*	Chir Pheasant	Phasianidae	r
78	*Pavo cristatus*	Indian Peafowl	Phasianidae	R
79	*Dendrocopos canicapillus*	Grey-capped Pygmy Woodpacker	Picidae	r
80	*Dendrocopos auriceps*	Brown-fronted Woodpecker	Picidae	r
81	*Picus chlorophus*	Lesser Yellownape	Picidae	R
82	*Picus squamatus*	Scaly-bellied Woodpecker	Picidae	r
83	*Picus canus*	Grey-headed Woodpecker (Blacknaped Green Woodpecker)	Picidae	R
84	*Psittacula himalayana*	Slaty-headed Parakeet	Psittacidae	r
85	*Psittacula cyanocephala*	Plum-headed Parakeet (Blossom-headed Parakeet)	Psittacidae	R
86	*Pycnonotus leucogenys*	Himalayan Bulbul	Pycnonotidae	R
87	*Pycnonotus cafer*	Red-vented Bulbul	Pycnonotidae	R
88	*Hypsipetes leucocephalus*	Black Bulbul	Pycnonotidae	R
89	*Sitta himalayensis*	White-tailed Nuthatch	Sittidae	r

90	*Tichodroma muraria*	Wall Creeper	Sittinae	rW
91	*Bubo bubo*	Eurasian Eagle Owl (Great Horned Owl)	Strigidae	R
92	*Glaucidium brodiei*	Collared Owlet (Collared Pygmy)	Strigidae	r
93	*Glaucidium cuculoides*	Barred Owlet,Asian Barred Owlet	Strigidae	r
94	*Sturnus pagodarum*	Brahminy Starling (Black-headed Myna)	Sturnidae	R
95	*Acridotheres tristis*	Common Myna	Sturnidae	R
96	*Orthotomus sutorius*	Common Tailorbird	Sylviidae	R
97	*Seicercus xanthoschistos*	Grey-hooded Warbler (Grey-headed Flycatcher Warbler)	Sylviidae	r
98	*Garrulax lineatus*	Streaked Laughingthrush	Sylviidae	r
99	*Garrulax variegatus*	Variegated Laughingthrush	Sylviidae	r
100	*Erythrogenys erythrogenys*	Rusty-cheeked Scimitar Babbler	Sylviidae	r
101	*Pteruthius flaviscapis*	White-browed Shrike Babbler (Red-winged Shrike Babbler)	Sylviidae	r
102	*Heterophasia capistrata*	Rufous Sibia (Black-capped Sibia)	Sylviidae	r
103	*Upupa epops*	Hoopoe, Common Hoopoe	Upupidae	RW
104	*Zosterops palpebrosus*	Oriental White-eye	Zosteropidae	R

Status Categories
R- Widespread resident
r-very local resident
W- widespread winter visitor
w- sparse winter visitor
P- widespread migrant
p- sparse migrant
E- Endangered
V- vagarant
? – status uncertain
p- sparse migrant
rl- introduced resident
ex- extinct
nT- near threatened
Source: Mishra (2002) Birdlife International

Table 7: List of Reptiles found in Majathal Wildlife Sanctuary

Sr.No	Local Name	Common Name	Zoological Name
1	Krait	Common Indian krait	*Bungarus caerules*
2	Kharpa	Indian cobra	*Naja naja*
3	Girgit	Common Indian monitor	*Cnlotas vessicoloan*

Table 8: List of Fauna found in Majhathal Wildlife Sanctuary

Sr.No	Local Name	Common Name	Zoological Name
1	Baghera	Leopard	*Panthera pardus*
2	Jungli Billi	Common jungle cat	*Felis chaus*
3	Lomri	Indian fox	*Vulpes bengalensis*
4	Shail	Indian procupine	*Hystrix indica*
5	Goral	Himalayan goat	*Nemorhaedus goral*
6	Kakkar	Barking deer	*Muntiacus muntjak*

7	Sambar	Sambar	*Cervus unicolor*
8	Jungli Suwar	Wild boar	*Sus scrofa*
9	Khargosh	Indian hare	*Lepus nigricollis*
10	Galheri	Himalayan striped squirrel	*Callosciurus macclellandi*
11	Bander	Monkey	*Macacque mulatta*
12	Langoor	Common languor	*Presbytis entellus*
13	Gidar	Jackal	*Canis aureus*
14	Chuha	Himalayan marmot	*Farmota bobak*
15	Newla	Common mongroose	*Herpestes edwardsi*
16.	Chamgadar	Barbastelle	*Barbastella barbastellus*