

OVERVIEW



Detailed Project Report

Rejuvenation of River

CAUVERY

Through Forestry Interventions

INSTITUTE OF FOREST GENETICS AND TREE BREEDING

(Indian Council of Forestry Research and Education)

P.B.No.1061, R.S.Puram, Coimbatore - 641 002



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मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
और
श्रम एवं रोजगार
भारत सरकार

भूपेन्द्र यादव
BHUPENDER YADAV

MINISTER
ENVIRONMENT, FOREST AND CLIMATE CHANGE
AND
LABOUR AND EMPLOYMENT
GOVERNMENT OF INDIA

Message



In the light of the conservation priorities and national targets and to fulfil sustainable developments goals, Government of India has adopted multi-pronged strategy and initiated programs for rejuvenation of rivers. Recognizing that both forests and rivers are connected with ecology and humanity as vital life support systems, National Afforestation and Eco-Development Board under the Ministry of Environment, Forest & Climate Change (MoEF&CC) envisaged forestry interventions as one of the approaches towards river rejuvenation.

Indian Council of Forestry Research and Education (ICFRE), Dehradun was entrusted to prepare the 'Detailed Project Reports (DPRs) on rejuvenation of Rivers through Forestry Interventions', for 13 major rivers of the country viz-a-viz., Jhelum, Chenab, Ravi, Beas, Sutlej, Yamuna, Brahmaputra, Luni, Narmada, Godavari, Mahanadi, Krishna and Cauvery thus aiming at significant contribution towards the rejuvenation of these rivers.

I am extremely happy to learn that DPR of River CAUVERY alongwith its tributaries has been prepared by Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore. The river flows through and enriches the States of Karnataka, Kerala, Tamil Nadu and Union Territory of Puducherry. The river has enormous cultural, social, economic and ecological significance besides it continue to immensely contribute towards the maintenance of aquatic life, supply of drinking water, agriculture production, hydropower generation, industrial development, and prosperity in the region.

The DPR proposes site specific, extensive afforestation activities in natural, agriculture and urban landscapes within the riverscape besides conservation interventions and execution of various supporting activities. I am sure that the proposed interventions will meaningfully contribute towards the broader goals of ecological rejuvenation of major rivers.

I sincerely applaud the earnest efforts made by the ICFRE, Dehradun, IFGTB, Coimbatore, the State Forest Departments and other line departments of the concerned States, subject matter experts and other stakeholders for adopting multidiscipline, multiscale, and multistakeholder planning and assessment approach for preparation of DPR. I am sure that the concerned Central Ministries and State Governments together shall mobilize required resources and shall extend full support for its successful implementation.

I convey my heartiest congratulations to the DG, ICFRE for providing desired leadership in this important endeavour, and I compliment his entire team for timely completion of the assigned task, and commendable work done by them.

I wish all success for the successful implementation of the DPR.

Date: 10.01.2022



(Bhupender Yadav)



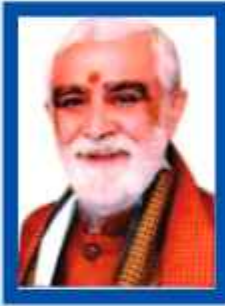
राज्य मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
उपभोक्ता मामले, खाद्य और
सार्वजनिक वितरण
भारत सरकार

अश्विनी कुमार चौबे
ASHWINI KUMAR CHOUBEY



MINISTER OF STATE
ENVIRONMENT, FOREST AND CLIMATE CHANGE
CONSUMER AFFAIRS, FOOD &
PUBLIC DISTRIBUTION
GOVERNMENT OF INDIA

Message



Water is life, and rivers are the life support systems that ensure functioning of the hydrological cycle and Ecosystem Services on this earth. Forests help recharge groundwater aquifers, cleanse waters, protect river banks and act as sponges to mitigate floods. Rivers also have special attributes as cultural heritage of humanity and have deep connections with our beliefs and practices.

Recognizing the connect between Forest and Rivers, the Ministry of Environment, Forest and Climate Change through National Afforestation and Eco-development Board (NAEB) had assigned the task to prepare the Detailed Project Report (DPR) for Rejuvenation of River **CAUVERY** through Forestry Interventions, to Indian Council of Forestry Research and Education (ICFRE), Dehradun.

I am delighted to learn that the DPR of River **CAUVERY** has been prepared by, Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore under ICFRE. I sincerely appreciate the efforts made by the ICFRE and its nine institutes for completing the assigned task and I would like to name this holistic project as “निर्मल जलधारा”

I wish all success for successful implementation of the DPR. The Ministry of Environment, Forest & Climate looks forward to work with State Governments, in rejuvenation of this important natural resource.

(Ashwini Kumar Choubey)



वन महानिदेशक एवं विशेष सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय

DIRECTOR GENERAL OF FOREST & SPL. SECY.
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MINISTRY OF ENVIRONMENT, FOREST AND
CLIMATE CHANGE

चन्द्र प्रकाश गोयल
CHANDRA PRAKASH GOYAL

Message



River Cauvery is revered as a divine mother and referred to as "Dakshina Ganga" or the "Ganges of the South". However, beyond its sanctity, the ownership and disputes of its hydrological bounty are traceable to the as early as the 1920s. Interestingly, in terms of Indian forest management perspective, it is on the banks of Cauvery the first step and initiatives for eco-restoration of forests were attempted. The Forest Working Plans of the then Madras State conceived by Sh.C.R.Ranganathan prescribed the pioneering methods on the regeneration of Sholas and Grasslands. The said work is earlier even to the advent of Champion's Forest Type classification (1932). Nanjangode, presently in Karnataka where Cauvery enters in to Tamil Nadu was the first experimental site wherein Shola regeneration was attempted. The stakeholder States have scientifically managed the natural resources while contributing to the GDP of the nation.

The Cauvery river Basin area encompasses a cross-section of Biodiversity and life forms. In fact, Cauvery traverses through over six major forest types. We the MoEF&CC team realise that, forests both natural and man-made are green warheads to combat environmental vagaries and the implications of climate change. In fact, river basins are highly resourceful in developing and sustaining afforestation initiatives and actions. It would be highly desirable at this stage, if well-conceived action plans on managing these precious riparian ecosystems *in toto* are made available to all our stakeholders. MoEF&CC was truly concerned and felt that it would be appropriate if all the river basins in the country are revisited and reflected upon on their ecological perspective in a climate change scenario. These DPRs in spirit are green capital management plans that would cascade to provision fair shares of carbon credits. The efforts of generating this DPR by IFGTB, Coimbatore in consultation with Forest Departments supported by NAEB hopes to bring in new perspectives, prospects and prosperity to the Cauvery riverscape Management in future.

I congratulate the entire team of IFGTB and ICFRE for their effort in bringing out the DPR on rejuvenation of River Cauvery through forestry interventions.

(Chandra Prakash Goyal)



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अमृत महोत्सव



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GOVERNMENT OF INDIA
INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION
DEHRADUN - 248 006

A.S. RAWAT, IFS
Director General, ICFRE
and Chancellor, FRI University

Foreword



It is very heartening to see the DPR of Cauvery, visualising the dynamics of life through this vital riverine system that links three States and a Union territory. Geologically, the River Cauvery is much older to the Ganges and has a very long cultural heritage that is easily traceable to over four thousand years.

This report addresses the long pending aspirations, perspectives and desires of different stakeholders of the river. In fact, the report recognises eco-restoration in its true spirit. With the UN Decade of Biodiversity (2010-2020) ends this year, the world looks forward to welcome the UN Decade of Eco-restoration (2021 -2030). Globally, there have been several eco-alarms raised by different stakeholders across riparian ecosystems. In this context, we trust that the perceptions of the DPR are not only apt in time but also very meaningful in its essence. In an era of climate change, it is realised that improving carbon dynamics in soil and vegetation is a key to healthy ecosystems and plans or blue prints to look upon rivers with positivity are most welcome. On a larger dimension, comparing perennial rivers that are fed by glaciers and those by monsoons are very contrasting phenomena. It appears that, the threshold levels of the said two types of rivers of this great country present very different situations. During the course of DPR preparation, the team ICFRE closely interacted with Forest Departments of Kerala, Tamil Nadu and Karnataka to formulate a plan that shall restore the riverscape and the joint field exercises have in fact mutually benefitted our competence in greening the riverscape. Comprehending the dynamics of the Cauvery Basin has truly given a different perspective and taken the DPR to the next possible level. However, it is also realised that implementation of DPR in part or *in toto* requires huge resources in terms of finance, time and human efforts. But fruition always is not that distant, as we all know improving river systems directly cascades to improvement in the quality of life.

I take this opportunity to congratulate Institute of Forest Genetics and Tree Breeding, Coimbatore, Institute of Wood Science and Technology, Bengaluru, Kerala Forest Department, Karnataka Forest Department, Tamilnadu Forest Department, and Puducherry Forest and Wildlife department in preparation of this report in time. It is well done and I hope it is received well in its spirit and concerns by the various stakeholders of this Nation.

(Arun Singh Rawat)



डॉ. सि. कुञ्जिकण्णन
निदेशक
Dr. C. Kunhikannan
Director

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INSTITUTE OF FOREST GENETICS AND TREE BREEDING
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Indian Council of Forestry Research & Education
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
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Preface



The river Cauvery (also known as Kaveri and Ponni in Tamil) is one of the seven most sacred rivers of the country. It is the 8th largest river in the subcontinent and ranks as a medium river on the global scale. The river occupies nearly 2.5% of the total geographical area of the country. The catchments of the river basin lie in the States of Karnataka, Tamil Nadu, Kerala and Union Territory of Puducherry. Of the total area of the basin, 41.2% is in the State of Karnataka, 55.5% in the state of Tamil Nadu and 3.3 % in Kerala. More than 50% of the land area in the basin is arable. Total forest cover of the basin is 19.53% and the rest of the area is inhabited.

The Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore was entrusted with the responsibility of preparation of a Detailed Project Report (DPR) for the rejuvenation of the river Cauvery through forestry interventions in natural, agricultural and urban landscape, considering the multidisciplinary expertise of the Institute. This DPR consolidates the scientific inputs of the best researchers in the country. Spread over 8 chapters, the Volume I deals with the general description of the river, its hydrology, the legislation and legal provisions in managing the water resource, the proposed forestry interventions and the cost norms of each activity, the budget required to carry out the forestry interventions in the state of Karnataka, Kerala, Tamilnadu and in the union territory of Puducherry, the budget required for monitoring, research, knowledge management, national level coordination and to scale up the project, and the expected outcome. The Vol. II deals with specific interventions for each implementing state and UT, the cost norms, budget proposal and the sites for interventions. An overview has also been prepared to bring out the above in a nutshell.

The proposed forestry interventions have been framed following exhaustive reviews, repeated consultation with the different stakeholders of the participating States, application of geospatial modelling in the riverscape and adoption of a scientific approach in tune with the requirements of different line departments of the State governments. Varied aspects of sustainable forest management were also considered while formulating the plans. Afforestation and augmentation proposed in the DPR shall lead to improved biodiversity, increased carbon sequestration and better adaptability to climate change. The multifaceted approach of afforestation in three identified landscapes of natural, agricultural and urban areas along with soil and water conservation measures in appropriate sites shall have a profound impact in reducing run-off and reducing soil erosion. The resulting enhanced vegetation through their foliage, bark, root system and leaf litter, shall decrease the speed of

water dispersion and favour greater infiltration of rain water to ensure smooth functioning of the hydrological cycle. The implementation shall also result in restoring and strengthening the riparian ecosystem. I am sure that the implementation of the DPR shall significantly help in rejuvenating the river Cauvery and DPR will remain as a reference document for the years to come.

I thank everyone involved in contributing significantly for the preparation of this comprehensive DPR and its timely submission. My special thanks to the Chief Secretaries, PCCF and HoFFs of the States and the CF of the UT Forest Department without whose support this enormous task would not have been possible. I thank the Ministry of Environment, Forest and Climate Change and ICFRE for reposing faith in IFGTB and supporting the institute for completing the project.



(C. Kunhikannan)

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 The art of Living.

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Dr. B.C. Nagaraja, Associate Professor
Dr. S.P. Subramani, CTO, IFGTB

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and Cost Norms**

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Dr. B. Nagarajan, Scientist, IFGTB
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Designing and drawing for the DPR, riparian corridors-a global perspective, rational for selection of reasonable river forest buffer	Dr. John Prasanth Jacob, Scientist, IFGTB Ms. Srijita Ganguly, TA, IFGTB
The Cauvery river environment-headstreams, main stream, tributaries, confluence points, distributaries and delta	Dr. A. Vijayaragavan, Scientist, IFGTB
The physical environment-western ghats, the eastern ghats, the alluvial plains. The Cauvery mouth and deltaic plain- the extent, fluvial process, water quality, sediments, vulnerabilities. etc.	Dr. K.R. Sasidharan, Scientist, IFGTB
The climate and its influence on the Cauvery river	Sh. Anish V. Pachu, CTO, IFGTB
Diversity of forests, forest types and their composition. Changes in forest cover in the different forest types of the basin Carbon stocks.	Dr. S.P. Subramani, CTO, IFGTB
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Sacred groves, places of religious significance and of Cauvery basin	Dr. Kannan C.S. Warriar, Scientist, IFGTB
Cauvery in literature	Sh. P. Chandrasekharan, ACTO, IFGTB

**Past management of the river-
Creation of forest reserves. Timber
extraction. Commercialization
of forests and deforestation,
Land and the People**

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Sh. P. Kathirvel, IFS, CF, IFGTB

**Legislations, acts, bills etc related
to Cauvery river management-
Flow, mining, biodiversity, land
use, wetlands, illegal constructions,
industries, pollution, zoning. EIA,
CATPs, NGT. Water in the Indian
constitution, Interstate water
dispute act, 1956 and its amendment
of 2002. Institutional arrangements
and definition of property rights
in the Cauvery basin, Cauvery
water Tribunal.**

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**GIS, RIS and their role in riverscape
analysis. Methodology for
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Cauvery prioritization of sites**

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intervention models for the
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Dr. S.P. Subramani, CTO, IFGTB
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**Identification of technologies
developed by IFGTB sited to the
Cauvery riverscape. Scope for
clonal forestry, agro forestry,
farm forestry, seed orchards in
Cauvery riverscape**

Dr.A. Nicodemus, Scientist, IFGTB
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**Scope for horticultural interventions
and medicinal plants for improving
livelihood in Cauvery riverscape**

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Dr. K. Panneerselvam, Scientist, IFGTB

**Different models of biological soil
amelioration adopted in different
riverscape globally**

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**Karnataka- State profile,
geographical extent, geology,
topography and soil, climate,
river system and hydrology
including past management,**

Dr. S.P. Subramani, CTO, IFGTB
Dr. D. Thangamani, Scientist, IFGTB
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forests and vegetation, agro-ecosystem, biodiversity, demography

Tamil Nadu- State profile, geographical extent, geology, topography and soil, climate, river system and hydrology including past management, forests and vegetation, agro-ecosystem, biodiversity, demography

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ABBREVIATIONS

AAG	- <i>Albizia amara</i> <i>Acacia</i> spp. <i>Gyrocarpus asiaticus</i> complex
ADB	- Asian Development Bank
AHADS	- Attappady Hill Area Development Society
AIBP	- Accelerated Irrigation Benefit Programme
AL	- Agriculture Landscape
AMRUT	- Atal Mission for Rejuvenation and Urban Transformation
AOFFPS	- Area Oriented Fuel wood and Fodder Projects Scheme
APCCF	- Additional Principal Chief Conservator of Forest
APOs	- Annual Plan of Operations
APT	- <i>Anogeissus latifolia</i> <i>Pterocarpus marsupium</i> <i>Terminalia</i> spp. type
ASTRP	- Association of Scheduled Tribes and Rural Poor in Regeneration of Degraded Forests
ATREE	- Asoka Trust for Research in Ecology and the Environment
ATT	- <i>Anogeissus latifolia</i> <i>Tectona grandis</i> <i>Terminalia</i> spp. type
BAAS	- British Association for the Advancement of Science
BOD	- Biochemical Oxygen Demand
BWSSB	- Bangalore Water Supply & Sewerage Board
C&SRO	- Cauvery & Southern Rivers Organisation
CAG	- Comptroller and Auditor General of India
CAMPA	- Compensatory Afforestation Fund Management and Planning Authority
CAT	- Catchment Area Treatment
CBD	- Convention on Biological Diversity
CBOs	- Community Based Organizations
CC	- Completion Certificates
CCFs	- Chief Conservator of Forests
CDZ	- Cauvery Delta Zone
CEO	- Chief Executive officer
CER	- Chemical Erosion Rate
CFs	- Conservator of Forests
CGWB	- Central Ground Water Board
CNNL	- Cauvery Neeravari Nigam Limited
CPCB	- Central Pollution Control Board
CPIC	- Circle Project Implementation Committee
CRA	- Cauvery River Authority
CrPC	- Criminal Procedure Code
CRZ	- Coastal Regulation Zone
CWC	- Central Water Commission
CWDT	- Cauvery Water Disputes Tribunal
CWMA	- Cauvery Water Management Authority
CWRC	- Cauvery Water Regulation Committee
CWRDM	- Centre for Water Resources Development and Management
CWS	- Coorg Wildlife Society
DAC	- Department of Agriculture and Cooperation
DCF	- Deputy Conservator of Forest
DDP	- Desert Development Programme

DFO	- District Forest Officer
DIC	- District level Implementing Committee
DO	- Demand of Oxygen
DOES	- Department of Economics and Statistics
DoLR	- Department of Land Resources
DPAP	- Drought Prone Area Programme
DPR	- Detailed Project Report
DRDA	- District Rural Development Agencies
DRIP	- Dam Rehabilitation and Improvement Project
DSMIS	- Decision Support and Management Information System
Dy RFO	- Deputy Range Forest Officer
EAPs	- Externally Aided Projects
EAS	- Employment Assurance Scheme
EDCs	- Eco Development Committees
EIA	- Environment Impact Assessment
EMAT	- Environment Management Agency of Tamil Nadu
EMPRI	- Environmental Management and Policy Research
EPA	- Environment Protection Act
ESZ	- Eco Sensitive Zone
FAO	- Food and Agriculture Organization
FC	- Fecal Coliform
FDA	- Forest Development Agency
FDA's	- Forest Development Agencies
FFVs	- Forest Fringe Villages
FL	- Ferruginous Limestone
FMP	- Flood Management Programme
FPC	- Flood Pulse Concept
FRLHT	- Foundation for Revitalisation of Local Health Traditions
FSI	- Forest Survey of India
FZC	- Fish Zone Concept
GAP	- Ganga Action Plan
GCA	- Gross Edited Zone
GEF	- Global Environment Facility
GHG	- Green House Gas
GIAHS	- Globally Important Agricultural Heritage System
GIM	- Green India Mission
GIS	- Geographic Information System
GL	- Gryphaea Limestone
GSi	- Geological Survey of India
HADP	- Hill Area Development Programme
HadRM2	- Hadley Centre Regional Model 2 HC High Court
HEC	- Human Elephant Conflict
HEP	- Hydro Electric Projects HoFF Head of Forest Force IA Implementing Agency
IAEPS	- Integrated Afforestation and Eco Development Projects Scheme
ICFRE	- Indian Council of Forestry Research & Education
ICRISAT	- International Crops Research Institute for the Semi Arid Tropics
IFGTB	- Institute of Forest Genetics and Tree Breeding
ILRs	- Interlinking of Rivers
INC	- Initial National Communication



IPC	- Indian Penal Code
IRBM	- Integrated River Basin Management
IRWD	- Inter State River Water Disputes
ISFR	- India State of Forest Report
IUCN	- International Union for Conservation of Nature
IUDM	- Integrated Urban Development Mission
IVI	- Important Value Index
IWDP	- Integrated Wasteland Development Project
IWMI	- International Water Management Institute
IWMP	- Integrated Watershed Management Programme
IWRM	- Integrated Water Resources Management
JBIC	- Japanese Bank for International Cooperation
JFM	- Joint Forest Management
JFMCs	- Joint Forest Management Committees
JICA	- Japan International Cooperation Agency
JnNURM	- Jawaharlal Nehru National Urban Renewal Mission
JRY	- Jawahar Rojgar Yojana
JSA	- Jal Shakti Abhiyan
JSYS	- Jala Samvardhane Yojana Sangha
KBA's	- Key Biodiversity Areas
KBJNL	- Krishna Bhagya Jala Nigam Limited
KfW	- Kreditanstalt für Wiederaufbau
KIP	- Karapuzha Irrigation Project
KMFT	- Kodagu Model Forest Trust
KNNL	- Karnataka Neeravari Nigam Limited
KRS	- Krishna Raja Sagar
KRSD	- Krishna Raja Sagar Dam
KSPCB	- Karnataka State Pollution Control Board
LAL	- Lower Arenaceous Limestone
IAs	- Implementing Agencies
LFA	- Logical Framework Analysis
LTD	- <i>Lagerstroemia microcarpa</i> <i>Tectona grandis</i> <i>Dillenia pentagyna</i> type
MBL	- Marl Bedded Limestone
MBs	- Measurement Books
MDF	- Moderate Dense Forest
MGNREGS	- Mahatma Gandhi National Rural Employment Guarantee Scheme
ML	- Marl Member
MMDR	- Mines and Minerals Development and Regulation
MNREGS	- Mahatma Gandhi National Rural Employment Guarantee Scheme
MoEFCC	- Ministry of Environment Forest and Climate Change
MoRTH	- Ministry of Road Transport and Highways
MoWR,RD&GR	- Ministry of Water Resources, River Development & Ganga Rejuvenation
MSL	- Mean Sea Level
MSSRF	- M S Swaminathan Research Foundation
NADP	- National Agriculture Development Project
NAEB	- National Afforestation and Eco Development Board
NAP	- National Afforestation Programme
NAPCC	- National Action Plan on Climate Change
NAQUIM	- National Aquifer Management
NBA	- National Biodiversity Authority
NBM	- National Bamboo Mission

NCIWRD	- National Commission for Integrated Water Resources Development
NE	- North East
NGC	- National Green Corps
NGHM	- National Green Highway Mission
NGOs	- Non Government Organizations
NGRBA	- National Ganga River Basin Authority
NGT	- National Green Tribunal
NH	- National Highways
NL	- Natural Landscapes
NM	- Nodal Ministry
NMPB	- National Medicinal Plants Board
NMSA	- National Mission for Sustainable Agriculture
NPCA	- National Plan for Conservation of Aquatic Eco systems
NPP	- National Perspective Plan
NPs	- National Parks
NPSC	- National Project Steering Committee
NRCD	- National River Conservation Directorate
NRCP	- National River Conservation Programme
NRCP/ NLCP	- National River /Lake Conservation Plan
NSS	- National Service Scheme NTFP Non Timber Forest Produce
NWDA	- National Water Development Agency
NWDPA	- National Watershed Development Project for Rainfed Areas
NWM	- National Water Mission
NWMP	- National Water Quality Monitoring Programme
NWP	- National Water Policy
NYKS	- Nehru Yuva Kendra Sangathan
OCPs	- Organo Chlorine Pesticides
OF	- Open Forest
OFWM	- On Farm Water Management
OSG	- Otter Specialist Group
PAs	- Protected Areas
PC	- Project Coordinator
PCCF	- Principal Chief Conservator of Forests
PD	- Project Director PF Project Facilitator
PFU	- Project Facilitation Unit
PMKSY	- Pradhan Mantri Krishi Sinchayee Yojana
PMU	- Project Management Unit
PMUY	- Pradhan Mantri Ujjwala Yojana
PRA	- Participatory Rural Appraisal
PSCs	- Programme Steering Committees
PWD	- Public Works Department
R & D	- Research and Development
RCC	- River Continuum Concept
RPM	- Riverine Productivity Model
RRZ	- River Regulation Zonation
RWH	- Rainwater harvesting
SBB	- State Biodiversity Boards
SDGs	- Sustainable Development Goals
SEB	- State Ecotourism Board
SEIAA	- State Environment Impact Assessment Authority
SER	- Soil Erosion Rate



SFDA	- State Forest Development Agency
SFDs	- State Forest Departments
SHGs	- Self Help Groups
SMAF	- Sub Mission on Agro Forestry
SMC	- Soil and Moisture Conservation
SNC	- Second National Communication
SPD	- State Project Director
SPMU	- State Level Project Management Unit
SPSC	- State Level Programme Steering Committee
SW	- South West
SWaRMA	- State Water Resources Management Agency
SWOT	- Strength Weakness Opportunity and Threat
TC	- Total Coliform
TDS	- Total Dissolved Solids
TER	- Total Erosion Rate
TMI	- Tank Management Institutions
TN IAMWARM	- Tamil Nadu Irrigated Agriculture Modernization and Water Bodies Restoration and Management Project
TNAU	- Tamil Nadu Agricultural University
TNUDP	- Tamil Nadu Urban Development Project
TOFs	- Trees Outside Forests
TSM	- Total Suspended Matter
TSS	- Total Suspended Solids
TWAD	- Tamil Nadu Water Supply and Drainage
UAL	- Upper Arenaceous Limestone
UC	- Utilization Certificate
UIDSSMT	- Urban Infrastructure Development Scheme for Small and Medium Towns
UKP	- Upper Krishna Project
UL	- Urban Landscapes
UNDP	- United Nations Development programme
UNESCO	- United Nations Educational, Scientific and Cultural Organization
UPSCAPE	- Upscaling Catchment Processes for Sustainable Water Management in Peninsular India
USAID	- United State Agency for International Development
UTs	- Union Territories
VDF	- Very dense forest
VFC	- Village Forest Committee
VFDC	- Village Forest Development Committee
VFDS	- Village Forest Development Society
VSS	- Vana Samrakshana Samithi
WCMC	- World Conservation Monitoring Centre
WGDP	- Western Ghat Development Programme
WLS	- Wild Life Sanctuaries
WPA	- Wildlife Protection Act
WQI	- Water Quality Index
WRD	- Water Resources Department
WRIS	- Water Resources Information System
WUAs	- Water Users Associations
βHCH	- Beta Hexa Chlorocyclo Hexane

UNIT ABBREVIATIONS

@	- At the rate of
$\mu\text{g L}$	- Microgram per litre
$\mu\text{g kg}$	- Microgram per kilogram
>	- Greater than
<	- Lesser than
$\geq$	- Greater than (or) Equal to
$\leq$	- Lesser than (or) Equal to
%	- Percentage
°	- Degree
'	- Minutes
BCM	- Billion Cubic Meter
Cu. Km	- Cubic Kilometer
Cm	- Centimeter
Cr.	- Crore
Cft	- Cubic feet
ETM	- Enhanced Thematic Mapper
g	- Gram
ha	- Hectare
Km	- Kilometer
Km^2	- Square Kilometer
Km^3	- Cubic Kilometer
Kg	- Kilogram
L	- Litre
MBGL	- Meters Below Ground Level
Mcum (MCM)	- Million cubic meter
Mg	- Milligram
M	- Meter
M	- Million
MT	- Metric Tons
MTC	- Metric Ton per capita
$\text{MTC ha}^{-1}\text{yr}^{-1}$	- Metric Ton Carbon per Hectare per year
$\text{MT/ha (MT ha}^{-1})$	- Metric Ton per Hectare
Mmt/yr	- Million metric Ton per year
Mm^3	- Cubic Mega meter
M/ha	- Million per Hectare
No.	- Number
Pits/ha	- Pits per Hectare
Qtl/ha	- Quintal per Hectare
Rs.	- Rupees
Sq. Km	- Square kilometer
t/ha/year	- Tons per Hectare per year
$\text{tc ha}^{-1}\text{yr}^{-1}$	- Tonnes Carbon per Hectare per year
tc/ha/yr	- Tonnes Carbon per Hectare per year
TM	- Thematic Mapper
TMC	- Thousand Million Cubic Feet
t/yr	- Tonne per year
Yr.	- Year
Yrs.	- Years

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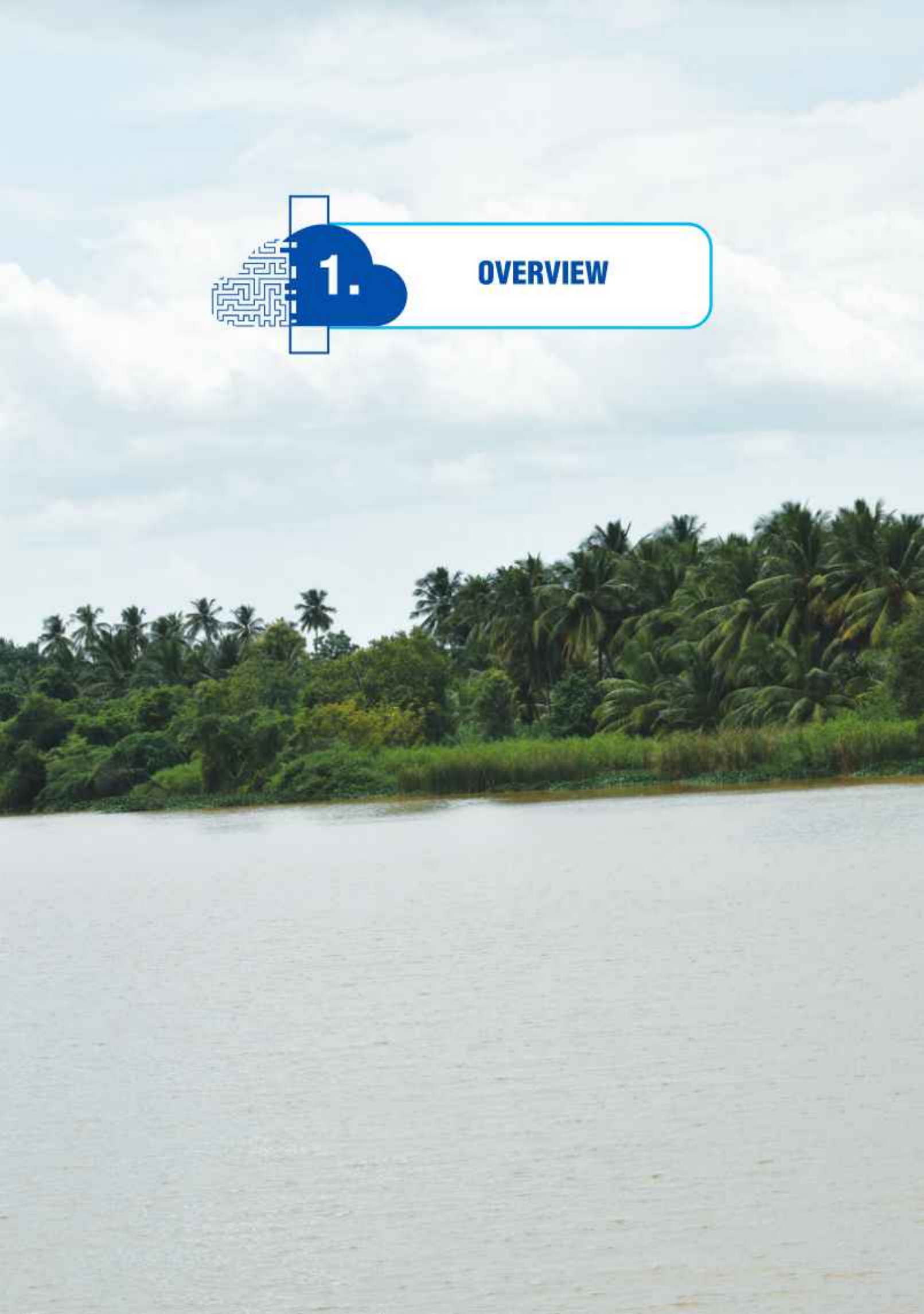


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OVERVIEW

RIVER ECOSYSTEMS - HUMAN WELL-BEING, MULTIPLE VALUES AND DISTURBANCE

Rivers are the most fascinating, complex and dynamic ecosystems connecting the catchments in the land with sea. While it flows, rivers drain nearly 75% of the earth's land surface, enrich the flood plains with nutrients and serve as habitat for multitude of organisms all along. Rivers are the core of civilization and since time immemorial they have greatly influenced human life. Most economic activities are woven around a river and rivers are the most managed natural resource in any part of the world. Rivers are the arteries of natural ecosystems and a key to its sustainable future is good water governance. It is therefore essential to secure a river ecosystem for the sustained well-being of the entire basin.

Today, due to several rapidly-growing human activities, almost all of the earth's rivers are impacted. The major anthropogenic threats to rivers include over-exploitation, disruption of flow, degradation of ecosystems and vulnerability to climate change. As a result, today very few of the world's large rivers retain their original functional and ecological integrity.

Unlike other ecosystems, rivers are dynamic networks of channels and floodplains, connected and disconnected through the action of flow. The existing pattern of flow and the processes that operate in rivers are unique and so unique management intervention models are required to effectively conserve and manage the landscape. Such management interventions are vital to maintain healthy ecosystem and should be considered to deliver multiple benefits to society and to overcome the ecosystem pressures.

The role of forests in the hydrological cycle, influencing water availability and quality, as well as reducing the risk of water related hazards such as landslides, local floods and droughts has been well understood. The interdependence of trees and water is even more visible in forests and tree covered landscapes that have adapted to specific soil and water conditions, and depend on particular water regimes to survive. A healthy forest alongside river deliver tremendous economic, ecological and other benefits like protection of drinking water quality, removal of excess nitrogen, phosphorus and other substances that can pollute water bodies, stabilization of stream banks and minimizing erosion, decreasing the frequency and intensity of flooding and low stream flows, preventing sedimentation of waterways, regulating water temperatures and preventing elevated temperatures harmful to aquatic life, providing food and habitat for wildlife of the land, water and air and allowing wildlife movement within natural corridors, and replenishing groundwater and protecting associated wetlands. The riverine forest through the interaction of their soils, hydrology and biotic communities serve many important physical, biological, and ecological functions.

Improving habitat heterogeneity through forestry interventions will promote biodiversity which will augment natural physical processes, features and physical habitats of a river system. The most essential components of restoration programme include controlling run-off and improving water recharge, improving riparian vegetation and habitat. Watershed restoration should be an integral part of the conservation programme to aid recovery of habitat and water quality. This includes managing catchments, restoring a more natural river course, floodplain reconnection and wetland creation, instream enhancement and removing or passing barriers. 'Forestry interventions' on a scientific basis are pertinent for river conservation, specifically river rejuvenation and overall ecological integrity of river ecosystems.



RIVER MANAGEMENT - INTEGRATED RIVERSCAPE APPROACH AND REJUVENATION

Rivers have been managed since time immemorial for various economic values in an isolated manner without involvement of multiple stakeholders which constrained the development of new scientifically based comprehensive approaches for river management. Only in recent decades hydrological, geomorphological and biological researches have been integrated to establish a new understanding for the dynamic river systems. Rivers being an open ecosystem, the recent approaches emphasize managing the riverine landscape or 'riverscape' for comprehensive river management.

The pre-requisite for successful river management and restoration is accounting for natural differences in flow variability and understanding the importance of such differences for the protection of river biodiversity and maintenance of goods and services. As the river flows, longitudinal changes in its character from the river source to its mouth, vertical interactions (river bed/aquifer) and lateral exchange processes across the floodplains play a major role in river landscapes. The riverscape approach integrates rivers with their surrounding landscape and seeks an insight through inter-disciplinary researches at all stages of the planning, implementation and evaluation process. In contrast to specific species focused management and evaluation, the current emphasis is on ecosystem management which focuses on key processes that enable river-floodplain systems to maintain, repair and regenerate themselves to a certain state.

THE CAUVERY RIVER- CONSERVATION SIGNIFICANCE

In India, the Land of Rivers, 329 million hectare of India's land area is occupied by several major and minor rivers. They are the freshwater resources that fulfil the water demands for agriculture, domestic and industrial purposes. The Cauvery River is of immense socio-economic, ecological, cultural and religious significance in peninsular India. It represents three bio-geographic regions namely the Western Ghats, the Deccan Peninsula and the Coastal including the deltaic regions. The Cauvery river basin is one of the twelve major basins in India (Figure 1). The basin occupies 2.7 percent of the total geographical area of the country. The river has its origin in the Brahmagiri hills in the Western Ghats and flows through the Delta into the Bay of Bengal. Referred to as the "Ganges of the South" in various literatures, the river is the lifeline for the states of Karnataka and Tamil Nadu, with its presence in Kerala and Karaikkal, meandering 805 km.

The basin has 132 watersheds with a total renewable surface water potential of 21.4 cu km. The potentially utilisable water in the basin is about 27.8 cu km. The basin spreads over thirty three constituencies, comprising 11 in Karnataka, 3 in Kerala, 18 in Tamil Nadu and one of Puducherry having a total population of 3,18,89,280. The basin supports an average density of approximately 478 persons per sq km of whom about 70 percent are rural. In Karnataka, rural population comprises 60 percent whereas in Kerala the population is completely rural. In Tamil Nadu part of the basin, around 75 percent of the population lives in rural areas. Total number of villages in the entire basin is around 17356. There are about 29 major and medium irrigation projects in Karnataka and 25 major and medium irrigation projects in Tamil Nadu. There are 15 major hydroelectric projects with 24 power houses available in the basin. The hydropower potential of the basin has been assessed as 1359 MW at 60 percent load factor. Grand Anicut built by King Karikala Chola (2nd Century CE) is the oldest water diversion or water-regulator structures in the world and the oldest in India which is still in use. Asia's first hydroelectric dam was built across the Cauvery at Shivasamudra, Karnataka.

Cultivable area in the basin is about 5.8 Million ha, which is 3 percent of the total cultivable area of the country. About 70 percent of the basin is under agriculture. The basin mainly consists of three crop seasons such as Rabi, summer and Kharif. Paddy, bajra, jowar, rice, ragi, cotton, millets etc., are grown in Kharif. Paddy is the primary crop, while ragi, jowar and other millet are also extensively cultivated depending on rainfall. Cocoa, betel, cinnamon, grapes and lemon are grown throughout the year as horticultural crops. Sandalwood, bamboo, teak, eucalyptus, blue gum, wattle, Cinnamon, honey are some of the forest products.

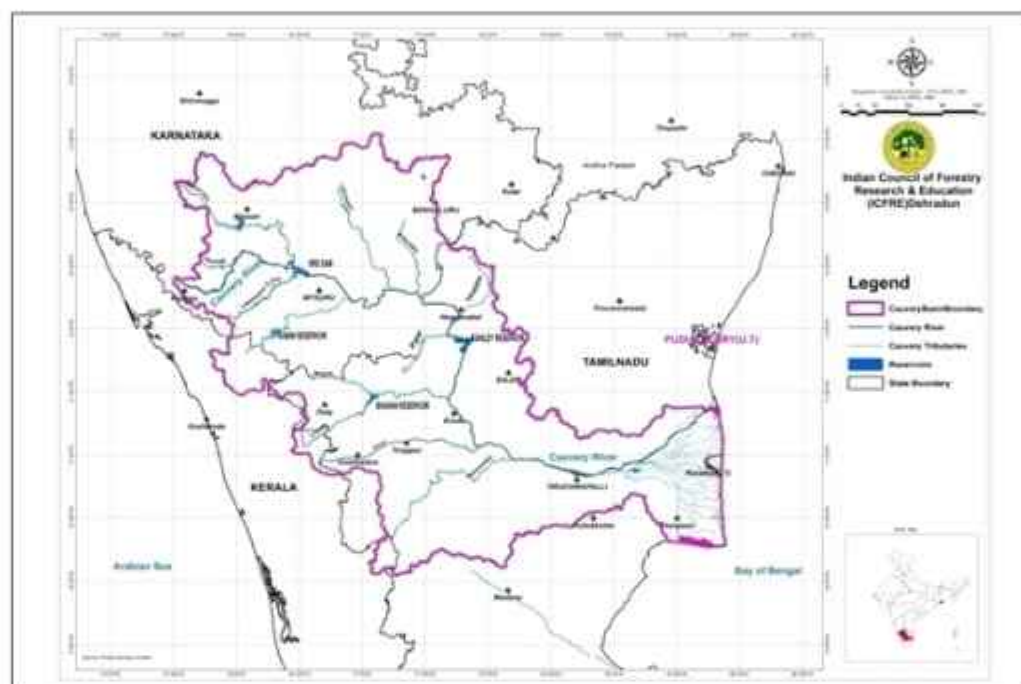


Figure 1: Cauvery river and its tributaries

The Cauvery delta region has been providing 40 percent of agricultural production of Tamil Nadu and 26 percent in Karnataka. Important industries in the basin include cotton textile industries, cement factories, industries based on minerals and metals, sugar mills, paper mills, chemical factories, dyeing and tanning industries. Livestock rearing is another unique feature in the semi-arid areas of the region, supported by traditional practices like 'korangadu', a traditional, sustainable/conservation grazing grassland. Several breeds, particularly in cattle, like *Kangeyam* bull, sheep and goats, like *Mecheri* (Maiylambadi), *Karuvai* (Kilakarsal), are preserved and reared.

The River Cauvery and its tributaries are linked closely to the culture, tradition and history of the States of Karnataka and Tamil Nadu for over 2000 years of recorded history. The river and its tributaries are worshipped as mother, for the river water sustains life for agriculture, the main source of revenue for the farmers. The people of the basin interact with the river through practices of ritualism; the Cauvery has attained a sacred status among farmers who not only worship the river, but also mark the commencement of the monsoon with different festivals. Along the river Cauvery there are a number of ancient temples which are of religious and cultural significance. There are as many as 55 main tourist places including many pilgrim centres, wildlife sanctuaries, waterfalls, hill station, forts and lakes.

THE CAUVERY RIVER - REJUVENATION AND CONSERVATION INITIATIVES

In spite of the religious and cultural significance of the river Cauvery advocating sustainable use and conservation, fragmentation and degradation of the river has continued. The availability and quality of water are strongly influenced by the extent and condition of forests in the upstream and downstream areas. Forestry interventions in headwater areas and all along the river and its tributaries enhance productivity and diversity of the forests. More so, climate change is also likely to alter the role of forests in regulating the water flows and influencing the availability of water resources. These strong linkages between forests and water urgently seek high priority attention. Recognizing that river restoration and rejuvenation is a multi-sectoral, multi-dimensional and multi-stakeholder process, the Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India entrusted the task of preparation of Detailed Project Report (DPR) for rejuvenation of major rivers in the country through forestry interventions to ICFRE.

PREPARATION OF DPR ON FORESTRY INTERVENTIONS FOR CAUVERY

The ICFRE through its regional institutes has identified thirteen (13) rivers (viz. Beas, Chenab, Jhelum, Ravi, Sutlej, Yamuna, Brahmaputra, Mahanadi, Narmada, Krishna, Godavari, Cauvery and Luni) belonging to nine (9) river basins for DPR preparation for their rejuvenation through holistic forestry interventions. This approach has been adopted for Cauvery rejuvenation, which emphasizes appropriate forestry interventions by way of protection, habitat management, biodiversity improvement, forest genetic resources maintenance and restoration, afforestation, catchment treatment - soil and moisture conservation works, ecological restoration of vital riparian forest buffer, improved livelihood of forest dependent communities and forest dwellers and awareness. It is envisaged that such concerted efforts and initiatives of forestry interventions for Cauvery will greatly facilitate the major goals of accomplishing **Sustainable, Clean and Steady flow**. ICFRE entrusted the major task of preparation of '**Detailed Project Report (DPR)**' on **Forestry Interventions for rejuvenation of River Cauvery** to the **Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore** within a time frame of 18 months.

VISION, MISSION, GOALS AND OBJECTIVES OF THE PROJECT

The main aim of the project is to develop a Detailed Project Report (DPR) under the aegis of MoEF&CC through Forestry interventions for Cauvery. The project will primarily aim to identify critical areas and develop suitable interventions in urban, agriculture and natural landscapes along the course of the river. This DPR examines increased income generation alternatives, especially in the catchment areas to reduce degradation. For the success of the programme, all stakeholders will be involved in the project formulation process.

The vision for this document was prepared after extensive reviews of literature, research, in-house discussions and in consultation with stakeholders across the basin and technical experts. It aims at improving the riparian zones of the Cauvery Basin through forestry interventions to ensure a clean and continuous flow of the river.

VISION

Towards a balanced Cauvery ecosystem to sustain ecological goods and services which ensures productivity and support of life-forms in the Basin.

MISSION

A healthy river is a healthy region: to achieve this, there is a need to restore the natural ecosystem of the Cauvery basin. This will ensure long term sustainable ecological, economic and social growth in the region. To accomplish this, we need to:

- Understand riverscape degradation factors to address resilience and stability of the river system.
- Adopt scientifically proven, time tested technologies for the wellbeing of all life-forms in the Cauvery basin.
- Forge people and eco-centric alliances and partnerships for the ecological, social and economic security.

GOALS

In conformity with the global, national, regional and local aspirations and expectations, the following goals are adopted:

1. Ensure rejuvenation of the Cauvery river system through innovative approaches thereby ensuring sustainable watersheds.
2. Address the stressors of the river ecosystem and accrue benefits from conservation for the sustenance and wellbeing of its inhabitants.
3. Infuse the available and prevalent knowledge systems of the people for the benefit of establishing a healthy ecosystem.
4. Harness the capacity of the river system for clean, clear and continuous flow of water.

OBJECTIVES

In order to accomplish the vision, mission and goals, the following objectives have been identified:

1. To introduce sustainable forestry and hydrological principles and management practices to ensure continuous flow of water.
2. To maintain the vegetation dynamics of the river for sustainable development of the basin.
3. To encourage adoptable and appropriate anthropogenic activities for ensuring the river basin productivity.
4. To involve the stakeholders in planning restoration activities in the basin for the overall health of the basin.

THE APPROACH

Varied expertise, rich experience, vast knowledge and advanced technologies available with IFGTB and various organisations within the States where River Cauvery flows, were optimally utilized for developing the framework, strategies and activities for the present DPR. The DPR preparation exercise envisaged exhaustive stakeholder consultative process, besides multi-pronged approach including spatial analysis and modelling of

delineated riverscape and identification of prioritized sites for forestry interventions (Figure 2).

A. THE CONSULTATIVE PROCESS

The preparatory phase for DPR included review of literature, primary and secondary data collection and analysis, expert consultations and receiving inputs from the wide ranging stakeholders. Accordingly, extensive and exhaustive consultations at the national and State levels were organized. The States of Karnataka, Kerala, Tamil Nadu and Union Territory of Puducherry forming part of the Cauvery riverscape and the respective State Forest Departments were instrumental in facilitating, planning and organization of state level consultations. The entire process of consultative process was facilitated by the IFGTB. Consultation and feedback from various stakeholders have been the key step in the preparation of the present DPR and proposed strategies and actions for its implementation.

B. THE CAUVERY RIVERSCAPE, SPATIAL ANALYSIS, GEOSPATIAL MODELING, AND PRIORITIZATION OF SUITABLE AREAS FOR PROPOSED FORESTRY INTERVENTIONS

Remote sensing and geospatial modelling was used in identification of prioritized and suitable sites for forest plantations to understand not just the river and at its tributaries but also the surrounding lands and expanding land uses. The area identified for assessment, planning, and prescription is hereinafter been referred as the "**Cauvery riverscape**" includes various forested watersheds of River Cauvery and its main tributaries, which contribute significant quantity of water to the river. In non-forested watersheds, areas which are highly prone to soil erosion ($>15\text{t/ha}$) are included in the riverscape. In rest of the areas, 5 km buffer riverscape on either side of River Cauvery and 2 km of buffer riverscape on either side of selected tributaries. The entire delta region of the basin which has a network of distributaries and highly fertile top soil has also been included in the riverscape. The riverscape also included all the areas in the basin which are highly prone to severe soil erosion and forest fire.

Image processing and GIS tools used were ERDAS Imagine 2015 and ArcGIS. Satellite data (Landsat 8, Landsat TM and ETM). They were used for the preparation of bank line map, and Land Use Land Cover map of the riverscape (Table 1 and Figure 3). State and district boundaries for the Cauvery basin were obtained from Survey of India toposheets, while the boundaries of various forest divisions were obtained from the State Forest Departments. Soil data was obtained from the National Bureau of Soil Survey and Land Use Planning, Nagpur. The forest cover map and data on forest fire from Forest Survey of India, Dehradun were used. Topographical sheets of Survey of India, Bhuvan data and Google Earth were also used wherever required for preparation of land use map.

Eighteen major land use land cover types (LULC 2015-16 of NRSC) such as dense forest, open forest, scrub forest, land without scrub, land with scrub, agricultural crop land, agricultural fallow land, horticultural plantation, built-up land, urban, aquaculture, industry mining quarry area, salt pan, water bodies, swamp/wetland and mangrove forest was mapped. GIS was used to generate different layers within the riverscape like land use pattern, soil erosion rates, and slope of the topography. Based on severity of the features, these combinations were then classified into (i) high (ii) medium and (iii) low priority areas. Out of 40998.71 Sq. Km riverscape area, about 32% (12951.9 Sq. Km) has been categorized in high priority area, 24% (9809.6 Sq. Km) falls in medium priority area while

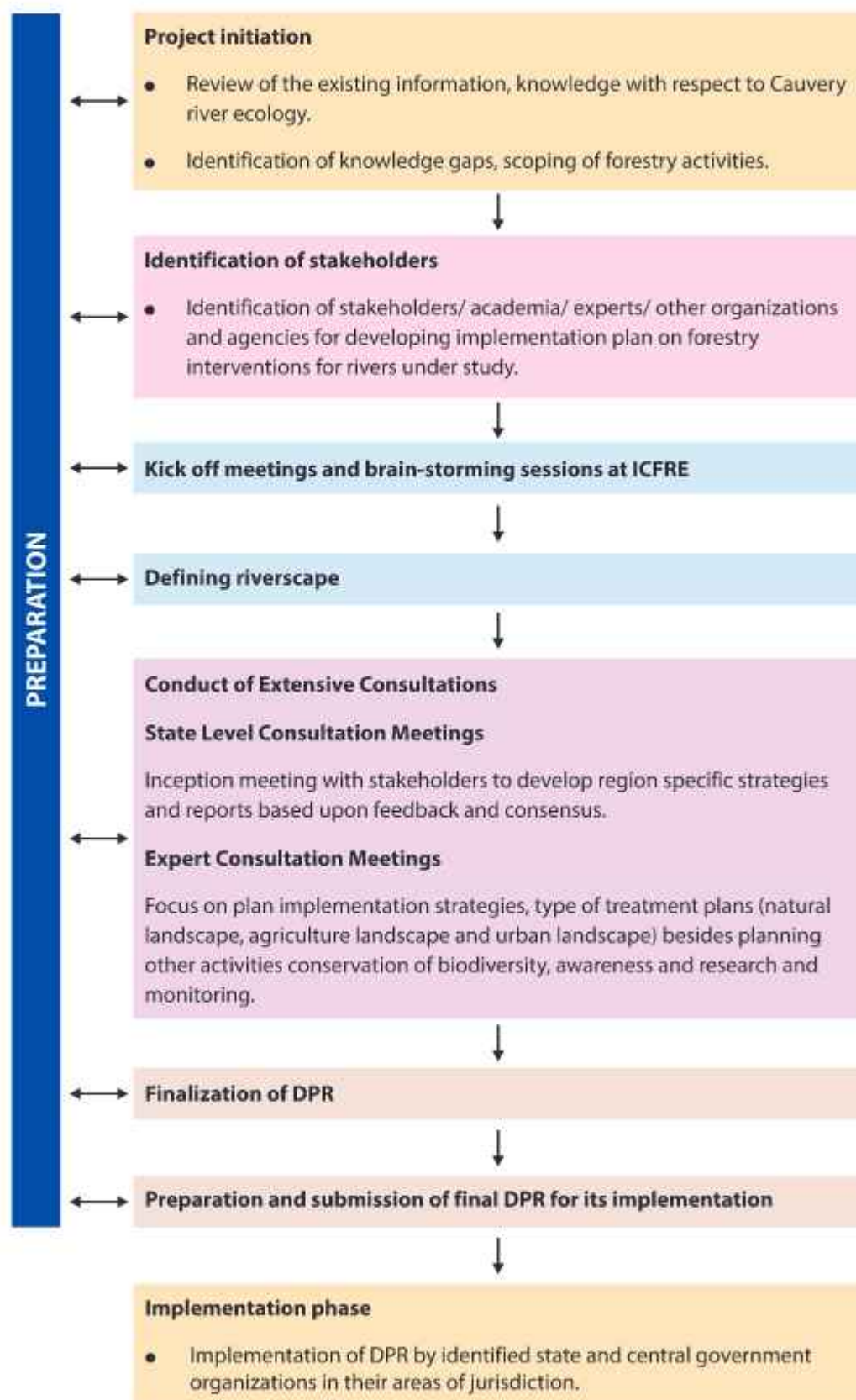


Figure 2: Approach for preparation of DPR for Cauvery River through forestry interventions

the remaining 44% (18237.108 Sq. Km) fall in low priority area (Figure 4). The sites for interventions identified by the field officers of the States were prioritised in the priority map.

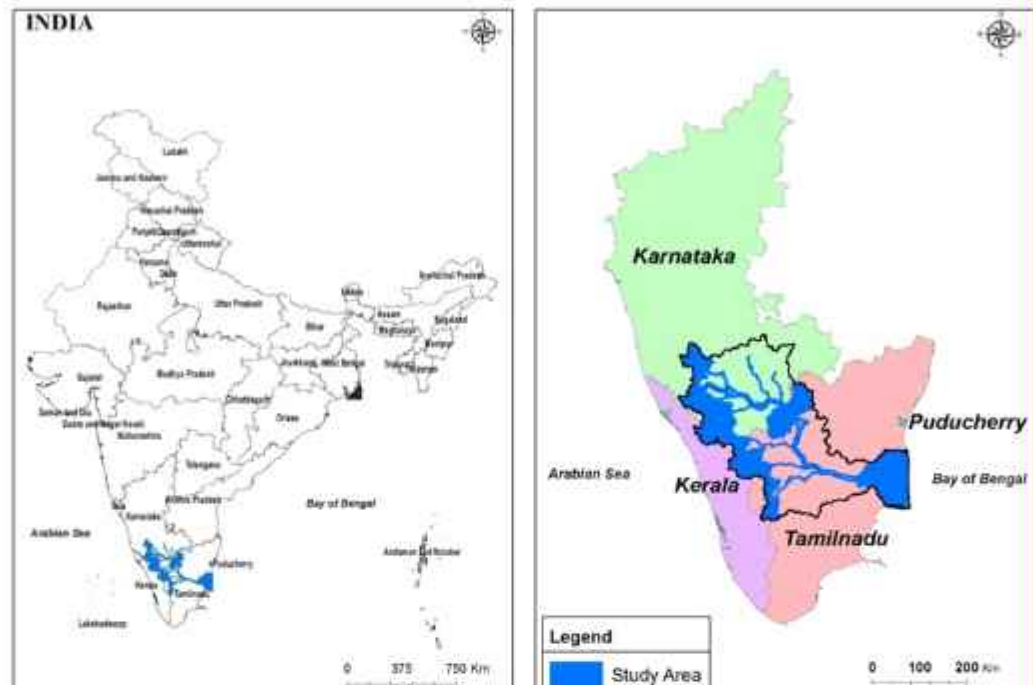


Figure 3: The location of Cauvery riverscape

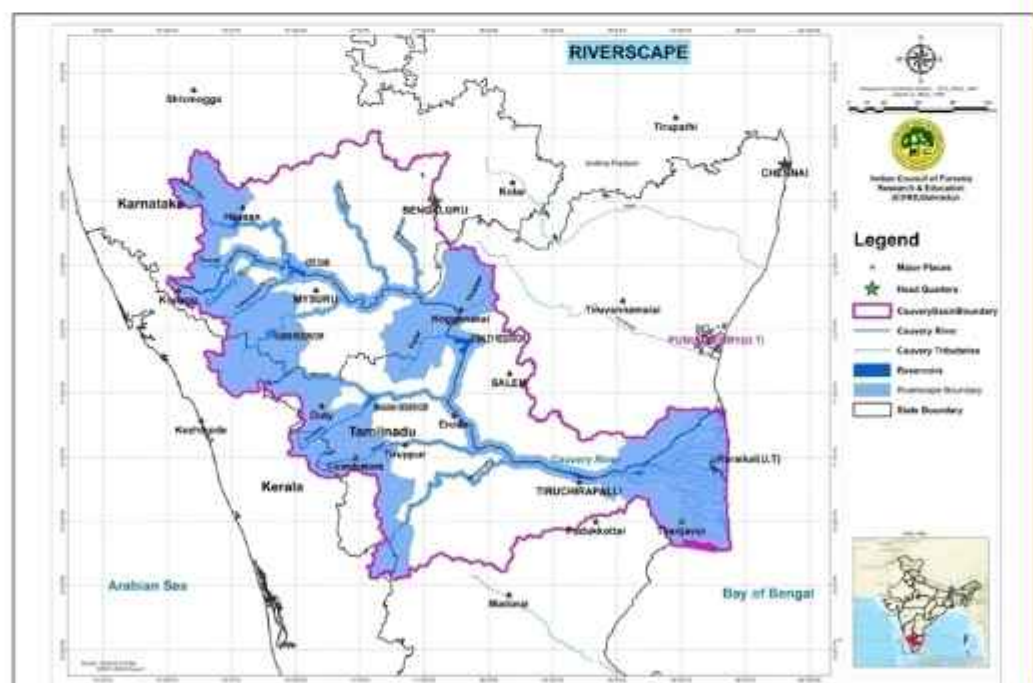


Figure 4: The Cauvery riverscape

Table 1: State wise spatial extent of Cauvery basin and riverscape

S. No.	State/UT	Geographical Area (Sq.km)	Area in riverscape (Sq.km)	Per cent Area in riverscape
1	Tamil Nadu	130461.20	22924.17	55.90
2	Karnataka	193022.30	14637.16	35.70
3	Kerala	38836.70	3245.04	7.90
4	Puducherry (Karaikal)	549.40	192.50	0.50
	Total	362869.60	40998.87	100.00

C. DEVELOPMENT OF PLANTATION AND TREATMENT MODELS

Based on the expertise available at IFGTB, and following consultations with all stakeholders, potential plantation and treatment models were proposed for forestry and other conservation interventions in three major types of landscapes namely (i) Natural (ii) Agriculture and (iii) Urban Landscapes. Suggested models varied for the hilly, plain and delta regions. The rationale behind the recommendation of different models in the natural landscapes is protection, eco-restoration and conservation of the area taking into consideration the biodiversity of the area also. The models were discussed in detail with the State Forest Department officials for selection and to recommend appropriate modifications, if necessary, based on local knowledge, expertise, and experience. In all, 16 different models relevant to natural landscapes were suggested. In case of extensive agriculture landscape, 5 models were suggested. Likewise, considering extensive urban landscapes all along the river, 4 different models focusing on: (i) riverfront development (ii) eco-park development (iii) institutional and industrial State plantations and (iv) avenue plantations were proposed.

The proposed models can be broadly categorized into 34; natural landscape – 16 models, agricultural landscape – 5 models, urban landscape - 4 models and conservation interventions - 9 models (Table 2).

Table 2: List of Forestry Intervention Models

Landscape/Activity	Name of the model
Natural	1 Artificial Regeneration of Degraded Forest (1000)
	2 Artificial Regeneration of Degraded Forest (800)
	3 Assisted Natural Regeneration (200)
	4 Assisted Natural Regeneration (400)
	5 Bamboo/Rattan/Canes
	6 Coastal shelterbelt
	7 Eco Restoration
	8 Forest Fire Control
	9 Habitat improvement of protected areast of protected areas
	10 Mangrove Plantation (Seedling Origin)
	11 Medicinal Plants and NTFP
	12 Rehabilitation of Weed Infested Forest

Landscape/Activity	Name of the model
	13 River side Plantation
	14 Sandalwood Conservation
	15 Shola and Grassland Restoration
	16 Teak and Other Valuable Timber Plantation
Agricultural	1 Agroforestry Block Plantation
	2 Agroforestry Bund Planting
	3 Agroforestry Silvi - Horti Plantation
	4 Canal Plantation
	5 Seedling Distribution
Urban	1 Nagar Van - Avenue/Roadside Plantation
	2 Nagar Van - Ecopark
	3 Nagar Van - Institutional Plantation
	4 Nagar Van - Riverfront Development
Conservation Interventions	1 Continuous Contour Trenches
	2 Contour Bunds
	3 Gabion Structures
	4 Loose Boulder Check Dams
	5 Masonry Checkdam
	6 Percolation Tank
	7 Staggered Contour Trenches
	8 Riparian Corridor
	9 Wetland Conservation

D. DESIGN OF FIELD DATA FORMATS AND SOFTWARE

Formats for field data collection, developed by IFGTB in English and vernacular language were sent to Karnataka, Kerala, Tamil Nadu and Puducherry (Karaikal) for collection of actual field information for the proposed forestry interventions, conservation initiatives and supporting activities. The details collected using the field format included the following:

1. Details of landscape and site.
2. Geographical details of forest division / village.
3. Baseline data on current status of flora and fauna , current land use, legal status of land, geology and soil type, slope and aspect, average annual rainfall, special features of the site etc.
4. Suggestive species for plantation.
5. Details of SMC works like contour bunds, contour trenches, check dams, gabion structure if required before planting.

6. Planting cost and maintenance including nursery cost.
7. GPS co-ordinates of the site at all the corners.
8. Past and present river basin management initiatives.
9. Supporting activities like Awareness, Research, Capacity building - trainings to communities, staffs, seminar, workshops and exposure visits inside/outside state, Monitoring and evaluation - participatory monitoring.

From Kerala, 648 data formats, 1146 from Karnataka, 949 from Tamil Nadu and 8 from Puducherry (Karaikal) were received for different interventions. Of these formats received from the States, 32 percent proposed interventions in natural landscape and 39 percent for agricultural landscape. The remaining 8 percent suggested interventions for urban landscape and 21 percent for conservation interventions. In order to effectively collate, analyse, synthesize, interpret and retrieval of desired summary information, Microsoft Excel and Access was used. Using these softwares, reports in the desired formats e.g. State wise, district wise, division wise, model wise, activity wise and annual consolidated reports were generated.

E. SECONDARY INFORMATION, COLLATION AND SYNTHESIS

Information on the physical, biological and social environment of the Cauvery river basin and the riverscape widely available in existing literature were consulted. The demographic information in the context of riverscape was downloaded from www.censusindia.gov.in. The information collected from the secondary sources formed the basis of understanding about the river basin. The concerns in the basin that affected the quality, quantity and flow of water in the river, SWOT analysis of the basin, Logical framework analysis to arrive at the vision, mission goals and objectives for the DPR were formulated from the above understanding.

ORGANIZATION OF DPR

The present DPR is prepared in two volumes. Volume I is the main DPR while the Volume II contains summaries of the three States and one Union Territory located in the Cauvery Basin. Volume-I has eight chapters dealing with the existing situation of the Cauvery riverscape. The first chapter of the DPR introduces the reader to the complexity and dynamic nature of rivers and its linkages with forests, other lands, and human well-beings, past and present river management, concepts and approaches of river management. It also touches upon the present task on forestry interventions, logical framework, and the organization of the DPR. The second chapter describes the riverscape, the scientific basis of defining the riverscape, the assessment area for the DPR and the approaches adopted. The third chapter provides detailed information on the Cauvery River basin, the physical, biological and socio-economic environment. This chapter describes the diverse forests, grasslands, wetlands, and associated threatened species in addition to climatic variables observed in the region. The fourth chapter deals with information on various Central and State government level agencies and organizations that are directly involved in policy and decision making, overseeing and implementation of various activities relevant to water resources, environment, forest management, biodiversity conservation, river management. This chapter critically examines existing policies, conventions, treaties and laws pertaining to the theme of the DPR, identifies gaps, imperatives and future needs from the perspective of various users and those who are responsible (either influence or



impact) for the management of water resources. The chapter also provides an insight into various civil society organizations that are or can undertake activities relevant to forestry interventions or assist and facilitate in various supporting activities. The fifth chapter describes the goals and objectives of forestry interventions and the adopted strategies for implementation. Chapter 6 is the soul of the DPR, which provides insights into the various arrangements and mechanisms for implementation of the DPR besides addressing aspects of sustainability. Chapter 7 provides details on the overall project budget, cost tables and the schedule of operations. Chapter 8 details on the tangible and intangible influences the DPR is expected to deliver. References are provided at the end. Volume II incorporates details of State summaries of the States located in the Cauvery Basin that have been included for implementation during the Phase - I.

CAUVERY - THE DEVELOPMENT PROGRAMMES, CONSERVATION, ISSUES AND IMPLICATION

Various initiatives and efforts by the Central, State governments, Panchayats and local communities for management of river, protection and conservation of forests and wildlife, development of industries, agriculture, fishery, animal husbandry etc., are in place. Some of the initiatives addressing the management of river include Catchment Area Treatment Plans, quality assessment of surface and ground water in entire Cauvery river basin by the Central Water Commission, State Action Plans on Climate Change, Central Pollution Control Board reports on river stretches for restoration of water quality, status of riparian vegetation in selected areas along Cauvery River, Project on sub-basin of Cauvery basin by Public Works and Water Resources Departments, National Wetland Conservation and Management Programme of the Ministry of Environment & Forests, livelihood of fishing communities in Pichavaram and Muthupet, Upscaling Catchment Processes for Sustainable Water Management in Peninsular India (UPSCAPE) in two tributaries of Cauvery namely Arkavathy and Kabini. Despite this, the biotic pressures continue to mount, resulting in degradation of catchments including forest and wildlife habitat. There are no holistic programmes on improving forest cover and forestry interventions aimed at augmenting water and its quality for the Cauvery basin, though many studies in the basin have recommended taking up ecosystem based initiatives.

LEGISLATIONS AND POLICIES IN CONTEXT OF CAUVERY RIVER

Various legal and policy foundations relevant to the river ecosystem and conservation in the country and also pertaining to Cauvery have been elaborated in the DPR.

The various legislative, policy and institutional context referred in the DPR are management of water and water laws in India, the Constitution of India and national water policies. The river conservation initiatives at the national level like activities under national river/lake conservation plan, River Regulation Zonation (RRZ), the inter-state river water disputes resolutions, the Inter-State River Water Disputes Act, 1956, the Cauvery Water Disputes Tribunal (CWDT), the Cauvery River Authority, Cauvery Water Management Authority (CWMA) and Inter-State River Water Disputes (Amendment) Bill 2019 have been consulted. Legal framework that deals with water resources management like Forest and Wildlife, Environmental legislation relating to water pollution in India and institutions and implementing agencies like Central and State Governments, the MoEF&CC and ICFRE/IFGTB, the civil society and NGOs of Karnataka, Kerala, Tamil Nadu, Puducherry (Karaikal) etc., have also been referred.

RESEARCH, MONITORING AND KNOWLEDGE MANAGEMENT CENTER

Research and monitoring activities are vital to develop the information base, setting goals and objectives and evolving strategies besides facilitating policy and decision making. The subject of river ecology and management is multi-faceted, intricate and elaborate. A large number of organizations in the country responsible for different aspects of river ecology (e.g. glaciology, hydrology, forestry, wildlife, demography, sociology, development, economics etc.) are working in isolation and as per the entrusted mandate of each sector. There is an urgent felt need to improve, strengthen, augment and institutionalize efforts in a more meaningful and effective manner. The relevance and importance of research and monitoring in the context of the river ecosystem and conservation in country like India and need for setting up a Knowledge Management Center, therefore, has been emphasized. Accordingly, the present DPR appropriately accentuates for inter-disciplinary and long-term researches as well as an effective way for an integrated monitoring system.

DPR - VISION, GOAL, OBJECTIVES, COMPONENTS, ACTIVITIES AND LOGICAL FRAMEWORK

The vision for this document was prepared after extensive reviews of literature, research, in-house discussions and in consultation with stakeholders across the basin and technical experts. It aims at improving the riparian zones of the Cauvery Basin through forestry interventions to ensure a clean and continuous flow of the river. Four objectives of project implementation aim to:

- (i) Introduce sustainable forestry and hydrological principles and management practices to ensure continuous flow of water.
- (ii) Maintain the vegetation dynamics of the river for sustainable development of the basin.
- (iii) Encourage adoptable and appropriate anthropogenic activities for ensuring the riverscape productivity.
- (iv) Involve the stakeholders in planning restoration activities in the basin for the overall health of the basin.

The Logical Framework Analysis (LFA) approach was adopted for the preparation of present DPR. Various problems in management of river Cauvery and its tributaries have been summarized through a SWOT analysis. Problems in achieving project objectives are:

- (a) Enhanced landslides, soil / river bank erosion, and high rate of sedimentation.
- (b) Extreme climatic conditions.
- (c) Traditional resource dependence, enhanced biotic pressure, unsustainable harvest practices, poverty, and vulnerable communities.
- (d) Faulty land use, intensification of agriculture, and enhanced use of pesticides and insecticides.
- (e) Encroachment of forest lands.
- (f) Habitat loss, fragmentation of terrestrial and aquatic ecosystems including rivers and streams, and their degradation.



- (g) Decline of biodiversity values, barriers and curtailments in migration of aquatic species, reduced distribution range and abundance of rare and threatened species.
- (h) Proliferation of exotic and invasive species, and lack of regeneration of native species.
- (i) Lack of awareness.
- (j) Enhanced tourism related activities and their impact on natural ecosystems.
- (k) Piecemeal approach to environmental impact assessment of sequential/ multiple development projects and inadequate cumulative assessments.
- (l) Multiplicity of policies and laws, occasional conflicting/ counter-productive, and lackadaisical law enforcement.
- (m) Inadequate research, monitoring, database, baseline information, lack of technological support and innovations and lack of capacity.
- (n) Isolationist approaches of different production sectors/ agencies and inadequate funds.

STRATEGIES

This project report aims to address the objectives in a phased manner and visualize specific outputs and outcomes. Strategies are formulated for three major programmes i.e.

- (i) Forestry interventions for sustainable land and ecosystem management.
- (ii) Biodiversity conservation.
- (iii) Improved livelihood.

In order to accomplish these three major programmes of forestry interventions with enhanced capacity, and prominent allied activities such as awareness, research, monitoring and evaluation are also visualized. For assessing ongoing forestry activities of different States engaged in the river management programmes, various working plans, reports and research papers were referred. Along with this, discussions with officers of State Forest Departments were carried out. For assessing potential and possibilities for regeneration, improvement and restoration of forest catchments, field information were obtained from all the four State Forest Departments and accordingly different models for forestry intervention were synthesized for overall rejuvenation of the River Cauvery. The proposed models can be broadly categorized into 34; natural landscape - 16 models, agricultural landscape - 5 models, urban landscape - 4 models and conservation interventions - 9 models. The intervention models applicable from the above categories for each State have been described and indicated separately. Each treatment plan includes the site characteristics, potential/ recommended species for raising plantation; specific activities involved, identified sites/forest divisions and cost norms on unit area basis. For allied income generation activities, various workable and successful models that could be potentially adopted were identified after consulting agriculture and line departments, State Agricultural Universities, universities, and research institutions. Efforts were also made to review various models published in scientific journals. While considering these models, emphasis was also on restoration and conservation of species and suitable sites.

In addition to forestry interventions and specific treatment models, supporting activities common to the riverscape have been proposed. They are grouped under (a) policy interventions (b) concurrent action research (c) capacity building (d) awareness (e) participatory monitoring and (g) evaluation. These activities have been planned at the State and local field levels. Various supporting activities will also be simultaneously carried out at the national level by the national partner level organization. Additionally, some of the supporting activities will be undertaken by the Central nodal ministry.

PROJECT IMPLEMENTATION - THE COMPONENTS, PARTNERSHIP ARRANGEMENTS AND MANAGEMENT

COMPONENT - A: IMPLEMENTATION OF FORESTRY INTERVENTIONS IN THE THREE STATES AND UNION TERRITORY OF CAUVERY RIVERSCAPE

Component - A mainly includes:

- (i) Forestry interventions in
 - (a) Natural Landscapes (NL)
 - (b) Agriculture Landscape (AL)
 - (c) Urban Landscapes (UL)
- (ii) Conservation Intervention
- (iii) Supporting Activities

The State Forest Departments (SFDs) of three States and Union Territory will be the primary Implementing Agencies (IAs) for this component. The institutional framework of the SFDs is the most appropriate for implementation of the proposed forestry interventions for clean Cauvery, as it provides for greater options for scientific interventions. The SFDs through its scientific, administrative and technical skills, have developed competencies to implement this programme through a new approach – the riverscape. Earlier experiences of watershed treatments will be appropriately fitted into the riverscape approach for sustainability of Cauvery River Ecosystem. Alongside the three States and Union Territory level IAs (SFDs), well known and established Civil Society Organizations are also likely the prominent partners in implementation of specific activities as planned in the DPR.

COMPONENT - B: STRENGTHENING KNOWLEDGE MANAGEMENT AND NATIONAL CAPACITY FOR FORESTRY INTERVENTIONS AND CONSERVATION OF RIVERSCAPE

This component aims to insert science into policy, planning, and management for informed decision making. ICFRE with its long standing experience of handling ecosystems have ventured to undertake this task of preparing the DPR for rejuvenation of rivers. IFGTB, Coimbatore, an institute under ICFRE umbrella has been given the task of preparation of the DPR for the river Cauvery. This DPR, a product of deliberations of wide stakeholders and exhaustive consultations has pooled in the best strategies for rejuvenation of the river in a holistic manner over a period of ten years. IFGTB will facilitate monitoring and evaluation, carry out concurrent research-related activities of the Project and at the same time play a vital role in building capacity for forest-river linkages and strengthening Knowledge Management required for conservation of the Cauvery riverscape by providing best available practices for forestry interventions and conservation, besides appropriate inclusion of science in policy, planning, and



management arena. However, this role could also be assigned to any other prominent, reputed national level organization having capacity to deal with riverscapes and related issues. It would be preferable to involve a national level organisation, the river being "Inter-State". The Component B will, therefore, support improved knowledge and capacity building on learning and experience from the three States and Union Territory in promoting riverscape conservation approaches nationwide by appropriate interventions and activities relevant to policy, development of knowledge management centre, training, co-ordination, extension, monitoring and evaluation. In order to accomplish this, the national level organization for knowledge management and capacity building will require establishing a Project Facilitation Unit (PFU).

COMPONENT - C : SCALING UP AND REPLICATION OF SUCCESSFUL MODELS OF FORESTRY INTERVENTIONS AND RIVERSCAPE CONSERVATION IN ADDITIONAL SITES/STATES

The river system, which is 805 km in length, has 21 tributaries. Out of this, the DPR, through a riverscape approach, addresses the main river course and three tributaries covering only 50 percent of the basin. The Component 3, therefore, seeks to incorporate the learnings from this model for the additional sites to be scaled up by selecting all other tributaries of the Cauvery. Planning for scaling up and replication of successful models in additional sites are proposed to be initiated at the end of fifth year of execution of the Implementation Plan.

COMPONENT - D : NATIONAL COORDINATION FOR FORESTRY INTERVENTIONS AND RIVERSCAPE CONSERVATION

Being a first time effort of such magnitude, an appropriate mechanism for national level coordination for forestry interventions and riverscape conservation is vital at the level of Central Nodal Ministry. The management of water resources, river development, and rejuvenation of rivers are priority agendas and to accomplish the full realization of forest-river linkages and better understanding of their intricacies, forestry interventions and new initiatives on riverscape conservation are at the forefront of this ambitious programme.

Component - D visualizes activities for:

- (i) The establishment of Decision Support and Management Information System (DSMIS) on riverscape conservation.
- (ii) Facilitating activities related to policy interventions, riverscape level coordination and monitoring, impact evaluation.
- (iii) Administering the implementation of this pilot Project on forestry interventions and future replication in additional sites.

In order to accomplish this, the Component D visualizes a Project Management Unit (PMU) at the nodal ministry level. The PMU at the nodal ministry will handle the execution of the Plan and co-ordination with implementing agencies at the State level in four States and other national and State level partner organizations.

IMPLEMENTATION, PROJECT OVERSEEING AND FUND FLOW MECHANISM

The project envisages two phases: (i) the Phase I including the Project Development Phase of 18 months (2019-20), a Project Implementation Phase of 5 years and (ii) The next phase

for upscaling and replication in additional sites. The Project Development Phase has been used for preparation of present Detailed Project Report (DPR) initially for 5 years. Subsequently, based on annual monitoring, evaluation, and lessons learned during the implementation of the Phase I, efforts to upscale and replicate in additional sites for the next 5 years will be made before the completion of fifth year for further execution of next phase of project implementation. The Project visualizes setting of two Programme Steering Committees (PSCs), one at the national level in the Central Nodal Ministry i.e. National Programme Steering Committee (NPSC), and other at the State level in each of the States i.e., State Programme Steering Committee (SPSC). The DPR provides an insight on proposed constitution of NPSC and SPSCs in the States. The NPSC would be responsible for approving the APOs submitted by the States and national level partner organization besides overseeing and steering the execution of the Implementing partners. The funds against the approved APOs of the States will be transferred to the respective SFDs and other implementing agencies on approval by NPSC. The national level PFU will follow its own mechanisms of governance and if required will have its own monitoring and steering committee constituted for overseeing the Project.

PROJECT BUDGET

The predominant **Component-A** on "Implementation of forestry interventions in the states of Kerala, Karnataka, Tamil Nadu and the union territory of Puducherry" accounts for 89.99% of the total Project budget outlay i.e. **Rs.2762.21 crore**. The **Component-B** on "Strengthening knowledge Management and National Capacity for Forestry Interventions and Conservation of riverscape" would require a sum of **Rs.253.20** which is 8.25 % of the total outlay. The component Preparation of DPR (Phase II) - "Scaling Up and Replication of Successful Models of Forestry Interventions and Riverscape Conservation in Additional Sites/States" account for **7 crore** which is 0.23 % of the outlay. **Rs.46.90 crore** has been proposed for "National Coordination for Forestry Interventions and Riverscape Conservation" which is 1.53 % of the outlay (Table 3).

Table 3: Project Budget (Rs. In Crore)

S. No.	Component and / or Activity – wise	Karnataka	Kerala	Tamil Nadu	Puducherry (Karaikal)	Total
A.	Implementation of Forestry Interventions in Three states and one Union Territory of Riverscape					2762.21
A.1	Plantations and Treatment Models in Three Categories of Landscape					
A.1.1	Natural Landscapes	462.25	385.70	615.42	0.00	1463.37
A.1.2	Agriculture Landscapes	185.89	101.91	331.34	0.20	619.34
A.1.3	Urban Landscapes	112.27	68.30	107.88	5.53	293.98
A.2	Conservation Interventions					
A.2.1	Soil and Water Conservation	115.09	5.63	103.3	0.00	224.01
A.2.2	Riparian Wildlife Management	26.32	1.61	0.00	0.00	27.93
A.2.3	Wetland Management (Natural and Artificial)	8.33	0.28	68.43	0.00	77.05

S. No.	Component and / or Activity – wise	Karnataka	Kerala	Tamil Nadu	Puducherry (Karaikal)	Total
A.3	Supporting Activities					
A.3.1	Capacity Building	2.28	0.91	2.57	0.26	6.03
A.3.2	Awareness	2.15	0.74	2.28	0.20	5.36
A.3.3	Research Activities	1.61	0.36	2.52	0.02	4.50
A.3.4	Contingency and Miscellaneous Activities	1.07	0.24	1.68	0.02	3.00
A.3.5	Monitoring and Evaluation	1.54	0.34	2.40	0.02	4.30
A.3.6	Cost of PMUs of Three States and one Union Territory Level Implementing Agencies	14.28	3.03	15.5	0.55	33.35
B.	Strengthening knowledge Management and National Capacity for Forestry Interventions and Conservation of Riverscapes					253.20
C.	Preparation of DPR (next phase) - Scaling Up and Replication of Successful Models of Forestry Interventions and Riverscape Conservation in Additional Sites/States/tributaries					7.00
D.	National Coordination for Forestry Interventions and Riverscape Conservation					46.90
	Total Project Cost (A+B+C+D)	933.06	569.04	1253.32	6.80	3069.31

Sub-component (A.1) on plantations and treatment models in three types of landscape

The total project budget outlay has been categorized into four broad components. Amongst these four components, field level activities by way of implementation of forestry interventions, conservation measures in riverscape and supporting activities in Karnataka, Kerala, Tamil Nadu and the Union Territory of Puducherry along the course of River Cauvery form the major component. This major component of project implementation would have the largest sub-component on plantations and treatment models in three types of landscapes (Natural, Agriculture, and Urban) within the riverscape. Among three landscapes, the highest emphasis is on extensive plantations and adoption of various treatment models in natural landscapes. An amount of Rs. 1463.37 crore has been provisioned for afforestation activities in natural landscapes (Table 4). Thus, budget allocation for natural landscapes alone accounts for 61.57% of the sub-component (A.1) on plantations and treatment models in three types of landscape within riverscape or 47.68% of the overall project budget outlay.

Budget provisions for agriculture landscapes and urban landscapes are to the tune of Rs. 619.34 crore and Rs. 293.98 crore or 26.06 % and 12.37 %, respectively of the sub-component (A.1) on plantations and treatment models. Activities on agriculture landscapes, which is the second most bigger component under the plantation activities mainly focus on tree cultivation along farm bunds, block plantation in farmlands, canal

Table 4: Proposed budget allocation for various plantations and treatment models in three types of landscape

A. Natural Landscape					
State	No of sites	Area (ha)	Cost of Establishment (crore Rs.)	Cost of Maintenance (crore Rs.)	Total Cost (crore Rs.)
Karnataka	104	16098.09	401.27	60.98	462.25
Kerala	377	23791.02	337.48	48.21	385.70
Tamil Nadu	373	67461.57	570.88	44.55	615.42
Total	854	107350.68	1309.63	153.74	1463.37
B. Agriculture Landscape					
State	No of sites	Area (ha)	Cost of Establishment (crore Rs.)	Cost of Maintenance (crore Rs.)	Total Cost (crore Rs.)
Karnataka	757	40724.09	185.17	0.71	185.89
Kerala	120	2778.39	82.41	19.50	101.91
Tamil Nadu	187	27998.32	253.42	77.91	331.34
Puducherry	5	40.00	0.15	0.05	0.20
Total	1069	71540.79	5521.16	98.17	619.34
C. Urban Landscape					
State	No of sites	Area (ha)	Cost of Establishment (crore Rs.)	Cost of Maintenance (crore Rs.)	Total Cost (crore Rs.)
Karnataka	53	591.00	102.05	10.22	112.27
Kerala	66	5831.42	58.39	9.91	68.30
Tamil Nadu	104	1381.55	97.31	10.58	107.88
Karaikal	3	101.00	5.24	0.28	5.53
Total	226	7904.97	262.99	30.99	293.98
Grand Total (A+B+C)	2149	186796.45	2093.77	282.90	2376.69

bank plantations, Silvi-Horti plantations of economic and fruit trees on privately owned farmlands, distribution of seedlings to farmers followed by incentives over four years for maintaining the plants. The project envisages higher outcome for Tree Outside Forests (TOF) in the project area. The activities in the urban landscapes include: (a) institutional/ industrial plantations, (b) riverfront development and ecotourism, (c) development of eco-parks, and (d) avenue plantations.

The second Sub-component (A.2) on 'Conservation Interventions' includes three major types of interventions / activities. These are: (a) soil and water conservation measures, (b) riparian wildlife management, and (c) wetland management. Budget outlay for the second Sub-component (conservation interventions) is Rs. 328.99 crore and this is 11.91% allocation of the funds provisioned for implementation of forestry interventions by the states (Table 5).

Table 5: Proposed budget allocation for various activities under the sub component (A.2) on conservation interventions

States	Number of sites	Area (ha)	Total cost (Rs. In crore)
Karnataka	232	12507.10	149.74
Kerala	53	661.00	7.52
Tamil Nadu	281	110287.20	171.73
Total	566	123455.30	328.99

The third sub-component on proposed forestry interventions to be implemented by three State and one Union Territory implementing agency pertains to supporting activities and this sub-component includes: (a) research, (b) capacity building, (c) awareness, (d) monitoring and evaluation, (e) contingency and miscellaneous activities, and (f) cost of PMUs of the three State level IAs. The overall budget provisions for various supporting activities over 5 - year period would be Rs.56.54 crore or 1.84 % allocation of funds provided to the States (Table 6).

Table 6: Proposed budget allocation for various activities under the sub component (A.3) on supporting activities (Rs. In crore)

State	Capacity Building	Awareness	Research Activities	Contingency and Miscellaneous Activities	Monitoring and Evaluation	Cost of PMUs	Total Cost
Karnataka	2.28	2.15	1.61	1.07	1.54	14.28	22.92
Kerala	0.91	0.74	0.36	0.24	0.34	3.03	5.61
Tamil Nadu	2.57	2.28	2.52	1.68	2.40	15.50	26.95
Puducherry	0.26	0.20	0.02	0.02	0.02	0.55	1.07
Total	6.03	5.36	4.50	3.00	4.30	33.35	56.54

The budget outlay of Rs. 253.20 crore has been made for national level partner organization for implementation of various priority activities towards strengthening knowledge management and enhancement of national capacity for forestry interventions for riverscape conservation. Activity-wise budget allocation for the national level partner organization (IFGTB, Coimbatore/any other organization). It is evident that the highest amount of budget allocation amounting Rs. 65 crore is for the purpose of concurrent research on priority thrust areas for strengthening knowledge management and capacity enhancement for forest-river intricacies and riverscape conservation. Necessary budget provisions for three other prominent activities, viz., (a) policy level interventions, (b) capacity building, and (c) awareness have been made accordingly. Budget of Rs.8.0 crore, Rs.13.0 Crore, and Rs.15.0 crore, respectively are meant for these activities (Table 7).

Table 7: Broad activities and costs for implementation of national level capacity enhancement and strengthening knowledge management by the national level partner organization (in crore)

S. No.	Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total cost
A	Recurring Cost						
A.1	Cost of PMU - Salary and Wages, Equipment, Office Expenses and Management, Travel, Vehicle and POL, Audits, etc.	5.00	4.00	4.00	3.00	3.00	19.00
A.2	Inputs for Policy Level Interventions	2.00	2.00	1.00	1.00	2.00	8.00
A.3	Concurrent Research and Development	10.00	20.00	20.00	10.00	5.00	65.00
A.4	National Capacity Enhancement and Knowledge Management	6.00	2.00	2.00	2.00	1.00	13.00
A.5	Scientific Exchange, Exposure Visits, and Engagement of International and National Consultants	10.00	6.00	6.00	10.00	8.00	40.00
A.6	Inputs for National Level Awareness	6.00	3.00	2.00	2.00	2.00	15.00
A.7	Monitoring - Project, and Ecological and Socio - economic	5.00	7.00	7.00	10.00	8.00	37.00
A.8	Project Evaluation	1.00	1.50	1.00	2.30	2.40	8.20
	Sub Total Recurring Cost (A)	45.00	45.50	43.00	40.30	31.40	205.20
B	Non-Recurring Cost						
B.1	Incorporation of Advance Technology	2.57	2.00	1.90	2.00	2.00	10.47
B.2	Permanent Equipment	2.00	1.00	0.50	0.50	0.50	4.50
	Sub Total Non-Recurring Cost (B)	4.57	3.00	2.40	2.50	2.50	14.97
C	Total (Recurring and Non-Recurring Costs) A+B	49.57	48.50	45.40	42.80	33.90	220.17
D	Institutional Charge @ 15 %	7.44	7.28	6.81	6.42	5.09	33.03
	Grand Total (C+D)	57.01	55.78	52.21	49.22	38.99	253.20

Table 8: Broad Activities and Costs for Project Management by the Central Nodal Ministry (in Crore)

S. No.	Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total Cost
A	Recurring Cost						
A.1	Cost of PMU - Salary and Wages, Equipment, Office Expenses and Management, Travel, Vehicle and POL, Audits, etc	1.50	1.50	1.50	1.50	1.50	7.50
A.2	Inputs for Policy Level Interventions	0.75	0.75	1.00	0.50	0.50	3.50
A.3	National Decision Support and Management Information System	3.00	2.00	2.00	2.00	2.00	11.00
A.4	Scientific Exchange, Exposure Visits, and Engagement of International and National Consultants	1.00	1.50	1.00	1.00	1.00	5.50
A.5	Inputs for National Level Awareness	1.00	1.00	1.00	1.00	1.00	5.00
A.6	Project Monitoring and Evaluation	1.00	1.25	1.25	1.50	1.50	6.50
	Sub Total Recurring Cost (A)	8.25	8.00	7.75	7.50	7.50	39.00
B	Non-Recurring Cost						
B.1	Incorporation of Advance Technology	1.50	1.00	1.00	1.00	1.00	5.50
B.2	Permanent Equipment	1.00	0.50	0.50	0.20	0.20	2.40
	Sub Total Non-Recurring Cost (B)	2.50	1.50	1.50	1.20	1.20	7.90
C	Total (Recurring and Non-Recurring Costs) A+B	10.75	9.50	9.25	8.70	8.70	46.90

The three State level and one Union Territory level implementing agencies (SFDs) in Kerala, Karnataka, Puducherry and Tamil Nadu will implement the programme and activities of the Project at the State and field levels. Accordingly, it can be noted that the highest amount of Rs. 1246.72 crore or 45.33 % of the total budget (Rs. 2750.43 crore) allocation to the State agency is to be provided to the State of Tamil Nadu. The financial allocations for the States of Karnataka, Kerala and Puducherry are to the tune of Rs. 928.86 crore, Rs.568.11 crore, and Rs. 6.74. Crore, respectively. The broad Activities and Costs for Project Management by the Central Nodal Ministry for Rs 46.90 crore is provided in Table 8 and the State-wise budget allocation can be seen in Table 9.

All the budget proposal for different forestry interventions were based on detailed works proposed for each field activity and the manpower, resources required for each activity. The abstract of the proposed cost for different models for the advance works to be executed in the first year, creation in second year and the maintenance for the third, fourth and fifth year are given in Table 10 and the State wise area for each model and the

Table 9: Budget allocation to the states (Rs. In Crore)

State	NL	AL	UL	CI	SA	PMU	Total	%
Karnataka	462.25	185.89	112.27	149.74	4.43	14.28	928.86	33.77
Kerala	385.70	101.91	68.30	7.52	1.65	3.03	568.11	20.66
Tamil Nadu	615.42	331.34	107.88	171.73	4.85	15.50	1246.72	45.33
Puducherry	0.00	0.20	5.53	0.00	0.46	0.55	6.74	0.25
TOTAL	1463.37	619.34	293.98	328.99	11.39	33.35	2750.43	100.00

Note: Natural Landscape (NL), Agriculture Landscape (AL), Urban Landscape (UL), Conservation Intervention (CI), Supporting Activities (SA) (for capacity building and awareness raising) and Project Management Unit (PMU).

Table 10: Proposed cost per model for implementing States (Rs in Lakhs)

Model No.	Name of the model	Advance
Karnataka		
Natural		
CV/KA/NL/02	Eco Restoration	21750.00
CV/KA/NL/03	Assisted Natural Regeneration (400)	66599.00
CV/KA/NL/04	Assisted Natural Regeneration (200)	59745.00
CV/KA/NL/06	Artificial Regeneration of Degraded Forest (1000)	89841.00
CV/KA/NL/07	Sandalwood Conservation	123786.00
CV/KA/NL/08	Rehabilitation of Weed Infested Forest	141278.00
CV/KA/NL/10	Forest Fire Control	32645.00
CV/KA/NL/11	River side Plantation	71410.00
CV/KA/NL/14	Habitat improvement of protected areast of protected areas	146868.00
Agriculture		
CV/KA/AL/05	Seedling Distribution	8000.00
Urban		
CV/KA/UL/01	Nagar Van - Institutional Plantation	317296.00
CV/KA/UL/02	Nagar Van - Avenue/Roadside Plantation	176630.00
CV/KA/UL/03	Nagar Van - Ecopark	9245000.00
CV/KA/UL/04	Nagar Van - Riverfront Development	18545000.00
Conservation Interventions		
CV/KA/CI/01	Continuous Contour Trenches	36414.00
CV/KA/CI/02	Staggered Contour Trenches	22430.00
CV/KA/CI/04	Loose Boulder Check Dams	779744.00
CV/KA/CI/05	Gabion Structures	301011.00

number of plants planted is given in Table 11. The labour cost for the project has been taken on Rs.357/Day for Karnataka, Rs.800/Day for Kerala, Rs. 418.4/Day for Tamil Nadu and Rs. 418.4 /Day for Puducherry.

Creation	Maintenance I st year	Maintenance II nd year	Maintenance III rd year	Total
14495.00	6298.00	3442.00	3442.00	49425.00
23769.00	7809.00	3777.00	3777.00	105731.00
14641.00	5743.00	3727.00	3727.00	87583.00
49084.00	13256.00	3802.00	3802.00	159785.00
23669.00	7809.00	3777.00	3777.00	162818.00
61157.00	13449.00	3670.00	3670.00	223224.00
32550.00	32550.00	32550.00	32550.00	162845.00
34164.00	17950.00	10830.00	10830.00	145184.00
88785.00	51080.00	43360.00	43360.00	373453.00
10000.00	14000.00	16000.00	0.00	48000.00
73986.00	63130.00	63130.00	63130.00	580672.00
53915.00	48130.00	48130.00	48130.00	374935.00
924500.00	924500.00	924500.00	924500.00	12943000.00
1854500.00	1854500.00	1854500.00	1854500.00	25963000.00
1785.00	1785.00	1785.00	1785.00	43554.00
1785.00	1785.00	1785.00	1785.00	29570.00
1785.00	1785.00	1785.00	1785.00	786884.00
1785.00	1785.00	1785.00	1785.00	308151.00

Model No.	Name of the model	Advance
CV/KA/CI/06	Masonry Checkdam	858121.00
CV/KA/CI/07	Percolation Tank	853609.00
CV/KA/CI/08	Riparian Corridor	80333.00
CV/KA/CI/09	Wetland Conservation	928125.00
Supporting activities		
	Exposure trip outside state	
	Local level training for communities	
	Division level training for SFD and line department personnel	
	State level inception workshop	
	State level seminar	
	Exposure trip within state	
	Awareness Campaign	
	Awareness activities for General public	
	Publishing Pamphlets, Brochures, Booklets, Signage, Boards and Hoardings	
	Publicity through mass media	
	Research	
	Contingency	
	M&E	
	PMU	
Kerala		
Natural		
CV/KL/NL/01	Shola and Grassland Restoration	59425.00
CV/KL/NL/02	Eco Restoration	45450.00
CV/KL/NL/03	Assisted Natural Regeneration (400)	144725.00
CV/KL/NL/04	Assisted Natural Regeneration (200)	129937.00
CV/KL/NL/05	Artificial Regeneration of Degraded Forest (800)	181089.00
CV/KL/NL/06	Artificial Regeneration of Degraded Forest (1000)	196678.00
CV/KL/NL/07	Sandalwood Conservation	180205.00
CV/KL/NL/08	Rehabilitation of Weed Infested Forest	310578.00
CV/KL/NL/10	Forest Fire Control	72515.00
CV/KL/NL/11	River side Plantation	154941.00
CV/KL/NL/12	Bamboo/Rattan/Canes	155809.00
CV/KL/NL/14	Habitat improvement of protected area of protected areas	291559.00
CV/KL/NL/15	Medicinal Plants and NTFP	196678.00
Agriculture		
CV/KL/AL/01	Agroforestry Bund Planting	214070.00

Creation	Maintenance I st year	Maintenance II nd year	Maintenance III rd year	Total
1785.00	1785.00	1785.00	1785.00	865261.00
1785.00	1785.00	1785.00	1785.00	860749.00
39376.00	18950.00	11230.00	11230.00	161119.00
1081250.00	284375.00	209375.00	184375.00	2687500.00
				400000.00
				100000.00
				200000.00
				500000.00
				500000.00
				300000.00
				100000.00
				100000.00
				40000.00
				100000.00
				16065000.00
				10710000.00
				15351000.00
				142770000.00
84206.00	43780.00	28200.00	28200.00	243811.00
31240.00	13740.00	7340.00	7340.00	105110.00
48834.00	16828.00	8340.00	8340.00	227067.00
30562.00	12534.00	8290.00	8290.00	189613.00
83310.00	24836.00	8340.00	8340.00	305915.00
100126.00	28960.00	8365.00	8365.00	342494.00
48734.00	16828.00	8340.00	8340.00	262447.00
126686.00	29020.00	8100.00	8100.00	482484.00
72420.00	72420.00	72420.00	72420.00	362195.00
74326.00	40100.00	24120.00	24120.00	317607.00
122290.00	53350.00	31025.00	30920.00	393394.00
196726.00	113100.00	96520.00	96520.00	794425.00
72926.00	28960.00	8340.00	8340.00	315244.00
95720.00	88685.00	88660.00	88660.00	575795.00

Model No.	Name of the model	Advance
CV/KL/AL/02	Agroforestry Block Plantation	237400.00
CV/KL/AL/03	Agroforestry Silvi - Horti Plantation	137370.00
CV/KL/AL/04	Canal Plantation	142560.00
CV/KL/AL/05	Seedling Distribution	8000.00
Urban		
CV/KL/UL/01	Nagar Van - Institutional Plantation	418320.00
CV/KL/UL/02	Nagar Van - Avenue/Roadside Plantation	234220.00
CV/KL/UL/03	Nagar Van - Ecopark	9245000.00
CV/KL/UL/04	Nagar Van - Riverfront Development	18545000.00
Conservation Interventions		
CV/KL/CI/01	Continuous Contour Trenches	81600.00
CV/KL/CI/03	Contour Bunds	110780.00
CV/KL/CI/04	Loose Boulder Check Dams	1478454.00
CV/KL/CI/05	Gabion Structures	310181.00
CV/KL/CI/06	Masonry Checkdam	858121.00
CV/KL/CI/08	Riparian Corridor	160541.00
CV/KL/CI/09	Wetland Conservation	928125.00
Supporting activities		
	Exposure trip outside state	
	Local level training for communities	
	Division level training for SFD and line department personnel	
	State level inception workshop	
	State level seminar	
	Exposure trip within state	
	Awareness Campaign	
	Awareness activities for General public	
	Publishing Pamphlets, Brochures, Booklets, Signages, Boards and Hoardings	
	Publicity through mass media	
	Research	
	Contingency	
	M&E	
	PMU	
Tamil Nadu		
Natural		
CV/TN/NL/01	Shola and Grassland Restoration	37374.00

Creation	Maintenance I st year	Maintenance II nd year	Maintenance III rd year	Total
95720.00	88685.00	88660.00	88660.00	599125.00
60460.00	60460.00	60460.00	60460.00	379210.00
129268.00	122760.00	122760.00	122760.00	640108.00
10000.00	14000.00	16000.00	0.00	48000.00
117400.00	103000.00	103000.00	103000.00	844720.00
96000.00	88000.00	88000.00	88000.00	594220.00
924500.00	924500.00	924500.00	924500.00	12943000.00
1854500.00	1854500.00	1854500.00	1854500.00	25963000.00
4000.00	4000.00	4000.00	4000.00	97600.00
4000.00	4000.00	4000.00	4000.00	126780.00
4000.00	4000.00	4000.00	4000.00	1494454.00
4000.00	4000.00	4000.00	4000.00	326181.00
4000.00	4000.00	4000.00	4000.00	874121.00
85324.00	41100.00	24520.00	24520.00	336005.00
1081250.00	284375.00	209375.00	184375.00	2687500.00
				400000.00
				100000.00
				200000.00
				500000.00
				500000.00
				300000.00
				100000.00
				100000.00
				40000.00
				100000.00
				3555000.00
				2370000.00
				3397000.00
				30250000.00
45184.00	22945.00	14997.00	14997.00	135495.00

Model No.	Name of the model	Advance
CV/TN/NL/02	Eco Restoration	25034.00
CV/TN/NL/03	Assisted Natural Regeneration (400)	77427.00
CV/TN/NL/04	Assisted Natural Regeneration (200)	69474.00
CV/TN/NL/05	Artificial Regeneration of Degraded Forest (800)	97047.00
CV/TN/NL/06	Artificial Regeneration of Degraded Forest (1000)	104649.00
CV/TN/NL/07	Sandalwood Conservation	131606.00
CV/TN/NL/08	Rehabilitation of Weed Infested Forest	164743.00
CV/TN/NL/09	Mangrove Plantation (Seedling Origin)	64676.00
CV/TN/NL/10	Forest Fire Control	38171.00
CV/TN/NL/11	River side Plantation	82988.00
CV/TN/NL/12	Bamboo/Rattan/Canes	83203.00
CV/TN/NL/13	Teak and Other Valuable Timber Plantation	79923.00
CV/TN/NL/14	Habitat improvement of protected areast of protected areas	166922.00
CV/TN/NL/16	Coastal shelterbelt	99092.00
Agriculture		
CV/TN/AL/03	Agroforestry Silvi - Horti Plantation	103431.00
CV/TN/AL/04	Canal Plantation	89174.00
CV/TN/AL/05	Seedling Distribution	8000.00
Urban		
CV/TN/UL/01	Nagar Van - Institutional Plantation	341237.00
CV/TN/UL/02	Nagar Van - Avenue/Roadside Plantation	184612.00
CV/TN/UL/03	Nagar Van - Ecopark	9245000.00
CV/TN/UL/04	Nagar Van - Riverfront Development	18545000.00
Conservation Interventions		
CV/TN/CI/02	Staggered Contour Trenches	26288.00
CV/TN/CI/03	Contour Bunds	59035.00
CV/TN/CI/04	Loose Boulder Check Dams	876585.00
CV/TN/CI/05	Gabion Structures	302282.00
CV/TN/CI/06	Masonry Checkdam	858121.00
CV/TN/CI/07	Percolation Tank	770582.00
CV/TN/CI/09	Wetland Conservation	928125.00
Supporting activities		
	Exposure trip outside state	
	Local level training for communities	
	Division level training for SFD and line department personnel	

Creation	Maintenance I st year	Maintenance II nd year	Maintenance III rd year	Total
16816.00	7329.00	3982.00	3982.00	57143.00
27243.00	9059.00	4410.00	4410.00	122548.00
16847.00	6684.00	4360.00	4360.00	101724.00
46524.00	13228.00	4410.00	4410.00	165617.00
56158.00	15432.00	4435.00	4435.00	185108.00
27143.00	9059.00	4410.00	4410.00	176626.00
70240.00	15607.00	4284.00	4284.00	259158.00
41112.00	25246.00	17404.00	15262.00	163702.00
38076.00	38076.00	38076.00	38076.00	190475.00
39730.00	21020.00	12672.00	12672.00	169082.00
64893.00	28928.00	16524.00	16419.00	209967.00
71042.00	21956.00	4410.00	4410.00	181740.00
103745.00	59676.00	50728.00	50728.00	431799.00
37824.00	14052.00	3029.00	3029.00	157025.00
53133.00	53133.00	53133.00	53133.00	315964.00
75859.00	72217.00	72217.00	72217.00	381685.00
10000.00	14000.00	16000.00	0.00	48000.00
80003.00	68656.00	68656.00	68656.00	627208.00
59748.00	53656.00	53656.00	53656.00	405328.00
924500.00	924500.00	924500.00	924500.00	12943000.00
1854500.00	1854500.00	1854500.00	1854500.00	25963000.00
2092.00	2092.00	2092.00	2092.00	34656.00
2092.00	2092.00	2092.00	2092.00	67403.00
2092.00	2092.00	2092.00	2092.00	884953.00
2092.00	2092.00	2092.00	2092.00	310650.00
2092.00	2092.00	2092.00	2092.00	866489.00
2092.00	2092.00	2092.00	2092.00	778950.00
1081250.00	284375.00	209375.00	184375.00	2687500.00
				400000.00
				100000.00
				200000.00

Model No.	Name of the model	Advance
	State level inception workshop	
	State level seminar	
	Exposure trip within state	
	Awareness Campaign	
	Awareness activities for General public	
	Publishing Pamphlets, Brochures, Booklets, Signages, Boards and Hoardings	
	Publicity through mass media	
	Research	
	Contingency	
	M&E	
	PMU	
Karaikal		
Agriculture		
CV/PY/AL/05	Seedling Distribution	8000.00
Urban		
CV/PY/UL/02	Nagar Van - Avenue/Roadside Plantation	184612.00
CV/PY/UL/03	Nagar Van - Ecopark	9245000.00
Supporting activities		
	Exposure trip outside state	
	Local level training for communities	
	Division level training for SFD and line department personnel	
	State level inception workshop	
	State level seminar	
	Exposure trip within state	
	Awareness Campaign	
	Awareness activities for General public	
	Publishing Pamphlets, Brochures, Booklets, Signages, Boards and Hoardings	
	Publicity through mass media	
	Research	
	Contingency	
	M&E	
	PMU	

Rejuvenation of River Cauvery

Creation	Maintenace I st year	Maintenace II nd year	Maintenace III rd year	Total
				500000.00
				500000.00
				300000.00
				100000.00
				100000.00
				40000.00
				100000.00
				25155000.00
				16770000.00
				24037000.00
				155030000.00
10000.00	14000.00	16000.00	0.00	48000.00
59748.00	53656.00	53656.00	53656.00	405328.00
924500.00	924500.00	924500.00	924500.00	12943000.00
				400000.00
				100000.00
				200000.00
				500000.00
				500000.00
				300000.00
				100000.00
				100000.00
				40000.00
				100000.00
				225000.00
				150000.00
				215000.00
				5450000.00

Table 11 : Model/Activity wise area & cost for Forestry Intervention

State	Landscape / Activity	Model	Name of the model	Area to be benefitted (ha)	Plants to be planted	No. of sites
Karnataka	Natural	CV/KA/NL/02	Eco Restoration	675.00	270000	8
		CV/KA/NL/03	Assisted Natural Regeneration (400)	150.00	60000	3
		CV/KA/NL/04	Assisted Natural Regeneration (200)	1080.00	216000	18
		CV/KA/NL/06	Artificial Regeneration of Degraded Forest (1000)	300.00	300000	6
		CV/KA/NL/07	Sandalwood Conservation	75.00	30000	1
		CV/KA/NL/08	Rehabilitation of Weed Infested Forest	200.00	200000	2
		CV/KA/NL/10	Forest Fire Control	4000.00	0	10
		CV/KA/NL/11	River side Plantation	768.09	153618	13
		CV/KA/NL/14	Habitat improvement of protected areast of protected areas	8850.00	1770000	43
	Agriculture	CV/KA/AL/05	Seedling Distribution	40729.69	14853477	757
	Urban	CV/KA/UL/01	Nagar Van - Institutional Plantation	277.00	110800	26
		CV/KA/UL/02	Nagar Van - Avenue/ Roadside Plantation	244.00	48800	20
		CV/KA/UL/03	Nagar Van - Ecopark	60.00	0	6
		CV/KA/UL/04	Nagar Van - Riverfront Development	10.00	0	1
	Conservation Interventions	CV/KA/CI/01	Continuous Contour Trenches	2000.00	0	2
		CV/KA/CI/02	Staggered Contour Trenches	4200.00	0	14
		CV/KA/CI/04	Loose Boulder Check Dams	3470.00	0	62
		CV/KA/CI/05	Gabion Structures	600.00	0	81
		CV/KA/CI/06	Masonry Checkdam	175.00	0	16
		CV/KA/CI/07	Percolation Tank	464.00	0	47
		CV/KA/CI/08	Riparian Corridor	1568.10	0	9
		CV/KA/CI/09	Wetland Conservation	30.00	0	1
Kerala	Natural	CV/KL/NL/01	Shola and Grassland Restoration	4188.66	6073557	28

State	Landscape / Activity	Model	Name of the model	Area to be benefitted (ha)	Plants to be planted	No. of sites
		CV/KL/NL/02	Eco Restoration	1699.00	679600	25
		CV/KL/NL/03	Assisted Natural Regeneration (400)	1882.36	752944	43
		CV/KL/NL/04	Assisted Natural Regeneration (200)	792.37	130474	19
		CV/KL/NL/05	Artificial Regeneration of Degraded Forest (800)	252.15	16200	4
		CV/KL/NL/06	Artificial Regeneration of Degraded Forest (1000)	611.91	611909	9
		CV/KL/NL/07	Sandalwood Conservation	1083.50	433400	26
		CV/KL/NL/08	Rehabilitation of Weed Infested Forest	1871.31	1871310	64
		CV/KL/NL/10	Forest Fire Control	8344.81	474700	75
		CV/KL/NL/11	River side Plantation	812.60	159920	17
		CV/KL/NL/12	Bamboo/Rattan/Canes	282.25	52981	12
		CV/KL/NL/14	Habitat improvement of protected areast of protected areas	3099.00	480000	53
		CV/KL/NL/15	Medicinal Plants and NTFP	150.00	100400	2
	Agriculture	CV/KL/AL/01	Agroforestry Bund Planting	550.89	330535	12
		CV/KL/AL/02	Agroforestry Block Plantation	1058.65	1164511	48
		CV/KL/AL/03	Agroforestry Silvi-Horti Plantation	894.85	501116	32
		CV/KL/AL/04	Canal Plantation	110.00	22000	3
		CV/KL/AL/05	Seedling Distribution	164.00	65600	25
	Urban	CV/KL/UL/01	Nagar Van - Institutional Plantation	3976.64	1590656	47
		CV/KL/UL/02	Nagar Van - Avenue/Roadside Plantation	839.17	167833	8
		CV/KL/UL/03	Nagar Van - Ecopark	995.80	0	5
		CV/KL/UL/04	Nagar Van - Riverfront Development	19.81	0	6

State	Landscape / Activity	Model	Name of the model	Area to be benefitted (ha)	Plants to be planted	No. of sites
	Conservation Interventions	CV/KL/CI/01	Continuous Contour Trenches	22.00	0	4
		CV/KL/CI/03	Contour Bunds	350.00	0	10
		CV/KL/CI/04	Loose Boulder Check Dams	110.00	0	9
		CV/KL/CI/05	Gabion Structures	62.00	0	3
		CV/KL/CI/06	Masonry Checkdam	70.00	0	5
		CV/KL/CI/08	Riparian Corridor	45.00	0	21
		CV/KL/CI/09	Wetland Conservation	2.00	0	1
Tamil Nadu	Natural	CV/TN/NL/01	Shola and Grassland Restoration	5297.20	7680940	26
		CV/TN/NL/02	Eco Restoration	10.00	4000	1
		CV/TN/NL/03	Assisted Natural Regeneration (400)	3978.07	1591228	30
		CV/TN/NL/04	Assisted Natural Regeneration (200)	4099.00	819800	18
		CV/TN/NL/05	Artificial Regeneration of Degraded Forest (800)	8088.16	6470526	27
		CV/TN/NL/06	Artificial Regeneration of Degraded Forest (1000)	3540.00	3540000	27
		CV/TN/NL/07	Sandalwood Conservation	290.00	116000	12
		CV/TN/NL/08	Rehabilitation of Weed Infested Forest	20534.47	20534474	88
		CV/TN/NL/09	Mangrove Plantation (Seedling Origin)	100.00	0	5
		CV/TN/NL/10	Forest Fire Control	4914.67	0	8
		CV/TN/NL/11	River side Plantation	10837.00	2167400	73
		CV/TN/NL/12	Bamboo/Rattan/Canes	100.00	62500	1
		CV/TN/NL/13	Teak and Other Valuable Timber Plantation	2700.00	1080000	18
		CV/TN/NL/14	Habitat improvement of protected areas of protected areas	2750.00	550000	33
		CV/TN/NL/16	Coastal shelterbelt	223.00	245300	6

State	Landscape / Activity	Model	Name of the model	Area to be benefitted (ha)	Plants to be planted	No. of sites
	Agriculture	CV/TN/AL/03	Agroforestry Silvi-Horti Plantation	22288.15	12481364	123
		CV/TN/AL/04	Canal Plantation	730.17	146033	9
		CV/TN/AL/05	Seedling Distribution	4980.00	195200	55
	Urban	CV/TN/UL/01	Nagar Van - Institutional Plantation	674.64	269854	45
		CV/TN/UL/02	Nagar Van - Avenue/Roadside Plantation	622.70	124540	45
		CV/TN/UL/03	Nagar Van - Ecopark	33.21	0	8
		CV/TN/UL/04	Nagar Van - Riverfront Development	51.00	0	6
	Conservation Interventions	CV/TN/CI/02	Staggered Contour Trenches	101943.00	0	78
		CV/TN/CI/03	Contour Bunds	20.00	0	1
		CV/TN/CI/04	Loose Boulder Check Dams	900.00	0	23
		CV/TN/CI/05	Gabion Structures	3830.00	0	53
		CV/TN/CI/06	Masonry Checkdam	1410.00	0	33
		CV/TN/CI/07	Percolation Tank	1908.20	0	87
		CV/TN/CI/09	Wetland Conservation	276.00	0	6
Karaikal	Agriculture	CV/PY/AL/05	Seedling Distribution	40.00	16000	5
	Urban	CV/PY/UL/02	Nagar Van - Avenue/Roadside Plantation	100.00	20000	2
		CV/PY/UL/03	Nagar Van - Ecopark	1.00	0	1

BUDGET OUTLAY - FOREST DIVISIONS

Altogether, 42 forest divisions in the three implementing States and Union Territory will participate and carry out activities pertaining to forestry interventions including plantations, conservation interventions, and supporting activities. Overall budget outlay for 42 forest divisions in the States is presented in respective state DPRs. The extent of budget allocation among 42 forest divisions ranges from Rs. 0.59 crore to Rs. 283. crore over a period of five years and maintenance after 5 years with an average cost of Rs. 59.60 Crore (Table 12).

Table 12 : Budget outlay for Forestry Interventions - Forest divisions

State	S. No.	Division	Budget (Lakhs Rs)	No. of Sites intervened
Karnataka	1	Bandipur Tiger Reserve	780.12	32
	2	Biligiri Ranganatha Swamy Temple WLS	787.19	32
	3	Cauvery Wildlife Division	38090.11	247
	4	Chamarajnagar SF	110.19	36
	5	Chikmagalur	695.71	37
	6	Hassan	992.18	37
	7	Hunsur	7735.51	293
	8	Madikere	625.16	45
	9	Madikere Wildlife Sanctuary	780.12	33
	10	Mandya	24339.88	117
	11	MM HILLS	1576.58	41
	12	Mysore Wildlife	25.00	31
	13	Mysuru	12885.83	538
	14	Rajiv Gandhi National Park (Hunsur)	787.19	33
	15	Ramanagara	965.12	37
	16	Tumkur	25.05	30
	17	Virajpet	239.11	37
Kerala	18	Mannarkkad	7087.65	163
	19	North Wayanad	18884.85	162
	20	Silent valley National Park	5527.99	65
	21	South Wayanad	8348.03	112
	22	Wayanad Wildlife	16619.48	264
Tamil Nadu	23	Ariyalur	3539.16	58
	24	Coimbatore	5842.08	64
	25	Cuddalore	3211.67	46
	26	Dharmapuri	1320.20	48
	27	Erode	14639.07	130
	28	Gudalur	2215.05	42
	29	Hosur	28369.34	189
	30	Karur	1204.86	42
	31	Krishnagiri	178.54	36
	32	Mudumalai Tiger Reserve	329.76	32

State	S. No.	Division	Budget (Lakhs Rs)	No. of Sites Intervened
	33	Nagapatinam	33.75	1
	34	Nagapattinam Wildlife Division	1520.36	40
	35	Namakkal	954.71	42
	36	Nilgiris	24934.89	291
	37	Salem	13789.05	89
	38	Sathyamangalam	7492.03	106
	39	Thanjavur	8490.21	110
	40	Thiruchirapalli	1692.24	60
	41	Thiruvarur	3331.23	59
Karaikal	42	Karaikal	671.99	58

PROJECT SCHEDULE

The execution period of first phase as designed and developed in this DPR will be five years. Accordingly, various activities under the four project components and different sub-components of the State level implementing agencies have been staggered during the 5-year of implementation. The bulk of the forestry interventions including plantations, conservation interventions, and supporting activities are planned in the first three to four years. Thus, cost for maintenance of plantations undertaken in third year of implementation will also spill in the subsequent years post completion of 5-year project. Since the project (Phase I) is of 5 years duration and maintenance cost on plantations spills over in additional three years, it is proposed that a comprehensive cost towards maintenance of plantations in additional years be provisioned to State during the fifth year itself so as to ensure maintenance and management of plantations carried out during the financial years, years 6th year onwards.

Like forestry interventions being staggered over 5-years project period, supporting activities (policy interventions, capacity building, research, awareness, monitoring and evaluation) by the national level partner organization and the State agencies are also appropriately staggered in the 5-year project period. In general, the first year of implementation would be more towards preparatory, inception, and engagement of contractual staff and initiation of various activities. The second and third year of the project will have greater quantum of activities. Fourth year onwards of implementation, most activities will gradually reduce. The midterm and terminal evaluation of the project has been specifically planned in the second half of the third year and the last quarter of the fifth year of implementation, respectively.

EXPECTED OUTCOMES

Keeping in mind the objective framed, the major outcomes expected are:

- Implement forestry practices for the effective and efficient management of the riverscape to augment environmental flow (e-flow) by improving water recharges, regulate run off and address sedimentation and siltation.

- (ii) Adoption of scientifically proven forestry practices for enhancing the productivity of riverscape in terms of carbon sequestered, employment generated, additional income through agroforestry and NTFP.
- (iii) Enhancement of biodiversity of the riverscape for improved benefit flow through ecosystem goods and services.
- (iv) Involvement of stakeholders for ensuring the riverscape health while assuring livelihood security.
- (v) Addressing knowledge gaps through research intervention.

Restoration of the Cauvery River through these interventions in the riverscape will result in following quantifiable benefits:-

- (i) Revegetation of the riparian corridor: Around 14030 ha of riparian corridor in the riverscape have been proposed for intervention under riverside plantation model and riparian corridor model by vegetating with 2480938 plants suitable to the site.
- (ii) Effective soil and water restoration: The DPR seeks to intervene in 237538 ha area. Around 230 to 260 Mcum runoff is expected to be regulated. The weighted average of 70 % reduction in soil loss over the treated area is 8.4 t/ha/yr. The estimated soil loss at the end project period prevented is around 2 Mmt/yr in 237538 ha area. If left untreated the soil loss would be 2.8 Mmt/yr. The surface run off is estimated as 274 Mcum per annum (9.67 TMC) for the riverscape, if left untreated. Due to interventions, 80 % run off is reduced (219 Mcum or 7.73 TMC). Annually 54.80 Mcum (1.94 TMC) alone will be the run-off and 25 % of the run off find its way to the water table, which is estimated to be 68.5 Mcum per annum (2.42 TMC). The water recharged to the table eventually find its way to the river by sub-surface movement contributing to sustained flow during lean months.
- (iii) Improving livelihoods for the communities. This DPR proposes to generate around 36.51 lakh mandays of employment in the riverscape over the project duration for advance work, establishment, and maintenance for three years alone (planting 7.67 crore plants).
- (iv) Around 9 crore trees, including seedlings distributed under seedling distribution model are proposed to be planted in the riverscape over the project duration as per the models proposed in the DPR.
- (v) Further through the planted areas, the NTFP components incorporated in the various models are estimated to provide at harvesting stage, 80 t/yr bark of Cinnamon, 23000 t/yr of bamboo culms, 140 t/yr. Madhuca flowers, 60 lakh t/yr fodder, 10 lakh t/yr edible fruits, 33 t/yr Boswellia gum and 15000 t/yr oil seeds.
- (vi) It is further estimated that the Carbon sequestered in treatment area amounts to around 0.5 lakh Mt from the 4.37 lakh trees planted and established in agroforestry models in the riverscape at 20th year. Assuming 40 years as harvestable age in the natural landscape and urban landscape, around 895 lakh trees planted in these landscapes would sequester 36% of Carbon at 10th year, 58% in the 15th year and 83% in 20th year. This amounts to 32.40, 52.20 and 74.70 lakh Mt respectively at 10th, 15th and 20th respectively.



While working with the farmers and SHGs, the growing stock will be enhanced. This will ensure sustained source of raw materials for small scale industries. It will also provide employment and enhanced value, especially where value addition is done.

GUIDELINES FOR IMPLEMENTATION OF REJUVENATION OF CAUVERY RIVER THROUGH FORESTRY INTERVENTIONS

The Cauvery is the fourth largest east flowing Indian Peninsular River that originates at Talacauvery, Kodagu in Western Ghats at an elevation of 1,341m and flows through the states of Karnataka, Tamil Nadu, and the Union Territory of Puducherry in a south east direction before finally draining into the Bay of Bengal. The Cauvery basin is spread out in the states of Kerala, Karnataka, Tamilnadu and the Union territory of Puducherry.

The activities shall be carried out in the riverscape as defined for this project. The extent of riverscape includes various forested watershed of River Cauvery and its main tributaries which contribute significant quantity of water to the river. In Non-forested watersheds, areas which are highly prone to soil erosion >15 tonnes of soil/ha/annum are included in the riverscape. In rest of the areas 5 km buffer riverscape on either side of River Cauvery and 2 km of buffer riverscape on either side of selected tributaries. The entire delta region of the basin which has a network of distributaries and highly fertile top soil has also been included in the riverscape. The riverscape also included all the areas in the basin which are highly prone to severe soil erosion. The treatments are proposed with "ridge to valley" approach in forested watersheds and in watershed having soil erosion >15 tonnes of soil/ha/annum.

DO'S AND DON'TS

- This DPR has proposed treatment in the riverscape along the river Cauvery and its tributaries Kabini, Hemavathy and Bhavani only.
- The treatments in Natural landscape are applicable to forests, grasslands, riparian and wetlands and include activities such as protection, habitat management by way of soil and water conservation measures, invasive weed control, establishment of plantations with various species for various end uses, eco-restoration, measures, etc.
- The interventions in agricultural landscape are to be implemented in the rural environment of the riverscape and mainly seek agricultural production in combination with tree/horticultural species.
- The interventions in urban landscapes is to develop site specific riverfront plantations, eco-park, institutional and industrial plantations, avenue plantations in urban and peri-urban landscapes.
- The conservation interventions shall regulate run off, arrest erosion of soil, conserve water and recharge the ground water in the riverscape through mechanical means and to conserve the riverine and wetland biodiversity across all landscapes.
- Detailed activities and budget requirement for 83 types of interventions in Cauvery riverscape represented by 37 models meant for natural landscapes, 10 models for agricultural landscapes, 14 models for the urban landscapes within the riverscape and 22 models aiming varied conservation interventions have been described in the proposal.

- The project will be implemented by MoEF&CC at the Centre (Nodal ministry) and the respective State Forest Departments (Primary Implementing Agency) in their jurisdiction.
- The project activities shall be mainly implemented by the state forest departments with support of various government departments/agencies (agriculture, horticulture, medicinal plant board, fisheries, urban and rural development, etc.), local communities, civil society, Non - Government Organisations (NGOs), panchayats, Joint Forest Management (JFM) Committees, etc.
- Altogether, 42 forest divisions in the three implementing states (Kerala, Karnataka and Tamil Nadu) and Union Territory of Puducherry will participate and carry out activities pertaining to forestry interventions including plantations, conservation interventions, and supporting activities.
- While selecting the species from the suggested list of spp against each model for planting the following points should be considered:
 - ▲ Suitability of soil and climatic conditions for the selected tree species and plants those are native to the sites to be planted.
 - ▲ Purpose of planting e.g., to control soil erosion and recharge of ground water.
 - ▲ The planted species should meet immediate needs of the community (fruit, fuelwood, fodder, timber etc.) living in the vicinity of the area.
 - ▲ Selection of species based on the specific locations where plantings are to be undertaken like roads, canals, farm bunds, wastelands etc.
 - ▲ Addressing the ecology and biodiversity of the area.
 - ▲ Addressing livelihood opportunities as well as industrial requirements.
 - ▲ Plant species that are endangered need to be conserved and propagated, to sustain ecological balance and livelihood opportunities of the community dependent on them.
- Land development works such as clearance of planting site, soil and moisture conservation measures (like construction of trenches, earthen bunds and boulder check dams on 'nalas'), protection, weed removal should be carried out before marking pits for planting of saplings.
- While developing the site for planting, care should be taken to retain all indigenous species of trees and shrubs that are naturally growing in the area. They should not be cut and burnt along with weeds and thorny species. They should be adopted in the plantation and also circular basin should be made around each of these plants for retention of moisture.
- Pits should be dug well in advance. Pits are dug to ensure that the roots of the plants do not curl up once the planting material is placed in it. The soil dug from the pits should be dumped close to the pit. While digging stones, roots of trees, grass or shrubs, if any, should be separated so that while filling the dug-up soil back in the pits, these are not mixed with the soil.



- Appropriate fencing of plantation areas is essential to protect the seedlings from damage by the cattle. The choice of fencing depends on the type of terrain, soil depth and nature of soil. Since most of the afforestation programmes are employment oriented, a fence type with significant labour input is preferred.
- The dug soil dumped near the pits should be filled back as per the schedule of activity for the plantation say in the month of May or before a month of monsoon, so that the pit and the soil to be filled are exposed to sunlight. Insecticides may also be mixed in the soil while filling back into the pit. The pit should be filled a little above the ground level so that the soil gradually settles in the upper surface of the pit, comes to the level of the ground thus avoiding any water logging. While filling the pits, the area surrounding the pit should be scraped with spade to remove grasses or weeds. Top soil should be filled in the bottom of the pit and after this, subsoil should be filled.
- The planting of saplings must be done immediately after the first rain of the monsoon. Planting of naked root plants should be completed as early as possible so as to take full advantage of the rain.
- Water conservation soil working should be carried out around each plant.
- Dead, dying or dry plants should be replaced within 15 days of completion of planting work. This operation is called beating up.
- Periodical watering, weeding, and manuring following the schedule of activities prescribed by the concerned department. They will also repair the tree guard/fencing whenever necessary to protect the plantation area from grazing and damage by stray cattle and trespassing.
- The implementing agency should maintain a plantation journal for proper up keeping of the plantations and maintenance.
- The schedule of activities prescribed by the department should be followed for the subsequent years also. Gap filling works should be carried out in the second and third year.
- In agricultural landscapes and urban landscape native species of tree, shrub and herb species are to be given priority. However, the preference of the landowner is important. Traditional horticultural and ornamental species which have long been in cultivation in the region are included in agricultural and urban landscapes. Monoculture plantation shall be avoided as far as possible. Care should be taken to ensure collection of seeds from locally identified sources and use Quality planting material for the plantations.
- FYM/compost/vermicompost will be applied to boost seedling growth in nurseries and planting site. Eco-friendly measures of weed and pest control measures (physical or mechanical methods, use of natural products, etc.) will be adopted and usage of chemical products (fertilizers, insecticides, pesticides, etc.) will be minimized.
- Protection against all types of biotic and abiotic stresses including fire will be effectively provided to planted seedlings for at least four years through fencing, watch and ward as well as public awareness in Natural landscape and community land.

- The individual intervention models have been specifically dealt with suggested choice of species, site and activities. No exotics should be chosen for natural landscape.
- A number of supporting activities, namely policy level interventions; concurrent research, capacity building, awareness, monitoring, and evaluation are considered vital for successful and effective execution of the DPR on proposed forestry interventions in the riverscape.
- A combination of both qualitative and quantitative descriptors shall be used in monitoring the progress of works proposed under forestry interventions for rejuvenation of Cauvery. This is essential to ensure timely implementation of activities and to achieve objectives as envisaged.
- Physical and financial progress of activities at local level shall be compiled and monitored jointly by the field level staff of Forest Department and the concerned local community-based organizations. The reports of these shall be submitted by the DFO to the PCCF. The scope of monitoring would include area and extent treated, expenditures, survival of plantations, performance of other activities and adherence to time schedules. It would elucidate the actual ground status of activities as implemented. The SFDs may design proforma for participatory monitoring based on local needs. Local level monitoring is to be done annually. The DFOs shall also submit a quarterly progress report of physical and financial achievements. The quarterly reports so obtained from the Divisions/FDAs shall be compiled for analysis by the PMU - Cauvery Cell under SFDA at State level and submitted further to the nodal Ministry for consolidated monitoring.
- Having a multi-disciplinary approach, monitoring of forestry interventions for rejuvenated Cauvery requires a well-defined monitoring mechanism at different levels. The following concurrent monitoring methods at different levels shall also be carried out. IT enabled monitoring using Remote Sensing and GIS based monitoring, Online monitoring; On-ground monitoring for Baseline Monitoring, Participatory monitoring at Division level and Third Party monitoring should be followed.
- **Component A - Implementation of Forestry Interventions in Three states and one Union Territory of Riverscape** of the project shall be implemented by the State Forest Departments (SFDs) of three states and the Union Territory which shall be the primary Implementing Agencies (IAs).
- **Component B - Strengthening knowledge Management and National Capacity for Forestry Interventions and Conservation of Riverscapes** of the project aims to provide scientific inputs for policy, planning, and management for informed decision making that can yield positive results for sustainable management of rivers in India.
- The river system, which is 805 km in length, has 21 tributaries. Out of this, the DPR, through a riverscape approach, addresses the main river course and three tributaries covering only 50 percent of the basin.
- **Component C - Preparation of DPR (next phase) - Scaling Up and Replication of Successful Models of Forestry Interventions and Riverscape Conservation in Additional Sites/States/tributaries**, therefore, seeks to incorporate the learnings from this model for the additional sites to be scaled up by selecting all other



tributaries of the Cauvery. Planning for scaling up and replication of successful models in additional sites are proposed to be initiated at the end of the fifth year of execution of the Implementation Plan.

- Component D - **National Coordination for Forestry Interventions and Riverscape Conservation** will be carried out by the nodal ministry - The MoEF&CC.
- A Project Management Unit (PMU) at the Nodal Ministry will be established with An Addl Secretary/Joint Secretary level officer designated as the Project Director (PD) to head the PMU. He/she would be supported by a Joint Secretary/Director level officer designated as the Project Coordinator (PC). would be Three senior project scientists, three junior project scientists, four project managers, four project assistants, four office assistants, and three attendants would assist the Project Co-Ordinator. For making the PMU fully functional, provision for its establishment, office equipment besides recurring costs on salaries and wages, office expenses, travel, publications and dissemination, and contingent and miscellaneous have been made. Further, adequate provisions for capacity building, planning and conduct of national level seminars and coordination meetings have been included to make the PMU functional and effective in its mandate.
- A Project Facilitation Unit (PFU) at the national level partner organization, i.e., IFGTB, Coimbatore or any other organization chosen by the nodal ministry for knowledge management and national capacity for forestry interventions and riverscape conservation would be headed by the Project Facilitator (PF). He/she would be supported by the Project Coordinator (PC). would be Six senior project scientists, six junior project scientists, four project associates, four project managers, six project assistants, four office assistants, and three attendants would assist the PF and PC. Provision for the establishment of PMU, office equipment besides recurring costs on salaries and wages, office expenses, travel, publications and dissemination, and contingent and miscellaneous have been made. Further, adequate provisions for engagement of international/national consultants, capacity building, planning and conduct of national level seminars/workshops and coordination meetings, awareness, ecological and socio-economic monitoring, international exposure visits/exchange, project and impact evaluation have been included to make the PFU and the national partner organization functional and effective in its diverse mandate relevant to knowledge management and national capacity building.
- A Project Management Units at State/ UT will be set up in each State Forest department/ UT since the SFDs are expected to cover large extents of natural, agriculture, and urban wherein diverse activities ranging from intensive plantations, soil and water conservation works, riverfront development, eco-parks and riparian wetland management, besides implementation of various allied/supporting activities viz. community mobilization, capacity building, awareness, research and monitoring, and evaluation have been planned. For this, a Project Management Unit (PMU) is provided at the State Level. Ideally An Addl. PCCF/CCF level officer would head the PMU and would be designated as the Project Director while the CCF/CF level officer would be designated as Project Coordinator to assist the PD. The DCFs would be responsible for actual implementation of forestry interventions and other activities envisaged in the DPR. The mechanism of existing FDAs operating at division/district level could be utilized for implementation at the field level while execution at the local level would be through respective JFMC as detailed above.

The PMU would avail existing government staff besides select contractual engagements specific for the Project duration. The contractual staff would include four Project Managers who would support in the consolidation of information generated in the project. The DPR offers scope for the involvement of other organizations actively involved in the restoration of the river.

- Two Programme Steering Committees (PSCs), one at the national level in the PMU of Central Nodal Ministry, i.e., National Programme Steering Committee (NPSC), while other at the state level PMU in each of the three states and the union territory i.e., State Programme Steering Committee (SPSC) shall be setup. The NPSC would have multiple members represented by senior officials of the MoEF&CC with various other Ministries involved with the river-related activities; all PCCFs and HoFF of the three states and CFs of the Union Territory or their representatives; Project Director of PFU (IFGTB/any other national-level organization and one representative each from Civil Societies. Thus, the NPSC is expected to have about 20-22 members. The NPSC shall meet at least once a year to approve the APOs and oversee execution of the Plan.
- The already existing framework at State level like State Forest Development Agency (SFDA) or similar/equivalent agency such as "Haritha Keralam Mission" in case of Kerala would be of immense utility for the Nodal Ministry for transferring and parking of funds at state level to be released on the recommendation of the State Project Steering Committee (SPSC), from which the matching funds then would be transferred to State Level Project Management Unit (SPMU), an exclusive State Level PMU (RRC - Cauvery cell) headed by PCCF or Additional PCCF rank officer designated as State Project Director (SPD) for its further allocation to Divisions as per their APOs duly approved by the SPSC. At the circle/district level, a Circle Project Implementation Committee (CPIC) would be constituted under the chairpersonship of Conservator of the forest with concerned DFO as the Member Secretary. A transparent and accountable mechanism for the implementation of various activities under the project is aimed at. The works to be undertaken under forestry interventions in the Cauvery could be implemented in close association and involvement of village/JFMC level set up. SPMU (Cauvery Cell) shall be formed in each of the implementing states. The SPMUs shall be responsible for all the directions, operations and control of forestry interventions in the Cauvery at State level through a State Level Steering Committee. The SPSC of Cauvery cell shall have Principal Secretary Forest/PCCF as Chairperson and Addl. PCCF rank Officer nominated by PCCF (HoFF) as the State Project Director (SPD) with equivalent representatives of line departments, civil society, NGOs, etc. The SPSC shall meet at least twice a year at appropriate times for approving the APOs and discussing other issues related to the implementation of forestry interventions in the Cauvery.
- The District level Implementing Committee (DIC) would have Conservator of Forests as the chairman, the concerned DCFs/DFOs as the member secretary and district level representatives of line departments. The DFOs shall submit an Annual Plan of Operations to the PMU (Cauvery Cell). Representatives of line departments, NGOs shall be invited every time for the consultation process. The SPMU (Cauvery Cell) shall scrutinize the APOs and get the same approved by SPSC. Upon approval of the APO, the funds shall be transferred to an account maintained separately by the respective SFDA. DFOs shall open separate accounts exclusively to operate the forestry interventions at Divisional level. The SPSC (Cauvery Cell) shall authorize



SFDA to further transfer funds against approved APOs to account opened by divisions specifically for the purpose.

- Financial expenses, creation and management of assets, incurring overhead expenditures, etc. shall be as per provisions of GFR - 2017 and/or any rules/guidelines framed by the Central Govt. and State Governments in this regard from time to time. The implementing Department and/or line departments shall be responsible for achieving the objective targets and maintaining complete accountability and transparency. The states of Karnataka, Kerala, Puducherry, Tamil Nadu would ensure active involvement of the SHGs, NGOs and volunteers in plantation and other related soil and water conservation works. The PMUs of concerned State Forest Departments would allocate funds to different agencies for implementation in areas under their command. About 40% budget on awareness provisioned in the IP would be utilized through state and local-level organizations. The PMU of SFDs would obtain proposals and APOs from other organizations, both government and private. The concerned SPSC would consider these proposals. On approval, timely funds would be released to the concerned agency.
- At the field level, the work shall be executed with the active involvement of JFMC and/ or other civil society organizations of the area. In case the works are executed by the JFMC and/ or other civil society organizations, the cash book and the account so maintained by them, in turn, shall be submitted to the concerned DFO. The total accounts, including the bank transactions for the works carried out under the project shall be maintained separately. The Measurement Books (MBs) for such activities done through JFMCs or Community Based Organizations of the SFDs shall be maintained by the concerned official of the SFDs. At the same time, the JFMCs shall submit Utilization Certificate (UC) duly verified by RFOs and Completion Certificates (CC) to the concerned Division (DFO).
- For the works to be executed by other Line Departments, Community Based Organizations, or NGOs, the DFOs shall intimate the approved APO to concerned official of the respective Departments and also release corresponding funds to them. The responsibility of execution shall completely rest with the Line Departments and other Agencies, and they shall maintain and submit accounts for the same to the DFO. These works shall be inspected jointly by the concerned field staff of SFDs with the executing Department/agency and inspection report submitted to DFO. The UCs and CCs compiled at State level at the PMU-Cauvery Cell shall be submitted to the Nodal Ministry for monitoring. The DFO shall also ensure participation of other recognized NGOs, SHGs of Tamil Nadu, VFCs of Kerala, etc. In areas where none of these exist or are not feasible for any justifiable reason, the DFO may opt for executing the works departmentally with the help of any other active Civil Society in the area. The expenditure incurred is auditable as per the Government of India Rules/Procedures and/or as per specifications of Nodal Ministry.
- At least fifty percent (50%) of the actual works carried out would have to be necessarily monitored, the mechanism of which shall be finalized by the concerned SPSC which would also lay down the procedure for submission of UC along with the approved APO for the next year's works. Based on APO and UC for the amount released during the previous year, the funds for the next year would be released after seeking the approval of the NPSC.

- A mechanism of Adaptive modifications is to be followed. Activities and models proposed in the DPR might need certain modifications to make them more adaptable to micro-level conditions during the project. New ideas and designs are likely to evolve from lessons learnt as execution progresses in the field. This approach of mid-course corrections would make the DPR more flexible and responsive to local conditions. The physical and financial norms of such adaptive activities during implementation shall align with the norms prevailing with the concerned partner Departments. Such adaptive modifications would have to be mentioned explicitly in the APO and approved by State Level PMU before its implementation. If need be, special approval may be granted by the State level Project Director for timely implementation, keeping in view the seasonal nature of such works.
- Two types of monitoring are envisaged during the implementation phase: (i) monitoring of project performance in terms of project objectives, activities, targets, outcomes, and outputs; and (ii) ecological and socio-economic monitoring in terrestrial, aquatic, and coastal ecosystems.
- It is vital to have mandatory periodic monitoring of plantations. Thus, provisions have been made in the project for in-house monitoring to be carried out by the Implementing Agencies (IAs) i.e., the concerned Forest Department only. At least fifty percent (50%) of the actual works carried out would have to be necessarily monitored.
- The DPR envisions actual field level annual monitoring at three hierarchical levels of the SFDs/ implementing agencies by way of monitoring of 40-50% plantation sites by the concerned ACFs, 20-25% sites by DFOs, and 10-12% by the CFs. The State Project Management Unit shall finalise the detailed mechanism for an overall 50% of in-house monitoring in consultation with the State Project Steering Committee (SPSC).
- The logical framework provides verifiable indicators and appropriate means. Project outcomes (biological, socio-economic, and institutional) would measure the impact of project interventions against the baseline developed during the Year-1 of implementation. The national-level partner organisation (IFGTB, Coimbatore/any other national-level organisation) would facilitate project monitoring and evaluation of outcomes/results through a consultative process with leading scientific organisations and effective coordination with the nodal ministry, state-level IAs and CSOs.
- Outcome indicators include: (a) adoption and implementation of community-driven, climate-resilient, ecosystem management approaches, (b) improved forest cover in natural landscapes and TOFs, (c) reduced biotic pressure, enhanced regeneration and productivity of degraded forests/grasslands, (d) conservation and sustainable harvest of medicinal and aromatic plants, (e) effective conservation of terrestrial/aquatic/coastal biodiversity within PAs/forests/production landscape units, (f) local communities deriving social and economic benefits from the various measures such as protection and conservation, extensive plantations including planting of economic and fruit trees, soil and moisture conservation works, development of small and micro enterprises, (g) herbal gardens, (h) enhanced nature/forest/river/wetland based ecotourism, (i) initiatives for mainstreaming



biodiversity concerns in production sectors, (j) enhanced capacity and awareness, and (k) science-based effective management interventions and actions for forest-river resources and knowledge management. The project lays greater emphasis on participatory monitoring.

- The national-level partner organisation in collaboration with SFDs would involve concerned experts and organisations to develop an integrated, long-term ecological and socio-economic monitoring programme during the first year and baseline information generation for evaluation of project impact in future. Long-term ecological and socio-economic monitoring would be appropriately executed periodically depending upon the intensity of monitoring decided for each of the variables/species. Additional evaluations would be supported at each of the landscape category type, river and its tributaries to supplement the participatory impact monitoring programme. Local universities, expert scientific organisations, CSOs would be involved in specialised monitoring planned for the project.
- The national level partner organisation (IFGTB, Coimbatore / any other national-level organisation) would undertake research and also facilitate supervision missions in consultation and coordination with the PMU of the nodal ministry to assess progress made in execution of Plan besides well-structured and designed mid-term (in third year) and terminal evaluations (last quarter of the fifth year of project implementation) by the third-party/external experts selected by the PMU of nodal ministry. The mid-term review would specifically focus on assessing progress in achieving project outcomes/outputs and deliverables besides effectiveness of institutional arrangements, the involvement of CSOs in project implementation, management and monitoring effectiveness, and national capacity building.
- **A COST ESCALATION** of 5% every year had been incorporated while calculating the budget. The cost of each activity calculated in the various models and the cost norms arrived is applicable to the base year. However, the PMU may revise the budget, if deemed, based on the Wholesale Price Index for consecutive years of operation.

