**DRAFT**

# DETAILED PROJECT REPORT

# FORESTRY INTERVENTIONS FOR THE BEAS RIVER

## OVERVIEW

# Beas River

## Introduction

The Beas, a major Himalayan River and the second most important tributary of the Indus River System as far as India is concerned, originates in the Pir Panjal Range at *Vyas Kund* near Rohtang Pass, Himachal Pradesh. After origin, the river traverses through the Great Himalayas, Lesser Himalayas and Outer Himalayas before descending into the alluvial plains of Punjab State and its confluence with the trans-boundary river Sutlej, the largest river of the Indus River System. Thus, the Beas River traverses a course of about 470 km through two States.

Mythologically, Beas attains immense significance owing to the fact that 'Ved Vyasa' is the eponym of river Beas, the author of the Indian epic the 'Mahabharata'; he is said to have created it from the sacred source lake the 'Vyas Kund'. The attraction of the river has been so great that great sages (*Narad, Vashisht, Vishwamitra, Prashar, Kanav* and *Parshuram*) mediated on the banks of this sacred river. The tale of Manikaran is popular lore with lord *Shiva* and goddess *Parvati* as the protagonists. Manikaran holds religious significance for Sikhs too as *Guru Nanak ji* is believed to have visited this spot. Besides mythological, religious and cultural significance, the river Beas has immense values from the geomorphological, ecological, environmental and economic perspective.

The Beas Basin spreads over 20,303 $km^2$ and is flanked in the north by drainage of the Ravi and Chenab Rivers while in the south by the catchment of the Sutlej. The northern and eastern tributaries of the Beas River are glacial or snow fed perennial whereas southern tributaries are seasonal. The Beas River forms the second largest catchment area in the State of Himachal Pradesh.

Owing to varied landforms, climatic conditions and a wide range of altitudinal gradient from 325 - 6,690 m amsl, the river basin is home to diverse forests (i.e., sub-tropical, temperate, sub-alpine and alpine) and wetlands, and also host to a variety of rare, endangered, and threatened floral and faunal species. The basin is home to several sensitive ecosystems (glaciers, snow-capped peaks, alpine meadows, high altitude wetlands, riparian forests, etc.). The basin has 5,520 natural and manmade wetlands including three Ramsar sites (Pong Dam Lake, Beas River Conservation Reserve, Harike Lake), 10 Important Bird Areas and one World Heritage Site (Great Himalayan National Park Conservation Area - GHNPCA) besides several other prominent protected areas. The GHNPCA provides habitat for four globally threatened mammals, three globally threatened birds including rare Western Tragopan and a large number of medicinal plants. The Beas River Conservation Reserve harbours the last surviving small population of the Indus River Dolphin within the Indian Territory.

The Beas River Basin has a potential of nearly 5,000 MW among 51 hydropower projects (> 5 MW). Prominent HEPs are Parbati, Dehar, and Pong Dam. The basin has several sites and places of high altitude and adventure tourism (Rohtang Pass), religious significance (Manikaran, Jwala Devi, Amritsar) and tourist attraction (Manali, Kullu, Mandi and Kangra). The multifarious economy arising due to forests, river, agriculture and horticulture, hydropower, cottage industries and tourism sectors have definitely brought the much desired prosperity within the basin and beyond.

Recognizing the conservation significance of the Beas and responding to the growing environmental concerns arising due to varied anthropocentric influences on the river, the Government of India, Ministry of Environment, Forest and Climate Change has entrusted the task to HFRI, Shimla, one of the research institute under ICFRE, to prepare the DPR on forestry interventions for river restoration.

## Restoration and Conservation Initiatives

Like other Himalayan Rivers, the Beas River has also been imperiled in the past century or so by enhanced natural and human disturbances *viz*., reduction in extent and degradation of forests, grasslands, and wetlands; expansion of agriculture; loss of river connectivity (longitudinal, lateral, vertical, and temporal) and fragmentation by physical barriers (i.e., dams, reservoirs, barrages), diversion of water and linking of rivers; disposal of untreated sewage and waste from built up urban environment, industrial effluents and varied pollution all along the river course; incompatible land use in surrounding lands; and implications of climate change (i.e., retreat of glaciers, erratic precipitation - snowfall/ rainfall and increased frequency of cloudbursts). Collectively, various natural and human disturbances over a long time have degraded the river and its ecosystem.

The stressed Beas River shows ample signs of reduced environmental flow, declined water quality, damaged and mutilated 'organs' – the tributaries, the riparian vegetation, the bed, the biota, and the floodplain; loss of ecological integrity, depleting ecosystem services, and overall poor health of the river.

The river restoration is widely accepted by most national governments and various stakeholders as an essential compliment to conservation and water management strategies. Despite legal mandate, huge investments, emergence of newer approaches, and fast developing industry of aquatic and riparian restoration, river ecosystems continue to deteriorate as a result of aggravated human influences.

The Government of India has recognized the concerns of growing water crisis as the main impediment in the country's development and in the process of nation building besides fulfilling various international obligations and commitments including the UN Agenda on Sustainable Development. Accordingly, the Government of India in recent decades has launched several countrywide priority programmes and initiated actions for sustainable management of water resources including restoration of major Indian River Systems vital for the maintenance of natural processes, healthy people and prosperous nation. The Government now aims for *Aviral Dhara* (uninterrupted flow), *Nirmal Dhara* (unpolluted flow), and ecological restoration. Current efforts towards the preparation of the present DPR on forestry intervention to restore the Beas is one such action.

## Conservation Significance

The Beas River along with the Jhelum, Chenab, Ravi and Sutlej Rivers within the Indian Territory constitutes five principal rivers of the trans-boundary Indus River System. Certainly, the Indus River and its tributaries have immense significance for two neighbouring and human dominated nations i.e., India and Pakistan. In the context of the Indian sub-continent, three mighty rivers (i.e., Indus, Ganga and Brahmaputra), originating in the Himalaya, not only form major river systems south of the Hindu Kush Himalaya (HKH) Ranges but also attain exceptional importance from the perspectives of history, mythology, culture, ecology and economy. The Indus Water Treaty (1960) grouped the Beas, Ravi and Sutlej as the 'Eastern Rivers' and they acquire notable status as well as prominence as all their waters originating in the country shall be available for unrestricted use by India.

The Beas River as the second most important tributary of the Indus River System as far as India is concerned forms the second largest catchment area in the Himalayan State of Himachal Pradesh after the Sutlej and supports a substantial human population in five districts of Himachal Pradesh and two districts of Punjab. Sequential reservoirs/ barrages and hydroelectric projects from upstream tributaries to downstream main stem of the river Beas have dramatically changed the scenario of agriculture expansion and production in the plains of Punjab State and it has been a major contributor towards the famous 'Green Revolution' and granary of agriculture production in the country.

The watershed of the Beas River extends over the mountain ranges of the Great Himalaya, the Lesser Himalaya, and the Outer Himalaya or the Shivaliks besides floodplains in the alluvial plains of the Indus River System. Diverse forests along the vast altitudinal range are repository to a wide array of plant and animal diversity including several rare, threatened and endangered taxa. Two States along the course of river Beas collectively harbours forest cover to the extent of 17,282 $km^2$ and represents 2.42% forest cover of the country. These forests constitute 401.94 $Mm^3$ of the total growing stock of the country and harboured 266.7 MT of carbon stock or 3.74% of the total estimated carbon stock in different forests of the country which sequester carbon and also help in the reduction of Greenhouse gas emissions. The Beas Basin is important as it has a wide diversity of natural and manmade wetlands including three famous Ramsar Sites (i.e., Pong Dam Lake, Harike Lake and Beas River Conservation Reserve). The Great Himalayan National Park Conservation Area, a World Heritage Site, being an island of undisturbed environment not only allows several distinct altitude sensitive ecosystems that sustain a natural diversity of unique assemblage of biota including several endemics but also promotes ecological and evolutionary processes to occur.

# Forests and Rivers

# Strong Linkages

Forests, nature, water, and people are interconnected and have an intricate relationship among them. Both, quantity and quality of water are strongly influenced by forests. Forests are crucial for the sustainable management of freshwater resources, particularly river ecosystems while water is essential for the sustainability of forest ecosystems. Humanity is strongly intertwined with forests as well as rivers, as both offer various ecosystem services to human-kind. Since time immemorial, humanity has been using forests as well as rivers for multiple uses, benefits and values.

Forests form the catchment of streams and rivers and harbour a variety of wetlands. Forested catchments serve as the guarantors for high value surface and drinking water. Forests help in the formation of soil and enrichment of soil minerals. Forests absorb precipitation (rainfall and snowmelt), slow runoff, reduce soil erosion, improve water infiltration and recharge groundwater and aquifers. Thus, forests have a 'sponge effect'. Forests regulate the carbon, oxygen and hydrological cycles. Riparian forests are most complex ecological systems, disproportionately used by wide range of organisms and are the interface between the terrestrial and aquatic ecosystems. Riparian forests serve as 'natural buffers' and 'biological filters' and have an ability to act as the ecological machinery for self-regulation, self-purification and self-support for the dynamic flow of the river water and its quality. Riparian forest buffers reduce the adverse impact of human activities on rivers. Forests help in sequestration of carbon and its storage and are repositories of biodiversity.

## Interactions between Forests and Rivers

### Need for Closer Cooperation

Throughout its journey from source to sea, a river integrates all that happens in the basin/ surrounding landscapes, particularly the impact of human activities. Thus, rivers have been regarded as 'arteries of the catchment', 'lifeblood', 'highways', 'pantries of the world' and even as the 'sentinels'. Rivers provide early clues as special signals of human impact and associated risks. Hence, the society can take advantage of early warnings and plan mitigation strategies to deal with adverse human impacts and likely risks.

Closer cooperation between the forest and water sector is a precondition for sustainable development as interactions between forests and water (flow, yield, and quality) are complex. In recognition, there has been an increasing international action to address 'forest – water' interactions.

## Integrated Riverscape Approach to Restoration

For a long, humans have altered rivers for multiple uses and benefits and often the alteration of the rivers has been carried out with the best of intention, but without knowledge of the potential implications and repercussions for the diversity, connectivity and ecological integrity of the river ecosystem. The complex subject of 'river science' has emerged, especially in the light of anthropogenic disturbances and regulations which have simplified most rivers and resulted into adverse consequences for its structure, composition and functions. The earlier interventions towards river management were mainly small scale interventions, piecemeal, and fragmentary in nature, and focused on isolationist scientific approaches to the management of river degradation and attempted to tackle the symptoms rather than the causative factors.

The complex and dynamic nature of river ecosystems require a comprehensive strategy following a systems-based approach, recognizing physical, biological, ecological, socio-economic, and political aspects of the river and human systems, intricately interconnected. The newer science of river management calls for integration and involvement of allied multidisciplinary subjects *viz*., geomorphology, hydrology, climatology, landscape ecology, hydraulic engineering, forestry, and aquatic and terrestrial ecology besides social sciences. 'River restoration' is now a common response to declining river health and its importance to water resource management can only be expected to grow. River restoration has been defined as 'assisting the recovery of the ecological structure and function in a degraded ecosystem by replacing lost, damaged or compromised components and reestablishing the processes necessary to support the natural ecosystem and to improve the ecosystem services it offers'. The concept of river restoration has evolved over time and it is different than other terms 'rehabilitation', 'remediation', 'reclamation', 'replacement', 'rejuvenation', 'mitigation', etc. used in the context of river management.

The rivers are a complex mosaic of habitat types and environmental gradients and characterized by spatial complexity and four types of connectivity (i.e., longitudinal, vertical, lateral, and temporal). Hence, rivers are increasingly investigated from a landscape perspective, both as 'landscapes' in their own right and as 'ecosystems'. A landscape perspective of streams and rivers has emerged and the riverine landscapes are viewed as 'riverscapes'. The concept of riverscape is used to describe broad-scale physical, biological and aesthetic nature of rivers as the riverscape approach integrates the elements of flowing water and surrounding lands those have been imperiled by human activities. The notion of riverscape is applied across multiple hierarchical scales as it recognizes a stream or river, its floodplain, and riparian area as an integrated ecological unit.

Appreciating the historical occurrence and abundance of diverse forests all along the river course from its origin to mouth; strong linkages between forests and rivers; intricacy of forest ecosystems; and critical functions performed by them, the recent focus of river restoration in India is on the riverscape and the ecosystem based approaches.

The river restoration efforts are multifaceted in nature as they try to accomplish concurrently the broader goals of the management of the river ecosystem by ensuring multiple benefits and values to varied users, four dimensional connectivity of a river, enhanced e-flows, biodiversity conservation, improved ecosystem services, and sustainable livelihoods.

The river restoration incorporates a wide range of activities including policy and legal interventions and regulations; catchment management; forestry interventions including afforestation/ reforestation, soil and moisture conservation measures, wetland management, and biodiversity conservation; flow modification and retrofitting-engineering designs; structures and development; floodplain reconnection; spring management and recharge of aquifers; bank stabilization; channel reconfiguration; instream species management; riparian management; treatment and appropriate disposal of sewage waste, industrial effluents and other pollutants; enhanced aesthetics and recreational facilities; and passive change of human behaviour. Thus, it is evident that forestry interventions are just one set of activities of a multipronged strategy aiming at river restoration.

# Vision, Aims and Objectives

## Vision

Conservation values of the river are identified, recognized, conserved, restored, and maintained in order to ensure the ecosystem diversity, ecological integrity and healthy river while allowing sustained flow of ecosystem services and other uses/ benefits essential for all life forms and the prosperity of the region.

## Goals and Objectives

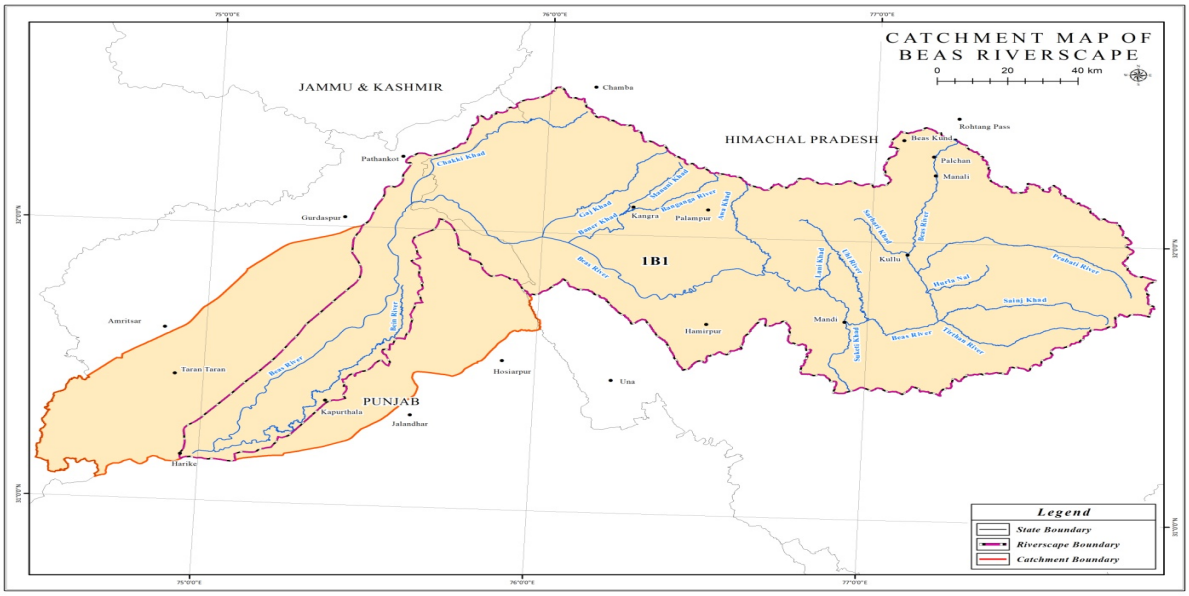
The proposed river restoration programme aims to accomplish broader goals of sustainable land and river ecosystem management, enhanced ecosystem services, and improved livelihoods. Specifically, the present project and Detailed Project Report (DPR) on proposed forestry interventions aims to contribute towards the broader objectives of *Aviral Dhara* (uninterrupted flow), *Nirmal Dhara* (clean water), and ecological regeneration of aquatic and terrestrial biota.

## Beas Riverscape

The river conservation and restoration requires appreciation and understanding not only of the complex and dynamic nature of the river and its tributaries but also of the surrounding lands and expanding human imprints. Hence, increasingly, the 'Potamology' (study of rivers) pays greater attention to fluvial and ecological processes and emphasizes the riverine landscape perspectives, as rivers are open ecosystems. Thus, the concept of riverscape indicates a holistic approach linking the rivers and its banks, or the riparian areas, within a fluvial system. Accordingly, the 'Beas Riverscape' area has been selected on a scientific basis and boundaries of the riverscape have been delineated for the purpose of planning, assessment and proposed forestry interventions.

The entire basin/catchment of the Bea River s and its tributaries within the mountainous State of Himachal Pradesh, wherein the river originates and traverses through three different Himalayan Ranges (i.e., the Great Himalaya, the Lesser Himalaya, and the Outer Himalaya or Shivaliks) before descending to the alluvial plains of Punjab State has been included as a larger part of the riverscape and covers 13,702.16 $km^2$ or 81.84% area of the riverscape. In addition, the collective extent of the concerned micro-watersheds all along the river channel in alluvial plains that have been impacted by the High Flood Level (HFL) in the past has been included as the lower part of the riverscape, covering 3,040.85 $km^2$ or representing 17.29% extent of the delineated riverscape.

| State | Geographical Area ($km^2$) | Geographical Coordinates of the Delineated Beas Riverscape | | Area Included in the Beas Riverscape ($km^2$) | Representative Area in the Riverscape (%) |
|---|---|---|---|---|---|
| | | Latitude N | Longitude E | | |
| Himachal Pradesh | 55,673 | $31^O$ 27' 12" N to $32^O$ 31' 27" N | $75^O$ 35' 39" E to $77^O$ 52' 7" E | 13,702.16 | 81.84 |
| Punjab | 50,362 | $31^O$ 4' 16" N to $32^O$ 27' 15"N | $74^O$ 30' 40" E to $75^O$ 56' 11" E | 3,040.85 | 18.16 |
| Total of Two States/ Beas Riverscape | 1,06,035 | - | - | 16,743.01 | 100 |

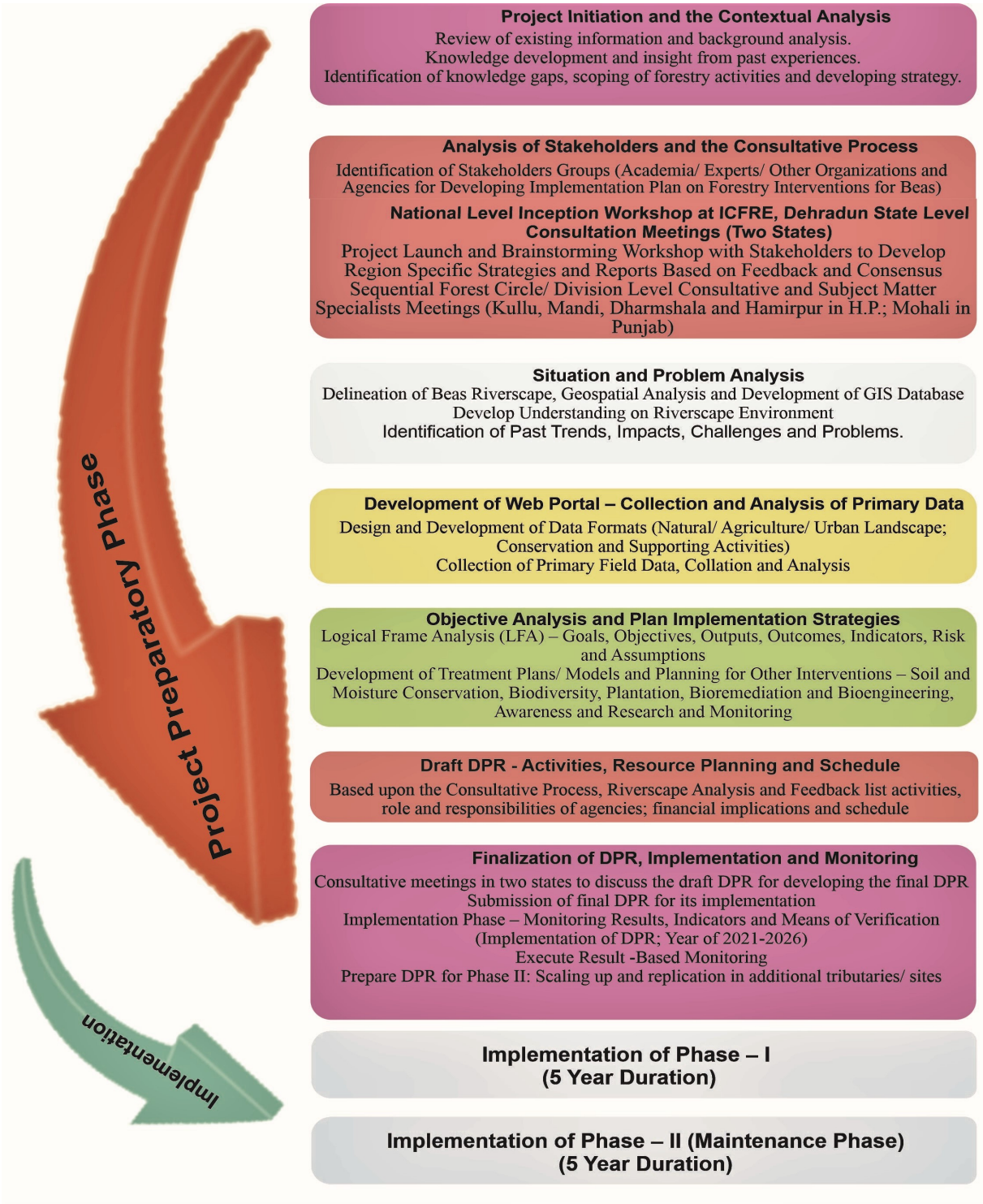



The river management is a daunting task and river managers face a wide array of challenges in managing rivers as they need to balance a range of competing interests, the complexity and scale of issues, and uncertainty over future conditions. The discipline of river management has evolved from one dimensional responses at addressing a single issue (e.g., water quality) at a time to more sophisticated and comprehensive approaches that involve both active management (i.e., physically changing the river and landscape) as well as passive management (i.e., policy measures to change human behaviour).

# Preparation of the DPR

## Approach

The Indian Council of Forestry Research and Education (ICFRE), Dehradun had entrusted the Government of India, Ministry of Environment, Forest and Climate Change (MoEF&CC) sponsored one-year assignment on the preparation of Detailed Project Report on Forestry Interventions for the restoration of the Beas River to the Himalayan Forest Research Institute (HFRI), Shimla, one of its regional institutes in April, 2019. Accordingly, the Institute has constituted a multidisciplinary team of scientists, technical officers and other contractual project staff for the purpose, supervised by senior officials of the organization. Additionally, the institute has also availed the services of a full time Consultant for providing the desired resource inputs and facilitating the preparation of the DPR. Further, the HFRI obtained technical resource inputs from various specialists/experts, particularly for the themes of policy and law, soil and moisture conservation, remote sensing and GIS, and the design and development of the web portal for the project activities. Broadly, a participatory approach was adopted, involving a wide range of stakeholders, predominantly the professional foresters and frontline staff of the Forest Department of two States located along the course of river Beas from its origin to confluence with the river Sutlej, besides representatives of various allied sectors, line agencies, users, specialized scientific organizations, NGOs and civil society organizations. The one-year preparatory phase included seven key steps as a part of the elaborate approach including contextual analysis, wider consultative process, situation analysis, and collection of field data collection.


Project Initiation and the Contextual Analysis
Review of existing information and background analysis.
Knowledge development and insight from past experiences.
Identification of knowledge gaps, scoping of forestry activities and developing strategy.
Analysis of Stakeholders and the Consultative Process
Identification of Stakeholders Groups (Academia/ Experts/ Other Organizations and Agencies for Developing Implementation Plan on Forestry Interventions for Beas)
National Level Inception Workshop at ICFRE, Dehradun State Level Consultation Meetings (Two States)
Project Launch and Brainstorming Workshop with Stakeholders to Develop Region Specific Strategies and Reports Based on Feedback and Consensus Sequential Forest Circle/ Division Level Consultative and Subject Matter Specialists Meetings (Kullu, Mandi, Dharmshala and Hamirpur in H.P.; Mohali in Punjab)
Situation and Problem Analysis
Delineation of Beas Riverscape, Geospatial Analysis and Development of GIS Database
Develop Understanding on Riverscape Environment
Identification of Past Trends, Impacts, Challenges and Problems.
Development of Web Portal – Collection and Analysis of Primary Data
Design and Development of Data Formats (Natural/ Agriculture/ Urban Landscape; Conservation and Supporting Activities)
Collection of Primary Field Data, Collation and Analysis
Objective Analysis and Plan Implementation Strategies
Logical Frame Analysis (LFA) – Goals, Objectives, Outputs, Outcomes, Indicators, Risk and Assumptions
Development of Treatment Plans/ Models and Planning for Other Interventions – Soil and Moisture Conservation, Biodiversity, Plantation, Bioremediation and Bioengineering, Awareness and Research and Monitoring
Draft DPR - Activities, Resource Planning and Schedule
Based upon the Consultative Process, Riverscape Analysis and Feedback list activities, role and responsibilities of agencies; financial implications and schedule
Finalization of DPR, Implementation and Monitoring
Consultative meetings in two states to discuss the draft DPR for developing the final DPR
Submission of final DPR for its implementation
Implementation Phase – Monitoring Results, Indicators and Means of Verification (Implementation of DPR; Year of 2021-2026)
Execute Result -Based Monitoring
Prepare DPR for Phase II: Scaling up and replication in additional tributaries/ sites
Implementation of Phase – I
(5 Year Duration)
Implementation of Phase – II (Maintenance Phase)
(5 Year Duration)
Project Preparatory Phase
Implementation

# Approach

## Contextual Analysis

All 'change processes' are part of a wider context or the overall environment. A project of the present nature is constantly influenced by economic, social and political processes that take place in society. Thus, the project planners and implementers seeking information about the overall picture or the wider environment including information of various sectors associated with the river that either use, impact or manage the river resources. Project activities started off by performing an overall preliminary study (*pre-study*), feasibility study or the inception phase. The foremost key step was a systematic review of vast available literature on the subject through internet surfing and library consultation. The websites of prominent international, national, state level agencies and organizations dealing with any of the aspects related to river resources and conservation were extensively searched and required information was downloaded for developing the desired insight. The relevant secondary information from related organizations was also collected. The combined effort on the review of literature and collection of background information immensely helped in the contextual analysis. The contextual analysis also provided desired insight on the Beas riverscape and its three sub-environments (i.e., physical, biological and socio-economic).

## Consultative Process

The second vital step for planning, assessment and preparation of DPR required broader participation of stakeholders at all stages of planning of the project activities. Broad five groups of stakeholders were identified: (a) the Target group (i.e., primary and secondary target groups and beneficiaries); (b) Project owners; (c) Decision makers; (d) Experts and subject matter specialists; and (e) Financing agencies. The preparatory phase included the extensive consultative process with identified groups of stakeholder's right from the beginning. The Inception Workshop, Project Launch and Brainstorming Workshop, and sequential consultative meetings were organized at the Forest Circle/Division level in the concerned States so as to make the State Forest Departments and other line agencies aware about the project, and the approach, field data formats and support required from them so as to achieve the objectives of the preparatory phase. During the consultative meetings, a wide range of themes *viz*., the concept of riverscape, delineation of riverscape boundaries, strategies for project implementation, collection of primary field data, data formats, geospatial analysis of riverscape, prioritization of sites, potential plantation and treatment models, monitoring, etc. were deliberated. Field functionaries were provided adequate trainings on the collection of field data and filling of prescribed formats during the sequential consultative meetings.

**Situation and Problem Analysis**

The third key step was to delineate the Beas Riverscape for the purpose of planning, situation and problem analysis, developing an insight on the riverscape environment, and prioritization of areas for proposed forestry interventions. Detailed geospatial analyses of the riverscape using remote sensing and GIS technologies were carried out. The review of secondary information from a variety of sources allowed developing an understanding on the riverscape environment (i.e., physical, biological, socio-economic) and identification of challenges, constraints, problems, and threats in river conservation. The consultative process and the sequential meetings with varied stakeholders immensely helped in the identification of focal problems, understanding their reasons/ causes, and effects or implications on the river itself and surrounding lands.

**Development of Web Portal - Collection and Analysis of Primary Field Data**

Considering the hierarchal organizational structure of the State Forest Department and well laid infrastructure of field units, expertise and experience, it was decided that the concerned SFDs will be the nodal agency for the purpose of planning and implementation of the DPR. Thus, the present project has envisaged collection of primary field data for the entire riverscape with the support of SFDs, Agriculture Department and other line agencies. Prior to the collection of primary field data, the essential requirement was on the development of plantation and treatment models, design of field data formats and software for the analysis of field data.

**Plantation and Treatment Models**

On the lines of a similar exercise earlier carried out in the context of the Ganga River and experience gained in the project implementation, three types of landscapes within the Beas Riverscape were also visualized for proposed forestry interventions. These were: (i) Natural, (ii) Agriculture, and (iii) Urban landscapes. Potential plantation models of varied nature were identified, designed and developed by the HFRI expert team considering the type of natural ecosystems, native vegetation, soil conditions and agro-climatic zones. The purpose of the various models planned in the natural landscape was primarily protection, eco-restoration and conservation. Each treatment/plantation model had incorporated details of various proposed activities planned, criteria for selection of sites, planting species, spacing, and cost norms during the establishment and maintenance phases. The multi-disciplinary expertise at HFRI developed altogether 22 treatment/ plantation models specific to natural, agriculture, and urban landscapes in consultation with the SFDs of participating States. Once, treatment/ plantation models were finalized, the next step was to design for field data formats.

**Design of Field Data Formats**

The Institute adopted and modified five field data formats earlier designed and developed at the time of planning of forestry interventions for the Ganga River. Modified data formats were used in the present exercise for collection of primary field data required for the preparation of the DPR. Details of five data formats, and the procedure to be adopted were shared with stakeholders, particularly the forest officials and frontline staff during the consultative process, so as to seek their valuable contribution in collection of primary field data, a prerequisite for the preparation of the DPR.

**Development of Software and Web Portal**

In order to efficiently handle large and voluminous data sets and to collate, analyze, and synthesize required information for the report generation and preparation of the DPR in a short time available, development of a desired software and web portal were considered essential. The software was developed in PHP/Mysql, Linux based server that works on Codeigniter Framework basis. It is a web based and easily accessed via internet. The software can compute cost calculations according to selected specified models for unlimited created models. In the software, field data can be entered as per the five specified types of models, *viz*., natural landscape, agricultural landscape, urban landscape, conservation interventions and supporting activities and can be saved in the digital format. The software is capable of generating reports in the desired formats e.g., State-wise, District-wise, Division-wise, Model-wise and Activity-wise, and Annual Consolidated Reports can be generated to obtain insight on year-wise areas under different landscapes to be treated at corresponding costs.

The SFDs of two concerned States provided a total of 1639 datasets. The State Forest Department (SFD), Himachal Pradesh provided in all 1231 formats belonging to 17 Forest Divisions while the SFD, Punjab submitted 408 data formats represented by 08 Forest Divisions.

**Objective Analysis and Strategic Planning**

The extensive consultative process allowed an understanding to develop the long-term vision and goals that indicate the desired direction or pathways for actions and activities. In the process, it was also understood which changes the project can contribute to in the longer term and why is the project important for society, biodiversity and the river ecosystem. In the process, the HFRI team was able to decide the goals, objectives, outputs and outcomes that can be attained. The consultative process gave the desired insight on the problems in achieving various objectives and identification of priority actions for the restoration of the river. The process also facilitated the formulation of the strategies for programme implementation. Accordingly, it was decided that the programme implementation has to be

concurrent in natural, agricultural and urban landscapes within the riverscape. Further, a variety of conservation and supporting activities would also be required for effective implementation, knowledge management and sharing, capacity development, monitoring, and adaptive management.

**Preparation of the Draft DPR – Activities, Resource Planning and Schedule**

The aforesaid key steps and the process adopted ultimately helped HFRI in the preparation of the draft DPR presenting the details of proposed activities, resource planning and year-wise schedule of operations. The Draft DPR (Vol. I and II) was shared with two involved States, SFDs, line agencies and other stakeholders in the state as well as the national level consultation meetings, seeking their feedback and valuable inputs. Copies of the draft DPR were also submitted to the ICFRE, Dehradun and the MoEF&CC, New Delhi and comments were invited. Necessary presentations were also made at ICFRE and MoEF& CC.

**Finalization of the DPR, Implementation and Monitoring**

The draft DPR was finalized incorporating the feedback and specific comments received from the respective States, SFDs, ICFRE and the MoEF&CC. The Phase I – 'Project implementation' has been planned for the duration of five years by respective States and SFDs as the nodal agencies. A provision for inbuilt, Results-Based Monitoring has been made for continuous monitoring, organizational learning and adaptive management. The Phase II – 'Maintenance Phase' of five - year duration would be executed after the implementation of Phase I, primarily with the objective to maintain plantations raised in three types of landscapes and planning for scaling up replication of the activities for the left over tributaries.

**Organization of the DPR**

The DPR for the Beas River is presented in two Volumes (Vol. I and II); Volume-I deals with the main DPR while Volume-II provides summaries of the two involved States located along the course of the river. Volume-I contains two parts (Part I and Part II). Part I contain four Chapters and describe the 'Existing Situation' of the riverscape while Part II deals with the proposed plan and also includes four Chapters. The four Chapters in Part I highlight the evolving concepts relevant to river ecology, management of river ecosystem and river restoration, riverine landscape or 'riverscape', and linkages between forests and the water/river; narrates the approach adopted for the preparation of the DPR; describes the Beas Riverscape and its environment; and summarizes the legislative, policy and institutional context relevant to river conservation and restoration. The four Chapters in Part II include the vision, goals, objectives, outputs and outcomes based on logical framework analysis; detailed account of envisaged forestry interventions by highlighting proposed plantation and treatment

models, conservation interventions and supporting activities; project management, partner organizations and implementation mechanism; project budget outlay, extent of proposed activities and schedule; and potential benefits of planned forestry interventions. Volume II incorporates summaries of the two concerned States.

**Beas Riverscape and its Environment**

'A river is more than just the water inside it and water is only one component of the intricate and dynamic river ecosystem'. The overall environment of a river is the sum reflection of the physical regime – climate, geology, topography and land cover; biological attributes – terrestrial and aquatic biodiversity; and the socio economic conditions in the surrounding lands of the river or beyond in its catchment.

The ecosystem-based approach to river management as a prerequisite seeks appreciation and understanding of the physical, biological and socio economic sub-environments of the river. The fluvial processes, hydrological regimes, and ecological processes are vital driving forces of the river ecology. Four types of connectivity are of paramount importance for the sustainability of river ecosystem. A dynamic river, from source to sea, reflects varied interconnectedness, intricacies, heterogeneity, and channel dynamics besides longitudinal changes, vertical interactions, lateral exchange processes, temporal variations, and the resultant spatial patterns in the overall environment of the river and its surrounding lands.

Like any river, the Beas River is also under immense human influence since the time of one of the oldest civilizations (the Indus Civilization) as the Beas is one of the principal rivers of the Indus River System. Historically, two States along the river course remained in the forefront of all round development, starting from the early process of civilization, forestry and forest management, construction of dams/reservoirs/barrages/canals/establishment of hydroelectric projects, expansion of agriculture/horticulture, development of fisheries, urbanization, industrialization, and enhanced tourism activities. Certainly, rapid and unplanned development activities have not only severely impacted the natural ecosystems (i.e., forests, grasslands and wetlands) along the river course but also imperiled the river itself and its tributaries.

Presently, the Beas River reflects fragmentation, decreased connectivity, reduced e-flow, enhanced pollution, declined aquatic and terrestrial biota, diminished ecosystem services, and overall poor health of the river.

**Legislative and Policy Context**

Rivers are intricately linked with forests, wildlife, surrounding lands, and the people. Hence, the subject of conservation and restoration of the river ecosystem is quite complex. In past five decades or so the Central and State Governments, have enacted various legislations

related to forests, wildlife, environment, rivers, etc. and formulated relevant policies. The DPR enumerates and reviews various legal and policy foundations relevant to river ecosystem and conservation that exist in the country and also highlights how various prominent judgments, directives and other interventions by different Hon'ble Courts including the National Green Tribunal have helped in safeguarding the interests of forests, wildlife, rivers, and wetlands besides protection of the environment. Despite considerable concerted efforts made, much needs to be done so as to effectively and efficiently manage rivers and other freshwater resources pivotal for human well-being and sustainable development. The cumulative environmental impact assessment and carrying capacity studies commissioned in the context of prominent rivers are a welcome step. However, maintaining essential e-flow and four types of connectivity in the context of a river is a formidable task.

Certainly, the Indian Forest Act, 1927; Wildlife (Protection) Act, 1972; Water (Prevention and Control of Pollution) Act, 1974; Forest (Conservation) Act, 1980; Environment (Protection) Act, 1986; and Biological Diversity Act, 2002, besides some of the provisions - Article 48A and Article 51A (g) of the Constitution of India, are pertinent from the perspective of river conservation. The National Forest Policy, 1988; Environment Impact Assessment Notification, 2006; Municipal Solid Waste (Management and Handling) Rules, 2000; National Water Policy, 2012; and Wetland (Conservation and Management) Rules, 2017 are some of the prominent policies and legal instruments applicable in the case of river conservation. The agreement made and provisions incorporated as per the Indus Water Treaty, 1960 are of utmost importance in the context of the Beas River from the perspective of the river water settlement, use and obligations as it is one of the 'eastern rivers' listed under the Treaty.

**Implementing Agencies and Institutional Context**

A wide range of sectors, agencies, institutions, organizations and authorities are connected with the use, management and regulation of the Beas River ecosystem. The wider subject of water resources in India comes under the ambit of the Union Ministry of Jal Shakti. In the past, subject's *viz*., river conservation, the Ganga Action Plan, and wetland management were under the domain of the MoEF&CC. Recently, the NITI Aayog has directed all Central Ministries to undertake/ contribute for various programmes relevant to river conservation and restoration. Accordingly, the MoEF& CC assigned the current task on the preparation of the DPR to HFRI, Shimla, a regional Institute of ICFRE.

It is assumed that the MoEF&CC may either decide to provide the desired funding support for the implementation of the project or may plan to execute the project as a joint venture in collaboration with other concerned central ministries. The DPR recognizes that the State Forest Departments of the respective States would function as the primary Implementing Agency (IA) at the State level, mainly for two reasons: firstly, the nature of the proposed activities fall in the domain of SFDs, and secondly, the department has a well-laid

hierarchical organizational structure and physical infrastructure required to implement a project of this nature in the vast extent of the Beas Riverscape. In recent times, the mandate of SFD has enlarged in its scope from just traditional multiple uses of forests to multiple values of forest ecosystem. Diverse roles/ functions of SFDs now cut across different sectors. Increasingly, SFDs are required to facilitate inter-sectoral convergences so as to accomplish goals and objectives of varied mandates. The interdisciplinary nature of the mandate entrusted to SFDs make them a focal point for inter-departmental convergence. The SFDs have been working in close association/ collaboration with varied agencies *viz*., different line departments, *Gram Panchayats*, community based organizations and NGOs. The most promising attribute of the SFDs is its ability to adopt a people-centric approach in natural resource management. During the past 3-4 decades, the SFDs have ensured public participation in both decision making as well as implementation of the decisions through the widely adopted institution of Joint Forest Management Committees (JFMCs) to restore the degraded forest areas and also to ensure community participation in forest management and wildlife conservation. The JFMCs, jointly with the SFDs, carry out regeneration, afforestation, protection, sustainable management and utilization of the forest areas allotted to them. Thus, the existing JFMCs and other related CBOs would appropriately be involved in programme implementation. The participating SFDs would also involve Central Armed Police Forces (ITBP), Eco Task Force, Nehru Yuva Kendra, Mahila Mandals, and other CSOs in programme implementation as envisaged in the DPR and considered appropriate by the concerned IAs.

## Need for Research, Monitoring and Knowledge Management Centre

The subject of river conservation and restoration is multifaceted. A large number of organizations at the national and state levels are responsible for river management. Often, they work in isolation. Available research and monitoring information on rivers is widely scattered and in several instances obsolete and archival in nature, piecemeal, relevant to specific tributaries/ segments/ stretches of a river. Under the stated situation, it is difficult to develop a comprehensive understanding of complex inter-relationships of dynamic river ecosystems. The review highlighted that there are substantial gaps in the information and overall understanding on the river complexities. Several agencies are involved in diverse monitoring activities concerning river ecology. In spite of notable efforts made for quite some time, India faces enormous challenges in the field of river conservation and restoration. Certainly, the formidable task of the restoration of major Indian rivers is challenging. It essentially requires the desired knowledge and technical know-how to deal with the intricate discipline of river ecosystem. There is a felt need to improve, strengthen, and augment knowledge. Research and monitoring are pivotal to develop the desired information base for evolving strategies besides facilitating policy and decision making. Regrettably, understanding on interrelationships and dynamic linkages between forests/ forestry with hydrology and river ecology has been ignored in a populous country wherein more than a dozen major river systems including the mighty Himalayan Rivers exist. There is an urgent need to develop a knowledge management centre in the fields of forest hydrology, river conservation and river restoration. Numerous rivulets, tributaries, and rivers suffer on account of pollution. Several countries have taken lead in developing appropriate tools and techniques such as bioremediation and bio-filters so as to treat polluted waters. However, much needs to be done in India in this grossly neglected field. In view of this, the present DPR envisages establishing a knowledge management center in the fields of forest hydrology, river conservation and river restoration besides support for multidisciplinary researches and monitoring activities relevant to priority disciplines/ fields.

The HFRI, Shimla, with its long standing, multidisciplinary team, well-laid infrastructure and expertise in the field of Himalayan environment, forestry, natural resource management, climate change, etc. is suitably placed and visualized to develop as the knowledge management centre for the above stated purpose.

**Project Components and Proposed Interventions**

**The Plan envisages four broad goals:**

**Riverscape Management:** Aiming a holistic riverine landscape (riverscape) approach for sustainable management of the Beas River, its banks, or its riparian areas, within its fluvial system.

***Aviral Dhara*, *Nirmal Dhara*, Ecological Restoration and Biodiversity Conservation:** Aim to address the drivers and stressors of the river ecosystem and promote sustainable use by balancing ecological requirements with the needs of sustainable livelihoods.

**Improved Ecosystem Services and Sustainable Livelihood**s: This goal aims to specifically seek enhanced ecosystem services so as to maintain sustainable livelihoods.

**Effective Implementation, Knowledge Management, and Innovative Approaches:** This goal aims to ensure effective implementation of the project, knowledge management, development of innovative approaches, and adoption of appropriate modern technologies.

**The Project includes the following four Components:**

**Component 1: Implementation of Forestry Interventions in Two States along the Riverscape -** Component 1 of the Project deals with the proposed forestry interventions in the concerned States along the course of the river and includes three sub-components: (i) 'Forestry Interventions' in three lower order sub-zones *viz*., (a) Natural Landscape (NL), (b) Agricultural Landscape (AL), and (c) Urban Landscape (UL) adopting appropriate plantation treatment models; (ii) 'Conservation Interventions'; and (iii) 'Supporting Activities'.

**Component 2: Strengthening Knowledge Management and Capacity Development for Forestry Interventions and Conservation of the Riverscape -** India lacks the desired experience in the restoration of rivers as it is relatively an emerging discipline for the country. However, efforts are on in this direction. Positive outcomes from any such effort aiming towards river restoration or river conservation are unlikely unless evidence and science-based holistic strategies are actively involved in planning, assessment, management and development of rivers and policies relevant to river conservation and restoration. Thus, this Component aims to incorporate science into policy, planning and management for informed decision making that can facilitate positive outcomes of concerted efforts towards sustainable management of rivers and river restoration in particular in India. HFRI Shimla, has taken a lead in the preparation of the present DPR adopting a multistep approach involving active participation of stakeholders. The HFRI, a reputed and established learning seat is envisaged to serve as the Knowledge Management/ Learning Centre and to undertake concurrent research related activities essential for the conservation and restoration of the Himalayan Rivers. The HFRI also play a pivotal role in building the desired national capacity for demonstrating the strong linkages between diverse forests in the Himalayas and rivers ecosystems. Component 2 specifically seeks activities relevant to policy, advocacy, outreach, monitoring, evaluation, and capacity development.

**Component 3: Scaling Up, Replication in Additional Sites and Maintenance Phase -** The present DPR focuses on the programme implementation on the select tributaries, particularly once the river descends in the plains. The Component 3 plans to support the scaling up and

replication of planned efforts in additional sites/tributaries besides primarily supporting the maintenance phase of plantations raised during the Phase I – Implementation Phase.

**Component 4: National Coordination for Forestry Interventions and Riverscape Conservations -** In general, a major river involves two or more States in its basin. Thus, programmes related to river management and restoration requires national-level coordination for proposed forestry interventions and various conservation efforts among the participating States located along the course of the river. As such, the MoJS is the central nodal ministry for all aspects of management of water resources including river development and restoration of rivers. However, several other ministries are also involved for specific components/needs. Component 4 envisages national-level coordination for forestry interventions and river restoration and visualizes varied activities *viz*., policy and legal interventions, riverscape level coordination, programme implementation, monitoring and impact evaluation besides extending support for the finances required for the project execution.

**Strategies**

The riverscape is a mosaic of varied land uses and it includes the: (a) natural ecosystems, (b) rural system predominated by agro-ecosystems, and (c) built-up urban environment represented by cities and towns. Each of these broad land use category represents significant area of the riverscape with unique conditions and situations, and varied use patterns, ownerships and management needs. Hence, three broad land use categories within the riverscape have been referred as the 'natural', 'agriculture', and 'urban' landscapes. These three landscapes immensely influence the intricate and vibrant nature of the Beas River ecosystem, especially the environmental flow, water quality, and aquatic biota besides terrestrial biodiversity in surrounding lands, and the various ecological processes of the *lotic* system. Thus, in view of the prominence of three types of landscape elements within the riverscape, a multipronged strategy for the proposed forestry interventions addressing specific requirements of each of the land use type/landscape category has been planned for execution. As a part of the broader strategy, zoning within the riverscape is visualized keeping in view three distinct landscape categories and specific targeted forestry interventions are being planned in each of the zones.

**Natural Landscapes –** The 'natural landscape' constitute the largest zone as various categories of land use/land cover of the natural environment represents nearly 63% extent within the riverscape. Altogether, 15 models/ treatment plans focusing on forests, grasslands and wetlands have been proposed in various prioritized sites based on geospatial analysis. The proposed interventions focus on the protection, soil and moisture conservation works, control of invasive and alien species, plantations, ecorestoration, etc.

**Agriculture Landscape –** The second lower order zone (the agriculture landscapes) largely in the rural environment all along the main channel and its tributaries constitutes the matrix

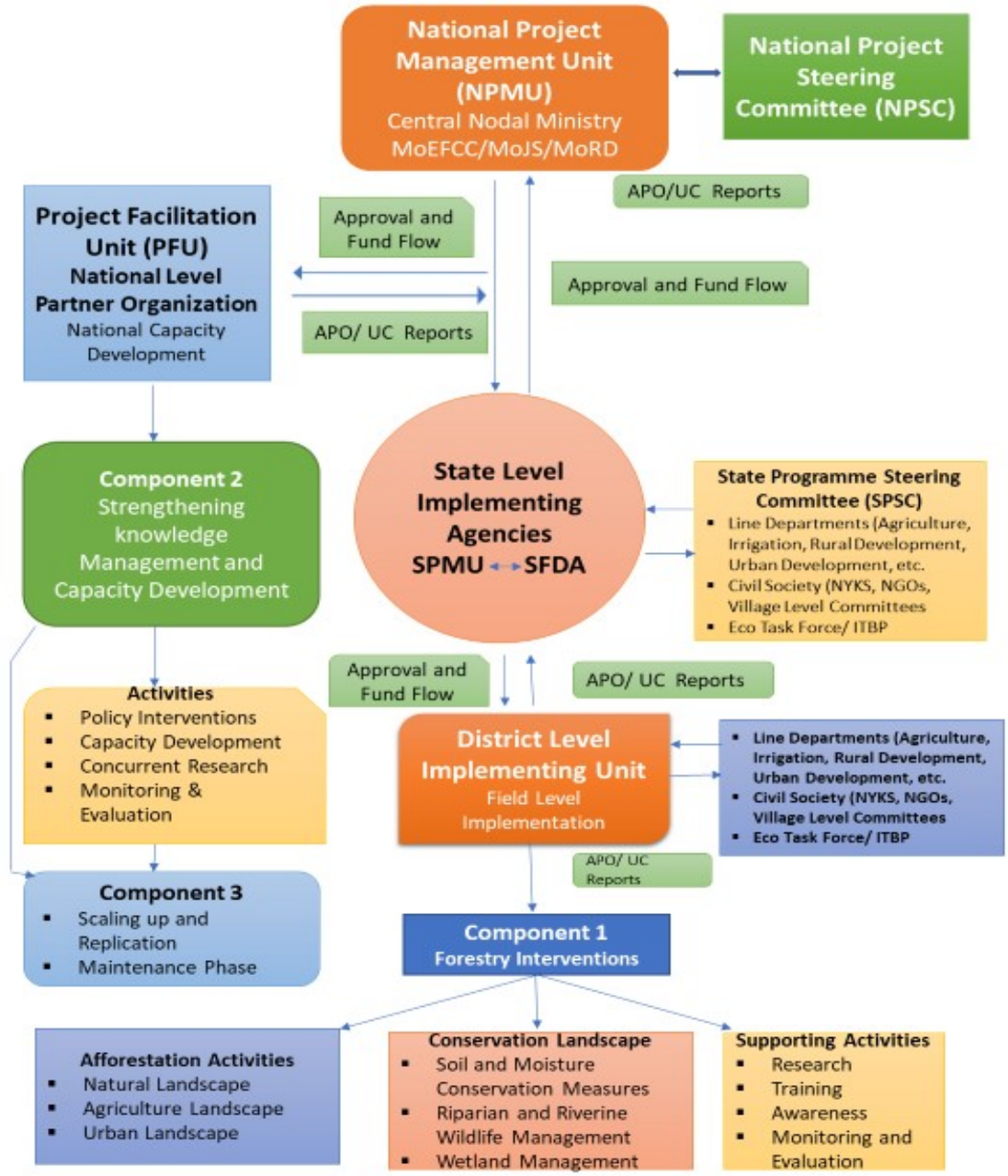
of the riverscape, predominated by agriculture and horticulture crops, mainly on private lands. The purpose of this zone is to promote planting of economic and fruit trees so as to enhance the overall conservation values and other expected ecological functions and ecosystem services. In all, different 04 models in agriculture landscapes have been proposed.

**Urban and Peri-urban Landscape –** A large number of settlements, towns and cities exist all along the course of the main river and its tributaries. A substantial proportion of the riverscape is thus constituted by the urban/ built-up environment. Proposed interventions in the third lower order zone i.e. the urban landscape include activities related to development of riverfront, ecopark, institutional and industrial estate plantations and avenue plantations. Altogether, 09 models in two States have been proposed for the stated purpose.

**Theme Plans:** Activities that are are common to two or lower order zones are being referred to as the Theme Plans. Theme-based activities are broadly grouped in two categories: (i) 'Conservation Interventions' including soil and moisture conservation, riverine and riparian wildlife management, and wetland management; and (ii) 'Supporting Activities' including policy and legal interventions, concurrent action research, capacity development, awareness, participatory monitoring, project management and evaluation. The theme-based activities have been planned and proposed at the national, state and local field levels. The State level implementing agency i.e., the State Forest Department will be responsible for execution of activities proposed as theme plans while the National Partner Organization (HFRI, Shimla) will concurrently carry out these activities at the national level. Some of the supporting activities such as project management will be undertaken simultaneously by the Central Nodal Ministry and the State Project Management Unit (SPMU) based at the headquarters of the concerned SFD/ IA.

**Implementation Mechanism**

The programme implementation has been planned in two phases of five-year duration each. Phase 1 deals with project implementation while Phase II primarily focuses on the maintenance of plantations established during Phase 1. The project visualizes constitution of two Programme Steering Committees (PSCs), one at the national level in the Central Nodal Ministry being referred as the 'National Programme Steering Committee (NPSC)' while the other one at the State level in the concerned SFD/IA, being referred as the 'State Programme Steering Committee (SPSC)'. The NPSC and SPSC would be responsible for the efficient execution of the project at the national and state level, respectively. The NPSC would be responsible for approving the APOs submitted by the two involved States and a National Level Partner Organization (NPO) in addition to primary functions of overseeing and steering the execution of the implementation plan. The NPMU at the Central Nodal Ministry will be responsible for the release of funds to IAs and the NPO once the APOs have been approved by the NPSC. The Project Facilitation Unit (PFU) at the NPO will follow its own mechanism of governance and will constitute its own monitoring and Steering Committee for overseeing the project.




**Project Budget**

An amount of Rs.727.91 crore, which is 83.73% of the overall project budget, is provisioned for principal Component A. This includes total cost for forestry interventions proposed in three landscapes including Conservation Interventions (Sub-component A.1 and A.2). The Sub- component A.1 on Plantations and Treatment Models in Three Categories of Landscape has provisioned a cost of Rs. 443.08 crores, Rs.190.20 crore for Sub-component A.2 (Conservation Interventions), and whereas Rs. 44.09 crore is provisioned for Supporting Activities (Sub-component A.3).

Component A -The Sub-component (A.1) on plantations and various treatment models in three types of landscapes within the riverscape is the largest in terms of its spread, extent and quantum of funds provisioned. Rs. 443.08 crore has been provisioned for forestry interventions in three landscapes, which is 50.97% of total budget outlay of the project. Amongst three landscapes, the obvious emphasis is on Natural Landscapes. Hence, a sum of Rs. 307.91 crore has been provisioned for proposed afforestation/reforestation activities in Natural Landscapes in Beas Riverscape. The projected budget outlay for proposed plantations in natural landscapes accounts for 69.49 % of the Sub-component. The projected budget outlays for Eco Task Force, Agriculture and Urban landscapes are of the tune of Rs. 22.43 crore, Rs. 32.96 crore, and Rs. 79.78 crore or 3.31%, 4.86 % and 11.78%, respectively of the envisaged cost of the Sub-component (Table 4.11).

The second Sub-component on 'Conservation Interventions' (A.2) includes three major types of interventions/activities. These are: (a) soil and moisture conservation measures, (b) riverine and riparian wildlife management, and (c) wetland management. In all, Rs. 190.20 crore has been provisioned for this Sub-component, which is 21.87% of total budget outlay. Of this, the budget outlay for SMC measures is Rs.160.99 crore, which is 23.77% allocation of the funds provisioned for Component A. The Cumulative budget outlay provisioned for Riverine and Riparian Wildlife Management, and Wetland Management is 29.20 crore, which is 4.31% of total budget of component A (Table 4.11).

The third Sub-component (A.3) pertaining to 'Supporting Activities' is to be executed by concerned state level IAs. This Sub-component includes seven broad based activities *viz*., (a) policy and legal interventions, (b) participatory monitoring, (c) adaptive research, (d) capacity development, (e) awareness, (f) project management, and (g) evaluation. A budget of Rs.44.09 crore or 6.51% of the component A or 5.07% of total budget proposed to the concerned states has been provisioned for carrying out various supporting activities for five-year period (Table 4.11).

Component-B- The Component B on 'Strengthening Knowledge Management and Enhancement of National Capacity for forest hydrology, forestry interventions, and conservation and restoration of rivers would require a sum of Rs. 29.52 crore or 3.39% of the overall project outlay. The highest budget amounting Rs. 7.79 crore has been provisioned for cost of PFU, while budget of Rs. 6.27 crore has been provisioned for Research and Development, 3.58 crore, 2.69 crore, 1.79 crore, 1.46 crore, 0.66 and 0.46 crore have been envisaged for scientific exchange, capacity development, policy level interventions, awareness, monitoring and evaluation, respectively.

**Component C –**The Phase II of the project of five-year duration primarily envisages the maintenance of plantations raised during Phase I of the project has also been planned. The Phase II would also include limited activities related to replication of efforts in additional tributaries/areas and scaling up of the planned effort. A sum of Rs. 136.67 crore or 15.72% of the total project financial outlay has been envisaged specifically for the Component – C on the 'Maintenance Phase'.

Component D - It pertains to project management at the national level which would include the establishment of National Project Management Unit (NPMU) at the Central Nodal Ministry with the responsibility to oversee, steer and manage this priority project. A sum of Rs. 25.82 crore, representing 2.97% of the overall budget over a period of five-year during the Phase I has been provisioned.

State and Forest-wise Allocations -Thus, it is amply clear that the major chunk (83.73 %) of the project budget outlay is meant for field level activities incorporating proposed forestry interventions, conservation interventions and supporting activities to be implemented by two States (Himachal Pradesh and Punjab). The higher proportion of budget allocation to the extent of Rs. 633.51crore or 72.87% of overall budget is meant for the state of Himachal Pradesh considering the fact that a larger extent of the riverscape is located in this mountainous state while a budget of Rs. 152.85crore or 17.58% of the total budget has been provisioned for the state of Punjab. Altogether, 25 Forest Divisions in the two States/IAs will carry out proposed activities relevant to forestry interventions within the rivers cape. The budget allocations to 25 Forest Divisions range from Rs. 0.5 crore to Rs. 48.20 crore over a period of 10 years (Phase I and II). Altogether, a total of 24319.50 ha area in two involved States is envisaged to be treated under the various forestry interventions. The state-wise area to be treated would be 16645.50 ha in Himachal Pradesh and 8684.00 ha in Punjab.

**Project Schedule**

The execution period of Phase I and Phase II of the project has been designed and incorporated in the present DPR and of 5-year duration in each case. Thus, the total duration for programme implementation including the maintenance phase is of 10-years. At this juncture, it is not clear when the project would commence and which will be the first year of programme implementation during Phase I. The Government of India may take its own time to decide the Central Nodal Ministry responsible for the implementation of the project and to allocate required funds for the execution of plan. Various proposed activities have been staggered over five years of Phase I. Experience illustrates that once the Government of India has accorded its approval for the project and earmarked required funds, the first year by IAs would be largely devoted for project initiation, preparatory works, particularly the establishment of nurseries and commencement of various activities related to conservation interventions and supporting activities. The planting material meant for high altitude Himalayan part of the riverscape would be ready in nurseries and available at the earliest by the end of second year of project implementation. Thus, the earliest effective establishment year of plantations would be the third year of Phase I in high altitude areas. Establishment of plantations is proposed in the third, fourth and fifth year of Phase I. Phase II of five-year duration is specifically designed and incorporated for the purpose of maintenance of plantations and other activities. Considering the fact that most proposed activities are time

bound and seasonal in nature, ideally the project initiation after all approvals, budget allocation, etc., should commence in the months of April–May so as to allow adequate time for preparatory works, establishment of nurseries, development of planting material for afforestation/reforestation in lower reaches of the riverscape before the onset of the monsoon season in the month of June or so in the next year. Thus, careful scheduling of project commencement would be vital for the overall success and effective implementation of the envisaged activities. The quantum of activities is expected to be at its peak in the third or fourth year of Phase I. The Mid-Term Review (MTR) is proposed in the last quarter of the third financial year of the project execution while the Terminal Evaluation (TE) is being envisaged in the third year of Phase II.

**ANNEXURE-1**

## Guidelines for Implementation of Detailed Project Report (DPR) on Rejuvenation of Beas River through Forestry Interventions

Beas River originates in the Pir Panjal Ranges and traverses through the state of Himachal Pradesh before descending into the Punjab Plains and joins Sutlej River at Harike Pattan, south of Amritsar. It covers 470 km long course through the states of Himachal Pradesh and Punjab, with the basin area of around 20,262.10 $km^2$. It has the second largest catchment area in Himachal Pradesh encompassing a total of 17 Forest Divisions in 5 Forest Circles with the river length of 307.2 km and its basin administratively falling in the districts of Kullu, Mandi, Kangra, Hamirpur and Chamba. The Western most part of the Beas River falls in the plains of Hoshiarpur and Gurdaspur districts of Punjab. The length of in Punjab is 149.7 km which covers 8 Forest Divisions under 3 Forest Circles. The Beas River basin(31°27'12"Nto 32°27'15"N Latitude and 74°30'40"Eto 77° 52'7" E Longitude)represents 2 biogeographic zones (the Himalaya and the Semi-Arid zone of the Punjab plains) and harbours a wide range of natural and man-made wetlands including three Ramsar sites i.e. Pong Dam Lake, Harike Lake, and Beas River Conservation Reserve, 10 important bird areas and one World Heritage Site i.e., Great Himalayan National Park Conservation Area - GHNPCA besides several prominent protected areas. The basin has potential of 4,877.7 MW hydro power, distributed among 51 Hydro Electric Projects (HEPs) of which, 22 projects have already been commissioned.

The '**DPR on Rejuvenation of Beas River through Forestry Interventions**' will be implemented by State Forest Department (SFD) of two states viz., Himachal Pradesh and Punjab. The guidelines for implementation of the DPR are as follows:

- The existing framework within the Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India (GoI) shall implement the DPR. National Afforestation Eco-development Board (NAEB) will be the National Project Management Unit (NPMU). SFDs of two states will be the primary Implementing Agencies (IAs). The headquarters of the SFD will have in place a State Project Management Unit (SPMU) headed by an Additional Principal Chief Conservator of Forest (APCCF) level official. Implementation will go through the hierarchical structure of Chief Conservator of Forest(CCF), Conservator of Forest(CF) and Divisional Forest Officer (DFO). A separate Beas Cell shall be created in NPMU, SPMU and Divisions to focus on activities related to the Beas River rejuvenation.
- Other departments such as Agriculture, Horticulture, Soil Conservation, Revenue, etc.; groups such as Gram Panchayat, Van Panchayat, Non-Governmental Organizations (NGOs), etc.; and public representatives shall be suitably involved in steering, execution and monitoring of the project.
- Separate bank account should be maintained to operate the DPR at division level. General Financial Rules (GFRs), other rules/guidelines of government to be followed strictly during implementation.

- A Steering Committee and a Monitoring Committee shall be created at National and State level. The State level Steering Committee shall meet at least twice a year for approving the Annual Plan Operations (APOs) and discussing other related issues.
- The SFDs would dovetail activities with similar ongoing /future schemes of various departments through appropriate MoUs for synergy and avoiding duplication.
- Incentives (free quality planting material of fruit or forestry plants and maintenance cost) already provisioned for farmers. Explore possibilities of providing more incentives from other schemes in the State also.
- An Execution Manual would be prepared by the SFD of Himachal Pradesh and Punjab in local official language at the start of project implementation in line with DPR recommendations with participation of all line departments specifying roles and responsibilities.
- The budget will be provided after submission of Annual Plan Operations (APO) for each year. So the prevailing wage rate will be applicable whenever DPR is implemented. There should be provision of regular financial reporting of the project at all level and compilation of quarterly financial reports and annual financial statements of the project. Also provision of internal and external audit should be ensured. APO shall serve as the standard document for Global Positioning System (GPS) location and extent of treatment site for DPR Beas. The cost estimates in models are for guidance and not serve as actual budget for the treatment of a site. The rates in force at the time and place would be applicable and reflected in the APO.
- Native species of trees, shrubs, herbs and grasses will be selected for the proposed treatment models/plantations. Traditional and prominent horticultural and ornamental species those under cultivation in the region for quite some time, are proposed in the Agriculture and Urban Landscapes. Mixed plantations will be adopted as far as possible instead of monoculture for enhancing plant diversity and greater ecosystem services. The species are proposed according to their occurrence in the altitudinal zones; however, Implementing Agencies are at liberty to plant site specific species also.
- The necessary preparations for planting works including digging of pits would be completed two-three months before the onset of monsoon or planting season. However, the period between pit digging and scheduled planting time would not be more than four months so that run-off of soil by wind and water could be minimized.
- Appropriate quantity of Farm Yard Manure (FYM)/organic manure/mycorrhiza to be applied to boost plant growth in nurseries and plantation sites. Eco-friendly measures (i.e., physical or mechanical methods, use of natural products, etc.) for weed and pest control would be adopted without resorting to the use of synthetic chemicals.
- Plantation sites would be protected against all types of biotic disturbances and abiotic stresses so as to effectively safeguard planted species for three years through fence, watch and ward, as well as local public awareness programmes and their active involvement.

- The Implementing Agency should either develop modern and centralized nurseries or identify various certified Research Institutes, Universities, NGOs, Institutions and progressive farmers for supply of best quality planting material.
- The fencing cost has been calculated on average basis of enclosure of area to the extent of 5 hac and average carriage lead is taken as 1 km (up & down). Adjustments need to be done in case of variable planting areas and carriage leads. The fencing must be ensured before planting activities.
- The nursery time for plants in multitier model is taken on average basis i.e., 1.5 – 4.5 years so average is 3 years, for calculating the norm. Also the plant cost is taken from the norm prescribed by the Forest Department of respective States of Himachal Pradesh and Punjab.
- The cost norms proposed in treatment models indicate the upper limits. The expenditure will be booked under various items shown in the detailed models as per actual work done in the field as per Schedule of labour rates of the respective States and will not exceed these Departmental Norms. The suggestive cost models are to create multistoried forest cover for improving the bio-diversity of the area which in turn conserves the water and soil *in-situ*.
- In *Lantana* eradication models or wherever *Lantana* removal is involved, the Cut Root Stock (CRS) method is to be adopted.
- In Fire Protection Model, the area is virtually targeted, hence Implementing Agency should rotate fire protection operations in areas of the Division so that each selected area takes operations after 3 years.
- In Agriculture models the guidelines of Sub-Mission on Agroforestry (SMAF) of Central Government should be considered as being adopted in the States.
- Under Urban Landscapes, the *Seechewal Model* (Punjab) for bio-remediation and bio-filtration may be taken into consideration. Also under Urban Landscapes, Eco-Parks Development, Institutional Plantations and Riverfront Development models can be converged with Nagar Van Yojna as launched by GoI.
- In Soil and Water Conservation models, the watershed approach and techniques should be adopted for desired results. For this intervention, the Annual Plan Operation (APO) should be submitted each year with the proposal of micro-plan of specific sites with detailed estimates.
- In the Riverine and Riparian Management and Wetland Management models, areas shown in budgetary provisions are virtual and concerned Implementing Agency (IA) should clearly mention the proposed activities in APO to be taken up in particular area with detailed micro plan and estimates.
- The suggested interventions are to be considered flexible and not rigid, in terms of changing the site location, area, species and minor changes in the models and the applicable schedule rates if the circumstances demand so while implementation the Beas

DPR and the concerned Conservator of Forest shall exercise the power to approve such changes as and when required.

- The project costs have been worked out on the basis of rate prevalent during year 2019-20 in the respective State and 7% escalation in the project cost during the subsequent years has been incorporated in anticipation of the cost escalation in future. However, actual project cost at the time of implementation on yearly basis shall need revision as per the change in Wholesale Price Index (WPI) on year to year basis. The Conservator of Forest may be empowered to revise the project cost accordingly for the quality desired output of the project.
- Soil and Moisture Conservation (SMC) measures and grasses would be given high priority for enhancement of ground water recharge and promotion of favourable conditions for rejuvenation of the entire ecosystem.
- Flexibility is allowed to address the changing stakeholder needs, national, regional or local priorities, and learning's from Indigenous Traditional/local knowledge, concurrent experiences and augmented research.
- Best practices of site selection (such as Decision Support System) and treatment of the site shall be adopted. 'Ridge to valley' approach would be followed for the treatment of sites in the riverscape of Beas and its tributaries.
- DFOs will have flexibility on choice of species, site, model, quantity of work, specifications and timing of activities within the total budget proposed in the DPR for the Division.
- Cost of the project would be adjusted for the actual date of start of implementation of the project based on Wholesale Price Index (WPI). The expenditure must be restricted to the actual amount sanctioned to the State.
- Services of suitable Experts may be used for bio-remediation, eco-park development, riverfront development, etc. and also for designing the SMC structures.
- Indigenous species recommended in the divisions should be used in the natural landscape. The Non Timber Forest Products (NTFPs) and other species that support livelihood would be given priority. Farmers would be allowed to choose species for plantation. The Quality Planting Material (QPM) of superior varieties of fruit species should be supplied in consultation with the Horticulture Department.
- Inhospitable and difficult areas would be identified by SFDs and assigned to Eco-Task Force for treatment as sufficient budget provision is there in the DPR.
- Public awareness and their active participation should be ensured in most activities undertaken in the project.
- Capacity building activities should be planned for the staff during first year of implementation and there should be continuous skill upgradation during later years.
- There should be proper Grievance Redress Mechanism (GRM) in place.

**Don’ts**

- No work should be implemented which are not comply with the environmental laws and policy at National and State levels.
- No work should be undertaken unless its Geographic Information System (GIS) tools are not used for planning and not incorporated in the APO.
- *Lantana camara* on fragile slopes and extremely harsh sites not be removed *en masse*.
- Species known to consume large amount of water are to be avoided.
- The plantation work should not be undertaken before imparting training to the field staff.
- No work should be undertaken which has negative impacts on environment and society.
- Exotics should not be planted in natural landscape. If it is very urgent to plant an exotic species, the consent of Competent Authority may be taken.
- Planting should not be restricted to the listed species in order in the DPR.