CENTRALWATER COMMISSION

GOVERNMENT OF INDIA

Dam Rehabilitation & Improvement Project

Dam Rehabilitation and Improvement Project

(DRIP)

DRAFT

UPDATED ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF)

June, 2018

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Project Background

The Central Water Commission (CWC), Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India (GOI) sought assistance from the World Bank and embarked upon a six year Dam Rehabilitation and Improvement Project (DRIP). The original DRIP includes investments in selected 223 dams spread across 6 states (namely Tamil Nadu, Kerala, Karnataka, Madhya Pradesh, Odisha and Uttarakhand), in addition to dams managed by Damodar Valley Corporation, which are located in Jharkhand. Main objectives of the project were to: i) Improve the safety and performance of selected existing dams and associated appurtenances in a sustainable manner, and ii) strengthen the dam safety institutional setup in participating states as well as at national level. The project has three major components including: (i) Rehabilitation and Improvement of Dams and Associated Appurtenances, (ii) Dam Safety Institutional Strengthening and (iii) Project Management. The activities / interventions included under the project are (i) physical and technical dam rehabilitation and improvement; and (ii) managerial upgrading of dam operation and maintenance, with accompanying institutional reforms and strengthening of regulatory measures pertaining to safe and financially-sustainable dam operations. The project was approved by the Board on June 29, 2010, and was declared effective on April 18, 2012 and is currently into fifth year of its implementation.

Additional Financing of DRIP

Additional Financing of USD 137 million includes: a) financing Gap to cover the construction of an Additional Spillway of Hirakud Dam, Odisha and related costs which will be incurred as a result of time extension of the project and b) cost over-runs that occurred primarily due to the difference between the original estimated costs at the time of project preparation and the actual total cumulative costs of the contracts as awarded and cost difference due to variation of quantities during the construction period. The sub-projects proposed under Additional Financing broadly comprise two categories of activities. First category involves creation of new infrastructure such as construction of additional spillway at Hirakud Dam, Odisha. The second category involves rehabilitation works such as improvements to existing control systems, surveillance systems, repairs to approach or service roads, repairs to existing spillway, repairs/replacement of sluice gates, turfing etc., across many dams in the participating states.

Assessment of Environment and Social Impacts

The project investments will improve the safety and operation of the project dams including revising design floods as per latest norms and standards. All the interventions ensure that structural or non-structural

measures are in place to safely cater for the increased design floods and are expected to reduce the failure risk of dams. Screening of these projects using the Project Screening Templates (PST) under the existing ESMF, indicate that except in case of Hirakud Dam wherein a major infrastructure is planned, there are nil or minor temporary social impacts on communities in all other sub-projects. In respect of environmental impacts, these would be similar to the sub-projects financed under the Original Project (which are mainly related to construction period impacts, and are temporary and reversible in nature, such as disturbance to borrow areas, etc.).

In case of Hirakud Dam, the construction of additional spillway at Hirakud Dam in Odisha will lead to adverse social impacts such as physical displacement of 716 squatter households that will be experience loss of structures – residential, commercial and community owned, etc. and for which, Resettlement Action Plan (RAP) has already been prepared and approved by World Bank. In terms of environmental impacts, an additional impact of the Hirakud sub-project will be use of 1.9 percent (9.41ha) of a degraded forest area (overall area of this degraded forest with mainly scrub and scanty vegetation is 490 ha), and cutting down of 3,610 trees of which 115 trees are within the said degraded forest area. However, there is no possibility of negative impact on the health and quality of the forests as the forest is already highly degraded and currently there is no benefit accruing to the surrounding community from this forest. The compensatory afforestation by the project will, in effect, improve the quality of this patch of forest. No wildlife, migratory birds and fish are expected to be impacted. The closest natural habitat or endemic bird area is more than 13km away with the areas in between populated by several villages.

Analysis of Alternatives

In order to assess alternatives scenarios and to identify the preferred alternative an analysis of the proposed sub-project activities was carried out with regard to their environmental and social implications. In case of all the sub-project components/activities identified thus far, Project Screening Templates developed under the original ESMF were used to carry out analysis of all sub-projects was carried out for three scenarios, namely, no-project scenario, no-component scenario and with component scenario as outlined in the screening table presented in the report. This approach was used in major civil work proposed at Hirakud Dam too, wherein alternatives were considered from safety, technical, social and environmental paramters. These included options of either raising the height of existing dam, construction of additional spillways on left and right bank dykes, lowering the spillway crest, etc., following which the most suitable option was chosen. Likewise, for other civil works such as construction of new dam related office infrastructure, adverse impacts have been minimized by utilizing available government land or department land. Environmental screening undertaken has confirmed that these sites are free from encumbrances, and

protected ecological resources. During the subsequent project planning and implementation this approach will be followed for other subproject components.

Applicable legislations and World Bank Safeguards Policies

Key environmental legislations applicable to the Additional Financing – DRIP include: Environment Protection Act, 1986; The Forest Conservation Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981, amended 1987; Construction and Demolition Waste Management Rules, 2016. Some of the key social legislation include: Orissa R&R Policy 2006, Right to Fair Compensation and Transparency in Land Acquisition and Resettlement and Rehabilitation Act, 2013; Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 and Right to Information Act 2005. In addition, some of the key legilsations applicable during construction stage include: Contract Labor (Regulation and Abolition) Act, 1970; Minimum Wages Act, 1948; Payment of Wages Act, 1936; Equal Remuneration Act, 1979; Workmen's Compensation Act 1923, Payment of Gratuity Act, 1972, Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979, etc. Applicable World Bank Safeguard Policies include: OP 4.01 on Environmental Assessment, OP 4.04 on Natural Habitats, OP 4.11 on Cultural Property Resources; OP 4.36 on Forestry; OP 4.37 on Safety of Dam; OP 4.12 on Involuntary Resettlement, OP 4.10 on Indigenous Peoples. In addition, Guidelines for Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx and World Bank Policy on Access to Information are also applicable.

Environmental and Social Safeguard Management

An Environmental and Social Safeguard Framework was prepared for the original project described the possible environmental and social impacts for each of expected rehabilitation activities. It provided templates to identify environment and social (E&S) impacts of each activity and their components; categorize them into A, B, C based on nature and magnitude of impact; and identify mitigation measures for preparation of mitigation plans. The ESMF detailed responsibilities of entities for implementation and monitoring of the proposed mitigation measures. Based on the screening criteria described in the ESMF, proposed activities under each dam were categorized depending on sensitivity of the intervention required. The State Project Management Unit (SPMU) carried out screening using each template, before submission to the Central PMU (CPMU) in the Central Water Commission – the main implementing agency. The Bank Task Team received and reviewed each template. Based on review of these templates, a final categorization of each of the dams was made. The categories are C -- no environmental and social issues nor technical issues, and designs can be finalized and tendered immediately; B -- requiring a brief dam-specific EMP and RAP to be prepared by the concerned state implementing agency and approved by the SPMU before the

start of the works; and A -- requiring a well-defined EMP and RAP (and TDP) before implementation, prepared by the concerned state implementing agency. The EMP was a part of the civil works contract and has to be adhered to and costed by the contractor. Also, while no tribal communities (indigenous people) have been identified to be affected by project activities, however in the event that a specific dam taken up under the project does affect tribal communities (indigenous people), the ESMF described the processes to be followed in preparation of an Indigenous People Development Plan. The ESMF envisaged environmental and social capacity building at various levels to make sure that all staff involved in the project is aware of the ESMF and how to address environmental and social issues for each dam. It also included a sample environmental and social management plan for guidance during further project planning and implementation.

The need for updating the ESMF in this Project context arose due to the following specific reasons: i) changes in applicable legislative framework; ii) need to incorporate world Bank's specific requirement on Labour Influx Management, Gender Based Violence, Citizen Engagement, OHS Guidelines and C&D Waste Management Rules, 2016 and finally iii) lessons learnt from the implementation experiences under the project during the period 2012 to 2017 and required institutional changes/modifications. The ESMF was revised based on the following approach: updating socio-economic and environment baseline of the project states and areas; ii) review of relevance and applicability of national and state level legal and policy framework; and Bank's policy guidelines applicable for the Project; iii) review of Project Screening Templates to ascertain nature and type of impacts in all major and minor civil works proposed under additional financing components and iv) site visits undertaken by to locations having high value works for interactions and consultations with CPMU and SPMU on implementation experiences and capacity.

The ESMF is be updated based on subsequent amendments to the existing applicable laws and policies and lessons learnt based on implementation experience of the ongoing dam rehabilitation project.

Institutional Arrangement

The organizational structure for day-to-day project coordination and management of DRIP consists of a Central Project Management Unit (CPMU) at the central level in CWC and one State level PMU for each of the nine implementing agencies. The CPMU, at central level, are staffed with one environment and one social safeguard expert who are, primary, responsible for monitoring of safeguard issues during the implementation of the projects and provide advises to SPMUs on mitigation measures. The environment as well as the social experts also liaison with the third-party QA/QC team during site inspections of the DRIP dams and monitors the compliance of safeguard norms by the implementing agency. They also signs-off

the QA/QC report with respect to safeguard compliances. In addition, these experts do regular site visits/ inspections of the dam sites and monitor the compliance of the safeguard norms by the implementing agencies and provide quarterly reports to National Level Screening Committee (NLSC) and World Bank in an agreed format.

Monitoring and Evaluation

Environmental and Social safeguards monitoring provide an essential tool to make necessary recommendations and adopt suitable control strategies so that menace of rising environmental degradation and social impacts could be minimized and a relief be extended to the people in case of any adverse impacts. Internal monitoring will be conducted by the environmental and social monitoring cell created at SPMU level under the supervision of designated specialist. In addition to the indicators suggested in the ESMF such as: environmental status, construction management, safety requirement including other measures suggested in the CESMP, labour standard, compensation, resettlement and livelihood restoration etc., subproject specific indicators will be devised during implementation.

Grievance Redressal

The contact details of officers of CPMU and SPMU are displayed at the DRIP website "https://damsafety.in" for registering any feedback and complaint regarding the Project activities. Specific grievance redress mechanism to receive and redress grievances of project affected persons will be established in projects (e.g. Hirakud) where there are likely to be grievances from communities. There will be a three-tier grievance redress mechanism will be followed, one at the project site level, the second at the district level and the third at the state level.

Disclosure

All safeguard instruments in full i.e. revised ESMF for the project, sub-project specific safeguard instruments such as EMP and RAP along with the translated summaries in vernacular language will require to be disclosed at the websites of CPMU and concerned SPMU. All these documents have also been disclosed on the World Bank Operations Portal as well.

Budget

CPMU and SPMUs will provide adequate budget for all preparation and implementation of all safeguard instruments from the counterpart funding, besides for conducting any trainings, exposure visits and capacity building events. The budget estimates and its sources will be reflected in respective sub-project mitigation

plans (EMP, RAP, etc.) and other procurement plans. World Bank' funding will be available for costs such as works, purchase of goods and services, if required.

CHAPTER 1

1. INTRODUCTION

1.1 PROJECT BACKGROUND

India has 5254 large dams in operation, the third largest in the world. Besides this, there are several thousands of smaller dams. A good number of dams, however, are quite old, construction of which dates back as long as sixty years. While these dams ensure in enabling water security, as adequate investments have not been made in the past, the situation has compelled attention towards undertaking remedial measures for ensuring 'safety'. Any lapse could result in huge loss of lives and property as well as flora and fauna. It is in this background in April 2012, the Central Water Commission (CWC), Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India (GOI) sought assistance from the World Bank and embarked upon a six-year Dam Rehabilitation and Improvement Project (DRIP) at an estimated cost of Rs. 21,000 million. The project originally envisaged the rehabilitation and improvement across four states -- Kerala, Madhya Pradesh, Odisha, and Tamil Nadu. Subsequently, three more states - Karnataka, Uttarakhand and Jharkhand—joined. Total number of dams covered under DRIP aggregates to 223 dams. The main objectives of the DRIP are to:

- Improve the safety and performance of selected existing dams and associated appurtenances in a sustainable manner, and
- Strengthen the dam safety institutional setup in participating states as well as at national level.

The objectives were to be achieved through investments for physical and technological dam improvements, managerial upgrading of dam operations, management and maintenance, with accompanying institutional reforms. This will in turn help to keep dams safe, respond to changing water demands, and keep the downstream population safe from floods. DRIP also aims at restoring the capacity of project dams for effective utilization of the stored water, and monitoring and managing the long-term performance of the dams. The project has three components:

a) Rehabilitation and Improvement of Dams and Associated Appurtenances: Project is financing the rehabilitation of 223 project dams, many of which are more than 25 years old and for which the current risk profile with respect to climate change induced impacts is also a matter of significant concern. The ongoing interventions include: treatment of leakage through masonry and concrete dams and reduction of seepage through earth dams; improving dam drainage rehabilitation and improvement of spillways, head regulators, draw-off gates and their operating mechanisms, stilling basins, and downstream spillway channels; improving approach roads; improving office and housing accommodation; and improving dam safety instrumentation. The project also supports hydrological assessments (including

inflow assessment to understand the changes in the hydrological inflow regimes as well the futuristic flow in the light of climate change) and specialized consulting services to formulate strategy for long-term management of these changing hydrological regimes. In addition, preparation and implementation of asset management plans, dam-wise Emergency Action Plans (including long term action plans to mitigate climate change induced risks), emergency warning systems, public awareness campaigns and flood inundation mapping are ongoing in all participating states.

b) Dam Safety Institutional Strengthening, focusing on regulatory and technical frameworks for dam safety assurance. The activities include customized training nationally and internationally to the Central Dam Safety Organizations (CDSO) and the State Dam Safety Organizations (SDSO); participate in dam safety courses; study tours, and linking with foreign agencies that have advanced dam safety programs such as the United States and Australia; development of Management Information Systems (MIS) and other programs to capture and analyze data for long-term planning including futuristic climate change scenarios and guiding of dam operations including the DHARMA tool; and training in hazard and vulnerability assessment and dam-break analysis.

a) Project Management: Establishment and operation of project monitoring and management units at central (Central Project Management Unit – CPMU) and state (State Project Management Units – SPMUs) levels.

The interventions are being implemented by 10 Implementing Agencies (IAs) viz.: Central Water Commission (CWC) under the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD&GR), Damodar Valley Corporation (DVC), Uttarakhand Jal Vidyut Nigam Limited (UJVNL), Odisha Water Resource Department, Tamil Nadu Water Resources Department, Tamil Nadu Generation & Distribution Corporation (TANGEDCO), Karnataka Water Resources Development Organisation, Madhya Pradesh Water Resources Department, Kerala Water Resources Department, and Kerala State Electricity Board.

1.2 IMPLEMENTATION STATUS

DRIP was approved by the Board on June 29, 2010, and was declared effective on April 18, 2012. As of April 2018, the project has disbursed 56% of the total project loan/credit amount. Progress has also been made on the institutional strengthening component. An annual training calendar (national as well as international) focusing on various dam safety aspects including instrumentation, dam break analysis, asset management, project management and construction supervisory etc. for the calendar year 2018 was prepared and is being implemented. So far, 87 training programs (four international and 83 national) have been carried out benefiting more than 3,000 central and state government officials. In addition, guidelines

have been prepared for: a) dam instrumentation and monitoring; b) dam safety operations after seismic events and five other selected topics relevant to dam safety and management. Based on the significant achievement made in the progress of activities, currently the Project Development Objectives (PDO) and Implementation Progress (IP) are rated as Moderately Satisfactory (MS). The project is fully compliant with its legal covenants.

1.3 ADDITIONAL FINANCING– SCOPE

The Additional Financing would cover the following:

Financial Gap: There is a financing gap of USD 83 million wherein a significant amount relates to the Hirakud Dam, Odisha, while the remaining amount covers project management related costs which will be incurred as a result of time extension of the project. In case of Hirakud Dam, the proposed work has two components (i) Construction of Additional Spillway on the Left Dyke [in the 2nd saddle near Gandhi Minar] of Hirakud Dam and (ii) Consultancy for Construction Supervisor.

Additional costs for project management and consultancies and institutional strengthening (USD 21 million): Due to extension of the project period by 3 years(2 years for the ongoing project and one year additional for the AF), there is a financing gap for covering the cost of the Project Management Consultancies, and the cost of managing and supervising the project by the 10 project implementing agencies as well their institutional capacity building including understanding climate change induced risk in dam safety and management and developing strategies to mitigate these risks.

The sub-projects proposed under Additional Financing broadly comprises two categories of activities. First category involves creation of new infrastructure such as construction of additional spillway at Hirakud Dam, Odisha and dam related office infrastructure at Kerala. In this category, adverse social impacts such as physical displacement of 716 households have been identified at Hirakud Dam, for which, Resettlement Action Plan (RAP) has already been prepared and approved by World Bank. Barring Hirakud, in respect of other dam rehabilitations, impacts are temporary in nature and reversible as these do not involve disruption or loss of access to communities. The second category involves rehabilitation works such as improvements to existing control systems, surveillance systems, repairs to approach or service roads, repairs to existing spillway, repairs/replacement of sluice gates, Turfing etc., across many dams in the participating states. Screening of these projects indicate that there are nil or minor temporary impacts on communities. Major civil works proposed under additional financing are summarized in the Table 1.1 below.

Table: 1.1 Major works under AF

IA	Name of Dam	Name of Work
MPWRD	*Chandpatha*	• Remedial measure civil & basic facilities work,
OWRD	*Hirakud*	• Construction of additional spillway with hydro mechanical works on left of Gandhi Hillock at Hirakud Dam. • Under water treatment of cavities in front of sluice barrels of left spillway • Construction of high level bridge over spill channel of additional spillway • Construction of R.R. Colony for the construction of Additional Spillway of Hirakud Dam. • Payment towards structure compensation for additional spillway of Hirakud Dam in village Tara Nagar at Jamada. • Shifting of utilities for construction of additional spillway of Hirakud Dam. • Consultancy Services for Construction Supervision and Quality Assurance of Works and Review of Design & Drawing for the Construction of Additional Spillway of Hirakud Dam. • Landscape development around spillway complex • Under Water repair of U/s face of left and right spillway and bottom floor cavities of Hirakud Dam
TNWRD	*Pechiparai*	• Hydro-Mechanical Work
TANGEDCO	*Mukurthi and Upper Bhavani*	• Civil Works at Mukurthy • Geo Physical Scanningat at Upper Bhavani • Civil Works at Upper Bhavani Hydro-Mechanical Work
KSEB	General, *Idukki, Sabarigiri and Sholayar*	• Construction of Dam Safety Head Quarters • Supply and Installation of surveillance system to all dams (19 Projects) • Supply & Installation of Security Surveillance System in dam premises (CCTV) • Supply, Installation, Testing, Commissioning, Training& Maintenance of CCTV Surveillance System at 18 Selected Dam Sites of KSEB Ltd • Supply, installation, testing, commissioning, training and maintenance of Real Time Structural Health Monitoring & Early Warning System at Idukki dam (RTSHMEWS) at Idukki • Upstream treatment of Anathode Dam using Geomembrane Sealing System at Sabarigiri • Upstream face treatment (after conducting Geophysical Investigation works) at Sholayar
KAWRD	*Krishna Raja Sagara Dam*	Replacement of Gates of +103 feet sluice gates covering +114 & +103 vents and replacement of +106 ft sluice gates at KRS Dam.

UJVNL	*Asan Barrage, Dakpathar Barrage, Ichari Dam, Maneri Dam, Virbhadra Rishikesh*	• Design, Manufacturing, Supply, Installation, Testing & Commissioning ofone no. Hydraulically Operated Movable Trash Rack Cleaning Machine (TRCM) with new Trash Rack Panels including dismantling of existing TRCM & Trash Rack Panels at Asan Barrage, Dhalipur in District Dehradun, Uttarakhand • Balance work of special repair of glacis, cracks on piers/abutment eroded concrete and protection work at downstream of Dakpathar Barrage Dehradun • Balance rehabilitation works of Ichari Dam. • Remaining works of Special repair of 7 nos. spillway and roller buckets & Repair of downstream left bank training wall of Ichari Dam. • Construction of TRC Gate (Back Regulator) at the confluence point of TRC of Tiloth Power House & Bhagirathi river • Repair and Restoration of under sluice wagen and works related to stiling basin energy desperation blocks o all ways of pashulok barrage at Rishikesh • Design, Manufacture, Supply, Erection, Testing and commissioning of Trash Rack Cleaning Machine at Virbhadra Barrage of Virbhadra Barrage, Pashulok, Rishikesh.
DVC	*Panchet*	Work of Under-sluices along with their Control systems, pumps etc. - Hydromechanical Package (2B)

1.4 PURPOSE OF ESMF

While the above table provides details of major civil works, some additional activities /sub-projects might be identified at a later date under the project. Environmental and social management framework (ESMF) is an instrument that examines the risks and impacts when a project consists of a program and/or series of subprojects, and the risks and impacts cannot be determined until the program or subproject details have been identified. The ESMF sets out the principles, rules, guidelines and procedures to assess the environmental and social risks and impacts. It contains measures and plans to reduce, mitigate and/or offset adverse risks and impacts, provisions for estimating and budgeting the costs of such measures, and information on the agency or agencies responsible for addressing project risks and impacts, including on its capacity to manage environmental and social risks and impacts.

During the initial phase of the project, a list of sub-project activities were identified and prepared which could be applied in the environmental and social assessment of impacts to dam rehabilitation projects under DRIP. The activities which are proposed in the Additional Financing phase based on the initial rehabilitation proposed for the previously identified dams and on the discussions with the CWC officials, as well as, officials of the concerned State Government Departments, have been included in the updated ESMF report.

1.5 IMPLEMENTATION EXPERIENCE OF ESMF IN DRIP

In the ongoing project ESMF approach was adopted to assess the environmental impacts of the interventions undertaken for each dam. The approach was based on a screening exercise at each dam, which identified environmental issues, and the subsequent development of a mitigation plan for enhancing the positive impacts of the interventions. Based on the screening criteria described in the ESMF, each dam was categorized, depending on the sensitivity of the level of intervention required. The screening template was used in the ESMF to review and provide final categorization of each of the dams. The categories are C - no environmental and social issues, and designs can be finalized and tendered immediately; B – requiring a brief dam-specific EMP to be prepared by the concerned state implementation agency and approved by the SPMU before the start of the works; and A – requiring a well-defined EMP before implementation, prepared by the concerned state implementation team, with the assistance of consultants, as needed, with approval to be provided by the CPMU and the World Bank. This ESMF was based on the ESA conducted for a sample of ten major dams in four states and a tentative list of activities proposed by each participating state. With the inclusion of new agencies and states, it was decided that during additional financing ESMF will be updated.

The capacity of implementing agencies and CPMU was identified as one of the major challenge in implementing ongoing DRIP project. The important learnings from the original project included:

a) Environmental Social Health and Safety monitoring is absent in the on-going sub-projects
b) project contractors are not submitting the mandatory EMPs for approval.
c) little interest of the SPMUs for monitoring the Environmental and Social parameters as stipulated in the ESMF. No specific discussion of the SPMUs to the project contractors on submission of EMP for their contracts;
d) State level IAs did not have any specific person designated or appointed to manage E&S aspects, besides which periodic reporting too was absent.
e) very few trainings were conducted to augment capacity of staff with respect to provisions laid down in the ESMF and their application;
f) Over and above lackadaisical attitude of CPMU advising SPMUs that there is a need to design and develop monitoring formats to collect environmental and social data on a monthly basis.

Some course corrections were taken during the Supervision such as: i) for projects under AF, Project Screening Templates (PST) including E&S aspects have been diligently filled along with categorization of respective components; ii) such screening and categorizing enabled to identify the major E&S impacts at Hirakud Dam and led to preparation of mitigation plans – EMP and RAP. However despite these, but system improvement remained a challenge.

In order to improve the environmental and social safeguard performance it was decided to update the ESMF during additional financing approval phase. Also on going ESMF was based on the ESA conducted for a sample of ten major dams in four states and a tentative list of activities proposed by each participating state. With the inclusion of new agencies and states, it was all the more important to update the ESMF so as to incorporate lessons learnt in totality. ESMF has been updated in to two separate sections on Environmental Management Framework (EMF) and Social Management Framework (SMF). This has necessitated to include the country's latest legislative development relating to R&R as well as the Bank's requirements in terms of management of Labor Influx, Gender Based Violence (GBV) and Citizen Engagement. In respect of Labor influx and GBV, bidding documents do provide for these under the umbrella, Environment, Social, Health and Safety (ESHS) conditions. Learning of ongoing ESMF implementation were also included to update current EMF and SMF.

To meet appropriate enforcement of environmental and social safeguards on institutional side, during additional financing phase, it will also be ensured to strengthened CPMU and SPMUs with dedicated, one or more specialists familiar with environmental and social issues and designated as EE (ESMF) will be appointed to review screening forms, EMPs, and other related documents, and monitor the compliance with the agreed documents. It will also be ensured that work cannot be awarded before EMP has been included in the bid document and is signed off by environmental and social designated staff. Adequate reporting will be made in progress reports about the compliance with the ESMF. This information will be compiled at the CPMU level in regular progress reports. The management and engineering consulting firm to be appointed at CPMU level will include environmental and Social specialists. Its terms of reference include tasks related to environmental (and social) compliance. Some of the relevant tasks are: provision of formal and on-the-job training to project staff at district, state, and central level to ensure that there is full awareness about environmental and social issues and the implementation of the ESMF and related EMP and RAP; provision of guidance and support to collect sufficient data at the investigation stage to determine the environmental and social impacts, if any, including whether any stand-alone EMPs, RAPs are required to be prepared; setting up and monitoring a reporting system that will show in a clear and transparent way whether there are any social and environmental issues related to the rehabilitation of the dams and the mitigation actions; and as part of the third-party construction supervision efforts, ensuring that actions agreed to minimize environmental impact and social impacts are being implemented. At state level senior engineers of WRDs and other dam operating agencies will be targeted to create awareness for the understanding and appreciation of the relevance and importance of environmental issues in general, as well as specific to the dam related activities. The staff will also be exposed to the application of the ESMF and ESMP to enable them to effectively supervise the ESMP activities. Finally, senior level officials will also be identified in the SPMUs and DSOs to be given exposure to environmental and social issues of projects,

similar to those given to the officials at the State level. The ESMF has estimated a budget for the proposed training and awareness activities. The detail on institutional improvement is also included in chapter 9.

1.6 NEED AND APPROACH TO REVISION OF ESMF FOR ADDITIONAL FINANCING

The need for updating the ESMF in this Project context arose due to the following specific reasons: i) changes in applicable legislative framework; ii) need to incorporate world Bank's specific requirement on Labour Influx Management, Gender Based Violence, Citizen Engagement, OHS Guidelines and C&D Waste Management Rules, 2016 and finally iii) lessons learnt from the implementation experiences under the project during the period 2012 to 2017 and required institutional changes/modifications.

The ESMF was revised based on the following approach: updating socio-economic and environment baseline of the project states and areas; ii) review of relevance and applicability of national and state level legal and policy framework; and Bank's policy guidelines applicable for the Project; iii) review of Project Screening Templates to ascertain nature and type of impacts in all major and minor civil works proposed under additional financing components and iv) site visits undertaken by to locations having high value works for interactions and consultations with CPMU and SPMU on implementation experiences and capacity.

Further, the ESMF is an "up-to-date" or a "live document" enabling revision, when and where necessary. Unexpected situations and/or changes in the project or sub-component design would therefore be assessed and appropriate management measures will be incorporated by updating the ESMF to meet the requirements of applicable legislations and Bank safeguards policies. Such revisions will be carried as appropriate in consultation with the World Bank and IAs.

1.7 STRUCTURE OF THE REPORT

The report has been presented under the following heads:

Executive Summary

Chapter 1	-	Introduction
Chapter 2	-	Legislative, Regulatory and Policy Framework
Chapter 3	-	Baseline Environment and Social Profile
Chapter 4	-	Stakeholders Consultations
Chapter 5	-	Analysis of Alternatives
Chapter 6	-	Assessment of Impacts: Environment and Social
Chapter 7	-	Environmental and Social Management Framework
Chapter 8	-	Sample Environment and Social Management Plan
Chapter 9	-	Institutional Arrangements and Capacity Building Measures

CHAPTER 2

2. LEGISLATIVE, REGULATORYAND POLICY FRAMEWORK

2.1 INTRODUCTION

Construction of dams and reservoirs require project-specific social environmental assessment and management plans for mitigation of potential adverse impacts. Though majority of the rehabilitation and improvement of proposed activities are generally not expected to have serious environmental concerns, an understanding of the policies and institutional framework that have a bearing on the activities envisaged under the DRIP, is required. The chapter reviews various policy and institutional framework within which the project is to be implemented. It includes national scenario of the environmental and social policies and regulations and operational policies/ directives of the World Bank.

2.2 APPLICABLE POLICY, RULES AND REGULATIONS: ENVIRONMENTAL

The key environmental laws and regulations as relevant to the investments under the project are given below:

a) **Environment Protection Act, 1986:** The Environmental Protection Act 1986 of the Government of India is an umbrella act for the prevention, control and abatement of environmental pollution for the conservation, preservation, protection, enhancement and management of the environment; and for matters incidental to or connected with the foregoing. This act authorizes the central government to intervene directly in order to protect the environment and also allows public interest litigation for the same purpose. In terms of responsibilities, this Act and the associated Rules requires for obtaining environmental clearances for specific type of projects addressed under EIA notification and this Act applies to the Project.

b) **The Forest Conservation Act, 1980:** This Act provides for the conservation of forests and regulating diversion of forestlands for non-forestry purposes. As per the provisions of the Forest (Conservation) Act, 1980 and Forest (Conservation) Rules, 2003, every user agency who wants to use any forest land for non-forestry purposes shall obtain forestry clearance from the MOEF prior to the construction within forest land. The Act is applicable under the DRIP projects to protect forest by restricting conversion of forested areas into non-forested areas and deforestation.

c) **Water (Prevention and Control of Pollution) Act, 1974, amended 1988:** This Act came in force in 1974 for the prevention and control of water pollution and for maintaining or restoring of

wholesomeness of water. The Act resulted in the establishment of the Central and State level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of projects in order to ensure compliance of the provisions of the Act by the project proponents. The Act is applicable to prevent and control water pollution during different stages of the DRIP project like operation for the batching plant and stone crushers.

d) **The Air (Prevention and Control of Pollution) Act, 1981, amended 1987:** This Act provides for the prevention, control and abatement of air pollution. It is triggered by air polluting activity in an area or when emissions of any air pollutants into the atmosphere exceed the standards set by the Central Pollution Control Board. The Act enforces the permits – Consent to Establish and Consent to Operate for various stages in the project operation like for batching plant and stone crushers, to prevent and control air pollution. The Act applies to the construction activities carried out under the DRIP.

e) Construction and Demolition Waste Management Rules, 2016: The newly established Construction and Demolition Waste Management Rules, 2016 apply to everyone who generates construction and demolition waste such as building materials, debris, rubble waste resulting from construction, re-modeling, repair and demolition of any civil structure of individual or organization or authority to address the indiscriminate disposal of C& D Waste and enable channelization of the waste for reuse and recycling in gainful manner. Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month has to submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work, segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar, keep the concerned authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis. The Rules is applicable to all the dam projects under construction or for construction or renovation for additional spillway

f) Other legislations in the Environment domain applicable to construction projects are provided in Table 2.1

Table 2.1: Other legislations in the Environment domain applicable to construction projects

S. No.	Legislation	Purpose
1.	EIA Notification, 2006	To protect and improve overall environment
2.	Noise Pollution (Regulation and Control Act) 2010 and amendment till date	Ambient Noise Standards for different areas and zones
3.	Hazardous and other waste Rules, 2016	Protection to general public against improper handling storage and disposal of hazardous waste. The rules prescribe the management requirement of hazardous wastes from its generation to final disposal.
4.	E-Waste Rules, 2011 as amended	Protection of environment against improper handling storage and disposal of hazardous waste.
5.	MSIHC Rules, 1989	Usage and storage of hazardous material
6.	The Batteries (Management and Handling) Rules 2001	To regulate the disposal and recycling of lead acid batteries
7.	Plastic waste management Rules, 2016	To manage the plastic waste generated so as it does not affect the water pipeline, animals and other environmental components
8.	Central Motor Vehicle Act 1988 and amendment Central Motor Vehicle Rules, 1989 and amendments till date	To minimize the road accidents, penalizing the guilty, provision of compensation to victim and family and check vehicular air and noise pollution.
9.	The Gas Cylinder Rules 2004	To regulate the storage of gas / possession of gas cylinder more than the exempted quantity
10.	Ancient Monuments and Archaeological Sites and Remains Act, 1958	Conservation of cultural and historical remains found in India.

2.3 APPLICABLE POLICY, RULES AND REGULATIONS: SOCIAL

The key environmental laws and regulations as relevant to the investments under the project are given below:

a) **Right to Fair Compensation and Transparency in Land Acquisition and Resettlement and Rehabilitation Act, 2013** The act repeals the Land Acquisition Act, 1984 and is applicable to all states in India (Except the state of Jammu and Kashmir). RFCT in LARR, 2013 is a first national/central law that addresses land acquisition and rehabilitation and resettlement.

This new Act provides an enhanced framework for providing compensation and resettlement and rehabilitation assistances through a participative and transparent process for land acquisition in the public interest. The Act lays down procedures for estimating fair compensation of the affected families (and not just the titleholders) due to land acquisition, rehabilitation and resettlement. Some of the key features include the following: (i) Preliminary Investigations/Preparation of Social Impact Assessment (SIA) and prepare Social Impact Management Plan (SIMP) (ii) Preliminary Notification stating: project/ public purpose; reasons necessitating land acquisition; summary of SIA; and particulars of the Administrator appointed for the purpose of rehabilitation and resettlement; receipt of Objections and Hearing after the approval of SIA and within 12 months

from the date of SIA approval; (iii) Preparation of Rehabilitation and Resettlement Scheme and its declaration by the District Collector after the same is approved by the Commissioner-Rehabilitation and Resettlement. (iv) Public notice and award of compensation and R&R assistances by District Collector within a period of twelve months from the date of the Award publication.

Salient features of the RTFCTLARRA, 2013 which is to be followed for the land acquisition; rehabilitation and resettlement during the projects proposed under DRIP are listed below:

I. The Act provides for land acquisition as well as rehabilitation and resettlement. It replaces the Land Acquisition Act, 1894 and National Rehabilitation and Resettlement Policy, 2007.
II. The Act provides for the baseline for compensation and has devised a sliding scale which allows States to fix the multiplier (which will determine the final award) depending on distance from urban centers
III. The affected communities shall be duly informed and consulted at each stage, including public hearings in the affected areas for social impact assessment, wide dissemination of the details of the survey to be conducted for R&R plan or scheme.
IV. Compensation in rural areas would be calculated by multiplying market value by up to two and adding assets attached to the land or building and adding a solatium. In urban areas, it would be market value plus assets attached to the land and solatium;
V. The Collector shall take possession of land only after ensuring that full payment of compensation as well as rehabilitation and resettlement entitlements are paid or tendered to the entitled persons; families will not be displaced from land till their alternative R&R sites are ready for occupation;
VI. The benefits to be offered to the affected families include; Financial support to the affected families for construction of cattle sheds, shops, and working sheds; transportation costs;
VII. Rehabilitation and resettlement benefits to which they are entitled in monetary terms along with a one-time entitlement of fifty thousand rupees;
VIII. For ensuring transparency, provision has been made for mandatory dissemination of information on displacement, rehabilitation and resettlement, with names of the affected persons and details of the rehabilitation packages. Such information shall be placed in the public domain on the Internet as well as shared with the concerned Gram Sabhas and Panchayats, etc. by the project authorities;
IX. No income tax shall be levied and no stamp duty shall be charged on any amount that accrues to an individual as a result of the provisions of the new law;

The act will apply in case any sub-project requires acquisition of land.

b) Orissa Resettlement and Rehabilitation Policy, 2006

The policy was used in the formulation of the Hirakud RAP. The Government of Odisha framed a comprehensive resettlement and rehabilitation policy to ensure sustained development through a participatory and transparent process. The basic objectives of the policy are:

- to avoid displacement wherever possible and minimize it exercising available options otherwise,
- to recognize voices of displaced communities emphasizing the needs of the indigenous communities and vulnerable sections,
- to ensure environmental sustainability through participatory and transparent process and
- to help guiding the process of developing institutional mechanism for implementation, monitoring, conflict resolution and grievance redressal.

However, it is applied under Hirakud as only non-titleholders (squatters) are affected under the subproject and no fresh land acquisition is proposed.

c) Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006:

Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, has been enacted to recognize and vest the forest rights and occupation of forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers, who have been residing in such forests for generations, but whose rights could not be recorded.

This Act not only recognizes the rights to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood, but also grants several other rights to ensure their control over forest resources which, inter-alia, include right of ownership, access to collect, use and dispose of minor forest produce, community rights such as nistar; habitat rights for primitive tribal groups and pre-agricultural communities; right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use.

The Act also provides for diversion of forest land for public utility facilities managed by the Government, such as schools, dispensaries, fair price shops, electricity and telecommunication lines, water tanks, etc. with the recommendation of Gram Sabhas. In addition, several schemes have been implemented by the Ministry of Tribal Affairs for the benefit of tribal people, including those in the forest areas such as "Mechanism for marketing of Minor Forest Produce

(MFP) through Minimum Support Price (MSP) and development of Value Chain for MFP". Funds are released out of Special Central Assistance to Tribal Sub Plan for infrastructure work relating to basic services and facilities viz. approach roads, healthcare, primary education, minor irrigation, rainwater harvesting, drinking water, sanitation, community halls, etc. for development of forest villages.

Under Section 3(1)(h) of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, the rights of settlement and conversion of all forest villages, old habitations, un-surveyed villages and other villages in forest, whether recorded, notified, or not, into revenue villages have been recognized as one of the forest rights of forest dwelling Scheduled Tribes and other traditional forest dwellers on all forest lands. This Act is applicable to the projects under DRIP near settlements of tribes and other forest dwellers.

d) **Dam Safety Act 2002 (Draft) and Dam Safety Bill 2018:** Dam Safety Organisation (DSO) has been created in the CWC, headed by a Chief Engineer who coordinates all dam safety related activities and conducts regular interaction / consultation with the State Dam Safety Organisations of the States in the country. In keeping with the provisions of the National Water Policy 2002, a draft Dam Safety Act has been prepared by the CWC. This has been approved by the Ministry of Water Resources, Government of India and has been circulated to the States. The States have responded well to the Draft Act and so far the Government of Bihar has passed the Dam Safety Act 2006 and the same was published in the Bihar Gazette on 4/5/2006. The Government of Andhra Pradesh has adopted a Resolution on 24/3/2007 that the Dam Safety Resolution should be regulated in the State of Andhra Pradesh by Parliament by Law. The Government of West Bengal has also passed a Resolution on 24/7/2007 empowering the Parliament of India to pass the necessary Dam Safety Act. The Government of Kerala have passed the Kerala Irrigation and Water Conservation Act 2003 which was subsequently amended through the Kerala Irrigation and Water Conservation (Amendment) Act 2006. The States of Madhya Pradesh, Maharashtra, Orissa, Uttar Pradesh are also actively processing the proposal for passing the Resolution in their respective State Assemblies. Government of India has already initiated action to pass a Central Act on Dam Safety.

   The Dam Safety Bill 2018is to be introduced in Parliament and seeks to provide for the surveillance, inspection and operation of the Dam parameters to ensure their safe functions. The law is applicable to Andhra Pradesh, West Bengal and all Union Territories.

A national committee on Dam Safety was proposed to be established with the Chairman, CWC as the Chairperson and at least 11 other specialist members, The functions of the national committee include:

- Monitoring the functions of the state or non-state dam safety organizations.
- Evaluating dam safety procedures in various states and suggest ways to improve dam safety practices consistent with the international practices and Indian conditions.
- Evolving a comprehensive safety management approach.
- Advise on specific matters of dam safety to Central or State Governments. The bill also includes a provision for setting up of a Central Dam Safety Organization.

The bill has not yet become an act but most of the provisions of the bill have been duly incorporated in the functioning of relevant authorities.

e) Other legislations in the Social domain applicable to construction projects

Construction stage involves equity, safety and public health issues also, therefore agencies will be required to comply with laws of the land, which include the following legislations summarized in Table 2.2.

Table 2.2: Other legislations in the Social domain applicable to construction projects

S. No.	Act	Provisions under the Act
1	Contract Labor (Regulation and Abolition) Act, 1970	The Act provides for certain welfare measures to be provided by the contractor to contract labour
2	Minimum Wages Act, 1948	The employer is supposed to pay not less than the Minimum Wages fixed by the Government as per provisions of the Act.
3	Payment of Wages Act, 1936	The Act lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers
4	Equal Remuneration Act, 1979	The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees
5	Workmen's Compensation Act 1923	The Act provides for compensation in case of injury by accident arising out of and during the course of employment
6	Payment of Gratuity Act, 1972	The gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years
7	Child Labour (Prohibition and Regulation) Act, 1986	The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry

S. No.	Act	Provisions under the Act
8	Employees PF and Miscellaneous Provision Act 1952	The Act provides for monthly contributions by the employer plus workers
9	Maternity Benefit Act, 1951	The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.
10	Payment of Bonus Act, 1965	The Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages
11	Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979	The inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home to the establishment and back, etc.;
12	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996	The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc
13.	Right to Information Act, 2005	Under the provisions of the Act, any citizen may request information from the authority which is required to reply expeditiously or within thirty days. The Act also requires every public authority to computerize their records for wide dissemination and to proactively certain categories of information so that the citizens need minimum recourse to request for information formally.

2.4 WORLD BANK SAFEGUARD POLICIES

Projects financed with IDA resources normally need to comply with World Bank Operational Policies. The World Bank has Environmental and Social Safeguard Policies to reduce or eliminate the adverse effects of development projects. The safe guard policies of World Bank are provided in the Table 2.3 below.

Table 2. 3: Safeguard Policies of World bank

World Bank Safeguard Policies	Objective	Applicability
OP / BP 4.01	Environmental Assessment- The objective of this policy is to ensure that Bank financed projects are environmentally sound and sustainable (Refer analysis part in text below for details)	Significant adverse social and environmental impacts are not expected as physical interventions are expected to be in the nature of rehabilitation of existing assets. However, an integrated Environmental and Social Assessment (ESA) with an Environmental Management Plan (EMP) have been developed to manage risk and maximize environmental and social benefits wherever it is applicable. This will be finalized based on earlier work and experiences of DSARP project and consideration of improvement activities

World Bank Safeguard Policies	Objective	Applicability
		proposed under DRIP. This policy is triggered to ensure that the project is environmentally sound and sustainable.
OP/BP 4.04	Natural Habitats-The policy recognizes that the conservation of natural habitats is essential for long-term sustainable development. The Bank, therefore, supports the protection, maintenance and rehabilitation of natural habitats in its project financing, as well as policy dialogue and analytical work. The Bank supports and expects the Borrowers to apply a precautionary approach to natural resources management to ensure environmentally sustainable development	This policy is not triggered.
OP 4.36	Forestry This policy focuses on the management, conservation, and sustainable development of forest ecosystems and resources. It applies to project that may have impacts on (a) health and quality of forests; (b) affect the rights and welfare of people and their level of dependence upon forests and projects that aim to bring about changes in the management, protection or utilization of natural forests or plantations, whether they are publicly, privately or community owned. The Bank does not support the significant conversion or degradation of critical forest areas or related critical natural habitats.	The safeguard policy is triggered as the locations of the existing dams where the rehabilitation/ modernization works are carried out may be in domain of the reserved forests.
OP 4.09	Pest Management – The objective of this policy is to promote the use of biological or environmental control methods and to reduce reliance on chemical pesticides.	**Pest / Vector management involvement in DRIP is not likely. The policy will not be triggered.**
OP/BP 4.12	Involuntary Resettlement-The objective of this policy is to avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs. Furthermore, it intends to assist displaced person in improving their former living standards; community participation in planning and implementing resettlement; and to provide assistance to affected people, regardless of the legality of title of land	No land acquisition is envisaged under the Project. However this policy triggered in case of Hirakud dam where 716 non-titleholder households (PAHs) comprising 1,415 families (PAFs) and 3,022 persons (PAPs) are displaced.
OP 4.10	Indigenous People -This policy aims to protect the dignity, right and cultural uniqueness of indigenous people; to ensure that they do not suffer due to development; that they receive social and economic benefits	This policy is triggered if there are indigenous people in the project area; when potential adverse impacts on indigenous people are anticipated; and if indigenous people are among the intended beneficiaries.

World Bank Safeguard Policies	Objective	Applicability
OP 4. 11	Cultural Property –This policy aims at assisting in the preservation of cultural property, historical, religious and unique natural value-this includes remains left by previous human inhabitants and unique environment features, as well as in the protection and enhancement of cultural properties encountered in Bank-financed project.	This policy is triggered by sub-projects under DRIP in those areas where cultural property, historical, religious and unique natural value-this includes remains left by previous human inhabitants and unique environment features may be affected during rehabilitation work of the sub-projects.
OP/BP 4.37	Safety of Dams-Refer analysis part in text for details.	It is applicable to all large Dams; Requires review of current monitoring system of Dam; Upgrading and/or rehabilitation of existing dams proposed under DRIP. The policy is triggered
OP/BP 7.50	Projects on International Waters	The policy will not be triggered.
OP/BP 7.60	Projects in Disputed Areas	The policy will not be triggered.
Bank Policy – Access to Information:	The policy governs the public accessibility of information in the Bank's possession. The Bank allows access to any information in its possession that is not on a list of exceptions. Documents such as RPF, all SIA and RAPs will be disclosed both by the borrower and Bank.	

Based on a review of the identified sub-projects, World Bank policies and guidelines, pertaining to environmental safeguards that are triggered include:

- OP/BP 4.01 Environmental Assessment
- OP/BP 4.37 Safety of Dams
- OP 4.12 Involuntary Resettlement
- Occupational Health and Safety Guidelines
- Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx

***OP/BP/GP 4.01 Environmental Assessment*:** As per this policy, the project coordinating entity or implementing institution carries out Environmental Assessment (EA) during the preparation of each proposed subproject according to country requirements and the requirements of this policy. The Bank appraises and recommends to strengthen the capabilities of the coordinating entity or the implementing institution to (a) screen subprojects, (b) obtain the necessary expertise to carry out EA, (c) review all findings and results of EA for individual subprojects, (d) ensure implementation of mitigation measures (including, where applicable, an EMP), and (e) monitor environmental conditions during project

implementation. If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A sub-projects and, as appropriate, Category B sub-projects -including any EA reports are subject to prior review and approval by the Bank.

The purpose of conducting an environmental assessment (EA) is to identify environmental and social consequences of the proposed sub-projects or components, in order to:

- Ensure the identification of potential environmental issues and social concerns early in the implementation of a proposed project to incorporate necessary safeguards in project design in order to prevent potential adverse impacts by determining appropriate mitigation and compensation measures;
- Minimize risks and enhance positive impacts/benefits;
- Avoid delays and extra costs which may subsequently arise due to unanticipated environmental problems;
- Identify the potential for maximizing environmental resources management and socio-economic benefits to local communities within the scope of the sub-project.
- The EA should cover physical-chemical, biological, socio-economic and cultural issues that are likely to arise during upgrading and rehabilitation of dams with safety risks and appurtenance structures and associated activities as appropriate.

OP 4.01 requires that arrangements be made whereby the project implementing institutions undertake the functions of sub-project screening, EA review and implementation of mitigation and monitoring plans. Therefore the purpose of this document is to outline a framework for environmental assessment and management, giving brief details of potential environmental issues typically associated with upgrading and rehabilitating dams with safety risks and suitable framework on how to prepare Environmental Management Plans (EMP). The ESMF will serve as a template to undertake appropriate environmental analysis and impact assessments of sub-projects, once the dams requiring upgrading and rehabilitation have been identified. This ESMF is being submitted in lieu of a project EA and has formed the basis for appraising the environmental aspects of the project. It will be made available for public review and comment in appropriate locations in accordance with BP 17.50 requirements of disclosure. Detailed EAs for individual subprojects will be carried out (in accordance with the ESMF) by the implementing agencies and will be reviewed and cleared by the designated Project Authority, as applicable (State Dam Safety Organization under present condition), under prevailing national environmental legislation in India and by IDA prior to the approval for disbursement of funds.

World Bank OP 4.01 requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that these projects are environmentally sound and sustainable. EA is a process whose breadth, depth and type of analysis depend on the nature, scale and potential for environmental impacts of the

proposed project. Environmental requirements of the World Bank are specified in detail in its Operational Policy (OP) 4.01 and other related OPs. The World Bank environmental requirements are based on a three-part classification system.

- *Category A*-requires a full Environmental Assessment (EA).
- *Category* B-projects require a lesser level of environmental investigation.
- *Category* C-projects require no environmental analysis.

A project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. A proposed project is classified as Category B if its potential adverse impacts on human populations or environmentally important areas including wetlands, forests, grasslands and other natural habitats are less adverse than those of Category A projects. These impacts are site specific; few if any are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of an EA for Category B projects may vary from project to project, but it is narrower in scope when compared with Category A projects.

Centre Water Commission has a component that involves Dam Safety Assurance and Operational Efficiency Improvement. While it is anticipated that the project overall is environmentally beneficial since the development objectives of the project is to improve water resource and asset management to ensure public safety, reduce water induced hazards and enhance the effectiveness of water related investments in the country, there is concern that the scale and potential of adverse environmental and social impacts in the event of a dam failure, could be significant, irreversible and unprecedented. Yet, since the objective of the project is to rehabilitate dams that may pose a safety risk, and proactive measures will be taken to strengthen such dams so that the safety risk is minimized, it is not anticipated that there will be any significant, irreversible and unprecedented adverse environmental impacts due to project financed activities. Therefore, this project has been classified as a Category B project for safeguards purposes. World Bank OP 4.01 is very clear that for all Category A, Category B and Category FI projects proposed for financing under an IDA Credit, the developer must consult project affected groups and local non-governmental organizations (NGOs) about the project environmental and social aspects and take their views into account in the design and implementation. The EA should particularly incorporate such comments to improve social acceptability and environmental sustainability. Such consultations should be initiated as early as possible, in the Project cycle and it is mandatory that consultations are undertaken after the draft EA is prepared. In addition, the developer is expected to consult with stakeholders throughout project implementation as necessary to address EMP related issues that affect them.

The OP 4.01 also highlights the importance of analyzing alternative designs, technologies and operational strategies systematically in terms of their potential environmental impacts in order to select the most environmentally friendly and economically viable option.

OP/BP 4.37 Safety of Dams: The World Bank's safeguard policy on Safety of Dams is based on the principle that, for the life of a dam, the owner (in this case the Government of India) is responsible for ensuring that appropriate measures are taken and sufficient resources are provided for the safety of the dam, irrespective of its funding sources or construction status. Because there are serious consequences if a dam does not function properly or fails. The Bank is concerned about the safety of a new dam, it finances and existing dams on which a Bank financed project is directly dependent. Upgrading and/or rehabilitation of existing dams, as proposed under this project, falls within the policy, thus OP/BP 4.37 is triggered. Under OP/BP 4.37 requires that the dam upgrading be designed and its civil works be supervised by experienced and competent professionals. It also requires that implementing agency adopt and implement certain dam safety measures for the design, bid tendering, construction, operation and maintenance of the dam and associated works.

The safe operation of dams has significant social, economic, and environmental relevance. World Bank has concern to strengthen the institutional, legislative, and regulatory frameworks for dam safety programs.

Occupational Health and Safety Guidelines: The Environmental, Health, and Safety (EHS) Guidelines of the World Bank are technical reference documents with general and industry specific examples of good practices. Sector specific EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. Under this, the guidelines with prime importance in the augmentation of the dams are the *Occupational Health and Safety Guidelines* which includes measures relating to occupational health and safety applied to the project. The OHS measures to be designed and implemented to address:

- identification of potential hazards to project workers, particularly those that may be life threatening;
- provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances;
- training of project workers and maintenance of training records;
- documentation and reporting of occupational accidents, diseases and incidents;
- emergency prevention and preparedness and response arrangements to emergency situations; and
- remedies for adverse impacts such as occupational injuries, deaths, disability and disease.

  During the augmentation of dams, the major activities are construction and decommissioning which includes the following occupational hazards and their safety measures:

1. **Over-exertion**

Over-exertion, and ergonomic injuries and illnesses, such as repetitive motion, over-exertion, and manual handling, are among the most common causes of injuries in construction and decommissioning sites. Recommendations for their prevention and control include:

- Training of workers in lifting and materials handling techniques in construction and decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary
- Planning work site layout to minimize the need for manual transfer of heavy loads
- Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations
- Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks

2. **Slips and Falls**

Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction and decommissioning sites. Recommended methods for the prevention of slips and falls from, or on, the same elevation include:

- Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths
- Cleaning up excessive waste debris and liquid spills regularly
- Locating electrical cords and ropes in common areas and marked corridors
- Use of slip retardant footwear

3. **Work in Heights**

Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal or permanent disabling injury at construction or decommissioning sites. If fall hazards exist, a fall protection plan should be in place which includes one or more of the following aspects, depending on the nature of the fall hazard.

- Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 200 pounds, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface

- Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 5000 pounds (also described in this section in Working at Heights above), as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 5000 pounds
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces.

4. Struck By Objects

Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities. Techniques for the prevention and control of these hazards include:

- Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels
- Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable
- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap · Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged
- Evacuating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures
- Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes.

5. **Moving Machinery**

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving. Techniques for the prevention and control of these impacts include:

- Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic
- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
- Ensuring moving equipment is outfitted with audible back-up alarms
- Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

6. **Dust**

- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements
- PPE, such as dusk masks, should be used where dust levels are excessive.

7. **Other Site Hazards**

Construction and decommissioning sites may pose a risk of exposure to dust, chemicals, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms, which should be prevented through the implementation of project specific plans and other applicable management practices, including:

- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated land as a first step in decommissioning activities to allow for safe excavation, construction, dismantling or demolition
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection.

Thus, the parties contractors/consultants who employ or engage project workers should develop and implement procedures to establish and maintain a safe working environment, including that workplaces, machinery, equipment and processes under their control are safe and without risk to health, including by use of appropriate measures relating to chemical, physical and biological substances and agents. The project

workers should be consulted in promoting understanding, and methods for, implementation of OHS requirements, as well as in providing information to project workers, training on occupational safety and health, and provision of personal protective equipment without expense to the project workers.

A system for regular review of occupational safety and health performance and the working environment should be put in place and include identification of safety and health hazards and risks, implementation of effective methods for responding to identified hazards and risks, setting priorities for taking action, and evaluation of results.

Operational Policy OP 4.12 on Involuntary Resettlement (July 2013):The objectives of the World Bank's policy with regard to involuntary resettlement are: (i) involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs; (ii) where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits and displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs; (iii) displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. Policy will be relevant as there will be land acquisition and associated resettlement impacts arising from the project activities. This policy and provisions of existing national and state policies shall form the basis for preparation of a SIA and RAP that will assess impacts and present entitlements to project affected persons.

Guidelines for Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labor Influx: World Bank OPCS has issued the above guideline to identify, assess and manage the risks of adverse social and environmental impacts that are associated with the temporary influx of labor resulting from Bank- supported projects. The Note contains guiding principles and recommendations to be considered as part of the design and implementation of projects with civil works that require labor from outside the project's area of influence. This Note does not introduce new requirements, but rather seeks to provide concrete guidance on how to approach temporary labor influx within the environmental and social assessment process. Key principles of this guiding note are:

- Reduce labor influx by tapping into the local workforce. The most effective mitigation measure against labor influx is to avoid or reduce it. Depending on the size and the skill level of the local workforce, a share of the workers required for the project may be recruited locally.

- Assess and manage labor influx risk based on appropriate instruments. The assessment and management of labor influx should be based on risks identified in the ESIA, other Bank-required assessments, and the Bank's sector-specific experience in the country. Depending on the risk factors and their level, appropriate mitigation instruments need to be developed such as a site-specific Labor Influx Management Plan and/or a Workers' Camp Management Plan (or other instruments with similar purpose) in a high-risk environment.
- Incorporate social and environmental mitigation measures into the civil works contract. Most adverse impacts from labor influx can only be mitigated by the contractor commissioned by the Borrower to carry out the works. It is therefore paramount to ensure (i) the safeguard instruments are reflected in the contractor's ESMP (CESMP), and (ii) ensure the project is implemented in accordance with the CESMP.

CHAPTER 3

3. BASELINE ENVIRONMENTAL AND SOCIAL PROFILE

During the process of assessment and preparation of the original ESMF, a study of the existing environmental and social conditions was carried out for the 10 representative dams across four different states (Annexure I). The current chapter provides of baseline environment and social profile for all the seven states wherein the original project and AF are being implemented.

3.1 MADHYA PRADESH

Madhya Pradesh, located in the central part of India is the second largest state with an area of 308,252 km² constituting 9.38% of the geographical area of the country. It lies between latitude 21°17' and 26°52' N and longitude 74°08' and 82°49' E. The state can be divided into four physiographic regions; the low lying area in north and North West of Gwalior, Malwa plateau, Satpura and Vindhyan ranges. The important rivers of the state are Chambal, Betwa, Sone and Narmada. **Climate of the state is subtropical** with hot dry summer (April-June) followed by monsoon rains (July-September) and a cool and relatively dry winter. The average annual rainfall varies from 800 mm to about 1800 mm; it decreases from south east and east to north-west and west.

The state has largest forest area in the country. The recorded forest area is 77,414 km² constituting 25.11% of the geographical area of the state. The central, eastern and southern parts of the state are rich in forest resources, whereas northern and western parts are deficient. Major forest types of the state are dry thorn, dry and moist deciduous, subtropical semi evergreen and tropical moist evergreen. The important Non Wood Forest Products (NWFP) are Tendu leaves (*Diospyros melanoxylon*), Sal seed (*Shorea robusta*), Harra (*Terminalia chebula*), Chironji (*Buchnania lanzan*) and flowers & seeds of Mahua (*Madhuca indica*). There are nine National Parks and 25 Wildlife sanctuaries spread over 1.1 million hectare. There are five tiger reserves in the state – Kanha, Panna, Bandhavgarh, Pench and Satpura.

View of Mohini Weir

Population of Madhya Pradesh is 7.27 Crores (Census 2011) out of the which, 72.37 % is rural and 27.63 % is urban. The Schedule Tribes accounts for 21.09% of the state. The main tribal groups are Gond, Bhil, Baiga, Kokru, Bhariya, Halba, Kaul,Mariya and Sahariya.

Soyabean oil, processing of sugar, cotton textiles, newsprint, pottery, cement, carpets, silk, rayon, jute, glass, steel, and electrical engineering goods are major industries of the state.

In addition to the above baseline condition of state, details baseline information of some sample dam locations are presented in the following section.

3.1.1 MOHINI PICK-UP WEIR

The dam is situated on Sind River in Shivpuri District of Madhya Pradesh. It was built in 1977 for irrigation purpose. The right bank canal is used for direct irrigation in the command area. There is a feeder canal, which is used for storage at Harshi dam, 6 km downstream and used for irrigation. The area has a tropical climate with average rainfall of 875 mm per annum. Maximum temperature in the region goes up to 46o C. The nearest meteorological station is at Shivpuri about 48 km from the dam. It is reported that there were floods in the area in 1984 and 1992 caused by excessive rainfall.

The topography of the area is plain with basalt rock underneath and falls in seismic zone–II. There are four main rivers namely Parwati, Sindh, Kuno and Betwa, which pass through the Shivpuri district. The Parwati is a tributary of Sindh River and joins it near Pawaya in Gwalior district. The Sindh River enters from Guna district and flowing north for a while then towards east forms the boundary between Gwalior and Datia districts and finally flows through Bhind to join the Chambal.

Forest cover of Shivpuri district is 25.09% covering 2,526 km2. The catchment area of the dam is 5944 km2 and has open and moderate forest cover.The flora of the area consist of Khair (Acacia catechu), Salai (Boswellia serrata), Tendu (Diospyros tomentosa), Palas(Butea monos[erma), Mahua (Madhuca indica), Saja (Terminalia tomentosa), Koha (Terminalia arjuna), Jamun (Syzygium cumini), Dhaman (Grewia elastica), Semal (Bombax ceiba) and Amaltas(Cassia fistula). Plantation was observed near the weir which has been done by Irrigation dept. The distribution of Forest cover of the state and district is given in the table below.

Table 3. 1: Distribution of Forest cover in the Sub-project District & State

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Madhya Pradesh	3,08,252	6,563	34,571	36,280	77,414	25.11
Shivpuri	10,066	18	781	1,727	2,526	25.09

Source: State of Forest Report, Forest Survey of India, 2017

Madhav National Park and Kaera Wildlife sanctuary is located in the district. Tiger (*Panthera tigris*), Panther (*Panthera pardus*), Jackal (*Canis aureus*), Hyena (*Hyaena hyaena*), Sloth bear (*Melursus ursinus*), Sambhar (*Cervus unicolor*), Wild Bear (*Sus scrofacristatus*), Fox (*Vulpes benghaleneis*), Chinkara (*Gazella bennetti*), Black buck (*Antelope cervicapra*) and black faced monkey (*Semlipetheous entellus*) are found in the District. Among avifauna Myna, Shikra Hawk, Jungle Crow, Black Crows, Hariyal Green Pigeon, Grey Jungle Fowl, Peacock, Jungle Bush Quail and Bustard Quail are present in the area.

Water quality of the reservoir appears to be good and is used for drinking. Soil type of the area is alluvial and major crops grown are Rice, Jowar, Bajra, Maize, Wheat, Barley, Gram and Tur (Arhar). Sugarcane, Condiments and Spices; Sesamum (til) and Linseed are other crops of the district. Plantationsof mango and other fruits are also observed in the district.

There is no industry in the vicinity; agriculture is the main occupation of the local people. The social set up of the district in which the dam falls is given in Table 3.3.

Shahariya Tribe is reported in disrict Shivpuri. The tribals live in the forests of the valleys of the Sindh river. Agriculture income is marginal but they get substantial additional income from working in the forests and collecting minor forest produce such as honey, edible gums, manufacture of kattha, collection of chironji, tapping salai trees etc.

3.1.2 KOLAR DAM

This dam was built in 1989 on Kolar River in Sehore District of Madhya Pradesh for drinking water supply and irrigation. For drinking purpose, the water is supplied through canal to raw water treatment plant and then sent through pipelines to Bhopal city. Balance water is supplied through barrage, about 30 km downstream from where irrigation canal starts. Water from Kolar dam is used for Irrigation in Nasrullaganj and Budhni Tehsil.

View of Kolar Dam

The area comes under tropical climate with average annual rainfall of 1260 mm. The temperature varies from about 8°C. to 42°C. The dam is located in a valley surrounded by hills.

Topography of Kolar Dam is hilly in the catchment area. Exposed rocks can be seen in the area. The command area is generally plain. It is bounded by Vindhya hills in the north and by Narmada River in the south. The area falls in Deccan trap which consist of basaltic rocks. The Kolar Dam site lies in seismic zone III. Soil of the Kolar dam area is formed from basaltic rocks with medium black colour. Depth of black soil varies from 50 cm to 150 cm. At some places yellowish brown and dark grayish brown soil is found. The texture of soil is generally clayey, soil along streams have loamy texture. The soil is alkaline in nature. Kolar Dam lies in the wheat zone. Rabi crops are main crop grown in the area and consist of wheat, gram etc. The Kolar River falls in Narmada basin. The main rivers of the district Sehore are Narmada, Parvati, Ajnal, Kolar, Utawali, Seep, Amber, Seewan, Kaliasot, Nevaj and Dudhi Rivers.

The area around Kolar project is densely forested. Teak (*Tectona grandis*) forest is dominant in the area. The main flora consist of Teak *(Tectona grandis)* Sal (*Shorea robusta*), Saja (*Terminalia tomentosa*), Bija (*Pterocarpus marsupium*), Lendia (*Lagerstroemia parviflora*), Haldu (*Adina cardifolia*), Dhaora (*Anogeissus latifolia*), Salai (*Boswelia serrata*) Aonla (*Emblic officinalis*), Amaltas (*Cassia fistula*)and Gamhar (*Gmelina arborea*). The forest cover of the sub project state and district is given in the **Table: 3.2** below.

Table 3. 2: Distribution of Forest cover of the Subproject State & District

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Madhya Pradesh	3,08,252	6,563	34,571	36,280	77,414	25.11
Sehore	6,578	24	640	740	1,404	21.34

Source: State of Forest Report, Forest Survey of India, 2017

There is degradation of the catchment area due to over grazing with consequential siltation of the reservoir. The reservoir is host to important fish species like carps, mrigel and mahaseer.

Total Population of Sehore district is 1,311,332 (Census 2011). The urban population is 248,462 and rural is 1,062,870. The social setup of the state and district is given below:

Table 3. 3: Social Status of Subproject State and Districts

Location	SR(out of 1000)	LR %	SC %	ST %	WPR %	MnW %	MlW %	NW %
State								
Madhya Pradesh	931	69.3	15.6	21.09	43.47	31.26	12.2	56.5
District								
Shivpuri (Mohini Pick-Up Weir)	877	62.5	18.6	13.2	44	29.82	8.50	61.68
Sehore (Kolar Dam)	918	70	20.69	11.10	44.69	28.38	16.3	55.3

Source: Primary Census Abstract, 2011

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe,

WPR – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

3.2 ODISHA

Odisha located in the eastern part of India surrounded by the states of West Bengal to north-east, Jharkhand to north, Chhattisgarh to the west and north-west and Andhra Pradesh to the south. It is the 9th largest state by area with total geographical area 155,707 km^2 and a coastline of 450 km. In the eastern part of the state lies the coastal plain. It extends from the Subarnarekha River in the north to

the Rushikulya river in the south. The lake Chilika is part of the coastal plains. The plains are rich in fertile silt deposited by the six major rivers flowing into the Bay of Bengal: Subarnarekha, Budhabalanga, Baitarani, Brahmani, Mahanadi and Rushikulya. Odisha lies between the latitudes 17.780N and 22.730N, and between longitudes- 81.37E and 87.53E Three-quarters of the state is covered in mountain ranges. Deep and broad valleys have been made in them by rivers. The highest point in the state is Deomali at 1672 metres. The other high peaks are: Sinkaram (1620 m), Golikoda (1617 m), and Yendrika (1582 metres).

The climate is typical tropical mainly because of its proximity to the sea. The average annual rainfall in the state is about 200 cm.

Odisha has 48,903 km^2 of forests which cover 31.41% of the state's total area according to the Forest Survey of India, 2012. The forests are classified into: dense forest, medium dense forest, open forest (forest without closed canopy) and scrub forest. The state also has bamboo forests and mangroves. There are two major National Parks and an Elephant Sanctuary, the Chandaka Elephant Sanctuary. Chilika Lake, a brackish water lagoon with an area of 1105 km2 on the east coast of the state is connected to the Bay of Bengal by a 35-km-long narrow channel and is a part of the Mahanadi delta.

The total population of Odisha is 41,947,358 (Census 2011) out of which 3,49,70,562 constitutes the rural population and the urban population is 70,03,656. The population density of the state according to Census 2011 is 270 per km2. State has a livestock population of 20.73 million (Livestock census, 2012)

Odisha has abundant natural resources and a large coastline. It contains a fifth of India's coal, a quarter of its iron ore, a third of its bauxite reserves and most of the chromite. Other industries are cement industry, fertilizer industry, agro based industry etc.

The details of one of the major component in Odisha i.e. Hirakud Dam is presented in the following section.

3.2.1 HIRAKUD DAM

The dam is situated about 15 kms from Sambalpur and is built across the Mahanadi River. The area is mainly underlaid by granite and granite gneiss and alluvium. The dam was built in the early fifties of twentieth century for multipurpose like irrigation and production of hydroelectric power. The project

area comes under zone-III of seismic zones of India. The distinct seasons are:

- Summer: March to June, May is the peak of summer season with maximum recorded temperature of 45^0C
- Monsoon: July onwards for four months. The normal annual rain fall in this area is 1415.1 mm
- Winter: October to February with minimum temperature goes up to 5^0C.

The flora of the area consist of more than 108 species including Mango (*Mangifera indica*), Chauli (*Eleodendron glaucum*), Jamun (*Syzyzium cumini*), Nima (*Azadirachta indica*), Jackfruit (*Artocarpus heterophyllus*), Guava (*Psidium guajava*), Siris (*Albizzia lebek*) etc. There are about 5777 trees found within affected area.

Table 3. 4: Distribution of Forest cover of the Subproject State & District

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Orissa	155,707	6,967	21,370	23,008	51,345	32.98
Sambalpur	6,624	499	1,675	1,106	3,280	49.52

Source: State of Forest Report, Forest Survey of India, 2017

The dam with the channel provides an ideal environment for the wildlife. The Debrigarh wildlife sanctuary is located here. Several species of migratory birds visit the reservoir during winter. Nearly 23 of birds are seen in the reservoir and common among them are common pochard, red-crested pochard, great crested grebe and several others. Chausingha, Gaur, elephant, Sambar and Spotted Deer, Bear, Leopard, porcupine, Jackal, Fox, Wolf, Hyena, Wild Dog are some of the main species found in the area. Fish species found in the area are Lal Chandi (*Parambassis lala*), Khasia (*Colisa fasciatus*), Gadisa (*Channa punctatus*), Bata (*Labeo bata*), Singla *(Mystus aor*), Punia Bachua (*Clupisoma garua*) etc.

Sambalpur has a population of 183,383, its urban / metropolitan population is 269,575, this includes Burla and Hirakud. Sambalpur is very ethnically diverse, with about 14 communities including Brahmin, Teli (oil extractors), Gour (milkmen), Guria (maker of sweets), Agaria (industrious cultivators), Sunari (goldsmith), Kultas (cultivators), Kewat (boatmen and fisherman), Dhobi (washermen), Bhuliya (weaver), Bhandari (barber), Kamar (blacksmith) Ganda (pipers and drummers) and Muslims, Sikhs and Christians cohabiting together.

Table 3. 5: Demographic Details of Odisha and Sambalpur

Location	SR (out of 1000)	LR %	SC %	ST %	WPR %	MnW %	MlW %	NW %
State								
Odisha	979	72.87	17.1	22.8	41.8	25.51	16.28	58.21
District								
Sambalpur	976	76.22	18.43	34.12	48.59	32.36	16.23	51.41

Source: Primary Census Abstract, 2011

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe,

WPR – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

3.3 KARNATAKA

3.3.1 BASELINE STATUS- ENVIRONMENT

Geography: Karnataka located in the south western region of India is bordered by the Arabian Sea to the west, Goa to the northwest, Maharashtra to the north, Telangana to the northeast, Andhra Pradesh to the east, Tamil Nadu to the southeast and Kerala to the south. It is the seventh largest Indian state by area covering an area of 191,791 square kilometers. Geographically the state is situated on a tableland where the Western and Eastern Ghat ranges converge into the Nilgiri hill complex and is confined roughly within latitudes 11.50N and 18.50N and longitude 740E and 78.50E.

Karnataka State forms part of two well-defined macro regions of Indian Union; the Deccan Plateau and the Coastal plains and Islands. The State has four physiographic regions namely Northern Karnataka Plateau, Central Karnataka Plateau, Southern Karnataka Plateau and Karnataka Coastal Region.

The state comprises of varied topographical structures that includes high mountains, plateaus, residual hills and coastal plains. The State is enclosed by chains of mountains to its west, east and south. There are quite a few high peaks both in Western and Eastern Ghat systems with altitudes more than 1,500 metres. The state consists mainly of plateau which has higher elevation of 600 to 900 metres above mean sea level. Plain land of elevation less than 300 metres above mean sea level is found only in the narrow coastal belt, facing the Arabian Sea. Among the tallest peaks of Karnataka are the Mullayyana Giri (1,925 m), Bababudangiri (Chandradrona Parvata 1,894 m) and the Kudremukh (1,895 m) from the Chikmagalur district and the Pushpagiri (1,908 m) in Kodagu district.

Soil Type: The common types of soil groups found in Karnataka are red soil, black cotton soil, lateritic soil, black soil, Alluvio-Colluvial Soils.

Water Resources: With a surface water potential of about 102 kilometers, Karnataka accounts for about six percent of the country's surface water resources. Around 60% of this is provided by the west flowing rivers while the remaining comes from the east flowing rivers. There are seven river basins in all formed by the Godavari, Cauvery, Krishna, the west-flowing rivers, North Pennar, South Pennar, and Palar.

Climate and Rainfall: Karnataka has the following four seasons in the year:

- Winters: January to February
- Summer: March to May
- Monsoon: May to September
- Post-monsoon: October to December.

The highest recorded temperature was 45.6 °C (114 °F) at Raichur on May 23, 1928. The lowest recorded temperature was 2.8 °C (37 °F) C at Bidar on December 16, 1918. The southwest monsoon accounts for almost 80% of the rainfall that the state receives. The annual rainfall across the state ranges from as low as 50 cm to abundant amount of 350 cm.

Forest

Table 3. 6: Distribution of Forest cover of the Subproject State

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Karnataka	191,791	4,502	20,444	12,604	37,550	19.58

Source: State of Forest Report, Forest Survey of India, 2017

Biodiversity: Karnataka has a rich diversity of flora and fauna. The forests support 25% of the elephant and 10% of the tiger population of India. Karnataka has five national parks: Anshi, Bandipur, Bannerghatta, Kudremukh and Nagarhole and also has 27 wildlife sanctuaries of which seven are bird sanctuaries.

Wild animals that are found in Karnataka include the elephant, the tiger, the leopard, the gaur, the sambar deer, the chital or spotted deer, the muntjac, the bonnet macaque, the slender loris, the common palm civet, the small Indian civet, the sloth bear, the dhole, the striped hyena and the golden jackal. Some of the birds found here are the great hornbill, the Malabar pied hornbill,

the Ceylon frogmouth, herons, ducks, kites, eagles, falcons, quails, partridges, lapwings, sandpipers, pigeons, doves, parakeets, cuckoos, owls, nightjars, swifts, kingfishers, bee-eaters and munias. Some species of trees found in Karnataka are *Callophyllum tomentosa, Callophyllum wightianum, Garcina cambogia, Garcinamorealla, Alstoniascholaris, Flacourtiamontana, Artocarpus hirsutus, Artocarpus acoocha, Cinnamomum zeylanicum, Grewia tilaefolia, Santalum album, Shorea talura, Emblica offici alis, Vitex altissima* and *Wrightia tinctoria*. Wildlife in Karnataka is threatened by poaching, habitat destruction, human-wildlife conflict and pollution.

3.3.2 BASELINE STATUS- SOCIAL

According to the 2011 census of India, the total population of Karnataka is 6,10,95,297. There is a decadal increase in population of 15.6% from 2001 to 2011. The sex ratio is 973 females to 1000 males and 38.70% of the people in Karnataka live in urban areas. The literacy rate is 75.4%. The demographic details of Karnataka are presented in Table: 3.7.

Table 3. 7: Demographic Details of Karnataka

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR %**	**MnW %**	**MlW %**	**NW %**
State								
Karnataka	973	75.4	17.1	7.0	45.6	83.9	16.1	54.4

Source: Primary Census Abstract, 2011

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

3.4 KERALA

3.4.1 BASELINE STATUS- ENVIRONMENT

Geography: The state of Kerala is located between the Lakshadweep Sea and the Western Ghats. With an area of 38,863 km^2, it is bordered by Karnataka to the north and northeast, Tamil Nadu to the east and south, and the Lakshadweep Sea to the west. Lying between northern latitudes 8°18' and 12°48' and eastern longitudes 74°52' and 77°22', the state has a coast of 590 km and the width of the state varies between 11 and 121 kms. Geographically, Kerala can be divided into three climatically distinct regions: the eastern highlands, the central mid-lands; and the western lowlands. Anamudi in the Idukki district is the highest peak in south India, is at an elevation of 2,695 m. Kerala's western coastal belt is relatively flat compared to the eastern region and is criss-crossed by a network of interconnected brackish canals, lakes, estuaries, and rivers known as the Kerala Backwaters.

Soil Type: On the basis of the morphological features and physico-chemical properties, the soils of the State have been classified into red loam, laterite coastal alluvium, riverine alluvium, Onattukara alluvium, brown hydromorphic, saline hydromorphic, Kuttanad alluvium, black soil and forest loam.

Water Resources: Kerala has around eight percent of India's waterways with 44 rivers including Periyar, Bharathapuzha, Pamba, Chaliyar etc. The average length of the rivers is 64 kms.

The state is recognized by the Kerala Backwaters which is an interconnected system of brackish water lakes and river estuaries that lies inland from the coast and runs virtually the length of the state. The state's largest lake Vembanad, dominates the backwaters; it lies between Alappuzha and Kochi and is about 200 km^2 in area. Many of the rivers are small and entirely fed by monsoon rain. As Kerala's rivers are small and lacking in delta, they are more prone to environmental effects such as sand mining and pollution. The state experiences several natural hazards like landslides, floods and droughts.The state has three of the world's Ramsar Convention listed wetlands— Lake Sasthamkotta, Ashtamudi Lake and the Vembanad-Kol wetlands.

Climate and Rainfall: Kerala experiences humid and tropical monsoon climate influenced by seasonal heavy rains of the southwest summer monsoon and northeast winter monsoon. The state experiences 120-140 rainy days per year, 65% of the rainfall occurs in the months of June to August (southwest monsoon) and the rest from September to December (northeast monsoon). The average rainfall in Kerala is 2,923 mm annually.

The state is prone to storm surges and cyclone related torrential downpours in summers along with occasional droughts. The mean daily temperature ranges from 19.8 °C to 36.7 °C. Mean annual temperatures range from 25.0–27.5 °C in the coastal lowlands to 20.0–22.5 °C in the eastern highlands.

Forest

Table 3. 8: Distribution of Forest cover of the Subproject State

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Kerala	38,863	1,663	9,407	9,251	20,321	52.30

Source: State of Forest Report, Forest Survey of India, 2017

The state has 1455.4 km^2 vast Nilgiri Biosphere Reserve. The remaining forest cover is protected from clear felling after subjected to extensive clearing of forest for cultivation in the 20th century. Eastern

Kerala's windward mountains shelter tropical moist forests and tropical dry forests, which are common in the Western Ghats.

Biodiversity: The biodiversity of the state is concentrated and protected in the Western Ghats. There are around 4,000 flowering species in the state out of which 1,272 of which are endemic to Kerala, 900 are medicinal, and 159 are threatened.

Kerala's fauna are notable for their diversity and high rates of endemism: it includes 118 species of mammals (1 endemic), 500 species of birds, 189 species of freshwater fish, 173 species of reptiles (10 of them endemic), and 151 species of amphibians (36 endemic). These are threatened by extensive habitat destruction, including soil erosion, landslides, salinisation, and resource extraction. In the forests, sonokeling, *Dalbergia latifolia*, anjili, mullumurikku, *Erythrina, and Cassia* number among the more than 1,000 species of trees in Kerala. Other plants include bamboo, wild black pepper, wild cardamom, the calamus rattan palm and aromatic vetiver grass, *Vetiveria zizanioides*. Indian elephant, Bengal tiger, Indian leopard, *Nilgiri tahr*, common palm civet, and grizzled giant squirrels are also found in the forests. Reptiles include the king cobra, viper, python, and mugger crocodile. Kerala's birds include the Malabar trogon, the great hornbill, Kerala laughingthrush, darter and southern hill myna. In the lakes, wetlands, and waterways, fish such as kadu; stinging catfish and choottachi; orange chromide—*Etroplus maculatus* are found.

3.4.2 BASELINE STATUS- SOCIAL

According to the 2011 census of India, the total population of Kerala is 3,34,06,061. The State has now 52.30 per cent rural population in 2011 Census as against 74.04 per cent in 2001 Census. The Overall sex ratio of Kerala is 1084 females per 1000 males. Sex ratio of rural area is 1077 and that of urban area is 1091. Total number of literates in Kerala is 28,234,227 and total literacy rate is 93.91%. Among these, literates in rural area are 14,595,727 and that in urban area is 13,638,500. The demographic details of Kerala are presented in Table: 3.9.

Table 3. 9: Demographic Details of Kerala

Location	SR (out of 1000)	LR %	SC %	ST %	WPR %	MnW %	MlW %	NW %
State								
Kerala	1084	93.91	9.10	1.45	34.78	80.30	19.70	65.22

Source: Primary Census Abstract, 2011

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

3.5 UTTARAKHAND

3.5.1 BASELINE STATUS- ENVIRONMENT

Geography: Uttarakhand became the 27th state of the Republic of India on 9 November 2000, created from the Himalayan and adjoining northwestern districts of Uttar Pradesh. It borders Tibet to the north; the Province No. 7 of Nepal to the east; and the Indian states of Uttar Pradesh to the south and Himachal Pradesh to the west and north-west as well as Haryana on its south-western corner.

The state is divided into two divisions, Garhwal and Kumaon, with a total of 13 districts. The state (30.0668° N, 79.0193° E) lies on the south slope of the Himalayan range. Geographically, the state varies from glaciers at the highest elevations to tropical forests at the lower elevations. The state has a total area of 53,483 km^2, of which 86% is mountainous and 65% is covered by forest.

Soil Type: Uttarakhand has various types of soil, all of which are susceptible to soil erosion. In the north, the soil ranges from gravel (debris from glaciers) to stiff clay. Brown forest soil—often shallow, gravelly, and rich in organic content—is found farther to the south. The Bhabar area is characterized by soils that are coarse-textured, sandy to gravelly, highly porous, and largely infertile. In the extreme southeastern part of the state, the Tarai soils are mostly rich, clayey loams, mixed to varying degrees with fine sand and humus; they are well suited to the cultivation of rice and sugarcane.

Water Resources: Two of the most important rivers in Hinduism originate in the glaciers of Uttarakhand, the Ganges at Gangotri and the Yamuna at Yamunotri. They are fed by myriad lakes, glacial melts and streams. These two alongwith Badrinath and Kedarnath form the Chota Char Dham, a holy pilgrimage for the Hindus. The land to the east of this basin is drained by the Bhagirathi and the Alaknanda—which join to form the Ganges at the town of Devaprayag—and the Mandakini, Pindar, and Dhauliganga, all principal tributaries of the Alaknanda. To the east again are the southward-flowing Ramganga and Kosi rivers, and draining to the southeast in the same region are the Sarju and

Goriganga, both of which join the Kali at Uttarakhand's eastern border with Nepal.

Climate and Rainfall: Uttarakhand is characterized by two types of climate, sharply differentiated in the plains and the mountainous regions. Summers in the plain region of Uttarakhand have similar climate as other surrounding plain regions of different states i.e. the maximum temperature can cross the 40°C mark and there can be considerable humidity. Warm temperate conditions prevail in the Middle Himalayan valleys with temperature around 25°C making it an idle getaway for people of the plains to beat the heat. However, in the higher areas of middle Himalayas the temperature is around 15 to 18°C, still pleasant. The season extends from April to June.

The Climate of Uttarakhand during summers in the plain region can be chilly with temperatures going below 5°C mark. The winters in the middle Himalayan valleys are very cold and in the higher areas the temperature can drop below the freezing point. The Himalayan peaks remain snow capped throughout the year and many places receive regular snowfall. Throughout the state the temperature ranges from sub-zero to 15°C and the season lasts from November to February.The monsoon is the most pleasant season when temperature differs from 15 to 25°C at most places which reigns from July to September. The state receives 90% of its annual rainfall in this season. The eastern parts of Himalayas are subjected to heavier rainfalls when westerns are relatively drier. About 1896 mm of precipitation falls annually in Dehradun.

Forest: 65% of the total area, i.e. 34,666 km^2 of state is covered with forest. The highest elevations are covered by ice and bare rock. Below them, between 3,000 and 5,000 metres (9,800 and 16,400 ft) are the western Himalayan alpine shrub and meadows. The temperate western Himalayan subalpine conifer forests grow just below the tree line. At 3,000 to 2,600 metres (9,800 to 8,500 ft) elevation they transition to the temperate western Himalayan broadleaf forests, which lie in a belt from 2,600 to 1,500 metres (8,500 to 4,900 ft) elevation. Below 1,500 metres (4,900 ft) elevation lie the Himalayan subtropical pine forests. The Upper Gangetic Plains moist deciduous forests and the drier Terai-Duar savanna and grasslands cover the lowlands along the Uttar Pradesh border in a belt locally known as Bhabar. These lowland forests have mostly been cleared for agriculture, but a few pockets remain.

Table 3. 10: Distribution of Forest cover of the Subproject State

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Uttarakhand	53,483	4,969	12,884	6,442	24,295	45.43

Source: State of Forest Report, Forest Survey of India, 2017

Biodiversity: Uttarakhand is home to diverse flora and fauna, many of which are protected by sanctuaries and reserves. National parks in Uttarakhand include the Jim Corbett National Park (the oldest national park of India) at Ramnagar in Nainital District, and Valley of Flowers National Park and Nanda Devi National Park in Chamoli District, which together are a UNESCO World Heritage Site. Rajaji National Park in Haridwar District and Govind Pashu Vihar National Park and Sanctuary and Gangotri National Park in Uttarkashi District are some other protected areas in the state.

A number of plant species in the valley are internationally threatened, including several that have not been recorded from elsewhere in Uttarakhand. Evergreen oaks, rhododendrons, and conifers predominate in the hills. *sal (Shorea robusta*), silk cotton tree (*Bombax ciliata*), *Dalbergia sissoo, Mallotus philippensis, Acacia catechu, Bauhinia racemosa,* and *Bauhinia variegata* (camel's foot tree) are some other trees of the region. Albizia chinensis, the sweet sticky flowers of which are favoured by sloth bears, are also part of the region's flora. A decade long study by Prof. Chandra Prakash Kala concluded that the Valley of Flowers is endowed with 520 species of higher plants (angiosperms, gymnosperms and pteridophytes), of these 498 are flowering plants. The park has many species of medicinal plants including *Dactylorhiza hatagirea*, *Picrorhiza kurroa, Aconitumviolaceum, Polygonatum multiflorum, Fritillaria roylei, and Podophyllum hexandrum.*

Leopards are found in areas which are abundant in hills but may also venture into the lowland jungles. Smaller felines include the jungle cat, fishing cat, and leopard cat. Other mammals include four kinds of deer (barking, sambar, hog and chital), sloth and Himalayan black bears, Indian gray mongooses, otters, yellow-throated martens, bharal, Indian pangolins, and langur and rhesus monkeys. In the summer, elephants can be seen in herds of several hundred. Marsh crocodiles (*Crocodylus palustris*), gharials (*Gavialis gangeticus*) and other reptiles are also found in the region. Local crocodiles were saved from extinction by captive breeding programs and subsequently re-released into the Ramganga river. Several freshwater terrapins and turtles like the Indian sawback turtle (K*achuga*

tecta), brahminy river turtle (*Hardella thurgii*), and Ganges softshell turtle (*Trionyx gangeticus*) are found in the rivers. Butterflies and birds of the region include red Helen (*Papilio helenus*), the great eggfly (*Hypolimnos bolina*), common tiger (*Danaus genutia*), pale wanderer (*Pareronia avatar avatar*), jungle babbler, tawny-bellied babbler, great slaty woodpecker, red-breasted parakeet, orange-breasted green pigeon and chestnut-winged cuckoo. In 2011, a rare migratory bird, the bean goose, was also seen in the Jim Corbett National Park.

3.5.2 BASELINE STATUS- SOCIAL

According to the 2011 census of India, the total population of Uttarakhand is 1,00,86,292. The Overall sex ratio of Uttarakhand is 963 females per 1000 males. Total number of literates in Uttarakhand is 68,80,953 and total literacy rate is 68.22%. The demographic details of Uttarakhand are presented in Table: 3.11.

Table 3. 11: Demographic Details of Uttarakhand

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR %**	**MnW %**	**MlW %**	**NW %**
State								
Uttarakhand	963	68.22	18.76	2.89	38.39	74.13	25.87	61.61

Source: Primary Census Abstract, 2011

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

3.6 DAMODAR VALLEY CORPORATION

3.6.1 BASELINE STATUS- ENVIRONMENT

The Damodar Valley Corporation has been generating and transmitting power since 1953. It emerged as a culmination of attempts made over a whole century to control the wild and erratic Damodar river.

Geography: The command area of 24,235 km^2 spread across the Damodar valley. The effect of DVC is majorly on two neighboring states, West Bengal and Jharkhand. In Jharkhand, Hazaribagh, Ramgarh, Koderma, Giridih, Dhanbad, Bokaro and Chatra and Bardhaman and Hooghly districts in West Bengal are covered in the area along with partially covered Palamu, Ranchi, Lohardaga and Dumka districts in Jharkhand and Howrah, Bankura and Purulia districts in West Bengal.

West Bengal and Jharkhand are Indian states located in Eastern India. West Bengal with an area of 88,752 km^2 borders Bangladesh in the east and Nepal and Bhutan in the north along with Indian states

of Odisha, Jharkhand, Bihar, Sikkim and Assam. The state, lying between 85 degree 50 minutes and 89 degree 50 minutes east longitude, and 21 degrees 25 minutes and 27 degrees 13 minutes north latitude is diverse of high peaks of Himalaya in the northern extremes to coastal regions down south, with regions such as plateau and Ganges delta intervening in between.

Jharkhand with an area of 79,710 km^2, is enclosed by Bihar to the northern side, Chhattisgarh and Uttar Pradesh to the western side, Odisha to the southern part and West Bengal to the eastern part. A lot many areas of Jharkhand lie on Chota Nagpur Plateau.

Soil Type: The major types of soil found in West Bengal are mountain soil, alluvial soil, red soil and saline soil, whereas in Jharkhand, the mostly found soils are red soil, micacious soil, sandy soil, black soil and laterite soil. The major soil type in Damodar valley is red soil.

Rich in mineral resources, the valley is home to large-scale mining and industrial activity. The Damodar valley is rich in coal. Massive deposits are found in the central basin spreading over 2,883 square kilometers. The Damodar Valley is one of the most industrialised parts of India. Three integrated steel plants (Bokaro, Burnpur and Durgapur) of Steel Authority of India Limited (SAIL) and other factories are in the valley.

Water Resources: Earlier known as the Sorrow of Bengal, Damodar river and its tributaries have tamed with the construction of several dams.DVC has a network of four dams - Tilaiya and Maithon on Barakar River, Panchet on Damodar river and Konar on Konar river. DVC dams are capable of moderating floods of 6.51 lac cusec to 2.5 lac cusecs.

Flood reserve capacity of 1,292 mcm has been provided in 4 reservoirs, which can moderate a peak flood of 18,395 cumec to a safe carrying capacity of 7,076 cumec. 419 mcm of water is stored in the 4 DVC reservoirs to supply 680 cusec of water to meet industrial, municipal and domestic requirements in West Bengal & Jharkhand. The Durgapur barrage on river Damodar was constructed in 1955 for supply of irrigation water to the districts of Burdwan, Bankura & Hooghly.

Climate and Rainfall: In West Bengal, there are five main seasons: spring, summer which extends from March to June, rainy stretching from July to September, autumn for very short period and winter experienced from mid-November to February, with January being the coldest month. The summer temperatures in the state ranges between 26 °C and 43 °C while the winter temperatures range from 10 °C to 19 °C.

The annual rainfall varies in the different parts of the state. North Bengal receives the highest rainfall,

200 to 400 cm. In the coastal areas rainfall is about 200 cm, in the Ganga plain and in the central part of the state rainfall is about 150–200 cm and in the western plateau region the amount of rainfall received is about 100 to 125 cm.

There are three well-defined seasons in Jharkhand. The cold-weather season, from November to February, is the most pleasant part of the year. The hot-weather season lasts from March to mid-June. The season of the southwest monsoon, from mid-June to October, brings nearly all of the state's annual rainfall, which ranges from about 40 inches (1,000 mm) in the west-central part of the state to more than 60 inches (1,500 mm) in the southwest. Rainfall on the plateau is generally heavier than on the plains. Nearly half of the annual precipitation falls in July and August.

Forest

Table 3. 12: Distribution of Forest cover of the Subproject States

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Jharkhand	79,716	2,598	9,686	11,269	23,553	29.55
West Bengal	88,752	2,994	4,147	9,706	16,847	18.98

Source: State of Forest Report, Forest Survey of India, 2017

The predominant commercial tree species is *Shorea robusta*, commonly known as the sal tree. The coastal region of Purba Medinipur exhibits coastal vegetation; the predominant tree is the *Casuarina*. A notable tree from the Sundarbans is the ubiquitous sundari (*Heritiera fomes*), from which the forest gets its name.

3.26% of the geographical area of West Bengal is protected land, comprising fifteen wildlife sanctuaries and five national parks– Sundarbans National Park, Buxa Tiger Reserve, Gorumara National Park, Neora Valley National Park, and Singalila National Park. Extant wildlife includes Indian rhinoceros, Indian elephant, deer, leopard, gaur, tiger, and crocodiles, as well as many bird species. Migratory birds come to the state during the winter. The high-altitude forests of Singalila National Park shelter barking deer, red panda, chinkara, takin, serow, pangolin, minivet, and kalij pheasants. The Sundarbans are noted for a reserve project devoted to conserving the endangered Bengal tiger although the forest hosts many other endangered species such as the Gangetic dolphin, river terrapin, and estuarine crocodile. The mangrove forest also acts as a natural fish nursery, supporting coastal fishes along the Bay of Bengal.

Jharkhand has a rich variety of flora and fauna. The National Parks and the Zoological Gardens located in the state of Jharkhand present a panorama of this variety. Part of the reason for the variety and diversity of flora and fauna found in Jharkhand state may be accredited to the Palamau Tiger Reserves under the Project Tiger.

3.6.2 BASELINE STATUS- SOCIAL

According to the 2011 census of India, the total population of Jharkhand is 3,29,88,134 . The Overall sex ratio of Jharkhand is 948 females per 1000 males. Total number of literates in Jharkhand is 18328069 and total literacy rate is 55.56%. The total population of West Bengal is 91,347,736 (Census 2011) and the sex ratio is 950 females per 1000 males. The literacy rate in the state is 76.26%.The demographic details of Jharkhand and West Bengal are presented in Table**: 3.13.**

Table 3. 13: Demographic Details of Jharkhand

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR %**	**MnW %**	**MlW %**	**NW %**
State								
Jharkhand	948	55.66	12.08	26.21	39.71	52.06	47.94	60.29
West Bengal	950	76.26	23.51	5.8	38.08	28.14	9.94	61.92

Source: Primary Census Abstract, 2011

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

3.7 TAMIL NADU

3.7.1 BASELINE STATUS- ENVIRONMENT

*Geography:*Tamil Nadu, the eleventh largest state in India by area, covers an area of 130,058 km^2. The state lies in the southernmost part of the Indian Peninsula (11.1271° N, 78.6569° E) bordered by the union territory of Puducherry and the South Indian states of Kerala, Karnataka, and Andhra Pradesh. It is bounded by the Eastern Ghats on the north, by the Nilgiri, the Anamalai Hills, and Kerala on the west, by the Bay of Bengal in the east, by the Gulf of Mannar and the Palk Strait on the southeast, and by the Indian Ocean on the south. The state shares a maritime border with the nation of Sri Lanka. Tamil Nadu has the country's third longest coastline at about 906.9 km.

The western, southern and the north western parts are hilly and rich in vegetation. The Western

Ghats and the Eastern Ghats meet at the Nilgiri hills. The Western Ghats traverse the entire western border with Kerala, effectively blocking much of the rain bearing clouds of the south west monsoon from entering the state. The eastern parts are fertile coastal plains and the northern parts are a mix of hills and plains. The central and the south central regions are arid plains and receive less rainfall than the other regions.

Soil Type: The common types of soil groups found in Tamil Nadu are red soil, black soil, lateritic soil and coastal soil.

Water Resources: With a surface water potential of about 102 kilometers, Karnataka accounts for about six percent of the country's surface water resources. Around 60% of this is provided by the west flowing rivers while the remaining comes from the east flowing rivers. There are seven river basins in all formed by the Godavari, Cauvery, Krishna, the west-flowing rivers, North Pennar River, South Pennar, and Palar.

Climate and Rainfall: The climate of Tamil Nadu is basically semi-arid tropical monsoon type. The state is mostly dependent on monsoon rains, and thereby is prone to droughts when the monsoons fail. The state has two distinct periods of rainfall:

- south west monsoon from June to September, with strong southwest winds;
- North east monsoon from October to December, with dominant north east winds.

The mean annual temperature is 28.2°C in the plains and 15.2°C in the hills. The temperature is minimum in the month of December with 24.7°C and maximum in May with 37.3°C.
The annual rainfall of the state is about 945 mm (37.2 in) of which 48 per cent is through the north east monsoon, and 32 per cent through the south west monsoon. Since the state is entirely dependent on rains for recharging its water resources, monsoon failures lead to acute water scarcity and severe drought. Tamil Nadu is divided into seven agro-climatic zones: north east, north-west, west, southern, high rainfall, high altitude hilly, and Kaveri Delta (the most fertile agricultural zone).

Forest

Table 3.14: Distribution of Forest cover of the Subproject States

Place	Geographical Area (km^2)	Very Dense (km^2)	Moderately Dense (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent (%)
Tamil Nadu	1,30,060	3,672	10,979	11,630	26,281	20.21

Source: State of Forest Report, Forest Survey of India, 2017

In Tamil Nadu forests cover an area of about 2.02 m hectares. Seven types of forests have been identified and they are located mainly on the hills:

- tropical evergreen,
- tropical moist deciduous,
- littoral and swamp,
- tropical dry deciduous,
- tropical dry evergreen,
- subtropical broad bared hill and
- mountain wet temperate.

Biodiversity: The Gulf of Mannar Biosphere Reserve established in 1986 is a marine ecosystem with seaweed and sea grass communities, coral reefs, salt marshes and mangrove forests. The Nilgiri Biosphere Reserve located in the Western Ghats and Nilgiri Hills comprises part of adjoining states of Kerala and Karnataka. The Agasthyamala Biosphere Reserve is in the south west of the state bordering Kerala in the Western Ghats. Tamil Nadu is home to five declared National parks located in Anamalai, Mudumalai, Mukurithi, Gulf of Mannar and Guindy located in the centre of Chennai city. Sathyamangalam Tiger Reserve, Mukurthi National Park and Kalakkad Mundanthurai Tiger Reserve are the tiger reserves in the state.

There are about 2000 species of wildlife that are native to Tamil Nadu. Protected areas provide safe habitat for large mammals including elephants, tigers, leopards, wild dogs, sloth bears, gaurs, lion-tailed macaques, Nilgiri langurs, Nilgiri tahrs, grizzled giant squirrels and sambar deer, resident and migratory birds such as cormorants, darters, herons, egrets, open-billed storks, spoonbills and white ibises, little grebes, Indian moorhen, black-winged stilts, a few migratory ducks and occasionally grey pelicans, marine species such as the dugongs, turtles, dolphins, Balanoglossus and a wide variety of fish and insects.

The common plants occurring among hill species are: *Eucalyptus sp., Albizia lebbeck, Bambusa*

arundinacea, Pterocarpus sp., Lantana camera, Prosopis spicigera, Acacia arabica, Borassus flabellifer, Casuarma sp., Prosopis juliflora, Calotropis gigantea, Cassia auriculeate, Opuntia dilleni and *Agave sp*. etc.

3.7.2 BASELINE STATUS- SOCIAL

According to the 2011 census of India, the total population of Tamil Nadu is 72147030. The Overall sex ratio of Tamilnadu is 996 females per 1000 males. Total number of literates in Tamil Nadu is 51837507and total literacy rate is 71.85%. The demographic details of Tamil Nadu are presented in Table: 3.15.

Table 3. 15: Demographic Details of Tamil Nadu

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR %**	**MnW %**	**MlW %**	**NW %**
State								
Tamil Nadu	996	71.85	20.01	1.10	45.58	84.97	15.03	54.42

Source: Primary Census Abstract, 2011

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

CHAPTER: 4

4. STAKEHOLDERS CONSULTATION

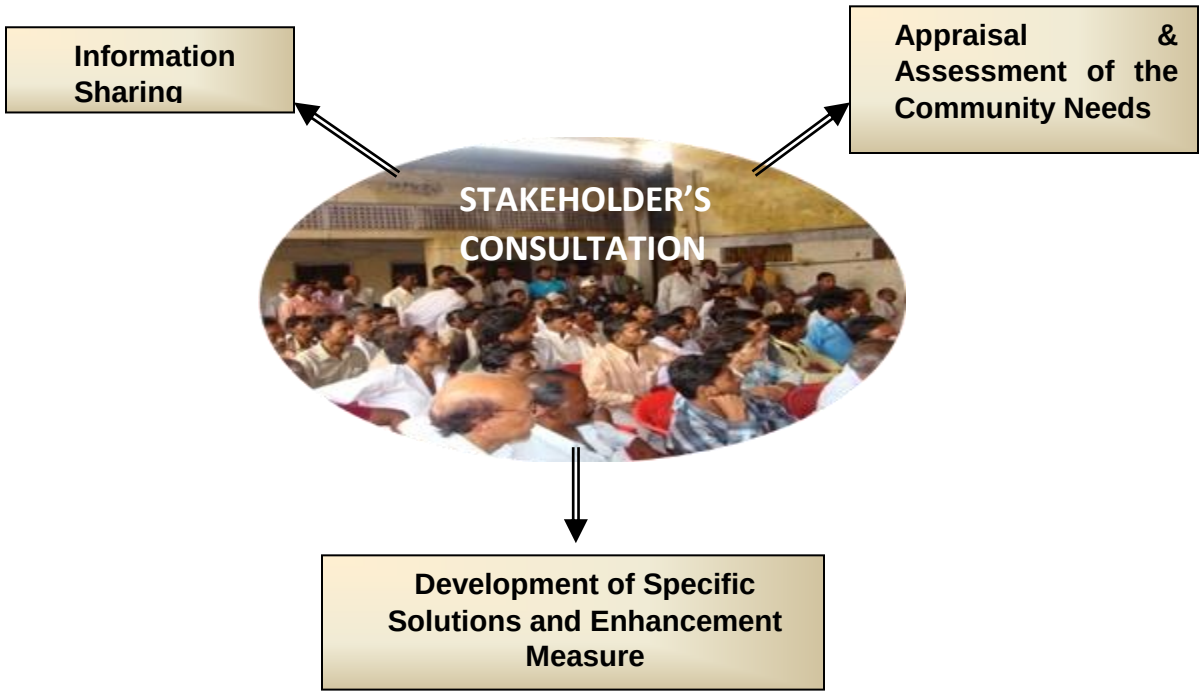
4.1 INTRODUCTION

Public participation and community consultation has been taken up as an integral part of environmental and social assessment. Public participation, viewed as a continuous two way process, involved promotion of public understanding of the processes and mechanisms through which developmental problems and needs are investigated and solved. Consultation was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decisions were made. The involvement of the various stakeholders ensured that the affected population and other stakeholders are informed, consulted and allowed to participate at various stages of project preparation.

This chapter presents the details of public consultation carried out during the preparation of environmental and social management framework and its revision.

4.2 OBJECTIVE

Stakeholder's consultations in the project area were undertaken with the objectives which may be grouped as given below:



Information Sharing

- To promote public awareness about the project.
- To educate the individuals/interested groups about the proposed course of action;
- To solicit the views of affected communities/individuals on environmental components and the significance of impacts;
- To serve as an important tool for collecting information about natural and the human environments, much of which would not be accessible through more traditional approaches of data collection;
- To ensure involvement of local community in the decision making process
- To achieve the basis for an Environment Management Plan for the project, with the incorporation of felt needs views and preferences of the people likely to be impacted.

Appraisal & Assessment

- To inform affected communities about the provision of ESMF, and to settle their felt need with mutual consent and to assist them during relocation of community property, if any
- Deduce information from the people about the local environmental issues and their dependence upon them.
- Collect peoples' perceptions about the project and how the adverse effects of the project may be mitigated.

Devising Specific Solutions

- To solicit the views of affected communities/individuals on environmental and social problems.
- Receive suggestions from the affected communities with regard to the preferences and options about the project in general and avoidance measures, mitigation/compensation measures, and benefits being provided, in particular.
- To ensure lessening of public resistance to change by providing them a platform in the decision making process.

The participation by the local community can influence not only environmental impact of the project area, but also the costs, success and duration of the project itself.

4.3 STAKEHOLDERS

Stakeholder includes all parties that have direct and indirect interests in the project and its potential impacts on them. The consultation processes involved range of formal and informal consultative tools

including individual interviews, on-site consultation and meetings with the Stakeholders.

- Central Water Commission
- State Water Resources Department
- Agriculture Department
- Hydro Power Development Agencies
- Municipal Development Board
- Public Health Department
- State Forest Department
- Fishery Department
- Tourism Department
- Water Users Association
- People Potentially adversely impacted by the Sub- Project activities
- NGO's

4.4 CONSULTATION WITH STAKEHOLDERS AT SUB PROJECT SITES

While preparing the ESA on DRIP project in 2009, a total of 10 public consultation meetings were held in 4 states to get an insight about the baseline condition and problems associated with existing dam operation systems and other related issues. This updated ESMF also includes findings of additional consultation carried out during environmental and social assessment process specifically during preparation of EIA and RAP for Hirakud dam in Odisha. The number of consultations carried out during ESMF and ESIA preparation of Hirakud dam is presented in the Table: 4.1. Details of the stakeholder consultation is given in Annexure II.

Table 4.1: Details of Consultation

State	Location	Date
Madhya Pradesh	Mohini Pickup Weir	12 Aug 2007, 17 Jan 2008
	Kolar Dam	11th Aug 2007, 16 Jan 2008
	Panam Dam	28 July 2007, 09 Jan 2008
	Kadana Dam	29 July 2007, 11 Jan 2008
	Dharoi Dam	27 July 2007, 08 Jan 2008
Maharashtra	Bhatsa Dam	30 Jan 2008, 30 Jan 2008
	Bhatghar Dam	7 Aug 2007, 25 Jan 2008
	Pawana Dam	06 Aug 2007, 24 Jan 2008
West Bengal	Bara Mandira Reservoir	09 Aug 2007, 20 Jan 2008
Odisha	Hirakud Dam	16 May 2016, 26 Sept 2016

The major findings of stakeholder consultation during the environmental and social assessment and recommended actions are presented in the Table: 4.2.

Table: 4.2 Consultation Findings and Recommended Actions during ESMF preparation

Major Findings	Recommended Actions
• The Alarm system for water release from most of the dams did not seem well built, as systematic forecasting system is absent. The warning system is predominantly dependant on the mobile service and hence depends on external agency's efficiency. In lack of an internal system for message any emergency consequences may not be fought properly. • Organized fisheries can be developed within the reservoir in most of the cases, which can be a permanent source of income for the local people. • Most of the dams having good potential of tourism potential. But, the law and order problems, bad road quality and lack of interest amongst officials and local people put hindrance on the tourism development. • Siltation rate is quite high in some places. This is affecting the storage capacity and water quality of the reservoir. • In most of the dams catchment has no rain gauge station and water level recording system to combat any emergency situation arises due to sudden cloud burst. • Catchment treatment program is mostly lacking for most of the areas. • In some places local residents especially the rehabilitated people have sense of deprivation as livelihood support was extended to them. • As per discussion held with dam officials, some major structural problem was found in some of the dam. • The alarm siren at the time of water release reaches nearly 3kms, which may not be enough for a higher rate of discharge. • Canal system need to be strengthened in most of the cases for better water distribution system and to minimize the water loss. • Hydropower generation is a major aspect. Generation of hydropower need to be compulsory for all potential dams. • Leakages in masonry work and choking of drains are major problems for most of the dam. • In some places river embankment is not so high so carrying capacity of the river is on lower side. Areas surrounding the river bed are often flooded during release of water from dam. Flood situation is restricted within small pockets which are lying adjacent to the river and relatively low land. Flood situation doesn't last for longer period.	• Adequate number of rainfall monitoring station and proper information system should be developed to assess the inflow from the upstream in advance. Simultaneously proper Alarm system should be developed to minimize the impact of any type of disaster caused by the weir and related activities. • Promotion of fishing activities should be taken up within the reservoir. A part of revenue generated from the fishing activity should go to the Water Resource Dept. for maintenance purpose of the dam. • Dam sites can be developed as an ecotourism site. Apart revenue generated from tourism can also be used in dam maintenance. • De-siltation is required in some of the dams as increased siltation rate has already reduced the original capacity of the dam. The suggestions given by various experts regarding the structural aspects of the dam should be followed as it is directly proportional to the dam safety. • Catchment area treatment may be prioritized. The tribal, if any I the area, may be sensitized regarding the importance of catchment area in relation to the dam, dam surroundings and dam environment. As deficiency is observed in interdepartmental co-ordination, better coordination among the Forest Department and Irrigation Department may be ensured. • Alarm system can be strengthened as siren reaches only about 2-3 kms, while the remaining villages are informed via telephone and television, which might fail. • Structural Strengthening of the dam is required from safety point of view and better survival of the dam. • Hydropower project to be installed for the wise use of resources and better sustainability of the dam may be explored. Local requirements may be considered in the area for direct revenue generation. • Extension of the guidewall and increase in the height of the sill is required to minimize the flooding effect in the immediate downstream and to protect the scouring of the stilling basin subsequently.

During the preparation of RAP and EIA for Hirakud dam, consultations, focus groups discussions and public hearings with affected communities were conducted during Census and Socio-Economic survey and also post identification of resettlement sites to elicit people's concerns, issues and perceptions on the overall project, proposed entitlement package and also on the identified resettlement sites.. . Information on the salient features, necessity of the intervention in respect of safety of the dam, purpose of surveys and provisions of the entitlement package were communicated to the persons. The public hearings were attended by representatives of the PAPs, District administration, Project authorities, Media, Non-government organizations, Project Management consultants and RAP preparation agency. Key benefits perceived by PAPs included: new opportunities for small scale business, more employment opportunities in the area, restoration of common property resources, R&R package including livelihood support and better civic infrastructure at the resettlement site, etc. Adverse impacts perceived included: loss of basic amenities, loss of ethnic group unity, disruption and irregularity to children's education and sports, increased time in commuting longer distance to workplace and disruption of brotherhood relationship (**Refer to the RAP for more details)**

a) During the preparation of EIA for Hirakud also public consultation findings are considered and measures taken under the EIA. The water pipeline will be re-aligned at project cost and the Project Authority agreed to construct a bridge over spill channel. Project authority agreed to shift the crematoria and temples to the adjacent area beyond proposed channel. Alternate arrangement will be provided to ensure uninterrupted electric supply to villages from both sides. The excess of earth material and top soil after utilization by project can be dumped at nearby places of degraded forest in consultation with forest department, so that the earth material can be utilized by forest department at a lesser cost for plantation purpose in the degraded forest. The project authority assured that all safety measures will be taken during construction and will be strictly monitored. The project authority agreed to construct a bridge across the spill channel prior to the excavation activities in the road network to ensure uninterrupted traffic movement.

CHAPTER 5

5. ANALYSIS OF ALTERNATIVES

In order to assess alternatives scenarios and to identify the preferred alternative an analysis of the proposed sub-project activities was carried out with regard to their environmental and social implications. The analysis was carried out for three scenarios, namely, no-project scenario, no-component scenario and with component scenario. The findings of the analysis are given in the following **Table: 5.1.**

Table 5. 1: Analysis of Alternatives

Sl. No.	Sub-Project Activities	No-Project Scenario	No-Component Scenario	With Component Scenario
1	Reservoir Desiltation	All the activities are envisaged to have some adverse environmental and social impacts of varying degrees. They may be avoided if these are not implemented. If not implemented, dam safety will suffer which may have greater environmental and social risk.	Environmental problems like air and noise pollution will reduce but dam safety aspects will suffer.	Dam safety aspect will improve. Mitigation and enhancement measures will reduce / avoid adverse impacts.
2	Tourism Development		Potential environmental degradation may be avoided. Social benefit in terms of source of income for local people will be lost.	Pollution due to solid waste and wastewater generation. Air and noise pollution due to vehicles. Suitable mitigation measures to be adopted to take care of their adverse impacts.
3	Approach road, dam crest roads, etc. construction / improvement		Though environmental problem will be avoided, problem in dam operation will be there, which is not desirable.	Land acquisition may or may not be there. Impacts on air, noise, vegetation cover, etc., are envisaged. Mitigation measures required.
4	Hydropower Generation		Social benefits will be compromised.	Environmental problems, particularly during implementation. Mitigation measures to be adopted.
5	Standby Generator		Environmental problems like air and noise pollution will reduce but dam safety aspects will suffer.	Dam safety aspect will improve. Mitigation and enhancement measures will reduce / avoid adverse impacts. Fully enclosed generator sets are available for silent operation and practically no air pollution.
6	River Regradation		Environmental problems like air, water and noise pollution will reduce but environmental and social risks envisaged if not implemented. In long run survival of the dam may suffer if not implemented.	Air, water and noise pollution due to construction, cutting of river bank, dredging etc. Reduction in environmental and social risk factors. Better sustainability of the dam due to uniform inflow of water.

Sl. No.	Sub-Project Activities	No-Project Scenario	No-Component Scenario	With Component Scenario
7	Flood Protection Network		Environmental problems like air, water and noise pollution will reduce but environmental and social risks envisaged if not implemented. In long run survival of the dam may be at stake due to reduction in live storage if not implemented.	Air, water and noise pollution due to dredging activity. Water quality will deteriorate during dredging period. Reduction in environmental and social risk factors due to increase in live storage. Better sustainability of the dam.
8	Wind Mill & Solar Power		Advantage of eco-friendly power generation will be lost.	Environmentally and socially beneficial.
9	Treatment of leakage through masonry and concrete dams and reduction of seepage through earth dams and their foundations		Dam Safety aspects will be affected – social and environmental risks may increase.	Short term impacts during construction which could be minimize with suitable mitigation measures
10	Improving Dam Drainage		Water pollution will not occur. Smooth operation of the dam may get affected. Dam safety may suffer	Surface water pollution during cleaning activity. Reduction of risk factor Better dam operation
11	Structural strengthening of dams to withstand higher earthquake loads		Environmental problems like air, water and noise pollution will reduce but environmental and social risks envisaged if not implemented. In long run survival of the dam may suffer if not implemented.	Air, water and noise pollution due to construction and repairing activity. Water quality may deteriorate during construction period. Reduction in environmental and social risk factors. Better sustainability of the dam.
12	Remodeling earth dams to safe, stable cross sections		Environmental problems like air, water and noise pollution will reduce but environmental and social risks envisaged if not implemented. In long run survival of the dam may suffer if not implemented.	Air, water and noise pollution due to construction and repairing activity. Water quality may deteriorate during construction period. Reduction in environmental and social risk factors. Better sustainability of the dam.
13	Improving toe drain and seepage measuring devices		Water pollution will not occur. Smooth operation of the dam may get affected. Dam safety may suffer	Surface water pollution during improvement activity. Reduction of risk factor Better dam operation

Sl. No.	Sub-Project Activities	No-Project Scenario	No-Component Scenario	With Component Scenario
14	Improving ability to withstand higher floods including additional flood handling facilities, if needed.		No Environmental Damage will occur. Dam safety and Social life may be at stake.	Minor Short term environmental impact may take place but risk factor will reduce and better flood handling system will be the outcome.
15	Repairs to damaged spillways, stilling basins and downstream channels		Water pollution will not occur. Smooth operation of the dam may get affected. Dam safety may suffer	Surface water pollution during improvement activity. Reduction of risk factor Better dam operation
16	Improving dam safety instrumentation		No Environmental Damage will occur. Dam safety and Social life may be at stake.	Minor Short term environmental impact may take place but risk factor will reduce and better flood handling system will be the outcome.
17	Improving communications – real-time as much as possible – between dams, upstream rain/river flow gauging stations and with other dams, control offices and civil authorities in flood plains downstream of the dam		No Environmental Damage will occur. Dam safety and Social life may be at stake.	Minor Short term environmental impact may take place but risk factor will reduce and better flood handling system will be the outcome.
18	Flood marking		No Environmental Damage will occur. Dam safety and Social life may be at stake.	Insignificant/Nil impact on environment. Risk factor will reduce and better flood handling system will be the outcome.
19	Low voltage electrical supplies in inspection and drainage galleries		No Environmental Damage will occur. Safe dam operation may affect	Insignificant/Nil impact on environment. Safer dam operation can be achieved; better aesthetics
20	Improving lighting for external areas of dams		No Environmental Damage will occur. Safe dam operation may affect	Insignificant/Nil impact on environment. Safer dam operation can be achieved; better aesthetics

Sl. No.	Sub-Project Activities	No-Project Scenario	No-Component Scenario	With Component Scenario
21	Inspection launches provision		No Environmental Damage will occur. Safe dam operation may affect	Insignificant/Nil impact on environment. Safer dam operation can be achieved; better aesthetics
22	Rehabilitation / Improvement of Spillway, head regulator and draw-off gates and their operating mechanisms		Water pollution will not occur. Smooth operation of the dam may get affected. Dam safety may suffer	Surface water, Air/noise pollution during improvement activity. Reduction of risk factor Better dam operation
23	Repair / Modification of Spillway Gates		Water pollution will not occur. Smooth operation of the dam may get affected. Dam safety may suffer	Surface water, Air/noise pollution during improvement activity. Reduction of risk factor Better dam operation
24	Cleaning of foundation drain & porous drain		Water pollution will not occur. Smooth operation of the dam may get affected. Dam safety may suffer	Surface water pollution during cleaning activity. Reduction of risk factor Better dam operation
25	Repair and cleaning of irrigation outlets		Water pollution will not occur. Smooth operation of the dam may get affected. Dam safety may suffer	Surface water pollution during cleaning activity. Reduction of risk factor Better dam operation

Based on the analysis, with-component scenario is suggested as the preferred alternative.

CHAPTER 6

6. ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

6.1 INTRODUCTION

Based on review of project screening templates, the list of sub-project activities to be financed under AF, , discussions with the CWC officials, as well as, officials of all IAs, the environmental and social impact assessment was carried out. Details are presented in this chapter.

6.2 SCOPING

A study of the activities was first carried out to identify the component involved for execution of the activities. Only components, which have potential environmental/social impacts, were identified. In the next stage, the potential environmental/social impacts due to the execution of the components were identified. A summary list of all these are given in table 6.1 below.

Table 6. 1: Environmental and Social Components for Scoping

Activities	Components	Impacts
1. Reservoir Desiltation 2. Tourism Development 3. Approach road, dam crest roads, etc. construction / improvement 4. Hydropower Generation 5. Standby Generator 6. River Regradation 7. Flood Protection Network 8. Wind Mill & Solar Power 9. Treatment of leakage through masonry and concrete dams and reduction of seepage through earth dams and their foundations 10. Improving Dam Drainagae	1. Acquisition of forest land 2. Borrow materials/ area 3. Quarry materials / area 4. Blasting 5. Dredging/Desiltation 6. Resettlement and Rehabilitation 7. Labour Camps 8. Heavy machinery 9. Hot mix plant 10. Concrete mixture and heavy pumps 11. Material handling and storage 12. Temporary land acquisition 13. Tree felling/ vegetation clearance 14. Haulage of machinery 15. Debris Disposal 16. Transport of materials 17. Small tools and pumps 18. Sheds to keep machines and tools 19. Utility shifting	1. Landscape Degradation 2. Soil Erosion 3. Land Acquisition 4. Air / Noise Pollution 5. 5. Water Pollution (Surface Water) 6. Soil Pollution 7. Impact on flora, 8. Loss of vegetation (tree cutting) 9. Habitat Loss, Fragmentation 10. Disturbance to Fauna 11. Impact on aquatic life and fisheries 12. Worker/Local people exposure (occupational Health and safety)

Activities	Components	Impacts
11 Structural strengthening of dams to withstand higher earthquake loads 12. Remodeling earth dams to safe, stable cross sections 13. Improving toe drain and seepage measuring devices 14. Improving ability to withstand higher floods including additional flood handling facilities, if needed. 15. Repairs to damaged spillways, stilling basins and downstream channels 16. Improving dam safety instrumentation 17. Improving communications – real-time as much as possible – between dams, upstream rain/river flow gauging stations and with other dams, control offices and civil authorities in flood plains downstream of the dam 18. Flood marking 19. Low voltage electrical supplies in inspection and drainage galleries 20. Improving lighting for external areas of dams 21. Inspection launches provision 22. Rehabilitation / Improvement of Spillway, head regulator and draw-off gates and their operating mechanisms		13. Trucks Traffic increase 14. Water Delivery Reduction 15. Generation of Excavated material 16. Deterioration of aquatic environment 17. Impact on borrow and quarry areas 18. Generation of debris and quarry material 19. Dam embankment erosion 20. Impact on local/tribal communities 21. Weed growth 22. Impact on human health specially workers working at construction site 23. Drainage and water logging problem 24. Impact on fisheries and fishermen livelihood 25. influx of migrant labor 26. Increased in incidents of Gender based violence

Activities	Components	Impacts
23. Repair / Modification of Spillway Gates 24. Cleaning of foundation drain & porous drain 25. Repair and cleaning of irrigation outlets		

6.2.1 CATEGORIZATION OF COMPONENTS

Categorization of components has been done based on their extent of adverse environmental and social impacts. Based on Potential environmental and social impacts associated with each component, these components have been classified under three categories.

Category A: Components which have major environmental/social impacts and require specific environment management plan (EMP) and RAP for implementation of mitigation measures. The EMP will be incorporated in the bid document and contractor/implementing agencies has to follow this during construction as well as operation.

Category B: Components which have moderate environmental and social impacts and certain precautionary measures have to be followed by the contractor and the project authorities to minimize impacts during construction as well as operation.

Category C: Components which have negligible or nil environmental and social impacts and as such no mitigation measures have been proposed for these activities.

The following table shows components under different categories:

Table 6. 2: Categorization of Components

Category A	Category B	Category C
Acquisition of forest land	Heavy machinery	Small tools and pumps
Borrow materials/ area	Hot mix plant	Sheds to keep machines and tools
Quarry materials / area	Concrete mixture and heavy pumps	
Blasting	Material handling and storage	
Dredging/Desiltingof reservoir	Temporary land acquisition	
Resettlement and Rehabilitation	Tree felling/ vegetation clearance	
Impact on aquatic life and fisheries	Haulage of machinery	
	Debris Disposal	
	Transport of materials	
	Labour Camps	
	Utility shifting	

6.3 SCREENING

A screening exercise was next carried out to delineate the potential environmental and social impacts due to the components identified in the screening stage. This has been done both for construction and operation stages.

6.3.1 ENVIRONMENTAL SCREENING

The details of environmental screening carried out for the identified components under the Project are given below in **Table 6.3**.

Table 6. 3: Environmental Components for Screening

Impacted Environmental Components		Type of Impact +Ve / -Ve	Remarks
Construction Phase			
S. No.			
1.	**Construction Phase** Landscape Degradation	Negative	It is a Direct Short term impact; Irreversible in nature; Severity is low
2.	Soil Erosion	Negative	It is a Direct Short term impact; Water Quality may deteriorate in the immediate downstream due to surface runoff; Severity is low
3.	Air / Noise Pollution	Negative	It is a Direct Short term impact; Reversible in nature; Severity is low; Low impact on local livelihood due to generation of dust, noise and handling of heavy machinery.
4.	Water Pollution (Surface Water)	Negative	It is a Direct Short term impact; Reversible in nature; Severity is low; Low impact on local livelihood due contamination of surface water by surface runoff from the construction site.
5.	Soil Pollution	Negative	It is a Direct Short term impact; Reversible in nature; Severity is low; Insignificant impact on local livelihood.
6.	Disturbance to Fauna	Negative	It is an Indirect Short term impact; Reversible in nature; Severity is low;
7.	Impact on Flora	Negative	It is an Indirect Short term impact; Irreversible in nature; Severity is low;
8.	Habitat Loss Fragmentation	Negative	It is an Indirect Short term impact; Reversible in nature; Severity is low;
9.	Impact on aquatic life and fisheries		It is an Indirect Long Term Impact; Reversible in nature
10.	Trucks Traffic increase	Negative	It is a Direct short term impact; Reversible in nature; Severity is low; Low impact on local livelihood due to generation of dust, smoke and noise from moving vehicles
11.	Water Delivery Reduction Interruption	Negative	It is a Direct short term impact; Reversible in nature; Severity is low; Low to moderate impact on local livelihood due to reduction or irregular water supply in the downstream during construction phase.
12.	Generationand handlingof Excavated material	Negative	It is a Direct short term impact; Reversible in nature; Severity is low; Low impact on local livelihood due to generation of dust and improper handling huge excavated material.

Impacted Environmental Components		Type of Impact +Ve / -Ve	Remarks
Construction Phase			
S. No.			
13.	Deterioration to aquatic environment	Negative	It is a Direct short term impact; Severity is low; Low to moderate impact on aquatic life due to reduction or irregular water supply in the downstream during construction phase.
14.	Impact on borrow/quarry areas	Negative	It is a Direct short term impact; Severity is low; with suitable mitigation measures
15.	Generation and handlingof Debris / waste materials	Negative	It is a Direct short term impact; Severity is low; with suitable mitigation measures
16.	Dam embankment erosion	Negative	It is a Direct impact; Severity is low; with suitable mitigation measures
17.	Weed growth within reservoir	Negative	It is a Direct impact; Severity is low; with suitable mitigation measures
18. 22	Drainage and water logging problem	Negative	It is a Direct short term impact; Severity is low; with suitable mitigation measures
Operation Phase			
1.	Air / Noise Pollution	Negative	It is a Direct long term impact; Irreversible in nature; Severity is low; Insignificant Impact on Livelihood
2.	Water Pollution (Surface Water)	Negative	It is a Direct Short term impact; Water Quality may deteriorate in the immediate downstream due to surface runoff; Severity is low; Insignificant Impact on Livelihood
3.	Soil Pollution	Negative	It is a Direct Short term impact; Reversible in nature; Severity is low; Low Impact on Livelihood
5.	Disturbance to Fauna	Negative	It is an Indirect Short term impact; Reversible in nature; Severity is low;
6.	Increased Traffic	Negative	It is a Direct long term impact; Severity is low; Due to tourism development traffic may increase up to several fold which may lead to more accident and air pollution.

6.3.2 SOCIAL SCREENING

The details of social screening carried out for the identified components under the Project are given below in Table 6.4.

Table 6. 4: Social Components for Screening

Impacted Social Components		Type of Impact +Ve / -Ve	Remarks
Construction Phase			
S. No.			
1.	**Construction Phase** Landscape Degradation	Negative	Insignificant Impact on Livelihood
2.	Temporary Land take	Negative	It is a Direct Long/Short term impact; Reversible in nature; Severity is low; Low Impact on Livelihood
3.	Worker/Local people exposure	Negative	It is a Direct short term impact; Reversible in nature; Severity is low; Low impact on local livelihood due to

Impacted Social Components Construction Phase S. No.		Type of Impact +Ve / -Ve	Remarks
			generation of dust, smoke and noise from machinery and vehicles.
4.	Trucks Traffic increase	Negative	It is a Direct short term impact; Reversible in nature; Severity is low; Low impact on local livelihood due to generation of dust, smoke and noise from moving vehicles
5.	Impact on local tribal communities	Negative	Depends on Magnitude and type of activity associated with project. Activities proposed under AF do not have any impacts on tribals
6.	Impact on Human health, especially workers working at construction sites. (Labour Camps)	Negative	It is a Direct short term impact; Severity is low; with suitable mitigation measures
7.	Impact due to influx of labor into the project area	Negative	It is a Direct short term impact; Severity can vary from low to high depending on nature and duration of the construction activities; can be addressed with suitable mitigation measures
8.	Gender based violence	Negative	It is a Direct short/long term impact; Severity is low as most of the projects will undertake works within dam premises ; can be addressed with suitable mitigation measures
9.	Impact on fisheries and fishermen livelihood	Negative	Impact can be minimize/neutralize with suitable mitigation measures.
10.	Temporary stoppages to irrigation water supply	Negative	It is a Direct short term impact;
Operation Phase			
1.	Air / Noise Pollution	Negative	Insignificant Impact on Livelihood
2.	Worker/Local population Exposure	Negative	It is a Direct long term impact; Irreversible in nature; Severity is low; Low impact on local livelihood due to generation of smoke and noise from the generator;
3	Disturbance to Fauna	Negative	It is an Indirect Short term impact; Reversible in nature; Severity is low;
4	Increased Traffic	Negative	It is a Direct long term impact; Severity is low; Low Impact on Livelihood. Due to tourism development traffic may increase up to several fold which may lead to more accident and air pollution.

CHAPTER 7

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK

7.1 INTRODUCTION

Environmental and Social Management Framework (ESMF) is a tool for use by a project proponent to identify and address the potential environmental and social concerns or impacts of a project across all stages from planning stage to its implementation and post-implementation operations. The objective of developing ESMF is to mainstream it with other project documents in the planning, execution and post-execution stages in order to ensure that environmental and social concerns are adequately taken care of in all these stages.

Keeping this in view, the present ESMF had been developed for use by the Central Water Commission (CWC) nine IAs while undertaking rehabilitation and strengthening of dams The ESMF can be used by the project authorities for incorporation of environmental and social safeguards in the planning, execution and operation stages of each sub-project (dam level) activity. A step-by-step methodology has been provided that can be followed along with engineering and institutional interventions required for the sub-project activities.

In general, the organizational structure for DRIP consists of a Project Management Unit (PMU) at the Central level (at the Central Water Commission (CWC)), with one State level PMU for each of the seven participating States. Each of these PMUs will include qualified Environmental and Social Development Specialists. The CPMU is supported by a multi-disciplinary management and engineering consultant team (Project Management Consultant) that assists CWC with the overall implementation of the project. The Consultant's team will include environmental and social specialists. The terms of reference include tasks related to environmental and social compliance. Some of the relevant tasks of the Consultant include: provide formal training to concerned staff at state, and central level to ensure that there is full awareness about environmental and social issues and the implementation of the ESMF; provide guidance and support to collect sufficient data at the investigation stage to determine the environmental and social impacts, if any, including whether stand-alone Environmental Assessments (EA), Environmental Management Plans (EMP) and Social Impact Assessments and Resettlement Action Plan (and also Indigenous Peoples Development Plans) are needed based on the outline provided in the ESMF; set up and monitor a reporting system that will show in a clear and transparent way whether there are any social and environmental issues related to

the rehabilitation of the dams and the mitigation actions; provide guidance and support to the implementation of adequate monitoring of social and environmental parameters; and as part of the third-party construction supervision efforts, ensure that actions agreed to minimize environmental impact are being implemented.

The key institution for monitoring the ESMF and the compliance related issues would be the SPMU which would be guided by the nodal environmental officer.

The state level steering committee would have representation from the State Water Resources Department, Nodal Environment Officer, Project Coordinator/ Manager (SPMU) and representatives from other state level institutions. A template will be used that will require the concerned State level PMUs during the investigation and preliminary design stage for each dam to provide detailed information on technical, environmental, social, and all implementation-related aspects of each dam. Details about the data to be collected and the specific forms to be prepared are given in the next sections. The State level PMU will for each sub-project dam incorporate in the template the essential elements from the environmental and social screening templates prepared as part of the ESMF. The Central PMU, assisted by the Consultant, will carry out a first level screening of each template. The Consultant will develop and maintain a web-based MIS that will capture the information from the templates. The Bank Task Team will receive and review each of the templates as well. Based on the review of the templates, a final categorization of each of the sub-project dams will be made. Those that have no major environmental or social issues can have the designs finalized and be tendered. Currently under the Project, for construction of Additional Spillway for Hirakud Dam, Orissabased on the identified environmental or social issues EIA and RAP has been prepared. This template and the MIS will allow an early identification of those dams where major issues can be expected. There will then be additional supervision efforts for these dams, which would be coordinated by the nodal environmental officer under the overall supervision of the state level steering committee.

It may be mentioned here that though the sub-project activities for the development of this ESMF and its updation have been done based on on the analysis of such activities in a large number of dams taken up for rehabilitation under the DRIP.

7.2 ESMF – PROVISION AND PROCESSES

In preparation of the ESMF, , a standard list of activities was developed which would be generally applicable to all sub-projects under the DRIP. Care was taken to select only those activities which may

have potential environmental and social impact. A scoping exercise was then carried out to select the environmental and social components which might get impacted by these activities. This was followed by a screening exercise for each activity to screen out the environmental and social components which are not impacted upon by the specific activity and retain those which do.

Presently **25 major sub-project level activities had been** analyzed for updating of this ESMF. These have been given in Form SC-1 for the purpose of identifying the activities relevant to a specific sub-project and screening out the other activities. The responsible entity at the dam level will carry out this task.

For the development of the ESMF, it was necessary to identify the potential environmental / social impacts of an activity. In order to do so, the tasks and facilities required to be performed and provided to implement the activity were needed to be identified, as these helped assess the potential impacts due to the activity. **These have been termed as components** of an activity. A list of all possible components have been prepared, which include requirements of labour, machinery, materials, space, etc. For each activity, the components involved can be identified by dam level officials. The list of components for screening purpose is given in **Form SC-2.**

Form SC-3 provides the identified sub-project activities in the first column, the components involved in the second column and potential impacts in the third column. Last two columns refer to implementation phase (I) and post-implementation phase (P).

Based on potential environmental and social impacts associated with each component, these have been categorized as A, B and C.

Category – A : Components which have major environmental / social impacts and require specific environment management plan (EMP) and RAP for implementation of mitigation measures. The EMP is to be incorporated in the bid document and contractor / implementing agency has to follow this during implementation, as well as, post-implementation.

Category – B : Components which have moderate environmental and social impacts and certain precautionary measures have to be followed by the contractor and the project authorities to minimize impacts during implementation as well as post-implementation.

Category – C : Components which have negligible or nil environmental and social impacts and as such, no mitigation measures are proposed for these activities.

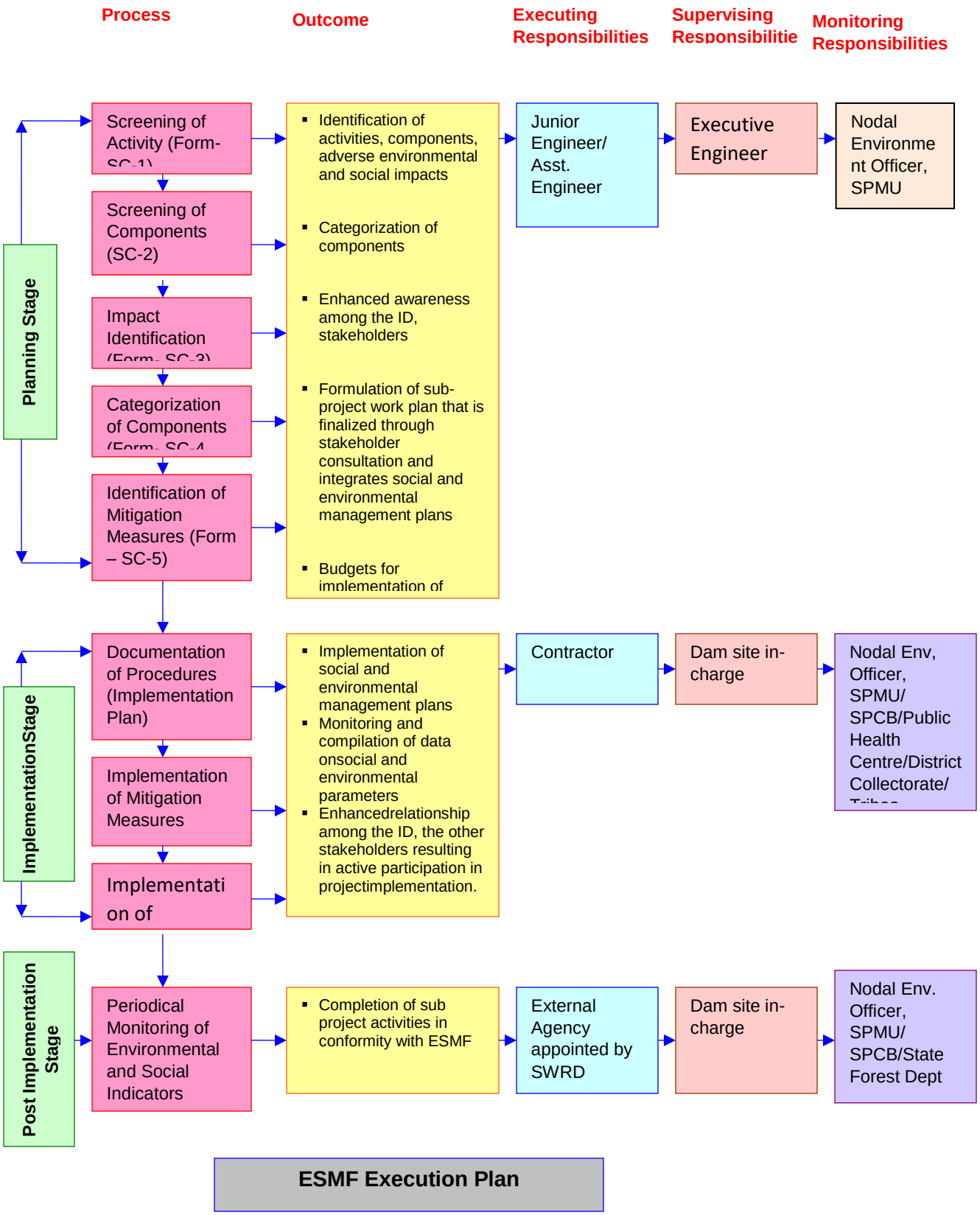
Form SC-4 provides for Screening and categorization of the components, which will enable the project

authorities to categorize the components in each activity at sub-project level and take action according to their categorization.

Form SC-5 has been developed to identify mitigation measures for each type of potential environmental and social impacts. For ease of understanding and use, the components identified are given in the first column, corresponding potential impacts are given in the second column and corresponding mitigation measures are provided in the third column. The remaining three columns indicate the entities responsible for execution, supervision and monitoring of the mitigation measures, respectively.

Forms SC-1 to SC-5 have been duly filled up based on the sub-project activities identified and are available in project files

The major provisions and processes of the ESMF at different stages of project evaluation have been detailed in the schematic diagram below:



Note: At central level consultant may be engaged for supervision and monitoring by CWC

7.3 APPLICATION OF ESMF

The ESMF is to be used for sub-projects under the DRIP at the planning, implementation and post implementation phases to identify the environmental and social concerns, as well as, the opportunities to be addressed, so that these could be integrated in the relevant project documents.

As already mentioned in Section 7.2 above, the forms developed (SC-1 to SC-5) are to be used for application of ESMF in the sub-project activities. The procedure to be followed is described below:

7.3.1 PLANNING STAGE

In the planning stage, following actions are to be taken:

- Screening of sub-project activities by using Form SC-1
- Screening of components associated with each activity using Form SC-2
- Identification of adverse impacts associated with each component using Form SC-3
- Categorization of components into A, B and C using Form SC-4
- Identification of mitigation measures for the adverse impacts caused by each component, including identification of entities responsible for execution, supervision and monitoring with the help of Form SC-5

Table 7. 1: Checklist for Screening and Mitigation

ESMF activities	Who will be involved	Coordinator
1. Screening of sub-project Activities through Screening Format (Form SC-1) 2. Screening of components associated with each activity through Screening Format (Form SC-2) 3. Identification of adverse environmental impacts associated with execution of each component. (Form SC-3) 4. Categorization of components through Screening format (Form SC-4) 5. Suitable mitigation measures for each adverse impact on natural and social environment caused by each component with the help of (Form SC-5).	Irrigation Department (ID) and Other Line Dept.	Nodal Environment& Social Officer, SPMU/ Executive Engineer from ID.

Outcomes of Planning Stage

The Outcomes of this stage are:

- Identification of activities
- Identification of components
- Identification of adverse environmental and social impacts
- Identification and categorization of components to be undertaken in each sub-project
- Enhanced awareness among the ID, stakeholders resulting in active participation

- Formulation of sub-project work plan that is finalized through stakeholder consultation and integrates social and environmental management plans
- Budgets for implementation of social and environmental management plans

7.3.2 IMPLEMENTATION STAGE

The primary tasks in this stage are implementation of proposed social and environmental management plans for sub-project following the checklist shown in Table 7.2.

Table 7. 2: Checklist for ESMF Activities – Implementation

ESMF Activities	Who will be involved	Co-ordinator
Procurement of clearances' documents, adherence to procedures and contracts awarded & equipment procured	Contractor, Implementation agency	Nodal Environment& Social Officer, SPMU/ Engineers from Irrigation Department
Implementation of the social and environmental management plans as Proposed in the Mitigation measures and EMP, RAP and CESMP.	Contractor, Implementation agency, Consultants authorized by ID	Nodal Environment& SocialOfficer, SPMU/ Engineers from Irrigation Department
Monitoring and evaluation of social and environmental parameters as identified in the Mitigation measures and EMP, RAP and CESMP. Special attention will be paid to ensure that no child labour (as per the GoI) is involved in the construction activities The dam site officials may monitor contract works or authorize the consultants to monitor processes and impacts at sub project level. However the consolidated monitoring and learning (M & L) report will be furnished by EE, In charge of Project to designated project authority i.e. CE, In-charge, and finally to PMU.	Contractor, Implementation agency, Consultants authorized by ID	Nodal Environment& SocialOfficer, SPMU/ Engineers from Irrigation Department

Outcomes of Implementation Stage

The outcomes of this stage are:

- Implementation of social and environmental management plans
- Monitoring and compilation of data on social and environmental parameters
- Enhanced relationship among the ID, the other stakeholders resulting in active participation in project implementation.

7.3.3 Post-Implementation Stage

The primary tasks in this stage are to monitor and assess the long-term impacts of the project (through Impact Indicators) and draw lessons from the success and failures, for improvement of subsequent sub-project interventions. Compliance of ESMF provisions has to be ensured through third party monitoring for verification of the sub-project completion report.

The Formats for monitoring the above parameters would be developed by PMU and would be validated before finalizing.

Outcome of Post Implementation Stage

Completion of sub project activities in conformity with ESMF

Screening TemplatesThe five screening templates are presented below:

Form SC-1: Screening of ESMF Activities

Sl. No	ESMF activity	Put mark if applicable	Responsibility
1.	Reservoir Desiltation		Field Engineer from ID
2.	Tourism Development		
3.	Approach road, dam crest roads, etc. construction / improvement		
4.	Hydropower Generation		
5.	Standby Generator		
6.	River Regradation		
7.	Flood Protection Network		
8.	Wind Mill & Solar Power		
9.	Treatment of leakage through masonry and concrete dams and reduction of seepage through earth dams and their foundations		
10.	Improving Dam Drainage		
11.	Structural strengthening of dams to withstand higher earthquake loads		
12.	Remodeling earth dams to safe, stable cross sections		
13.	Improving toe drain and seepage measuring devices		
14.	Improving ability to withstand higher floods including additional flood handling facilities, if needed.		
15.	Repairs to damaged spillways, stilling basins and downstream channels		
16.	Improving dam safety instrumentation		
17.	Improving communications – real-time as much as possible – between dams, upstream rain/river flow gauging stations and with other dams, control offices and civil authorities in flood plains downstream of the dam		
18.	Flood marking		
19.	Low voltage electrical supplies in inspection and drainage galleries		
20.	Improving lighting for external areas of dams		

Sl. No	ESMF activity	Put mark if applicable	Responsibility
21.	Inspection launches provision		
22.	Rehabilitation / Improvement of Spillway, head regulator and draw-off gates and their operating mechanisms		
23.	Repair / Modification of Spillway Gates		
24.	Construction of new spillway		
25.	Cleaning of foundation drain & porous drain		
26.	Repair and cleaning of irrigation outlets		
27.	Repair and cleaning of irrigation outletsEmbankment shifting		

Form SC-2: Screening of components

Sl. No	Components associated with ESMF activity	Put mark if applicable	Responsibility
1.	Acquisition of forest land		SPMU
2.	Borrow materials/ area		
3.	Quarry materials / area		
4.	Blasting		
5.	Dredging/Desiltation		
6.	Resettlement and Rehabilitation		
7.	Labour Camps		
8.	Heavy machinery		
9.	Hot mix plant		
10.	Concrete mixture and heavy pumps		
11.	Material handling and storage		
12.	Temporary land acquisition		
13.	Tree felling/ vegetation clearance		
14.	Haulage of machinery		
15.	Debris Disposal		
16.	Transport of materials		
17.	Small tools and pumps		
18.	Sheds to keep machines and tools		
19.	Utility shifting		

Form- SC-3: Screening of Adverse (Environmental and Social) impacts

Activity	Component		Impact	I	P
1.Reservoir Desiltation		1. Acquisition of for land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
	√	5. Dredging/Desiltation	Air / Noise Pollution	√	
			Water Pollution (Surface)	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Water Delivery reduction, interruption	√	
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
		10. Concrete mixture and heavy pumps			
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Water Pollution (Surface)	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Landscape Degradation	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
		18.Sheds to keep machines and tools			
	√	Utility Shifting	Air / Noise Pollution	√	

Activity	Component		Impact	I	P
2.Tourism Development		1. Acquisition of forest land			
	√	2. Borrow materials/ area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Soil Erosion	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
		4. Blasting			
		5. Dredging/Desiltation			
	√	6. Resettlement And Rehabilitation	Land acquisition	√	
			Impact on local and tribal communities	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√√	
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	9. Hot mix plant	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	12.Temporary land acquisition	Air / Noise Pollution	√	
			Soil Pollution	√	
			Disruption or loss of livelihood	√	
			Worker local People Exposure	√	
	√	13.Tree felling/ vegetation clearance	Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	

Activity	Component		Impact	I	P
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19. Utility Shifting	Air / Noise Pollution	√	
3. Approach road, dam crest roads, etc. construction / improvement	√	1. Acquisition of forest land	Impact on flora	√	
			Disturbance to Fauna	√	
			Habitat loss fragmentation	√	
			Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	2. Borrow materials/ area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Soil Erosion	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
	√	4. Blasting	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Generation of Debris	√	
		5. Dredging/Desiltation			
	√	6. Resettlement And Rehabilitation	Land acquisition	√	
			Impact on local and tribal communities	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	

Activity	Component		Impact	I	P
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	9. Hot mix plant	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	12.Temporary land acquisition	Air / Noise Pollution	√	
			Soil Pollution	√	
			Disruption or loss of livelihood	√	
			Worker local People Exposure	√	
	√	13.Tree felling/ vegetation clearance	Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19. Utility Shifting	Air / Noise Pollution	√	
4. Hydropower Generation	√	1. Acquisition of forest land	Impact on flora	√	
			Disturbance to Fauna	√	
			Habitat loss fragmentation	√	
			Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	2. Borrow materials/ area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Soil Erosion	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	

Activity	Component		Impact	I	P
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
		4. Blasting	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Generation of Debris	√	
		5. Dredging/Desiltation			
	√	6. Resettlement And Rehabilitation	Land acquisition	√	
			Impact on local and tribal communities	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	12.Temporary land acquisition	Air / Noise Pollution	√	
			Soil Pollution	√	
			Disruption or loss of livelihood	√	
			Worker local People Exposure	√	
	√	13.Tree felling/ vegetation clearance	Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	

Activity	Component		Impact	I	P
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19. Utility Shifting	Air / Noise Pollution	√	
5. Standby generator		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
		7. Labour Camps			
	√	8. Heavy machinery	Air / Noise Pollution	√	√
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
		10.Concrete mixture and heavy pumps			
		11.Material handling and storage			
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		15. Debris Disposal			
		16.Transport of materials			
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Utility Shifting	Air / Noise Pollution	√	
6. River Regradation		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
	√	4. Blasting	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Generation of Debris	√	
		5. Dredging/Desiltation	Air / Noise Pollution	√	
			Water Pollution (Surface)	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	

Activity	Component		Impact	I	P
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Water Delivery reduction, interruption	√	
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Impact on human health (Labour Camps)	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19 Utility Shifting	Air / Noise Pollution	√	
7. Flood Protection Network		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
		7. Labour Camps			

Activity	Component		Impact	I	P
		8. Heavy machinery			
		9. Hot mix plant			
		10.Concrete mixture and heavy pumps			
		11.Material handling and storage			
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
		14.Haulage of machinery			
		15. Debris Disposal			
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
8. Wind mill, Solar power		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
	√	13.Tree felling/ vegetation clearance	Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	

Activity	Component		Impact	I	P
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19 Utility Shifting	Air / Noise Pollution	√	
9. Treatment of leakage through masonry and concrete dams and reduction of seepage through earth dams and their foundations		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	9. Hot mix plant	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	

Activity	Component		Impact	I	P
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
10. Improving Dam Drainage		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
11. Structural strengthening of dams to withstand		1. Acquisition of forest land			
	√	2. Borrow materials/ area	Air / Noise Pollution	√	
			Soil Pollution	√	

Activity	Component		Impact	I	P
higher earthquake loads			Trucks Traffic increase	√	
			Soil Erosion	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		15. Debris Disposal			
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
12. Remodeling earth dams to safe, stable cross sections		1. Acquisition of forest land			
	√	2. Borrow materials/ area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	

Activity	Component		Impact	I	P
			Soil Erosion	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation	Land acquisition Impact on local and tribal communities		
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		15. Debris Disposal			
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
13. Improving toe drain and seepage measuring devices		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			

Activity	Component		Impact	I	P
		6. Resettlement And Rehabilitation			
		7. Labour Camps			
		8. Heavy machinery			
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
14. Improving ability to withstand higher floods including additional flood handling facilities, if needed.		10. Acquisition of forest land			
		11. Borrow materials/ area			
		12. Quary materials / area			
		13. Blasting			
		14. Dredging/Desiltation			
		15. Resettlement And Rehabilitation			
		16. Labour Camps			
		17. Heavy machinery			
		18. Hot mix plant			
		10.Concrete mixture and heavy pumps			
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			

Activity	Component		Impact	I	P
		13.Tree felling/ vegetation clearance			
		14.Haulage of machinery			
		15. Debris Disposal			
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
15. Repairs to damaged spillways, stilling basins and downstream channels	√	1. Acquisition of forest land			
		2. Borrow materials/ area			
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10.Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11.Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12.Temporary land acquisition			
		13.Tree felling/ vegetation clearance			
	√	14.Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	

Activity	Component		Impact	I	P
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16.Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17.Small tools and pumps	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	18.Sheds to keep machines and tools19 Utility Shifting	Air / Noise Pollution	√	
16. Improving dam safety instrumentation		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
		7. Labour Camps			
		8. Heavy machinery			
		9. Hot mix plant			
		10. Concrete mixture and heavy pumps			
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
		14. Haulage of machinery			
		15. Debris Disposal			
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
17. Improving communications – real-time as much as possible – between dams, upstream rain/river flow gauging stations		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			

Activity	Component		Impact	I	P
and with other dams, control offices and civil authorities in flood plains downstream of the dam		7. Labour Camps			
		8. Heavy machinery			
		9. Hot mix plant			
		10. Concrete mixture and heavy pumps			
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
		14. Haulage of machinery			
		15. Debris Disposal			
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and Utility Shifting	Air / Noise Pollution	√	
18. Flood marking		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
		7. Labour Camps			
		8. Heavy machinery			
		9. Hot mix plant			
		10. Concrete mixture and heavy pumps			
		11. Material handling and storage			
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
		14. Haulage of machinery			
		15. Debris Disposal			
		16. Transport of materials			
	√	17. Small tools and pumps	Air / Noise Pollution	√	

Activity	Component		Impact	I	P
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
19. Low voltage electrical supplies in inspection and drainage galleries		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
		7. Labour Camps			
		8. Heavy machinery			
		9. Hot mix plant			
		10. Concrete mixture and heavy pumps			
		11. Material handling and storage			
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
		14. Haulage of machinery			
		15. Debris Disposal			
	√	16. Transport of materials	Air / Noise Pollution	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
20. Improving lighting for external areas of dams		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
		7. Labour Camps			
		8. Heavy machinery			
		9. Hot mix plant			
		10. Concrete mixture and heavy pumps			

Activity	Component		Impact	I	P
		11. Material handling and storage			
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
		14. Haulage of machinery			
		15. Debris Disposal			
	√	16. Transport of materials	Air / Noise Pollution	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
21. Inspection launches provision		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
		7. Labour Camps			
		8. Heavy machinery			
		9. Hot mix plant			
		10. Concrete mixture and heavy pumps			
		11. Material handling and storage			
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
		14. Haulage of machinery			
		15. Debris Disposal			
	√	16. Transport of materials	Air / Noise Pollution	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
22. Rehabilitation / Improvement of Spillway, head regulator and draw-off gates		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			

Activity	Component		Impact	I	P
and their operating mechanisms		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10. Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
	√	14. Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
23. Repair / Modification of Spillway Gates		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	

Activity	Component		Impact	I	P
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10. Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
	√	14. Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
24. Construction of new spillway	√	1. Acquisition of forest land	Impact on flora	√	
			Disturbance to Fauna	√	
			Habitat loss fragmentation	√	
			Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	2. Borrow materials/ area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase		
			Soil Erosion	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation		
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	

Activity	Component		Impact	I	P
	√	4. Blasting	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Generation of Debris	√	
	√	5. Dredging/Desiltation	Air / Noise Pollution	√	
			Water Pollution (Surface)	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Water Delivery reduction, interruption	√	
	√	6. Resettlement And Rehabilitation	Land acquisition	√	
			Impact on local and tribal communities	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	9. Hot mix plant	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	10. Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	12. Temporary land acquisition	Air / Noise Pollution	√	
			Soil Pollution	√	
			Disruption or loss of livelihood	√	
			Worker local People Exposure	√	
	√	13. Tree felling/ vegetation clearance	Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
	√	14. Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation		
			Water Pollution (Surface)		
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	

Activity	Component		Impact	I	P
			Trucks Traffic increase	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Utility Shifting	Air / Noise Pollution	√	
25. Cleaning of foundation drain & porous drain		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10. Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
	√	14. Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility Shifting	Air / Noise Pollution	√	
26. Repair and Clearing of irrigation outlets		1. Acquisition of forest land			
		2. Borrow materials/ area			
		3. Quary materials / area			

Activity	Component		Impact	I	P
		4. Blasting			
		5. Dredging/Desiltation			
		6. Resettlement And Rehabilitation			
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		9. Hot mix plant			
	√	10. Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
		12. Temporary land acquisition			
		13. Tree felling/ vegetation clearance			
	√	14. Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Water Pollution (Surface)	√	
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Sheds to keep machines and toolsUtility shifting	Air / Noise Pollution	√	
27. Construction of new spillway	√	1. Acquisition of forest land	Impact on flora	√	
			Disturbance to Fauna	√	
			Habitat loss fragmentation	√	
			Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
	√	2. Borrow materials/ area	Air / Noise Pollution	√	
			Soil Pollution	√	

Activity	Component		Impact	I	P
			Trucks Traffic increase		
			Soil Erosion	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation		
	√	3. Quary materials / area	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Landscape Degradation	√	
	√	4. Blasting	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation	√	
			Generation of Debris	√	
	√	5. Dredging/Desiltation	Air / Noise Pollution	√	
			Water Pollution (Surface)	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
			Worker local People Exposure	√	
			Generation Excavated Material	√	
			Water Delivery reduction, interruption	√	
	√	6. Resettlement And Rehabilitation	Land acquisition	√	
			Disruption or loss of livelihood	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on local and tribal communities	√	
	√	7. Labour Camps	Worker local People Exposure	√	
			Influx of migrant labour	√	
			Gender Based Violence	√	
			Impact on human health (Labour Camps)	√	
	√	8. Heavy machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	9. Hot mix plant	Air / Noise Pollution	√	
			Soil Pollution		
			Worker local People Exposure	√	
	√	10. Concrete mixture and heavy pumps	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	11. Material handling and storage	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	12. Temporary land acquisition	Air / Noise Pollution	√	
			Soil Pollution	√	
			Disruption or loss of livelihood	√	
			Worker local People Exposure	√	
	√	13. Tree felling/ vegetation clearance	Landscape Degradation	√	
			Impact on flora	√	
			Soil Erosion	√	

Activity	Component		Impact	I	P
	√	14. Haulage of machinery	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
	√	15. Debris Disposal	Air / Noise Pollution	√	
			Soil Pollution	√	
			Worker local People Exposure	√	
			Landscape Degradation		
			Water Pollution (Surface)		
	√	16. Transport of materials	Air / Noise Pollution	√	
			Soil Pollution	√	
			Trucks Traffic increase	√	
	√	17. Small tools and pumps	Air / Noise Pollution	√	
	√	18. Sheds to keep machines and tools	Air / Noise Pollution	√	
	√	19. Utility Shifting	Air / Noise Pollution	√	

I : Implementation Phase; P : Post implementation Phase

Form SC-4: Screening and Categorization of Components

Sl. No	Environmental and Social Components	A	B	C
1.	Acquisition of forest land	√		
2.	Borrow materials/ area	√		
3.	Quarry materials / area	√		
4.	Blasting	√		
5.	Dredging/Desilting of reservoir	√		
6.	Resettlement And Rehabilitation	√		
7.	Labour Camps	√		
8.	Heavy machinery		√	
9.	Hot mix plant		√	
10.	Concrete mixture and heavy pumps		√	
11.	Material handling and storage		√	
12.	Temporary land acquisition		√	
13.	Tree felling/ vegetation clearance		√	
14.	Haulage of machinery		√	
15.	Debris Disposal		√	
16.	Transport of materials		√	
17.	Small tools and pumps			√
18.	Sheds to keep machines and tools			√
19.	Utility Shifting		√	

Form SC - 5: Screening format for identification of suitable mitigation measures

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
Implementation Phase						
1.	Dredging /Desiltation	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. ▪ ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMUD/ SPCB
		Water Pollution (Surface Water)	▪ Dump solid waste in specified place to minimize contamination of water ▪ Dump wastewater in authorized locations and after treatment ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ SPCB
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills ▪ Bid documents to include ESHS norms ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMUD/ SPCB
		Trucks Traffic increase	▪ Avoid traffic in populated areas as much as possible ▪ Install speed breaker and signages near settlements ▪ Roadside plantation ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ SPCB

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signages near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ SPCB
		Generation of Excavated material	▪ Remove dredged material as soon as possible from river side ▪ Dumping of dredging material only in designated place by the engineers to minimize impact on environment ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ SPCB
		Water Delivery Reduction Interruption	▪ Arrange alternate source of water to fulfill basic needs	Contractor	Dam site in-charge	SPMU/ SPCB
2.	Labour Camps	Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited	Contractor	Dam site in-charge	SPMU/ SPCB

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Provide signages near construction sites and approach roads			
		Labour Influx Management	▪ Contractor ESMP include: ▪ source all unskilled labor from within the project area and its vicinity to minimize labor influx into the project area. Skilled labor force, if unavailable locally, would be brought in from outside the project area either from within or outside the state. ▪ develop a Workers' Camp Management Plan that addresses specific aspects of the establishment and operation of workers' camps e.g. cordoning of separate areas for labor camps and material storage; ▪ conducttraining programs on HIV/AIDS and other communicable diseases ▪ develop a complaint handling mechanism at the project level ▪ provide information to communities in project area and to host communities about the contractor's policies and Worker Code of Conduct (where applicable).	Contractor	Dam site in-charge	SPMU
		Gender Based Violence	Contractor ESMP include: ▪ conduct mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women; ▪ inform workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted; ▪ introduce a Worker Code of Conduct as part of the employment contract, and including sanctions for non-compliance (e.g., termination), and	Contractor	Dam site in-charge	SPMU

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ adopt a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence; and ▪ provide specific facilities for women workers including, designated health centre, Day Crèche Facilities for workers with infants and small children; organizing of construction schedule so as to exempt women workers from night shifts as far as possible			
		Impact on Human health, especially workers working at construction sites (Labour Camps)	▪ Routine medical check-up of Field staff and labours ▪ Provision of potable drinking water at site ▪ Provision of proper sewage and waste disposal system. Sanitation facilities have to be provided at the camp sites. ▪ Awareness program on HIV aids and other communicable disease may be provided to the work force. ▪ First aid facilities to be provided at the construction camps. Any case of disease outbreak may be immediately subjected to medical treatment. Mosquito repellant to be provided to the labors such as odomos, coil and sprays. The camps may maintain cleanliness and hygienic condition. ▪ Proper ventilation may be provided in labour camps ▪ Sufficient fuel may be provided to the work force at campsite. Alternate arrangement for fuel such as provision of LPG, Kerosene etc. to be provided to the camp	Contractor	Dam site in-charge	SPMU/ Public Health Centre

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Head phones, ear plugs to be provided to the workers at construction site. ▪ All workers employed on mixing of asphaltic material, cement, lime mortars, concrete etc. may be provided with protective footwear and protective goggles. Workers involved in welding work may be provided with welder's protective eye shields ▪ Adequate precaution must be taken to prevent danger from electrical equipments			
3.	Heavy Machinery	Air / Noise Pollution	Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ Public Health Centre
		Soil Pollution	▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/Public Health Centre
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited	Contractor	Dam site in-charge	SPMUD/ Public Health Centre
4.	Material Handling And Storage	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust.	Contractor	Dam site in-charge	SPMU/ Public Health Centre

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Contractor ESMP including metrics for ESHS reporting			
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ Public Health Centre
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signages near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ Public Health Centre
5.	Haulage of Machinery	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used	Contractor	Dam site in-charge	SPMU/ Public Health Centre

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Air quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting			
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ Public Health Centre
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signages near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ Public Health Centre
6.	Debris Disposal	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ SPCB

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
		Water Pollution (Surface Water)	▪ Dump solid waste in specified place to minimize contamination of water ▪ Dump wastewater in authorized locations and after treatment ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU SPCB
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
		Trucks Traffic increase	▪ Avoid traffic in populated areas as much as possible Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU
		Landscape Degradation	▪ It is a direct, short term impact; Irreversible in nature; Severity is low; Insignificant Impact on Livelihood ▪ Carry plantation work on open sites ▪ Do not dump waste along settlement or access route ▪ Frame Muck disposal program ▪ Frame quarry & borrow area rehabilitation program ▪ Develop green belts along approach road ▪ On completion of the works all the temporary structures may be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the whole site Contractor ESMP including metrics for ESHS reporting	Dam Site In-charge	State Water Resource Dept. (SWRD)	SPMU
7.	Transport of Materials	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust.	Contractor	Dam site in-charge	SWRD/ Public Health Centre

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting			
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Trucks Traffic increase	▪ Avoid traffic in populated areas as much as possible ▪ Install speed breaker and signages near settlements ▪ Roadside plantation Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
8.	Small Tools and Pumps	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
9.	Borrow Materials/ Area	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure	Contractor	Dam site in-charge	SWRD/ Public Health Centre

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting			
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills ▪ Bid documents to include ESHS norms ▪ Metrics for ESHS reporting ▪ Contractor ESMP	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Trucks Traffic increase	▪ Avoid traffic in populated areas as much as possible ▪ Install speed breaker and signages near settlements ▪ Roadside plantation Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
		Soil Erosion	▪ Limitation of earth moving to dry periods ▪ Protection of vulnerable areas with mulch ▪ Protection of drainage channels with beams, straw or fabric barriers ▪ Installation of sedimentation basins ▪ Seeding or planting of erodible surfaces as soon as possible Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting	Contractor	Dam site in-charge	SWRD/ SPCB

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signages near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting			
		Generation of Excavated material	▪ Remove dredged material as soon as possible from river side ▪ Dumping of dredging material only in designated place by the engineers to minimize impact on environment Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
		Landscape Degradation	▪ It is a direct, short term impact; Irreversible in nature; Severity is low; Insignificant Impact on Livelihood ▪ Carry plantation work on open sites ▪ Do not dump waste along settlement or access route ▪ Frame Muck disposal program ▪ Frame quarry & borrow area rehabilitation program ▪ Develop green belts along approach road ▪ On completion of the works all the temporary structures may be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the whole site Contractor ESMP including metrics for ESHS reporting	Dam Site In-charge	State Water Resource Dept. (SWRD)	State Water Resource Dept. (SWRD)
10.	Quary Materials/ Area	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure	Contractor	Dam site in-charge	SWRD/ Public Health Centre

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. ▪ Contractor ESMP including metrics for ESHS reporting			
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Trucks Traffic increase	▪ Avoid traffic in populated areas as much as possible ▪ Install speed breaker and signages near settlements ▪ Roadside plantation Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signages near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
		Generation of	▪ Remove dredged material as soon as possible from river side	Contractor	Dam site in-charge	SWRD/ SPCB

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
		Excavated material	▪ Dumping of dredging material only in designated place by the engineers to minimize impact on environment Contractor ESMP including metrics for ESHS reporting			
		Landscape Degradation	▪ It is a direct, short term impact; Irreversible in nature; Severity is low; Insignificant Impact on Livelihood ▪ Carry plantation work on open sites ▪ Do not dump waste along settlement or access route ▪ Frame Muck disposal program ▪ Frame quarry & borrow area rehabilitation program ▪ Develop green belts along approach road ▪ On completion of the works all the temporary structures may be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the whole site Contractor ESMP including metrics for ESHS reporting	Dam Site In-charge	State Water Resource Dept. (SWRD)	State Water Resource Dept. (SWRD)
11.	Resettlement & Rehabilitation	Land Acquisition	▪ Follow provisions measures under RFCTLARRA 2013 and as per definition of affected persons in Bank's OP 4.12. ▪ The compensation award shall be declared before displacement of the affected families. Full payment of compensation as well as adequate progress in resettlement shall be ensured. ▪ The compensation award shall as per Section 26-30 of the Act ▪ Conversion to the intended category of use of the land being acquired (for example, from agricultural to non-agricultural) shall be taken into account in advance of the acquisition, and the compensation award shall be determined as per the intended land use category.	Contractor	Dam site in-charge	SWRD / District Collectorate

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ The rehabilitation and resettlement benefits shall be extended to all the affected families in accordance with Schedule II of Act ▪ The land or house allotted to the affected families may be in the joint names of wife and husband of the affected family. ▪ In case of involuntary displacement infrastructural facilities and amenities shall be provided in the resettlement area in accordance with Schedule III of the Act			
		Impact on local/ tribal communities	▪ The rehabilitation and resettlement benefits shall be extended to all the affected families in accordance with Schedule II of Act ▪ Develop Tribal Development Plan in accordance with IPPF provided in the ESMF	Contractor	Dam site in-charge	SWRD/ District Collectorate/ Tribes Advisory Council
12.	Hot Mix Plant	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SPMU/ Public Health Centre
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
14.	Concrete Mixture and Heavy Pumps	Air / Noise Pollution	Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Soil Pollution	▪ Collection and recycling of lubricants Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signage near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
15.	Temporary Land	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling	Contractor	Dam site in-charge	SWRD/ Public

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
	Acquisition		▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting			Health Centre
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting ▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signages near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ SPCB
16.	Tree Felling, Vegetation Clearance	Landscape Degradation	▪ It is a direct, short term impact; Irreversible in nature; Severity is low; Insignificant Impact on Livelihood ▪ Carry plantation work on open sites ▪ Do not dump waste along settlement or access route	Dam Site In-charge	State Water Resource Dept. (SWRD)	State Water Resource Dept. (SWRD)

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Frame Muck disposal program ▪ Frame quarry & borrow area rehabilitation program ▪ Develop green belts along approach road ▪ On completion of the works all the temporary structures may be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the whole site Contractor ESMP including metrics for ESHS reporting			
		Impact on Flora	▪ Frame compensatory afforestation plan ▪ If any rare and endangered species present in the area frame conservation plan for the species ▪ Encourage farming of medicinal plants found in the area ▪ Distribute fruit plants grown in the region ▪ Plantation with native species along dam periphery, approach road and colony area ▪ Protection/fencing of planted area, provision of guard for three year ▪ Location of camp away from forest area. Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ State Forest Dept
		Soil Erosion	▪ Limitation of earth moving to dry periods ▪ Protection of vulnerable areas with mulch ▪ Protection of drainage channels with beams, straw or fabric barriers ▪ Installation of sedimentation basins ▪ Seeding or planting of erodible surfaces as soon as possible ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD
17.	Sheds to keep	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling	Contractor	Dam site in-charge	SWRD/ SPCB

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
	Machines amd Tools		▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting			
18.	Blasting	Air / Noise Pollution	▪ Air pollution control measure like water sprinkling ▪ Limit hours of operation in populated areas ▪ Use of barriers to reduce exposure ▪ Plants, machinery and equipment may be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Air quality monitoring may be conducted at construction sites. Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Soil Pollution	▪ Collection and recycling of lubricants ▪ Measures to prevent accidental spills ▪ Contractor ESMP including metrics for ESHS reporting	Contractor	Dam site in-charge	SWRD/ Public Health Centre
		Worker/Local people exposure	▪ Locate handling sites away from populated areas ▪ Follow proper operation and handling measures to minimize exposure ▪ Provide prior warning /signals for blasting	Contractor	Dam site in-charge	SWRD/ SPCB

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			▪ Provide sirens in vehicles to avoid any collision with human/animals ▪ Organise awareness programs on environmental resource management ▪ Organise Health camps ▪ Child labour must be strictly prohibited ▪ Provide signages near construction sites and approach roads Contractor ESMP including metrics for ESHS reporting			
		Landscape Degradation	▪ It is a direct, short term impact; Irreversible in nature; Severity is low; Insignificant Impact on Livelihood ▪ Carry plantation work on open sites ▪ Do not dump waste along settlement or access route ▪ Frame Muck disposal program ▪ Frame quarry & borrow area rehabilitation program ▪ Develop green belts along approach road ▪ On completion of the works all the temporary structures may be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the whole site Contractor ESMP including metrics for ESHS reporting	Dam Site In-charge	State Water Resource Dept. (SWRD)	State Water Resource Dept. (SWRD)
		Generation of Debris / waste materials	▪ Identification of debris disposal site to minimize the impact on environment and local people. ▪ Debris disposal site should be located at least 500m away from any human settlement and prior NoC has to be obtained from the State Pollution Control Board before duping debris on the identified site. ▪ Debris can be used as filling material or river embankment protection material.	Contractor	Dam site in-charge	SWRD

Sl. No	Components	Potential Impacts	Mitigation Measures	Executing Responsibilities	Supervising Responsibilities	Monitoring Responsibilities
			Contractor ESMP including metrics for ESHS reporting			
Post Implementation Phase						
1.	Increased Traffic/ Operation of Heavy Machinery for Regular Maintenance etc.	Air / Noise Pollution	▪ Specific air and noise pollution control measure to minimize impact on environment. ▪ Periodic air quality monitoring Contractor ESMP including metrics for ESHS reporting	External Agency appointed by SWRD	Dam site in-charge	SWRD/ SPCB
		Water Pollution (Surface Water)	▪ Control oil spillage ▪ Setup a covered place for operation and handling of oil to stop contamination ▪ Periodic water quality monitoring Contractor ESMP including metrics for ESHS reporting	External Agency appointed by SWRD	Dam site in-charge	SWRD / SPCB
		Soil Pollution	▪ Control oil spillage ▪ Setup a covered place for operation and handling of oil to stop contamination ▪ Soil quality testing at least once a year Contractor ESMP including metrics for ESHS reporting	External Agency appointed by SWRD	Dam site in-charge	SWRD / SPCB
		Worker/Local population Exposure	▪ Arrange mask for generator operator ▪ Use modern device to reduce smoke generation	External Agency appointed by SWRD	Dam site in-charge	SWRD
		Disturbance to Fauna	▪ Fencing is required on the both side of the road to avoid accident in forest area ▪ Use of sign boards on the road side to avoid accident	External Agency appointed by SWRD	Dam site in-charge	SWRD/ State Forest Dept
		Increased Traffic	▪ Avoid traffic in populated areas as much as possible ▪ Follow precautionary measures to avoid accident ▪ Install speed breakers and signages near settlement	External Agency appointed by SWRD	Dam site in-charge	SWRD

7.4 MONITORING CHECKLIST FOR PERFORMANCE INDICATORS

ESMF-01: Checklist for Regulatory Permissions and Clearances

Project Name:

Name of the Contractor: Month:

2. Status Statutory Clearances/ Permits for different Plants

A. Forest Clearance/ Wildlife Clearance and permission of Tree Cutting (One Time)

		Construction Packages			
(i) Forest Clearance					
Does Project involves acquisition of Forest Land in the Construction Package					
Area of Forest Land to be diverted in the Construction Package					
Status of Permission from Forest department for the Construction Package					
(ii) Permission for Tree Cutting					
Number of trees proposed to be felled in the Construction Package					
Status of Permission for tree felling and the section for which tree permission is obtained					
Proposed No. of Trees to be Planted under Compensatory Plantation					
Status of tree cutting					
Status of tree plantation till date					
(iii) Wildlife Permission/ Clearance					

B. Other Licenses & Approvals (Statement to be submitted on quarterly Basis)

Sl. No.	Permits/Approvals/ Licenses for	Numbers of locations/ labours	Type of Permit/License	Reference No.	Date of Issue	Date of Validity	Remarks
1			Lease License				

	Stone Quarry/ Borrow area		Environmental Clearance				
2	Blasting activities		Explosive License from District Authority/Chief Controller of Explosives,				
3	Labour		Labour License				

Provisions for addressing impacts due to Labor influx

The responsibility to manage these adverse impacts needs to be clearly reflected in the contractual obligations of the Civil Works Contractor with appropriate mechanisms for addressing non-compliance. The bid documents for construction needs toincorporate requirements for Environment, Social, Health and Safety (ESHS) including list of applicable labor laws[1]and provisions and the metrics for periodic reporting by contractors. The bidders are required to submit the following as part of their technical bid:ESHS strategy and implementation plan; code of conduct; and declaration of past ESHS performance. The successful Bidder will submit an Environmental, Social, Health and Safety (ESHS) Performance Security @ 1% of accepted contract value.

Prior to starting construction, the contractor will prepare and submit the Contractor ESMP (CESMP) to the Project Authority for acceptance. The CESMP will include a detailed explanation of how the contractor will comply with the project's safeguard documents, and demonstrate that sufficient funds are budgeted for that purpose. It will include Management Strategies and Implementation Plans (MSIPs) for: (i) work activities; (ii) traffic management; (iii) occupational health and safety; (iv) environmental management; (v) social management; and (vi) labor influx. The C-ESMP shall be approved prior to the commencement of construction activities. The approved C-ESMP shall be reviewed, periodically (but not less than every six (6) months), and updated in a timely manner, as required, by the Contractor to ensure that it contains measures appropriate to the Works activities to be undertaken.

To address labor influx, contractor will:

- source all unskilled labor from within the project area and its vicinity to minimize labor influx into the project area. Skilled labor force, if unavailable locally, would be brought in from outside the project area either from within or outside the state.
- develop a Workers' Camp Management Plan that addresses specific aspects of the establishment and operation of workers' camps e.g. cordoning of separate areas for labor camps and material storage;
- conducttraining programs on HIV/AIDS and other communicable diseases
- develop a complaint handling mechanism at the project level
- provide information to communities in project area and to host communities about the

[1]Workmen Compensation Act, 1923, Minimum Wages Act, 1948, Payment of Wages Act, 1936, Equal Remuneration Act, 1979, Child Labour (Prohibition & Regulation) Act, 1986, Inter-State Migrant Workmen's (Regulation of Employment & Conditions of Service) Act, 1979, etc.

contractor's policies and Worker Code of Conduct (where applicable).

To address Gender Based violence, contractor will:

- conduct mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;
- inform workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted;
- introduce a Worker Code of Conduct as part of the employment contract, and including sanctions for non-compliance (e.g., termination), and
- adopt a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence; and
- provide specific facilities for women workers including, designated health centre, Day Crèche Facilities for workers with infants and small children; organizing of construction schedule so as to exempt women workers from night shifts as far as possible;

The Contractor will periodically submit report to the Project Authorities as per ESHS metrics and update the Labour Management Plan as necessary during construction period.

Resettlement Policy Framework (RPF)A Resettlement Policy Framework (RPF) hasbeen prepared as the extent of resettlement in each sub-projects are known at appraisal stage. RPF is prepared in accordance with World Bank guidelines as set out in their OP 4.12 and in compliance with new LA Act 2013 The framework provides for any situation that may arise where need for temporary or permanent land acquisition is inevitable and resettlement and compensation activities for the lost land are to be conceived and executed in sustainable manner. The RPF is intended for use as practical tool, to guide the preparation of Resettlement Action Plan (RAP), depending upon the scale and severity of impacts. More precisely, it has been prepared as instrument to be used to deal with issues like Involuntary Resettlement, Indigenous People and Gender issues. Involuntary resettlement arising from projects often gives rise to severe economic and social hardships. The hardships stem from the following reasons among others:

a) Loss of land and other private and community assets
b) Disruption of production and income generating systems;
c) Affected persons' skills being rendered inapplicable in new environments;
d) Weakening of community and social fabric and networks;

e) Dispersion of kin groups;
f) Loss of cultural identity and traditional authority;

Objectives of RPF

The objective of this RPF framework is to avoid or minimize the potential adverse impacts of proposed project interventions resulting in displacement (physical or economic or both) of people in the project area. Where displacement (physical, economic or both) is inevitable due to technical reasons of the project design, the objective is to minimize the hardship to the affected families, enhance, or at least restore their livelihood opportunities

Principles of RPF

Based on the above analysis of Government statutes and the World Bank policy, the following resettlement principles will be adopted to this project:

i. Screen the project early on to identify past, present, and future involuntary resettlement impacts and risks. Determine the scope of resettlement planning through a census and socio-economic survey of displaced persons, including a gender analysis, specifically related to resettlement impacts and risks. Measures to avoid and minimize involuntary resettlement impacts include the following: (i) explore alternative alignments which minimize impacts, (ii) ensure the appropriate technology is used to reduce land requirements, (iii) modify the designs to ensure involuntary resettlement is avoided or minimized.
ii. Where displacement is unavoidable, improve, or at least restore, the livelihoods of all displaced persons through; (i) land-based resettlement strategies, where possible, when affected livelihoods are land based, and when loss of land is significant, or cash compensation at replacement cost for land when the loss of land does not undermine livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, and (iii) prompt compensation at full replacement cost for assets that cannot be restored.
iii. Ensure that displaced persons without titles to land or any recognizable legal rights to land are eligible for resettlement assistance and compensation for loss of non-land assets at replacement value.
iv. Improve the standards of living of the displaced poor and other vulnerable groups, including women, to national minimum standards or standard before displacement whichever is higher.
v. Carry out meaningful consultations with displaced persons, host communities, and concerned agencies/departments. Inform all displaced persons of their entitlements and resettlement options. Ensure their participation in planning, implementation, and monitoring and evaluation of resettlement

programs. Pay attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and indigenous peoples, and those without legal title to land, and ensure their participation in consultations.

vi. Prepare a Social Impact Assessment (SIA) and Resettlement Action Plan (RAP) elaborating on the entitlements of displaced persons, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.

vii. Vulnerable families will be identified and provided additional support in their efforts to improve their living standards.

viii. Disclose a draft resettlement action plan, including documentation of the consultation process in a timely manner, in an accessible place and a form and language(s) understandable to displaced persons and other stakeholders. Disclose the final resettlement action plan and its updates to displaced persons and other stakeholders.

ix. Pay compensation and provide all resettlement entitlements before physical or economic displacement and before commencement of civil works in that stretch of the sub-project. Implement the resettlement plan under close supervision throughout project implementation.

x. Establish an accessible grievance redressal mechanism to receive and facilitate resolution of the concerns of displaced persons within stipulated time-frames.

xi. Monitor and assess resettlement outcomes, their impacts on the standard of living of displaced persons, and whether the objectives of the resettlement plan have been achieved by considering the baseline conditions and the results of resettlement monitoring. Disclose monitoring reports.

Eligibility Criteria

The displaced persons falling in any of the following three categories will be eligible for compensation and resettlement assistance in accordance with the principles of this RPF:

- those who have formal legal rights to land (including customary and traditional rights recognized under the laws of the country)
- those who do not have formal legal rights to land at the time the census begins but have a claim to such land or assets; provided that such claims are recognized under the laws of the country or become recognized through a process identified in the resettlement plan; and,
- those who have no recognizable legal right or claim to the land they are occupying (squatters and encroachers occupying the RoW or government land).

Definitions

In this Resettlement Policy Framework, following terms shall mean as described below, unless the context requires otherwise,

- **Agricultural Land**: land used for: (i) agriculture or horticulture; (ii) dairy farming, poultry farming, pisciculture, sericulture, seed farming, breeding of livestock or nursery growing medicinal herbs; (iii) raising of crops, trees, grass or garden produce; and (iv) land used for the grazing of cattle.
- **Assistance:** All support mechanisms such as monetary help, services, trainings or assets given to DPs constitute assistance in this project.
- **Compensation:** Compensation refers to restitution made to property as per provisions laid down in RFCTLARR Act 2013
- **Corridor of Impact (CoI):** The Corridor of Impact (CoI) is the width required for the actual construction area
- **Cut-off Date:**For title holders, the date of notification of intended acquisition under Section 4(1) of the RFCLARR Act, 2013 will be treated as the cut-off date, and for non-titleholders the start date of project census survey for that sub-project will be the cut-off date.
- **Encroacher:** Any person illegally occupying public property by extending their land boundary or a portion of their building onto the existing government land or RoW is an encroacher.
- **Entitled Person (EP):** Entitled Person includes all those who qualify for, or are entitled to, compensation / assistance since being impacted by the project. The basis for identification of Entitled Persons (EP) in the project will be the cut-off date and first notification for land acquisition.
- **Household** for this purpose means all the males/females, their family members and relatives staying in a house/tenement/hut.
- **Temporary Building**: Temporary building means a temporary type of structure, which includes buildings with roofs constructed of thatch, galvanized iron or asbestos. ‘
- **Major Impact:** The DPs suffering the following impacts and requiring relocating are categorized as Major Impacted DPs: (i) loss of place of dwelling, (ii) loss of place of business; (iii) loss of livelihood; (iv) loss of agricultural productive land of marginal farmers; those who become marginal farmers or landless after acquisition; those who lose land equivalent or more of marginal landholding size (1.0ha of un-irrigated and 0.5ha of irrigated).
- **Marginal Farmer:** A cultivator with an un-irrigated land holding up to one hectare or irrigated land holding up to one-half hectare;
- **Minor Impact:** A DP suffering minor impact is one who is affected to a lesser degree than the major impacts defined above. Compensation for minor impacts will be limited to one-time payment of cash or giving notice.

- **Minimum Wages**means the minimum wage of a person for his/her services/labor by type of trade per day as stipulated by respective state government.
- Non-Perennial Crop: Any plant species, either grown naturally or through cultivation that lives for a season and perishes with harvesting of its yields has been considered as a non-perennial crop in the project. For example, paddy, sugarcane, groundnut, etc.
- **Perennial Crop:** Any plant species that live for years and yields its products after a certain age of maturity is a perennial crop. Generally, trees, either grown naturally or horticulturally and yield fruits or timber have been considered as perennial crop in the project. For example, tamarind, coconut, mango, teak, neem etc. are perennial crops.
- **Persons Losing their Livelihood:** Persons losing their livelihood are individual members of the DHs, who are at least 18 years of age and are impacted by loss of primary occupation or source of income.
- **Displaced Household (DH):** Any household living, cultivating land or carrying on business, trade or any other occupation within the Corridor of Impact (CoI) who are impacted by the project is a Displaced Household. All the members of a DH in the project will be treated as DPs.
- **Displaced Person (DP):** Any individual or part of the DHs living, cultivating land or carrying on business, trade or any other occupation within the Corridor of Impact (CoI) who are impacted by the project is a Displaced Person (DP).
- **Permanent Buildings:** Buildings of a permanent construction type with reinforced concrete
- **Replacement Cost:** The amount required for an affected person to replace the lost asset through purchase in the open market and transaction costs and taxes, if any.
- **Resettlement Area**means an area where the affected families who have been displaced because of land acquisition are resettled by the appropriate Government;
- **Small Farmer:** A cultivator with an un-irrigated land holding up to two hectares or with an irrigated land holding up to one hectare, but more than the holding of a marginal farmer.
- **Semi-Permanent Building:** Buildings of a semi-permanent type with tiled roof and walls not of concrete or permanent brickwork.
- **Severance of Land:** Severance of land can be defined as division of a land holding caused due to acquisition of land mainly for laying new project alignment, such as a bypass or a re-alignment.
- **Squatter:** Any person occupying structures entirely within the RoW (with no legal rights to occupy that parcel of land) for residential and/or business purposes, is a squatter.
- **Tenant:** Any person by whom or on whose account rent is payable for any property.
- **Women Headed Household (WHH):** A household that is headed by a woman and does not have an adult male earning member is a Woman Headed Household. This woman may be a widowed, separated or deserted person.

- **Vulnerable Group (VG):** Vulnerable Group includes but is not limited to the following categories: (i) DPs falling under 'Below Poverty Line' (BPL) category, as identified by the Planning Commission of India's State specific rural poverty line and updated to current period using consumer price index (CPI); (ii) landless people; (iii) persons who belong to Scheduled Castes (SC) and Scheduled Tribes (ST); (iv) Women Headed Households; (v) Children and elderly people[2], including orphans and destitute; and (vi) Physically and mentally challenged / disabled people.

A. Entitlement Framework

In accordance with the principles of this resettlement policy framework, all displaced households and persons will be entitled to a combination of compensation packages and resettlement assistance depending on the nature of ownership rights on lost assets and scope of the impacts including socio-economic vulnerability of the displaced persons and measures to support livelihood restoration if livelihood impacts are envisaged. The displaced persons will be entitled to the following five types of compensation and assistance packages:

a) Compensation for the loss of land, crops/ trees at their replacement cost;
b) Compensation for structures (residential/ commercial) and other immovable assets at their replacement cost;
c) Assistance in lieu of the loss of business/ wage income and income restoration assistance;
d) Assistance for shifting and provision for the relocation site (if required), and
e) Rebuilding and/ or restoration of community resources/facilities.

An generic Entitlement Matrix has been developed, that summarizes the types of losses and the corresponding nature and scope of entitlements; and follows National, State laws and World Bank OP. Entitlement matrix presents the entitlements corresponding to the tenure of the DPs in the following order.

a) Impact to private property (title holders) consisting of: (i) loss of private land; (ii) loss of private residential structure; (iii) loss of private commercial structure; (iv) impact to tenants (residential / commercial / agricultural) of title holders; and (v) impact to trees, standing crops, etc.;
b) Impact to Non-title holders consisting of: (i) impact to squatters; and (ii) impact to encroachers;
c) Loss of employment to agricultural and non-agricultural workers/employees;
d) Additional assistance to vulnerable DPs; and

[2]PAPs up to 14 years have been considered as children, while those over 60 years of age have been considered as elderly people in the project.

e) Unforeseen impacts.

Entitlement Matrix

S. No.	Impact Category	Entitlement Framework as per RFCTLARR Act	Explanation
1.	**Impacts to Title holders (Loss of Private Properties)**		
A	**Loss of Land (agricultural, homestead, commercial or otherwise)**	Compensation as per RFCTLARR Act, 2013 criteria provided in paragraph 26 of the Act One time grant not exceeding Rs. 5,00,000/- for each affected household or annuity policy that shall pay Rs. 2,000/- per month for 20 years with appropriate indexation to Consumer Price indexation.	Higher of (i) market value as per India Stamp Act,1899 for the registration of sale deed or agreements; or (ii) average sale price for similar land ascertained from the highest 50% of sale deeds of the preceding 3 years or (iii) consented amount paid for PPPs or private companies. Plus100% solatium and 12% interest from date of notification to award. The multiplied factor adopted by respective project for distance from urban area to the affected area will be applied. The provision of infrastructural amenities will be as per the Third Schedule of RTFCTLARR Act 2013, wherever alternative resettlement sites are provided. The provision of purchase or lease as available under RTFCTLARR act, 2013, will be exercised wherever appropriate. The acquiring entity shall consider acquisition of residual land or asset, if it is required.
B	**Loss of residential structure**	The Compensation for the structure will be paid as per the provisions of the RFCTLARR Act 2013 • Cash compensation as per the Market Value of the structure and 100 % solatium. • Each affected family having cattle shed will be provided one time financial assistance of Rs. 25,000 /- • Provision of alternative house as per PMAY or equivalent financial assistance in Urban Areas. Provision of House in case of rural area as per IAY specifications or equivalent cost of the house. • Transportation cost of Rs. 50,000/- • Right to salvage affected materials	The value of houses, buildings and other immovable properties will be determined without depreciation and as per the provisions of RTFCTLARR Act 2013. Stamp duty and registration charges will be borne by project authority in case of new houses or sites.

C	**Loss of Commercial structure**	The Compensation for the structure will be paid as per the provisions of the RFCTLARR Act 2013. 1. Cash compensation as per the Market Value of the structure and 100 % solatium. 2. One time grant to artisan, small trader and certain others shall get a one-time financial assistance of Rs. 25,000/- 3. Transportation cost of Rs. 50,000/- 4. Right to salvage affected materials	The value of commercial structures and other immovable properties will be determined without depreciation and as per Section 29 of RTFCTLARR Act 2013.

D	**Impacts to tenants (residential / commercial/ agricultural)**	**<u>Residential</u>** • Reimbursement of • Each affected family that is displaced due to land acquisition shall be given a monthly subsistence allowance equivalent to Rs. 3000/- per month for a period of one year from the date of award. • One time financial assistance of Rs. 50,000 as transportation cost for shifting of the family, building materials, belongings and cattle. • Right to salvage affected materials • Reimbursement of amount for unexpired lease period **<u>Commercial</u>** • One time financial assistance of Rs. 50,000 as transportation cost for shifting of the family, building materials, belongings and cattle. • One time grant to artisan, small trader and certain others shall get a one-time financial assistance of Rs. 25,000/- • Reimbursement of amount for unexpired lease period **<u>Agricultural Tenants</u>** In case of agricultural tenants advance notice to harvest crops or compensation for lost crop at market value of the yield determined by agricultural department	Reimbursement of amount for unexpired period, provided a formal lease agreement is in place

E	**Impacts to trees, plants and standing crops,**	The Collector for the purpose of determining the value of trees, plants and standing crops attached to the land acquired, use the services of experienced persons in the field of agriculture, forestry, horticulture, sericulture, or any other field, as may be considered necessary by him.	The compensation for the affected trees, plants shall be determined as per Section 29 (2) & (3) of the RTFCTLARR Act 2013.
2.	**Impacts to Non-title holders (Squatters)**		
A	**Loss of House**	• Compensation at Market Value for the affected structure OR Alternative house with minimum area as per Government norms • One time Subsistence grant of Rs. 18,000/- • One time financial assistance of Rs. 25,000/- as transportation cost for shifting of the family, building materials, belongings and cattle. • Right to salvage the affected materials;	The Titles for alternatives houses shall be provided in the joint name of the wife and husband preferably, if both exist.
B	**Loss of Shop**	• Compensation at Market Value for the affected structure. • One time financial assistance of Rs. 25,000/- as transportation cost for shifting • One time grant of Rs. 25000/- for loss of trade/self-employment for the business owner • Right to salvage the affected materials;	
C	**Encroached Structure**	• Cash compensation for the affected structure as per the Market Value • One time shifting assistance of Rs. 5000/- for Kiosks • Right to salvage material.	The value of commercial structures and other immovable properties will be determined by the Market Value of the encroached structure without depreciation
3.	**Loss of Income Livelihood**	• Subsistence allowance equivalent monthly minimum agricultural / industrial wages for 3 months • For temporary disruption of livelihood, minimum wages as per collector rate for the period of disruption	• Only agricultural labourers, who are in fulltime /permanent employment of the land owner or those affected full time employees of the business will be eligible for this assistance. • Only to regular vendors or roadside shopkeepers whose income is affected during construction period will be eligible for this assistance. • Prior notice before start of construction works.
4.	**Impact to Vulnerable Displaced People**	Training for skill development. • This assistance includes cost of training and financial assistance for travel/conveyance and food.	Training will be provided through relevant training institutions

		• One adult member of the affected household, whose livelihood is affected, will be entitled for skill development. • Additional assistance for vulnerable households whose livelihood/loss of shelter is impacted by the project will be paid additional one time assistance of Rs. 50000/- in case of non-title holder families. • In addition to this amount, the Scheduled Castes and the Scheduled Tribes displaced from Scheduled Areas shall receive an amount equivalent to Rs. 50,000/- (as per provisions of RTFCLARR Act 2013)	The one time assistance tothe Vulnerable PAFs will be paid to only one type of impact for the multiple vulnerable impacts.
4	**Impacts to Community Assets**	Wherever possible the community assets will be relocated in consultation with community. When there location of the community assets are not feasible, will be provided afresh.	

Note: All unit costs will be updated to 2018 prices or revised to the year of payment prior to payment

In case of Hirakud Dam, a Specific Entitlement Matrix for the squatter households was devised based on the existing Orissa R&R policy 2006. Refer to approved RAP for Hirakud dam.

B. Resettlement Plans

RAP Process will follow the project cycle stages. All sub projects shall be screened for their likely adverse impacts, in the Planning Stage. If the issues related to resettlement are triggered, the RAP will have to be prepared for the concerned scheme / sub project. Such a plan shall be prepared at the Planning and Design Stage of the project preparation, wherein the physical intervention / measures shall be planned and designed.

A Resettlement Plan (RP) or an Abbreviated RP is prepared at the time, when it is inevitable that activities require land and people or their economic activities will be affected or damage to their property is expected. The plan is based on up-to-date and reliable information about (a) the proposed resettlement and its impacts on the displaced persons or adversely affected groups, and (b) the legal issues involved in resettlement. The rule for determining whether project or sub project will require RP or an abbreviated RP depends to large extent upon number of PAPs likely to be affected.

Abbreviated Resettlement Plan Procedures:

For projects where impacts on the entire displaced population are minor, or less than 200 people are likely to be affected (e.g., not requiring changes in occupation or relocation of residence). Under such circumstances, an abbreviated resettlement plan will be prepared for each sub-project.

Full Resettlement Action Plan (RAP) Procedures: n cases where a sub-project would incur involuntary resettlement or other significant or large-scale impacts, a full Resettlement Action Plan will be prepared for that individual sub-project. The full RAP requires more in-depth studies than the abbreviated resettlement action plan, including socio-economic and other supporting studies

The SIA **study is conducted by a qualified social scientist that** examines the nature of the impacts; the socio-economic and cultural setting, local organizations, and social risks, as well as the indicators that would ensure that the project affected people at minimum regain their former quality of life or preferably are enabled to improve it.

Organizational Support

RAP will form an integral part of the sub-project Plan and its implementation will be synchronized with other project interventions at sub-project level, both at the state level (in the Project Management Unit) and sub project level and the Social Development Specialists will be responsible for guiding and supervising the preparation and implementation of resettlement plans. The responsibility of approving RAP as part of sub-project Plan will be with the PMU. The social development specialist with both PMU and PIU will ensure that RAP conforms to the agreed R&R Entitlement Framework of the project. At the sub-project level involving RAP, the concerned E&Sspecialist ofSPMU. will be assigned the responsibility of implementing RAP.

Funding for RAP Activities

All the cost of resettlement activities will be met from the sub-project cost. Detailed R&R cost estimates will be developed based on the proposed mitigation measures proposed and will be included in the project cost at the sub-project level.

Time Frame

This will be guided by the sub-project implementationschedule and coverage of the information on project affected households, its adequacy and sufficiency, impacts due to project and proposed remedial measures and feasible implementation arrangements proposed for R&R implementation in RAP.

Documentation

Documentation of the following information should be ensured:

- Database on project affected households, land acquisition, community assets, religious structures and public utilities.

- Documentation of community consultation and focus group discussion and information disclosure requirement.

Disclosure

In order to make the RAP preparation and implementation process transparent, a series of public consultation meetings with all stakeholders will be carried out in the field for dissemination of information regarding rehabilitation process and entitlement framework. The salient features of RAP and the R&R policy shall be translated in Vernacular languages and disclosed on the websites of Central PMU (CWC) website. The documents available in public domain will include: Entitlement Matrix and RAP (summary in local language) and the list of eligible PAFs for various R&R benefits. As per Access to Information Policy of the WB all safeguard documents will also be available at the World Bank Portal. The SPMU will assist in community level disclosure and information dissemination work, which will include community display, meetings and consultations.

C. GENDER DEVELOPMENT AND STRATEGY

In general, women are excluded or benefited in a limited way and quite often are marginalized due to development projects. Very few attempts have been made to mainstream gender concerns into the project planning and implementation. Thus, there is an ardent need for providing social justice and reduce marginalization of women and empower them to draw maximum benefits from development projects. Thus, incorporating gender and other social issues in the development projects helps to improve project performance and facilitate achievement of the Bank's goal of poverty reduction.

In most rural societies, poor women are more disadvantaged than poor men, first, because women in general usually have less power, access, and control over resources than men, and second, because men have more prominent public roles. For these reasons, it is easy to overlook the importance of involving women in water projects/programs at all levels, unless a special focus on women is included. A gender approach highlights such differences and changes. Social factors underlie and support gender-based disparities. These factors include:

- Institutional arrangements that create and reinforce gender-based constraints or, conversely, foster an environment in which gender disparities can be reduced
- The formal legal system that reinforces customs and practice giving women inferior legal status
- Socio-cultural attitudes and ethnic and class/caste-based obligations that determine men's and women's roles, responsibilities, and decision-making functions

- Religious beliefs and practices that limit women's mobility, social contact, access to resources, and the types of activities they can pursue.

Strategy for Addressing Gender Issues: The right approach would be to focus on specific issues that relate to the project so as to ensure that the women of the project areas get benefits from the project activities. This would require gender specific activities to alleviate the existing differential access to project benefits and to ensure that women become real partners of proposed development activities. The approach, therefore, is to formulate specific project interventions focusing on women issues and at the same time concerted efforts would be required to dovetail existing relevant government programs for the socio-economic benefit of women members. Following this approach, gender development strategy is proposed (Table 2).

Table 1: Gender Development Strategy

Issues	Strategies	Proposed activities	Responsibilities
Poor leadership qualities	- Training in leadership & organizational development	- Work with women groups to communicate the goals, strategies and plans of the project. - Explain project activities and benefits. - Design and organize specific capacity building programs for women groups	Social Development Specialist, Project staff
Joblessness and wage disparity	- Ensure employment to women in project construction activities - Ensure equal wages for equal work	- Identify women interested in construction activities and provide employment on preferential basis - Monitor that women get same wages as that of male members for the same type of involvement in construction activities - sensitize contractors on women issues	Social Development Specialist, Project staff
Access to market	Ensure that women get a fair price for the produce	- Provide market information - Encourage SHGs to take up marketing - Identify and select educated young women who after undergoing training on marketing aspects will help local women in marketing	Social Development Specialist, Project staff

Issues	Strategies	Proposed activities	Responsibilities
Access to development programs and credit	Extend support to access development programs and institutional credit	- Provide information on various development programs implemented in the area - Help the eligible families to complete formalities - Ensure that the benefits received are productively used	Social Development Specialist, Project staff
Access to common properties for fuel and fodder	- Plant fuel/fodder species in the fore shore and canal bunds	- Plant fuel and fodder tree species under the environmental management plan	Social Development Specialist, Project staff
Low literacy	- promote functional literacy	- Integrate with mass education and total literacy programs - Customize training programs to meet the needs of illiterate and neo-literate women groups	Social Development Specialist, Project staff
Inadequate awareness on health and sanitation	- promote health awareness - increase access to health and sanitation facilities	- Organize health campaigns, health camps (general and referral) in association with line departments and local medical institutions - Promote nutritional gardens with the support of line departments. Distribute seed material kit and saplings	Social Development Specialist, Project staff
Gender Based Violence	- Awareness generation and specific facilities	conduct mandatory and repeated training and awareness raising inform workers about national laws that make sexual harassment and gender-based violence provide specific facilities for women workers including, designated health centre, Day Crèche Facilities for workers with infants and small children -	Social Development Specialist, Project staff

Gender Action Plan through the Project Cycle: Involvement of women groups in the identification of impacts and opportunities through sub-project activities shall form the basis for preparation of gender sensitive sub-project activities. The procedure to be followed and process and outcome are presented in the following matrix **(Table 3):**

TABLE 2: ACTIVITIES OF GENDER ACTION PLAN THROUGH PROJECT CYCLE

Sub-Project Stages	Procedures	Process & Outcome	Responsibility
Planning Stage	Identify gender concerns/issues in relation to the project activities through PRA exercises	List issues	Social Development Specialist, Project staff
	Organize women stakeholders meeting to inform about the project activities and benefits sensitize and discuss the preliminary findings	Number of consultations held	Social Development Specialist, Project staff
	Sensitize other stakeholders on gender concerns/issues	Number of meetings held	Social Development Specialist, Project staff
	Identify key areas of constraints that may be improved through the project	List areas of constraints - Number of consultations & signed minutes	Social Development Specialist, Project staff
	Incorporate and highlight the issues	List of issues mentioned (Gender Expert,/ PMU)	Social Development Specialist, Project staff
	Involve women in Joint Walkthrough, Consultations and PRA exercises and identify possible impacts and opportunities	List of issues identified on sub-project map Identification of activities to be included in Sub-Project Gender Action Plan	Social Development Specialist, Project staff
	Consultations for fine tuning the proposals of Sub-Project Gender Action Plan	Number of meetings &signed minutes	Social Development Specialist, Project staff
Implementation Stage	Implementation of provisions of sub-project plan addressing gender concerns Implementation of GAP	• Progress in the implementation • Measures undertaken as per Checklist for both the Sub-Project as well as Gender Action Plan.	Social Development Specialist, Project staff, PMU and external M&E agency
Post Implementation Stage	Continuation of activities initiated under the project	Changes in the Economic and social conditions as	Social Development Specialist, Project staff,

Sub-Project Stages	Procedures	Process & Outcome	Responsibility
		highlighted in Impact Indicators of Post Implementation Stage	PMU and external M&E agency

Monitoring of Gender Action Plan: The indicators, frequency and agency recommended for monitoring are presented in **Table 4.**

Table 3: Monitoring of Gender Action Plan

Aspects	Indicators	Frequency	Who will monitor
Economic	• Wage employment gained (no. of days of employment availed, wages earned) • Changes in occupation profile • Reduction in no. of days of migration • Income earned – contribution to household income • Changes in time spent on different activities • Women taking up self employment activities (no of women and income earned) • Level of skill improved (no. of women trained)	- Planning Stage for the base line data -During implementation at half yearly interval	Internal monitoring by SPMU
Social	• Representation in various committees and groups. (no. of members) • Representation in various committees and groups. (No. of women holding specific posts). • no. of SHGs formed /strengthened • no. of SHGs taking up small work contracts (no. and value of contracts)- no. of women/SHGs taking up marketing of farm produce	Planning Stage for the base line data - at half yearly interval during project implementation	Internal monitoring by SPMU

Implementation Arrangements: The preparation, implementation and monitoring of Gender Action Plan (GAP) is the responsibility of the project functionaries. The Social Development specialist, at the SPMU level will facilitate and supervise this process of preparation and implementation of Action Plan. All efforts will be made to coordinate and work with all relevant line departments (specifically the

Departments of Women and Child Development, and Rural Development) to help dovetailing with their development programs for the socio-economic development of women.

D. Tribal Development

It is required to assess the potential and adverse impacts on tribal community due to the development measures and to mitigate them at par with others. In the Indian context, indigenous people are categorized as tribals who often become vulnerable in development projects not only because their cultural autonomy is undermined as a consequence of the project outcomes, but also because they endure specific disadvantages in terms of social indicators of quality of life, economic status, and usually as subjects of social exclusion. Consequently, they are unable to participate in the development process on an equal footing with the rest in the community, nor able to reap a fair share of the benefits of developmental projects. Therefore the study also attempts to identify issues that may constraint their participation in the project and suggest measures to enhance their involvement and enable them to access project benefits at par with others.

Legal Policies and Provisions for Tribals: Article 366(25) refers to STs as those communities who are scheduled in accordance with Article 342 of the Constitution. According to Article 342 of the Constitution, STs are the tribes or tribal communities or part of or groups within these tribes and tribal communities which have been declared as such by the President through a public notification. Identification of tribes is a State subject. Thus, classification of a tribe would depend on the status of that tribe in the respective project State.

Approach to IPDP Preparation:

An Indigenous Peoples Planning Framework (IPPF) is a policy and procedural framework for Indigenous People Development Plans (IPDPs) that are developed for projects and that are to be approved during Project implementation. Further, an IPPF sets out the indigenous people's policy together with the screening and planning procedures.

Operational Policy OP 4.10 - Indigenous Peoples underscores the need for Borrowers and Bank staff to identify indigenous peoples, consult with them, ensure that they participate in, and benefit from Bank-funded operations in a culturally appropriate way - and that adverse impacts on them are avoided, or where not feasible, minimized or mitigated.

Strategy for Tribal Development: The project would focus on issues that are directly related to the tribals' involvement in project activities and accessing project benefits. Thus the bottom line is to ensure equitable

opportunities for tribals to get project benefits. The main objective of a tribal development strategy would be therefore, to ensure that the tribals are actively involved with the project activities and they have access to project benefits at par with the rest of the community. The strategy also aims at minimizing any negative impacts like creating further sources of social and economic imbalances between communities. The specific objectives of the strategy (table 5) are:

- To ensure project benefits are accessible to the Tribal living in the project areas.
- To enable the tribals to participate in the community institutions with better capacity in decision making process.

Tribal Development Strategy and Responsibilities

Issue	**Strategies**	Proposed activities	**Responsibilities**	**Possible linkages**
Lack of participation	- Educate tribals and involve them in project related activities - Insist on required quorum in meetings - encourage free discussion & consider issues raised by tribal - IEC strategy to focus on tribal issues.	- Frequent meetings, periodical review & interactions with tribal groups - Organize training on leadership; - Focused group discussion on tribal issues/ rights - Document proceedings of the meetings - Sub-project to reflect tribal issues - Use of folk art forms, mass media - Strengthen eco clubs in schools in tribal areas - Frequent meetings with tribal groups - apply PRA technique.	Consultant/ Social Development Specialist	Public Relation Dept.
Poor leadership qualities	- IEC focused on the tribal rights and roles in various committees - Training in leadership & organizational development	- Work with ST groups to communicate the goals, strategies and plans the project. - Ensure adequate representation for ST members in various committee - Design and organize specific capacity building programs for tribal groups	Social Development Specialist	
High incidence of joblessness	- Employment in project construction activities and O&M work on preferential basis	- Identify those dependent on wage employment and ensure that contractors during project construction and O&M activities	Social Development Specialist	Rural Dept./ Women and Child Welfare Dept./ Banks
Low literacy	- Promote functional literacy	- Integrate with mass education and total literacy programs - Farm extension programs to include audio-visual aids and participatory learning methods. - Customize training programs to meet the needs of illiterate and neo-literate ST communities	Social Development Specialist	Education Dept./ TDD

Issue	Strategies	Proposed activities	Responsibilities	Possible linkages
Inadequate awareness on health and sanitation	- Promote health awareness - Increase access to health and sanitation facilities	- Organize health campaigns, health camps (general and referral) in association with line departments and local medical institutions - Promote nutritional gardens with the support of line departments. Distribute seed material kit and saplings.	Social Development Specialist	Public Health Engineering Department (PHED)

Indigenous People Development Framework (IPPF)

The precise nature of interventions and the additional activities needed to address any specific problems of tribals would be determined when the strategic social assessment is carried out at individual sub-project level for preparing sub-project plans. All specific measures proposed to develop tribal people in a sub-project area will form part of the sub-project plan.

Steps for Formulating IPDP: The IPDP seeks to ensure that IPs are informed, consulted, and mobilized to participate in the sub-projects during IPDP preparation. Their participation can either provide them benefits with more certainty, or protect them from any potential adverse impacts of the sub-project. The main features of IPDP will be a preliminary screening process, a social impact assessment to determine the degree and nature of impact of each sub-project, and an action plan developed, if warranted. Consultations with and participation of IP communities, their leaders, and local government representatives will be an integral part of the overall IPDP.

a. **Preliminary Screening:** The Social, Resettlement and Rehabilitation Expert will study all IP communities and villages within and in the vicinity of the proposed sub-project area. The IA/SPMU will arrange public meetings at IP communities to provide information regarding the proposed sub-project. During these meetings, community leaders and other participants will be given an opportunity to present their views and concerns.

An initial screening will check for the following:

- Name(s) of IP community group(s) in the area;
- Total number of IP community groups in the area;
- Percentage of IP community population in the area compared with the total population; and
- Number and percentage of IP households to be affected by the sub-project site.

b. **Social Assessment:** The policy on indigenous people ensures that the process of initial social assessment includes specific consideration of indigenous peoples as a potentially affected population. If the initial social assessment identifies indigenous peoples specifically as a significantly and adversely affected population, or vulnerable to being so affected, it is required that an indigenous peoples plan acceptable to World Bank is prepared by the project proponent. The SIA will gather relevant information on demographic data; social, cultural, and economic situation; and both positive and negative social, cultural and economic impacts.

Information will be gathered through separate group meetings within the IP community, including IP leaders; group of IP men and women, especially those who live in the zone of influence of the proposed sub-project. Discussions will focus on positive and negative impacts of the sub-project as well as recommendations on the design of the sub-project. The Social, Resettlement and Rehabilitation Expert will prepare the SIA and the SPMU will be responsible for analyzing the SA and for leading the development of an action plan with the support of IP community leaders. If the SA indicates that the potential impact of the proposed sub-project will be significantly adverse—threatening the cultural practices and IP sources of livelihood, or that the IP community rejects the sub-project works—the SPMU will consider other design options to minimize such adverse impacts. If IP communities support the sub-project an IPDP will be formulated.

Mitigation Measures: Where impacts on indigenous households are potentially positive, measures will be undertaken to ensure that benefits are equally shared. This will be through ensuring indigenous peoples as stakeholders take part during all stages of the Project. Where impacts are potentially negative, all affected indigenous households will be provided with assistance, which would help them to improve their living standards without exposing their communities to disintegration. As vulnerable groups, they are entitled to receive special assistance not only to restore and improve their income and livelihood, but also to maintain their distinct cultural identity.

As indigenous peoples, they are likely to have traditional land rights; these will be honored and the absence of land titles will not be a bar for receiving compensation and alternate land. Their compensation entitlements will be the same that are listed in the approved Resettlement Policy Framework (RPF) of the Project. The RPF defines IPs as vulnerable people/ households.

If the sub-project impacts are not significant, and if they could be addressed by resettlement plans that will be prepared according to the agreed RPF, ‘specific actions’ could be built into resettlement plans

to safeguard their entitlements. This decision will depend on the severity of impacts on them. Such 'specific actions' are outlined in the RPF.

Monitoring: Monitoring and Evaluation (M&E) help ameliorate problems faced by project implementing agencies and develop solutions without delay. IPDP includes a set of monitoring indicators, for periodic assessment of planned activities, which will be reviewed during IPDP implementation. The PIU will periodically report the assessment under these indicators and reports will be sent to the PMU. The PMU after initial check will send these reports to World Bank for final evaluation.

Involvement of Tribal Groups: The affected IPs will be informed and consulted in preparing IPDP. Their participation in planning will enable them to benefit from the project and to protect them from any potential adverse impacts of the project. The IPDP prepared in consultation with affected IPs will be translated into local language of IPs and made available to them before implementation of the project. The PMU will ensure that adequate funds will be made available for consultation and facilitation.

Involvement of IPs / indigenous groups in problem identification and design of solutions has to be ensured through the entire cycle of project interventions. Table 6presents the activities to be undertaken by the implementation agency to ensure inclusion of indigenous issues in the main project.

Activities and Indicators of IPs' Involvement Issues

Project Stage	Procedures	Process and outcome Indicator	Remarks
Planning Stage	- Identify locations of dominant indigenous population in the sub-project sites. - Sensitization and consultation through focus group discussions with indigenous communities - Identification of environmental and social issues of indigenous population and possible impacts as a result of the project	- IP Screening - List of all indigenous communities in the project areas - Documentation on number of discussions and minutes of the meetings - Documentation of the issues	

Project Stage	Procedures	Process and outcome Indicator	Remarks
Design Stage	- Consultation to establish existing concerns related to: 1. Land availability and tenure 2. Access to urban infrastructure facilities 3. Representation in Community Based Developments 4. Existing Government schemes 5. Dependency on Cultural Property Resources (CPRs) - Discussion on possible intervention measures , through the project their likely impacts and safeguard measures (mitigation and monitoring) to be incorporated into the project activities 1. Loss of agricultural and homestead land 2. Loss of structure and immovable assets 3. Loss of livelihood 4. Loss of CPR Consultation with indigenous group for further suggestions	- Justification for preparing IPDP - List spatial and non spatial issues - List of safeguard measures - Enlistment of project impacts - List of safeguards measures into Draft Plan	To be carried out by SPMU
Implementation Stage	- Participatory approach to be taken up to involve IPs in finalizing projects, - Resettlement Action Plan/IPDP etc. - Disbursement of entitlements as per the RP/IPDP/Framework - Implementation of safeguards measures as per IPDP /Framework proposals	- Measures to be taken in complying with the frameworks prepared for resettlement and IPDP. - Measures undertaken as suggested in RP/IPDP/Framework - Measures undertaken as suggested in RP/IPDP/Framework	To be carried out by PIU
Post Implementation Stage	- Evaluation of success of programs and safeguard measures undertaken - Follow up activities based on lesson learnt	- Indicators developed for evaluation of project impacts - Listing of modified programs to be	Consultant engaged for impact evaluation study will do that after

Project Stage	Procedures	Process and outcome Indicator	Remarks
		implemented for uplifting affected indigenous communities	project completion

Electronic version of the IPDP will be placed in the official website of the SPMU / State Government and the official website of World Bank after approval of the IPDP by Government and World Bank.. The information of the IPDP including entitlements for IPs and implementation arrangements will be presented in the form of a brochure that will be circulated among the indigenous PAPs. Posters designed to mass campaign the basic tenets of the IPDP will be displayed at suitable locations for generating mass awareness.

E. Institutional arrangement: IPDP will form an integral part of the sub-project level and its implementation will be synchronized with other project interventions at Sub-project level. The responsibility of approving IPDP as part of sub-project Plan will be with the PMU organization. The social development specialist with PMU will ensure that IPDPs conform to the agreed Tribal Development (TD) strategy of the project.

At all the sub project level for all major activities which has significant adverse effect on tribal population, there will be a designated person to be responsible for TD activities who will ensure that IPDPs prepared at the sub-project level are in accordance with the agreed TD strategy of the project. Allocation of funds for TD at sub-project level will be in proportion to the tribal membership.

Strategy for implementing TD component under the DRIP is to work in close association with the existing TD agencies duly supplementing their efforts with Project initiatives. The Project will facilitate ongoing welfare measures for the over-all upliftment of tribal communities in irrigation areas covered under the project. This will require the project functionaries to work in close coordination with the functionaries of the above agencies and ensure proper linkages with government schemes for the over-all socio-economic development of tribal communities. Any direct investment from the Project will be with an aim to help tribals access project benefits at par with others.

In order to have focused attention on tribal development under the project, a Social Development Specialist within the Social and Environmental cell at the SPMU will coordinate with the relevant government departments and agencies. This Unit will also be responsible to monitor the preparation and

implementation of IPDPs at the individual sub-project level. At the sub-project level, preparation and implementation of IPDPs will be the responsibility of the designated Social Development Specialist. Where ever suitable are available, they will be engaged to facilitate the preparation and implementation of IPDP.

CHAPTER 8

8. SAMPLE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 INTRODUCTION

Environmental and Social Management Plan is an action plan to mitigate and offset the potential adverse environmental and social impacts and enhance the positive impacts. It consists of mitigation, monitoring and institutional measures to be taken up.

Following activities require attention during preparation of EMP:

- Environmental policy and legal requirements
- Significant Environmental Impacts identified in EIA
- Technological aspects and best practices
- Budget for environmental management measures

The construction agency is required to comply with the laws with respect to environment protection, pollution prevention, forest conservation, resettlement and safety and any other applicable law. Control of pollution during implementation phase is of considerable importance. The Environmental management plan is an executable part of Project and should be provided to construction site in charge.

8.2 MANAGEMENT PLANS

The management plans to be followed at construction site are described below.

8.2.1 GROUTING WORKS MANAGEMENT PLAN

- The wastewater from grouting operations such as sediment laden waters from drilling operations, cement inclusive wastewater and wastewater with additives must be cleaned by settlement pond to prevent water pollution.
- Water contaminated by concrete should not be discharged over land and not allowed to flow into the river.
- Material safety data sheets (MSDS) for the materials to be used in grouting mixture must be obtained from the manufacturing company and prescribed precautions must be followed.
- When grouting works are interrupted for long, it will be necessary to wash the grouting lines. Wastewater from washing of the pipes must be directed through chutes to settling ponds in the grouting manufacturing facilities.
- Precautions must be taken to avoid spilling of concrete additives.

8.2.2 Emission and Dust Management Plan

Fugitive dust from site works and emission from vehicles and plants (eg crushing and concrete batching) have the potential to affect the air quality. The contractor must implement prevention method to control dust resulting from construction related activities including quarry sites, crushing and concrete batching plants, engineering structures such as road construction, embankment and haulage material and construction camps.

- The asphalt plant used for access road construction must be equipped with dust collectors
- Water sprinklers must be used to reduce particulate matter emission.
- Speed limit must be maintained by the trucks and dumpers
- The machinery and vehicles must be inspected with regard to their exhaust system and emission level
- Vehicles carrying fine materials such as cement, soil etc must be covered
- Central or State Pollution Control Board norms for emissions must be complied with.

8.2.3 Borrow & Quarry Area Management Plan

An appropriate Borrow & Quarry Area Management Plan must be formulated to control degradation of the surrounding landscape due to the excavation work.

- Borrowing of earth must be carried out upto depth of 150cm from existing ground level.
- Top soil (20cm) from all areas must be preserved in stockpiles and utilized for redevelopment of borrow / quarry areas. Measures must be taken to control erosion of preserved top soil.
- Borrow pit should be developed as far as possible from the river side, where the inner edge of any borrow pit should be not less than 15m away from the toe bank. Borrowing of earth shall not be carried out on productive land in the event of such an occasion, contractor has to obtain permission of the engineer incharge.
- Borrow or quarry areas must be opened after taking permission from the local administrative bodies like Village Panchayats, Collector and State Pollution Control Boards etc.
- Reclamation of borrow & quarry area should be mandatory and must be included in the agreement made with the Construction Contractor
- The pits formed should be backfilled by construction waste and site should be stabilized.
- May be developed as ponds and used for aquaculture as per local requirement.
- Landscaping of borrow area may be done and grasses, shrubs & tree species may be planted around the reclaimed area. Ornamental plants may be planted on the access route.

8.2.4 SOLID WASTE MANAGEMENT PLAN

Solid waste generated from construction activities comprise of wood, reinforcement steel left over, pipes, bolt, nails, concrete bricks, electrical cutting, equipment parts etc. Domestic waste include food containers such beverage can, coffee /tea cups wrapping papers, plastic, left over food, glass etc.

- Construction work must be carried in such a way that minimum or no solid waste is generated at construction site.
- Adequate number of dustbin/ container must be provided
- Solid waste must be collected and disposed properly in compliance with hazardous waste management act.
- Domestic waste must be collected separately. Toxic waste (oil, solvents, paints, acids, additives) should not be collected with solid waste.
- Hazardous material product storage must be regularly monitored for leak and repair as necessary.
- Project personnel must be trained on collection and disposal method for different waste.
- It must be ensured that domestic and collection waste is collected and disposed at designated disposal areas.
- Illegal dumping at construction waste at site, camp area or into river will not be allowed

8.2.5 CONSTRUCTION / LABOUR CAMP MANAGEMENT

- During implementation phase large numbers of labor population is likely to influx in the project area. A proper Construction Camp Development Plan has to be formulated to control degradation of the surrounding landscape due to the location of the proposed construction camp. The Contractor must provide, erect and maintain necessary living condition and ancillary facilities tat the camp and all this must be included in contract document provided to the Contractor.
- Sufficient supply of potable water may be provided at camps and working sites. If the drinking water is obtained from the intermittent public water supply then storage tanks must be provided.
- Adequate washing and bathing facility must be provided in clean and drained condition.
- Adequate sanitary facilities may be provided within camp. The place must be cleaned daily and kept in strict sanitary condition. Separate latrine must be provided for women. Adequate supply of water must be provided.
- Collection of domestic waste and its disposal may be carried out.
- The contractor must ensure that there is proper drainage system to avoid creation of stagnant water bodies.
- Periodic health check ups may be conducted. These activities may be provided in consultation with State Public Health Department.

- At every Camp first aid facility may be provided, ambulance must be provided to take injured or ill person to the nearest hospital.
- Adequate supply of fuel in the form of kerosene or LPG may be provided to construction labours to avoid felling of trees for cooking and other household activities. No open fires may be allowed in camps.
- The sites should be secured by fencing and proper lighting
- Construction camps may be located away from forest areas, settlements, cultural heritage & historical sites and water bodies & dry river beds
- It should be ensured by the construction contractor that area of the construction camp be cleared of the debris and other wastes deposited on completion of construction. The land should be restored back to its original form and condition as it was prior to the establishment of the construction camps.

8.2.6 BIODIVERSITY ASPECT

- If the subproject activity involves acquisition of forest land or cutting of trees compensatory afforestation plan may be formulated.
- Felling of trees must be undertaken only after obtaining clearance from the Forest Dept.
- The forest land likely to be acquired must be compensated by providing value trees as per Net Present Value (NPV).
- Compensation may be provided for plantation of trees. At least double number of trees may be planted in lieu of trees felled for the project. If barren land is not available with the forest Dept. for compensatory afforestation in that case double amount degraded forest land can be chosen for compensatory afforestation.
    - Based on climatic & edaphic site-specific conditions species must be selected by Forest Department for afforestation. However, preference of local communities as regard the choice of species must be given.
    - If any rare, endangered or threatened species is found, detailed study of the habitat must be taken and conservation plan must be formulated.
    - Labour camps and office site may be located outside & away from Forest areas.
    - Poaching must be strictly banned in the Forest area. It may be ensured by the Contractor that no hunting or fishing is practiced at the site by any of the worker.
    - Awareness program on Wildlife Conservation may be provided to the work force. Forest Act and Wildlife Act may be strictly adhered to.

Green Belt Development

Green belt development may be undertaken to enhance esthetic and ecological value. Plantation may be undertaken to augment air quality, vegetation and aesthetic value of the area. Social forestry may be practiced for success of the plantation. Local people can be involved in plantation and maintenance of plantation.

Table 8.1: Plant Species suggested near Water Logging Areas & Water Bodies

S. No.	Scientific name	Vernacular name
1.	*Salix tetrasperma*	Jalmala
2.	*Terminalia belerica*	Bahera
3.	*Terminalia arjuna*	Arjun
4.	*Albizzia lebbek*	Siris
5.	*Acer oblongum*	Pangoi
6.	*Casuarina equisetifolia*	Suru
7.	*Acacia catechu*	Khair
8.	*Eucalyptus sps.*	Safeda
9.	*Dendrocalamus strictus*	Bans
10.	*Bambusa arundinacea*	Kanta-Bans

Grass species such as *Arundo donax* and *Vitivier*, are also suggested for water logged areas.

Table 8.2: Plant Species suggested near Settlements

S. No.	Scientific Name	Common Name
1.	*Cassia fistula*	Amaltas
2.	*Dalbergia sissoo*	Shisham
3.	*Pongamia pinnata*	Karanj
4.	*Saraca indica*	Ashoka
5.	*Delonix regia*	Gulmohar
6.	*Azadirachta indica*	Neem
7.	*Bauhinia variegata*	Kachnar
8.	*Melia azederach*	Bakain, Dhenk
9.	*Acacia nilotica*	Babul
10.	*Acacia catechu*	Khair
11.	*Millingtonia hortensis*	Aakash Neem
12.	*Callistemon citrinus*	Bottle brush

Besides the above mentioned plants fruit bearing trees may be also planted. The plantation must have provision for maintenance for at least three years. Survey of survival of the trees may be conducted periodically.

8.2. 7 Rehabilitation and Resettlement Plan

Resettlement Action Plan Contents

The contents of the Resettlement Plan to be prepared for individual sub projects consistent with the Resettlement Framework are as below:

Introduction

Description of the project

Profile of the sub-project (s)

Objective of RAP

Description of RPF and its provisions

Approach to Minimizing impacts

Potential impacts – positive and adverse

Land Acquisition/Direct Purchase and R&R

Land take approach including Extent of land take

Valuation of land

Impacts and PAPs by nature and extent of impact

R&R entitlements payable

Baseline Socio-economic findings (Gender Dis-aggregated Information)

Demographic profile

Socio-economic profile

Impact on vulnerable households

Livelihood issues, opportunities and existing income enhancement programs

HIV/AIDS

Likely labor influx and gender based violence issues

Preferences for resettlement and income enhancement measures/training needs

Stakeholder Consultations

Stakeholder categories

Consultations during SIA stage – Community consultations, FGDs, Public meetings, etc.

Matrix on key issues raised, responses given and suggestions incorporated, if any

Resettlement arrangements

Site selection, site preparation, and relocation

Housing, infrastructure, and social services

Environmental protection and management

Integration with host population

Institutional Arrangements

Organizational responsibilities

Eligibility and entitlement

Implementation schedule

Costs and budget

Monitoring and evaluation

Grievance procedures

Implementation Procedures: Implementation procedures for resettlement and rehabilitation entails the income restoration activities, institutional arrangements, implementation schedule, resettlement sites, grievance redressal mechanism, costs and budget and monitoring and evaluation of the resettlement components.

8.2.8 Public Health and Safety

- All machines & equipments used in the construction must conform to relevant Indian Standard (IS) Codes, must be free from defects, in good working condition, regularly inspected and properly maintained as per provisions.
- Safety goggles, helmets, earplugs and masks etc. must be provided to the workers.
- All workers employed on mixing of asphaltic material, cement, lime mortars, concrete etc. may be provided with protective footwear and protective goggles. Workers involved in welding work may be provided with welder's protective eye shields.
- No men below age of 18 years or women should not be employed on the work of painting with products containing lead in any form. Face mask may be supplied to for use to the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
- Measures must be taken to prevent fire, flood etc.
- Necessary steps must be taken to prompt first aid treatment of all injuries likely to sustain during the course of work.
- Anti malarial instructions, including filling up of borrow pits and cleaning of the site.
- On completion of the works all the temporary structures must be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the whole of the site left clean and tidy.
- All the construction workers should be provided training to handle potential occupational hazards which include the following:
  - Environmental Awareness program
  - Engineering controls, work practices and protective equipment

- ❖ Handling of raw and processed material
- ❖ Emergency response

8.2.9 GENDER ACTIONPLAN

It has been observed that during implementation of rehabilitation and resettlement procedure women are most vulnerable and suffer most due to this process. Before commencement of project activity or resettlement and rehabilitation process project authority should ensure that proper and adequate care has taken to minimize adverse impacts on women. Care should be taken and the following issues should be addressed to minimize discrepancies amongst men and women during R&R process.

- ➢ Separate action plan should be formulated for those households headed by women.
- ➢ Pay parity must be maintained while providing employment opportunities to the displaced people. This should be ensured by the employer who should also undertake regular inspection/checks for proper implementation of the process.
- ➢ Proper Training programme must be a part of the Rehabilitation and Resettlement procedure for women for better sustainability of livelihood.
- ➢ As special case relaxation of work hours should be there for working women having small children.

8.2.10 ENVIRONMENTAL MANAGEMENT RESPONSIBILITIES

Table 8.3 presents summary of Environmental Management Plan with the objective of minimization of adverse environmental impacts. The table covers all possible environmental issues involved and necessary mitigation measures and responsible Agency.

Table 8.3: Environmental Management Plan & Responsibilities

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
Implementation Phase				
1.	Air Quality	▪ Adequate dust suppression measures such as regular water sprinkling on construction sites, haul & unpaved roads particularly near habitation must be undertaken to control fugitive dust	Construction Contractor	Environmental incharge, Project Authority

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
		▪ Trucks carrying soil, sand and stone may be duly covered to avoid spilling. ▪ Low emission construction equipment, vehicles and generator sets may be used ▪ Plants, machinery and equipment should be handled so as to minimize generation of dust. ▪ All crusher used in construction should confirm to relative dust emission devises ▪ Air quality monitoring may be conducted at construction sites.		
2.	Noise & Vibration	▪ Modern technologies producing low noise may be used during construction. ▪ Construction equipment's and vehicles must be in good working condition, properly lubricated and maintained to keep noise within permissible limit as prescribed by CPCB. ▪ Head phones, ear plugs to be provided to the workers at construction site. ▪ All vehicles, equipment and machinery used in construction should be fitted by exhaust silencers, mufflers or acoustic cover. ▪ Noise level monitoring must conducted during implementation phase.	Construction Contractor	Environmental incharge, Project Authority

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
3.	Water Quality	▪ Silt fencing may be provided avoid spillage of construction material. ▪ Discharge of waste from construction/ labour camp into water bodies may be strictly prohibited. ▪ Construction methodologies with minimum or no impact on water quality may be adopted, disposal of construction wastes at designated sites and adequate drainage system may be provided. ▪ Project design may take care of irrigational canal and proper measures may be provided so that irrigation setup is not disturbed ▪ Construction activity may be prohibited during rainy season. ▪ Water quality monitoring may be conducted during construction phase.	Construction Contractor	Environmental incharge, Project Authority
4.	Soil conservation	▪ Suitable protection measures consisting of bio-engineering techniques such as plantation of grasses and shrubs & check dams, may be provided to control erosion. ▪ Borrow areas may be finalized in concern with ecological sensitivity of the area. Agriculture land may not be used as borrow areas. Priority may be given to degraded area for excavation of borrow material. Rehabilitation of borrow area may be taken under the	Construction Contractor	Environmental incharge, Project Authority

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
		project. Top soil removed from may be stored separately in bunded areas and utilized during plantation or refilling of excavated area. ▪ Construction work may be avoided during rainy season to evade erosion and spreading of loose material.		
5.	Solid Waste	▪ Construction work must be carried in such a way that minimum or no solid waste is generated at construction site. ▪ Adequate number of dustbin/ container must be provided ▪ Solid waste must be collected and disposed properly in compliance with hazardous waste management act. ▪ Domestic waste must be collected separately. Toxic waste (oil, solvents, paints, acids, additives) should not be collected with solid waste. ▪ Project personnel must be trained on collection and disposal method for different waste. ▪ It must be ensured that domestic and collection waste is collected and disposed at designated disposal areas. ▪ Illegal dumping at construction site, camp area or into river will not be allowed	Construction Contractor	Environmental incharge, Project Authority

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
6.	Flora	▪ If any forest area is diverted then Forest clearance may be obtained as per Forest Conservation Act 1980 ▪ Efforts must done to protect trees of the are. ▪ Labour Camps and office site may be located outside & away from Forest areas. ▪ Plantation must be undertaken in surroundings of the dam to enhance esthetic and ecological value. ▪ Social forestry may be practiced for success of the plantation.	Construction Contractor	Forest Dept/ Environmental incharge, Project Authority
7.	Fauna	▪ Poaching must be strictly banned in the area. It may be ensured by the Contractor that no hunting is practiced at the site. All site personnel must be are aware of the location, value and sensitivity of the wildlife resources ▪ Awareness program on Environment and Wildlife Conservation may be provided to the work force. Forest Act and Wildlife Act may be strictly adhered to.	Construction Contractor	Forest Dept/ Environmental incharge, Project Authority
8.	Safety measures	▪ Warning and safety signs must be provided all around the sites ▪ An ambulance must be provided which is ready to mobilize, on site for 24 hrs for emergency situation ▪ First aid facility must be available at site	Construction Contractor	Environmental incharge, Project Authority

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
		▪ Extra precaution must be taken while working with flammable material. Flammable liquid leaks and spills must be cleaned immediately. ▪ Adequate Fire extinguishers must be provided at site and workshop. All workers must know the use of extinguisher. ▪ Emergency preparedness plan must be formulated		
9.	Livelihood and Public Health	▪ Safety instruction may be provided at the work site. Near school, market place and residential area sign board providing warning sign and danger marks may be installed. ▪ In settlement area embankment may be provided. ▪ Light may be provided throughout the stretch at crossing points of Roads and Railway Lines. Road & Railway safety norms may be followed to prevent any mis-happening. Diversion path may be provided at the crossings during construction. ▪ Labour working at forest site may not be allowed to carry any arms and ammunition to avoid harm to wildlife. ▪ Open fire shall be strictly prohibited; any incidence of fire may be immediately reported to the Forest Deptt.	Construction Contractor	Environmental incharge, Project Authority

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
		▪ Borrow area which fall on the way of settlement may be fenced, reclamation of borrow areas may be undertaken by filling it by construction material and covering with top soil and planting trees. Landscaping of the borrow area can be also undertaken as per the site condition. ▪ At barrage sites extra precaution may be taken to avoid any mis-happening ▪ Construction vehicles may be provided with siren to alert the workforce and wildlife, if any. ▪ Child labour may be strictly prohibited at work site. ▪ Labour camp may not be settled near river/streams or dry beds. ▪ First Aid facility may be provided at the construction site. Ambulance may be provided at the camp site and any accident taking place may be immediately referred to the nearest hospital. ▪ The work force at site may be provided with safety measures such as helmet, gloves, jacket, boots, ear plugs etc. ▪ Environmental awareness training may be provided to the Contractor staff and labour force. ▪ Work may be planned and scheduled to limit damage to sensitive ecosystem.		

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
10.	Aquatic Life	▪ Detailed study is required to assess the impact on Aquatic life is required.	Construction Contractor	Environmental incharge, Project Authority
11.	Solid Waste	▪ Debris generated due to the dismantling of the existing structure shall be suitably reused in the proposed construction, subject to the suitability of the material and the approval of the Engineer, as follows: ▪ Unutilisable debris material shall be suitably disposed off by the concessionaire, either for the filling up of borrow areas created for the project or at pre designated dump locations, subject to the approval of the Engineer. ▪ All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental to the work and should be planned and implemented by the contractor as approved and directed by the Engineer. ▪ Bentonite slurry or similar debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area.	Construction Contractor	Environmental incharge, Project Authority

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
12.	Schedule Caste/ Schedule Tribe	▪ Schedule Caste/ Schedule Tribe Should be involved in project related activity and decision making processes. ▪ Schedule Caste/ Schedule Tribe should have equal rights as per GOI rules and notification.	Construction Contractor	Environmental incharge, Project Authority
13.	Traffic Control and Safety	▪ The Concessionaire shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marketing, flags, lights and flagman as may be required by the Traffic Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement ▪ All signs barricades, pavement markings shall be as per the MoST specification. Before taking up construction on any section of the highway, a traffic control plan shall be devised to the satisfaction of the Engineer.	Construction Contractor	Dam Level Authority Environmental in-charge
14.	Risk of Hazardous Activity	▪ Workers employed will be provided with protective foot wear and goggles, stone breakers will be provided with protective goggles and clothing as advised by the Project Safety Officer. Use of any herbicide another toxic chemicals	Construction Contractor	Dam Level Authority Environmental in-charge

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
		shall be in accordance with manufacturers instructions.		
Post Implementation Phase				
1.	Maintenance Plantation	▪ Provision for maintenance of plantation must be made for at least three years. ▪ Plantation may be taken to replace dead sapling. Survey of survival of plants may be taken periodically. Species of local importance must be planted.	Dam Level Authority Environmental in-charge	Forest Dept
3	Water distribution	▪ Prioritization of water distribution for drinking, irrigation and other purpose	Dam Level Authority Environmental incharge	State Water Resources Dept.(SWRD) District Administration
3	Safety System	▪ Proper communication network system in the catchment dam site and command area. ▪ Awareness program for the stakeholders ▪ Emergency Action Plan ▪ Pre monsoon inspection report	Dam Level Authority Environmental inharge	SWRD
4.	Soil Quality	▪ Flooding may cause water logging in some low lying areas, plantation may be done in these area with species such as Eucalyptus and Bamboo and grass species of *Arundo donax, Vitivier, Pandanus* etc are suggested. ▪ Awareness program on soil conservation may be held.		

S.No	Environmental Issue	Actions to be Taken	Implementation Agency	Supervision Agency
5.	Surface Water Quality	▪ Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals	Dam Level Authority Environmental inharge	SWRD
6.	Aquatic Life	▪ Detailed study is required to assess the impact on Aquatic life is required.	Dam Level Authority Environmental inharge	SWRD
7.	Livelihood	▪ Monitoring System should be established to assess the change in livelihood of the local people especially impacted by the project.	Dam Level Authority Environmental inharge	SWRD
8.	Schedule Caste/ Schedule Tribe	▪ Monitoring System should be established to assess the change in livelihood of the local schedule caste / schedule tribe communities especially impacted by the project.	Dam Level Authority Environmental inharge	SWRD
9.	Public Health	▪ Malaria awareness program may be held in the Project Area. ▪ The reservoir and associated water bodies may be maintained and cleaned to avoid mosquito breeding. ▪ Adequate supplies of medicine to the public health centre may be ensured, occurrence of water borne diseases and malaria may be monitored in the project area for atleast 5 years.	Dam Level Authority Environmental inharge	SWRD

8.3 ENVIRONMENTAL MONITORING

Environmental monitoring is essential to monitor the changes in environmental aspects due to the project activities. The aim of monitoring is to provide information that will aid impact management and to achieve a better understanding of cause-effect relationships to improve EIA prediction and mitigation methods.

Monitoring should be conducted during implementation and post implementation phase. During implementation phase monitoring includes:

i. Monitoring of environmental aspects such as water, air, noise, soil and plantation program.
ii. Monitoring of implementation of mitigation measures suggested in EMP

An Environmental Management Action Plan (EMAP) for compliance must be prepared.The Environmental in-charge should be appointed to conduct on-site verification and should provide documentary proof on mitigation measures taken. Environmental Monitoring Framework is given in the table below.

Table 8.4 : Environmental Monitoring Framework

S. No	Environmental Indicators	Parameter	Standards	Implementation	Supervision
	Implementation Phase				
1	Air Quality	SPM, RPM, CO, NOx, SOx	CPCB Standards	Construction Contractor	Environmental incharge, Project Authority
2	Surface Water Quality	pH, DO, BOD, TDS, Total Coliform, Oil & Grease, Phenols Pb, Zn Hg Cl, Fe, Na	CPCB Standards	Construction Contractor	Environmental incharge, Project Authority
3	Sediment Quality	Physical, chemical & heavy metals	Pre and post monsoon	Construction Contractor	Environmental incharge, Project Authority
4	Noise	Noise level on dB(A) scale	CPCB Standards	Construction Contractor	Environmental incharge, Project Authority
	Post Implementation Phase				
1.	Meteorology	Temperature, humidity, rainfall, wind speed and direction	Daily / Hourly throughout the year	Environmental incharge Dam Level Authority	SWRD
2.	Surface Water Quality	pH, DO, BOD, TDS, Total Coliform, Oil & Grease, Phenols Pb, Zn Hg Cl, Fe, Na	CPCB Standards	Environmental incharge Dam Level Authority	SWRD
3.	Aquatic ecology	Primary productivity, density & diversity of plankton, invertebrates and fish fauna	Pre-monsoon & Post-monsoon	Environmental incharge Dam Level Authority	SWRD
4.	Plantation	Survival Rate	Periodically	Environmental incharge Dam Level Authority	SWRD / Forest Dept

8.4 INSTITUTIONAL FRAMEWORK

For successful implementation of EMP Institutional setup play vital role. The Implementation of EMP must start from the smallest unit that is at dam level and further move upward at divisional and state

level. The Dam level authority must coordinate all issues in the catchment and command area with the concerned dept. An Environmental incharge must be appointed for implementation of EMP.

8.5 ENVIRONMENTAL AWARENESS AND TRAINING

For implementation of EMP awareness on environmental issues is indispensable. It is required to communicate and work with community and understanding the socio-political dynamics prevalent in the region. During implementation phase training/awareness program should be organized for Project Implementation Unit (PIU) Staff and the Construction Contractor. Some of the Training programs that can be taken for proper understanding of environment and its application is given below:

Table 8.5: Proposed Training Modules

Subject	Target Group	Method
Environmental Awareness ➢ Environmental Impact Assessment Methods and Process ➢ Environmental Regulations, Acts & Legislation	Senior level Engineers involved in planning. All Staff at Dam site Environmental in-charge	Workshops and Lectures
Environmental Management Plan ➢ Mitigation and Enhancement Measures ➢ Monitoring & Evaluation ➢ Environmental Budget	Dam Level Authority All Field Engineers Environmental incharge	Workshops and Lectures
Environmentally Sound Construction Practice ➢ Clean Construction Technology ➢ Waste Minimization and Management ➢ Storage and maintenance of equipments ➢ Control on Soil Erosion ➢ Transplantation and Plantation ➢ Construction Camp Management ➢ Safety Practices	All Field Engineers Dam Level Authority Environmental incharge	Workshops and Lectures
Participatory Irrigation Management ➢ Formation of WUA ➢ Water Conservation Techniques ➢ Record Keeping	All Field Engineers Environmental incharge WUA	Workshops and Lectures Site Visit

All the specification provided in the EMP must form part of contract document given to the contractor during implementation and separate bill of quantity must be allotted for the implementation of the same.

CHAPTER 9

9. INSTITUTIONAL ARRANGEMENTS AND CAPACITY BUILDING MEASURES

9.1 OVERALL INSTITUTIONAL ARRANGEMENTS

The organizational structure for day-to-day project coordination and management of DRIP consists of a Central Project Management Unit (CPMU) at the central level in CWC and one State level PMU for each of the nine implementing agencies. All PMUs are staffed with qualified government staff, supplemented with consultants so that the needed technical, safeguard, monitoring and evaluation (M&E), and fiduciary (procurement and financial management) capacity is available. A multi-disciplinary management and engineering consulting firm assist CWC with the overall implementation of the project.

A National Level Steering Committee (NLSC) has been established for oversight on dam safety assurance and rehabilitation, and disaster management. The NLSC is headed by the Secretary MOWR, and includes senior representatives from CWC and participating states. A separate Technical Committee (TC) is also in place providing technical input to NLSC, coordinate with implementing committees of respective state governments, and review progress of development projects.

At the state level, SPMUs, will have overall responsibility for the coordination of the project activities at state level, both technically and qualitatively, will monitor the physical and financial progress including safeguard issues, and summarize the implementation of the project and submit reports to the CPMU in a format generated for a MIS. The SPMUs will coordinate the work with Chief Engineers of the WRDs and other owners of dams.

Multi-disciplinary Dam Safety Review Panel (DSRP) was constituted by each implementing agency under the project and were responsible for visiting and assessing all 223 DRIP dams. They also provided recommendations for remedial measures of these dams. Based on these recommendations, detailed structural as well as non-structural rehabilitation plans were prepared for its implementation under the project.

9.2 INSTITUTIONAL ARRANGEMENT FOR MONITORING AND IMPLEMENTING OF SAFEGUARD ISSUES

Central Level: The CPMU, at central level, are staffed with one environment and one social safeguard expert who are, primary, responsible for monitoring of safeguard issues during the implementation of the projects and provide advises to SPMUs on mitigation measures. The environment as well as the social experts also liaison with the third-party QA/QC team during site inspections of the DRIP dams and monitors the compliance of safeguard norms by the implementing agency. They also signs-off the QA/QC report with respect to safeguard compliances. In addition, these experts do regular site visits/ inspections of the dam sites and monitor the compliance of the safeguard norms by the implementing agencies and provide quarterly reports to NLSC and World Bank in an agreed format.

State/ IA Level: Each SPMU of all 9 implementing agencies has a designated environment and social safeguard expert. He/she, in coordination with CPMU experts, are responsible for monitoring and compliance of safeguard issues during the implementation of the projects. He/she liaison with the QA/QC experts at the state level and signs-off the QA/QC reports with regards to safeguard compliance.

Special arrangement for Hirakud Additional Spillway: Odisha SPMU will have designated environment and social officer. He/she will be support by one social and one environment expert, who will be stationed at the Hirakud site. In addition, the Project Management Consultant, who are in the process of being recruited through a competitive bidding process will also have designated Social as well as environment experts who will be responsible for monitoring and compliances of safeguard issues during the project construction phase. The construction firm who will be constructing the additional spillway is also envisaged to have their own social and environment cell. In order to have smooth re-settlement process, the Government of Odisha is designating a special officer from Revenue Department to overlook the entire re-settlement process.

Consultation with affected persons/ beneficiaries: The take-aways from the earlier consultations undertaken in 2009 with various stakeholders have also been used to plan an institutional mechanism in terms of issues such as Land Acquisition, Compensation, Livelihoods, Resettlement and Rehabilitation etc. The participatory process would enable the participation of the local people in the decision-making process. In addition, consultation mechanisms would be established in all sub-projects that would have a direct or indirect inter-face with communities. The process of community consultation had been key to the formulation of safeguards instruments in case of Hirakud Dam. The institutional mechanism would ensure that the affected population and other stakeholders are informed, consulted and allowed to participate at various stages of project preparation.

Citizen Engagement/ Beneficiary Feedback: The original ESMF was prepared and ESA and ESMF were disclosed in each state. The ESMF once revised and approved by CWC, participating states and World Bank shall be disclosed by these entities on their websites. In addition, the specific mitigation plans – EMP and RAP that have been prepared for Hirakud Dam, Orissa has been uploaded onto the websites of CWC, DoWR and World Bank, besides their disclosure locally within the project area. Mechanisms for continued consultations have been detailed in the RAP wherein PAPs and affected communities will be consulted through RAP implementation period on all aspects such as provision of entitlements, physical relocation, livelihood restoration, etc. Specific beneficiary feedback indicators as developed in the case of Hirakud RAP, shall be devised in all sub-projects having clearly identifiable beneficiaries.

Further, during project implementation, the farmers in the command areas of the dams will be informed of alterations, if any, in the irrigation delivery schedule on account of the rehabilitation works. Populations living downstream of dams will be made adequately aware of the Emergency Response Plans prepared for specific dams, including their own responsibilities in this regard vis a vis those of the dam management and local authorities. Under the original project, Emergency Action Plans were prepared for 26 dams in accordance with guidelines issued by CPMU – CWC, besides in case of Krishnagiri Dam in Karnataka, community level consultations were held on the draft EAP. Several brochures, pamphlets, posters and videos depicting activities under DRIP as well as dam safety aspects are being prepared by CPMU for wider circulation to all stakeholders and general public for awareness. Several workshops have been conducted in Odisha, Uttarakhand and Kerala for local communities and students. Such activities would continue and also will be scaled up under the Additional Financing.

9.3 CAPACITY BUILDING NEEDS AT CPMU AND SPMUS

For effective use of ESMF to address the environmental and social issues in the dams' rehabilitation and improvement project, institutional strengthening would be required at following levels:

Dam Sites Officials: Select officials at junior levels will be trained in the environmental and social assessment related to project activities. This will involve understanding of baseline environmental and social conditions, analysis and assessment of project impacts on environmental and social components; segregating of significant impacts; identifying mitigation and enhancement measures and development of an environmental and social management plan.

SPMUs: All SPMUs have designated environment and social safeguard officials who will be primary responsible for the application of ESMF and monitor the compliance of safeguard norms. The World Bank

in coordination with CPMU will conduct series of in-house and customize training to enhance their understanding and appreciation of the relevance and importance of environmental and social issues in general, as well as, specific to the dam related interventions.

CPMU: In addition to the existing Environment as well as Social experts in CPMU, senior officials of CPMU and CWC including the Project Director will be trained on safeguard aspects through customized training programs/ workshops and study tours.

9.1. Disclosure of safeguard instruments

All safeguard instruments in full i.e. revised ESMF for the project, sub-project specific safeguard instruments such as EMP and RAP along with the translated summaries in vernacular language will require to be disclosed at the websites of CPMU and concerned SPMU. All these documents shall also lso be disclosed on the World Bank Operations Portal as well.

CHAPTER 10

10. MONITORING AND EVALUATION

10.1 INTRODUCTION

Environmental and Social safeguards monitoring provides an essential tool to make necessary recommendations and adopt suitable control strategies so that menace of rising environmental degradation could be minimized and a relief be extended to the people including labours in case of any damage caused under occupational health hazards. The monitoring is necessary for the following reasons:

- To see what impacts have occurred;
- To evaluate the performance of mitigation measures proposed in the ESMF;
- To ensure that the conditions of approval are adhered to;
- To suggest improvements in management plan, if required;
- To see that benefits expected from the implementation of safeguard measures are achieved as the project proceeds; and
- To satisfy the legal and community obligations

Monitoring and evaluation is primarily required to ensure proper and timely implementation of environmental and social mitigation measures identified in the planning stage, based on the ESMF. Monitoring at regular intervals during implementation and for a specified period in the post implementation stages is necessary to identify and implement any change / improvement needed in the execution of the activity or in the mitigation measures. A monitoring and evaluation cell may be created at State level under the supervision of an official familiar with environmental and social issues of the sub-projects. He may be given suitable training if needed. In specific situations, one may consider appointing external agencies to carry out the monitoring and evaluation activities and report to the supervising official. The indicators to be monitored can be framed from the ESMF taking into consideration the activities involved. A list of indicators for monitoring and evaluation in the implementation and post implementation stages is given in the following section.

10.2 PERFORMANCE INDICATORS (PIS)

The physical, biological and social components, which are significant in affecting the environment as well as society, have been suggested as Performance Indicators. The following specific environmental parameters can be qualitatively measured and compared over a period of time and therefore selected as Performance Indicators for monitoring due to their regulatory importance and the availability of standardized procedures and relevant expertise.

A. Environmental Performance Indicators

- Soil contamination & Erosion indices
- Air quality
- Water quality
- Noise levels around sensitive locations
- Restoration of borrow pits
- Construction camp management
- Debris Clarence and disposal
- Floral Aspects (Tree survival)
- Safety Aspects

B. Socioeconomic Performance Indicators:

- Employment of local population
- Labour standards at camp
- R&R Components:
    - Livelihood Restoration

a. Livelihood training

b. Change in Income

- Gender Issues:

a. Women employment (%)

b. Wages

10.3 MONITORING OF ENVIRONMENTAL PERFORMANCE INDICATOR

Monitoring of Statutory compliance: The status of necessary permits and licenses including their renewals will be monitoring for each project to assess the statutory compliances. These statutory compliances are mainly labour license, permits/ clearance for stone quarry and borrow areas, batch mix plant/ hot mix plant, etc.

10.3.1 AIR QUALITY (AAQ) MONITORING

Ambient air quality parameters which are recommended for monitoring of are PM10 (Particulate Matter having less than 10 micron size) or PM2.5 (Particulate Matter having less than 2.5 micron size), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NOx) and Carbon Monoxide (CO) and Hydrocarbon (HC). These parameters are to be monitored at Dam site and Disposal areas, before commencement of dredging activities during desiltation activities. Data should be generated prior to commencement of desiltation activities and once in a month during desiltation, transportation and disposal of dredged materials in each phase of work to compare the data in with National Ambient Air Quality (NAAQ) Standards 2009.

10.3.2 AMBIENT NOISE MONITORING

The measurement for monitoring the noise levels to be carried out at the dredging area and neardumping areas towards habitation/ temple area in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB). Sound pressure level would be monitored on twenty-four hourly basis. Noise shall be recorded at "A" weighted frequency using digitized noise monitoring instrument. The equivalent Noise Level will be recorded for comparison with prescribed limit.

10.3.3 WATER QUALITY

Water quality of the reservoir and local water stream adjacent to the dumping site that is used by local community shall be monitored on downstream of the disposal area. The physical and chemical parameters recommended for analysis of water quality are pH, turbidity, total solids, total suspended solids, total dissolved solids, COD, BOD, DO, Oil and Grease, Chloride, Iron, heavy metals, Nutrient content, Pesticide residue, Presence of Industrial Effluents, Pathogens etc. Monitoring parameters will be as per as per CPCB Guidelines for used based surface water classification.

10.3.4 SOIL/ SEDIMENT QUALITY

The soil quality of the surrounded fields close to the dredging and disposal site will be monitored to understand the impact of soil quality. The physico-chemical parameters recommended for analysis are physical Parameter: Soil Texture, Grain Size, Gravel, Sand, Silt and Clay and Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen and Absorption Ratio, heavy metal, pesticides, etc.

10.3.5 EROSION CONTROL MEASURES:

Visual inspection of vulnerable locations such as embankment slopes, borrow areas, etc. will be carried out on periodical basis, especially before and after monsoon.

10.3.6 Debris Clearance and Disposal

The contractor has to clear the debris material from all the site of activities on regular basis and the same will required to be disposed off at approved disposal sites. To ensure regular clearance and disposal of debris the monitoring will be required for the same. Visual monitoring of the site will be carried out on periodical basis especially in the section which is completed.

10.3.7 Site Restoration

The restoration of all the temporary sites utilized for construction such as borrow areas, stock yards, camp site, etc. will be monitored after completion of works to monitored restoration works to the satisfactory level before issuing completion certificate.

10.3.8 Floral Aspects (Tree survival)

Acquisition of reserved forest area, tree cutting and disposal along with compensatory tree plantation is required to be observed by the site supervisor/engineer of the project. The Forest Diversion Proposal to be approved by the forest department.

10.3.9 Safety Aspects:

Visual inspection of safety at site is required to be checked on day to day basis by the site supervisor/ Engineer. The parameters to be checked on daily basis are:

- Number of labourers working at site
- Number of PPEs used by the Labourers
- Safe access to worksite and safe working platform
- First Aid Kit

Apart from monitoring of above safety parameters the Record safety training for workers, Safety register, First Aid Register, incidence report are required to be checked on monthly basis

10.3.10 Monitoring of Socio-Economic Performance Indicators:

Compensation, Resettlement and Livelihood Restoration: In the project where displacement of population is involved such as in the Additional Spillway at Hirakud Project in Odisha following components will be monitored on periodic basis. The following indicators will be monitored on periodical basis:

a. Payment of compensation /ex-gratia
b. R&R Components:
    - Payment of assistances
    - Relocation of displaced persons to resettlement colonies
    - Resettlement colony development
    - Provision of livelihood restoration measures and assistances
    - Provision of support measures to vulnerable PAPs
    - Employment of PAPs and local population
c. Labour standards at camp and migrant labor working in the project

Employment of local population: Percentage of local and migrant labour engaged for different works will be assessed by checklist method on monthly basis to indicate total employment generated verses local employment of labourers.

Labour standards at campsite: Labour camps are provided by the contractors for their migrant labours including operators. The labour standards at campsite with respect to basic facilities such as drinking water availability, basic sanitation facility like mobile toilets, life and fire safety, first aid, awareness on disease prevention etc. provided to the labour at the labour camp and their maintenance will be checked visually on monthly basis through checklist method.

ESMF Monitoring Action Plan: The monitoring action plan covering various performance indicators, frequency and institutional arrangements of the project in the construction and operation stages is given in the following **Table 10.1.**

Table 10.1: Monitoring Plan for Performance Indicators on ESMF Compliance

S. No	Environment & Social Parameters	Performance Indicators	Implementing Agency	Monitoring Agency	Frequency	Remarks
1.	**Compliance to Statutory Norms**	Labour License	Contractor	IA and SPMU	Quarterly	Applicable in all ongoing project
		Statutory permission for Borrow area (If the Contractor operate their own new borrow area)				
		Statutory permission for stone quarry (If the Contractor operate their own new stone quarry)				
		Explosive permit (In the project involving blasting)				
2.	**Air Quality**	Particulate matters PM10 and PM2.5, Oxides of Sulpher (SOx), Oxides of Nitrogen (NOx), Carbon Monoxide (CO) Hydrocarbon (HC)	Contractor through Approved Environmental Laboratory	IA and SPMU	Quarterly	Applicable in High Value Projects
3.	**Water Quality**	Salinity, Nutrient content, Pesticide residue, Pathogens	Contractor through Approved Environmental Laboratory	IA and SPMU	Quarterly	Applicable in High Value Projects
4.	**Soil Quality**	Organic Matter content/ Nutrient Content / Pesticide residue	Contractor through Approved Environmental Laboratory	IA and SPMU	Quarterly	Applicable in High Value Projects
5.	**Aquatic life**	Health of aquatic creatures	Contractor through Approved Environmental Laboratory	IA and SPMU	Yearly	Applicable in High Value Projects

S. No	Environment & Social Parameters	Performance Indicators	Implementing Agency	Monitoring Agency	Frequency	Remarks
6.	**Personnel Safety**	Total supply of PPEs vs number of workers working Number of workers working using PPEs Safe access Safe working platform for work site	Contractor	IA and SPMU	Daily	Applicable in all DRIP projects
7.	**Labour Standards**	Basic Facilities at labour camp • Mobile toilets • First Aid • Emergency plan and preparedness • Access to safe drinking water • Awareness on disease prevention • Life and fire safety	Contractor	IA and SPMU	Monthly	Applicable in all DRIP Project where migrant labours are engaged
8.	**Site Restoration**	Visual Observation of Allied sites including plant site, borrow area,camp site	Contractor	IA and SPMU	After completion of works & before demobilization of the contractor	Applicable in all the contract
9.	**Debris Management**	Removal of debris from site (visual Observation)	Contractor	IA and SPMU	After completion of works & before issuing completion certificate	Applicable in all the contract
8.10.	**Compensation, Relocation and Livelihood**	• Number of PAPs losing structures, assets • Number of • Number of PAPs losing livelihood and provided with support measures • No. of vulnerable Households • Livelihood training for eligible persons	IA	IA and SPMU Through third party	Before commencement of construction	Applicable in proposed additional spillway at Hirakud dam, Odisha or in otherprojects where displacement of people is involved.

S. No	Environment & Social Parameters	Performance Indicators	Implementing Agency	Monitoring Agency	Frequency	Remarks
		• Number of female Dam officers employed				
11.	**Tree Survival**	• Acquisition of Reserved Forest area, • Tree cutting & disposal • Compensatory plantation	Contractor	IA and SPMU State Forest Department	Pre construction and construction stages	Applicable in identified land by the forest department in all DRIP sub-projects at pre and during construction stages
12.	**Gender issues**	• Percentage of women labours engaged • Wage parity	IA	IA and SPMU	Monthly	Applicable in all DRIP sub-projects

10.4 GIS BASED SOCIAL AND ENVIRONMENTAL MONITORING AND EVALUATION

The Geographic Information System (GIS) is a technology to integrate different spatial data inputs from variety of data sources like GPS, Total station, existing maps, remotely sensed images and tabular attribute data. These data are integrated and brought to one platform, so as to be made overlayable and give flexibility to undertake spatial analysis and spatial modeling.

Remote Sensing is a multi-disciplinary activity which deals with the inventory, monitoring, evaluation and mapping of terrestrial features through the analysis of remotely collected data obtained by observations from remote platforms like satellite or aircraft. It gives pictorial representation of ground and terrain at variable periodicity, resolution, spectral bands and colour depths. These characteristics can be used to generate temporal (time series) information of the land surface at various levels of details for planning in Pre construction and Implementation stages as well as monitoring and evaluation in the post implementation phase.

GIS and remote sensing are helpful in recording the database in spatial format of pre- implementation phase as well as monitoring and evaluation of the changed environmental and social scenarios, both adverse and beneficial, over different periods in post implementation phase.

GIS based monitoring and evaluation is, however, practicable and effective in projects having a sizeable project influence area, with pronounced environmental and social impacts and where a large database is required to be handled. Since this is not the case with the sub-project activities to be taken up under the dams rehabilitation and improvement project (DRIP), it is felt that GIS based monitoring and evaluation of environmental and social management of these activities may not be practicable.

CHAPTER-11

11. GRIEVANCE REDRESSAL MECHANISM

The contact details of officers of CPMU and SPMU are displayed at the DRIP website "https://damsafety.in" for registering any feedback and complaint regarding the Project activities. Aggrieved persons can contact the concerned departments through phone, fax or written complain., it is also linked to Centralized Public Grievance Redress and Monitoring System (CPGRAMS), CPGRAMS is the platform based on web technology which primarily aims to enable submission of grievances by the aggrieved citizens from anywhere and anytime (24x7) basis to Ministries/Departments/Organizations who scrutinize and take action for speedy and favorable redress of these grievances. Tracking grievances is also facilitated on this portal through the system generated unique registration number.

In addition, wherever project activities have a direct or indirect impacts on communities, specific Grievance redress are to be established and its regular meetings should conducted so as to allow people to put forth their grievances so that it becomes easy for the authority to find solutions. There will be a three tier grievance redress mechanism will be followed, one at the project site level, the second at the district level and the third at the state level.

First level would be a Project level Grievance Committee comprising representatives of the project authority, representative of R& R Authority, district administration, and representatives of the affected persons. The committee shall include at least two females from the affected colonies, besides the Gender Expert from RAP Execution Agency to better articulate concerns of female PAPs. Key functions of the committee will be to:

a) record the grievances received, categorize and prioritize them and provide solution;
b) committee may undertake site visit to ascertain facts and status and seek information as necessary from concerned authorities;
c)) fix a time frame to resolve the grievance; and
d) inform PAPs through PMU about their decision to PAPs for compliance. The first level committee shall try and respond to each grievance within a period of not more than 21 days. If the complainant is not satisfied, the complainant can approach the second level committee.

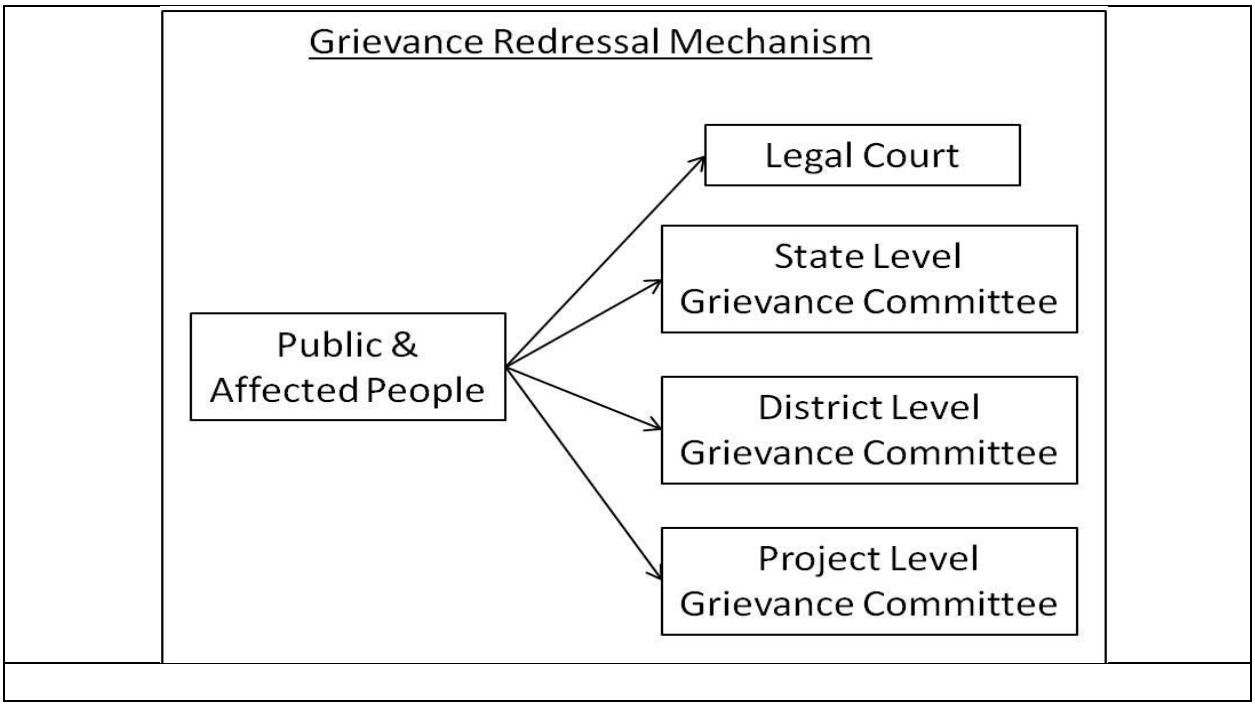
Grievances can be recorded either in person, through post/ email, verbal or written communication through the RAP Execution Agency. RAP Execution Agency will also support illiterate or physically challenged

PAPs to record their grievances. Grievances will be received at the Office of Project level RAP Execution Committee within the Dam Authority. Additionally, RAP Execution Committee will set up a landline phone number to receive and record grievances. RAP Execution Committee shall designate one person to attend to these phone calls, record details, provide PAP with a complaint number and explain the redressal process and finally document it in a MS -Excel based Grievance Management Database. S/he shall then, inform concerned officials of the complaint for necessary follow up and action. Contact details (phone number, email id and address) of the Grievances Redressal Committee will be incorporated in the pamphlets/brochures, which would be disseminated among all affected persons.

The Second level Committee would be constituted at the District level under the Chairmanship of the District Collector and comprise representatives of R&R Authority, Project Authority, R&R Manager, Police and the representatives of the colonies. At this level, attempt will be made to resolve the complaint within a period of 14 days. If the complainant is not satisfied, the complainant can approach the second level committee.

The third level committee will be at the state level under the Chairmanship of Secretary, Department of Water Resources and shall comprise R&R Director, Engineer in Chief, Water Resources Department, Chief Engineer, Dam Safety, District Collector, R& R authority, R&R Manager and representatives of the colonies. At this level, the committee will take not more than 7 days to resolve the issue.

The decision of the Grievance Committees will not be binding on the PAPs and they will have the option of taking recourse to court of law, if s/he so desires at his or her own expense.


Grievance Redressal Mechanism
Legal Court
State Level Grievance Committee
Public & Affected People
District Level Grievance Committee
Project Level Grievance Committee

CHAPTER-12

12. ESMF IMPLEMENTATION BUDGET

The budget for implementation of the ESMF primarily comprises of the following items:

1. E&S specialists within the SPMUs
2. E&S Specialists within the PMC supporting the CPMU
3. Trainings/capacity building events and exposure visits/thematic studies that required to be conducted periodically,
4. Preparation of safeguard instruments – EMP, RAP for specific sub-projects
5. External agencies that might be contracted for monitoring the implementation of EMP, RAP

In order to meet the expenses towards the aforementioned items/activities, CPMU and SPMUs will provide adequate budget for all preparation and implementation of all safeguard instruments from the counterpart funding, besides for conducting any trainings, exposure visits and capacity building events. The budget estimates and its sources will be reflected in respective sub-project mitigation plans (EMP, RAP, etc.) and other procurement plans. World Bank' funding will be available for costs such as works, purchase of goods and services, if required. The budget will be calculated based on EMP and SMP prepared for each subproject and should be monitored for intended use by SPMU and CPMU.

ANNEXURE-I: BASELINE ENVIRONMENTAL AND SOCIAL STATUS OF OTHER STATES

4.A.2 GUJARAT

Gujarat has an area of 196,022 km² which constitutes 5.96% of the geographic area of the country. It is situated on the western coast of the country and lies between latitude 20° 07' to 24° 43' N and longitude 68° 10' to 47° 29' E (Fig **4.6**). The state comprises of three regions viz. The peninsula traditionally known as Saurashtra, which is essentially a hilly tract sprinkled with low hills; Kuchchh on the northwest is barren and contains the famous Rann of Kuchchh, and the mainland extending from the Rann of Kuchchh and the Aravalli hills to the river Damanganga is on the whole a level plain of alluvial soil. The plains of Gujarat are watered by four major rivers - Sabarmati, Mahi, Narmada and Tapti. The average annual rainfall ranges between 800 to 1000 mm and the mean temperature from 25° C to 27.5° C.

The recorded forest area is 18,962 km², which constitutes 9.67% of the geographic area of the State. There are four major forest types found in the state viz. Tropical Moist Deciduous, Tropical Dry Deciduous, Tropical thorn and Littoral & Swamp forests. The forests are mostly distributed in the southern part bear bamboo forests of inferior quality. The main forests formations in the state are of teak, bamboo and mangroves. There are 4 National Parks and 21 wildlife sanctuaries in the state. Gir Forests in Saurashtra are abode of world famous Asiatic Lions.

The total population of the state is 50.67 million (Census 2001). Out of total poulation 62.64% is rural and 37.36% is urban having population density of 258 persons per km². Scheduled Tribes constitute 14.8% of the total population mainly spread over 8 districts of the state. Total livestock population is 21.66 million (Livestock Census 2003). Cotton textiles and non-metallic mineral products are famous industries of Gujarat. Other industries are Chemicals, Petrochemicals, Fertilizers, Engineering, Electronics etc. With the largest petro- chemical complex in the country, Gujarat is a major producer of inorganic chemicals such as soda-ash and caustic soda as well as chemical fertilizers.

4.A.2.1 Panam Dam

This is a multi-purpose dam on Panam river in Panchmahal District of Gujarat. The dam is meant for irrigation, water supply, fishery and hydro power and was built in 1999.

View of Panam Dam

The area experiences semi-arid climate with average annual rainfall of around 700 to 1000 mm. The maximum and minimum temperatures are 44° C. and 11° C. The area is surrounded by hills and underlying rocks mainly quartzite. It falls in seismic zone – III. Geologically the Panchmahal District comprises of Igneous & Metamorphic rocks viz. Phyllites, Quartzites &

Schists, which are seen towards the Northern Eastern & Southern part of the district, whereas Granite & Deccan Trap Basalt are exposed in the Central, Western & South- eastern part of the District.

The soils around Panam Dam area are of coarser texture, usually sandy loam / loamy sand, loam soil, clay-loam and clay. Main crop of the district consist of paddy, wheat, maize, sorghum, pulses and oil seeds.

The rivers flowing through the district are Panam, Banas, Sabarmati, Mahi and Orsang. The total watershed for the region spreads over approximately 56,000 sq km. 30 major and medium size dam reservoirs creating about 5000 million cubic meter of dispersed storages have been constructed. More than 70% of this storage is being used for irrigation in the adjoining downstream region of alluvial plains.

The forest cover of the district is low (7.52%) with no dense forest. The area has degraded open forest area. Major vegetations in the area include Casuarina (*Casuarina cunninghamiana),* Bottlebrush *(Callistemon vimnalis),* Pipal *(Ficus religiosa*), Bargad *(Ficus benghalensi),* Neem *(Azadirachta indica),* Gulmohar *(Delonix regia),* Khajoor *(Phoenix sylvestris*) and Teak *(Tectona grandis)* etc. There is forest in the catchment area and plantation has been done around the reservoir. Distribution of forest cover in the state and district is given below

Table 4.5: Forest cover in the Subproject State & District

Place	Area (km^2)	Very dense forest (km^2)	Moderately dense forest (km^2)	Open Forest (km^2)	Total Forest Area (km^2)	% of Forest Area
Gujarat state	196,022	114	6,024	8,577	14,715	7.52
Panchmahal district	4461	0	180	385	566	12.67

Source: State of Forest Report, Forest Survey of India, 2005

Jambughoda Wildlife Sanctuary is located in Panchmahal District. Spread over 130.38 km^2 it is home to a variety of wild animals including mammals, reptiles and birds. Important fauna includes Sloth bear, Leopard, Jungle Cat, Hyena, Wolf and Barking deer

Water quality of the reservoir appears to be good and is used for drinking purpose. The soil texture of the area is clayey loam and sandy loam. A significant percentage of the population belongs to backward community. Main occupation of the people is agriculture and fishing. Demographic Profiles of state along subproject district and tehsil is given below.

Table 4.6: Social Status of Subproject State, District and Tehsil

Location	SR (out of 1000)	LR %	SC %	ST %	WPR %	MnW %	MlW %	NW %
State								
Gujarat	920	69.1	7.1	14.8	41.9	33.6	8.3	58.1
District								
Panchmahal	938	60.9	4.6	27.5	48.2	30.5	17.8	51.8
Tehsil								
Santrampur	958	59.8	3.0	72.1	48.8	31.0	17.8	51.2

Source: Primary Census Abstract, 2001

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

4.A.2.2 Kadana Dam

View of Kadana Dam

The dam is situated on the Mahi River in Panchmahal District of Gujarat. Established in 1979, the dam is meant for irrigation and hydro power generation. Sketch of dam given as **Fig 4.10**. Mahi River originates in the Mahi Kanta hills in the Vindhyachal range, in the western part of Madhya Pradesh and enters Rajasthan in Banswara District near Chandangarh. It leaves the Rajasthan at Salakari village and enters Gujarat and falls into bay of Khambat. On an average the river is about 100 - 130 m wide and it flows mostly through rocky terrain. Its banks are steep, though not very high. Rivers Erav, Chap, Nori, Anas, Jakham, Som are major tributaries of river Mahi. However, barring Earu all other rivers converge into Mahi main stream down stream of Mahi Dam.

The area has tropical semi-arid climate with annual average rainfall of 700 to 1000 mm. Temperature varies from maximum 44^{o} C. to minimum 11^{o}C. The nearest meteorological station is in Diwada, about 5 km away. The area is surrounded by hills and quartzite is predominant geological rock and comes in seismic zone – III. Geo-hydrologically in Panchmahal district, ground water is available in unconfined aquifer, in secondary porosity like fractures, fissures, cracks and joints in the upper weathered mantle. Abstraction of ground water is from different type of sources like open wells, hand pumps and shallow tube wells. Ground water level goes down in summer and sometimes sources become dry. In general quality of ground water is potable

The district has 12.67 percent forest cover (refer Table 4.5). Major vegetation in the area include Neem (*Azadirachta indica),* Teak *(Tectona grandis),* Babul *(Acacia nilotica),* Aak *(Calotropis procera),* Kejra *(Prosopis spicigera),* Dhak *(Butea monosperma)* and Shisham (*Dalbergia sissoo).*

The soil is typical sandy loam to clayey loam. Agriculture and fishing are the main occupation of the people. Main crop of the district consist of paddy, wheat, maize, sorghum, pulses and oil seeds.

Majority of the population belong to backward communities. 51.8% of population fall in non worker category and work participation is 48.2%. Panchmahal district has a high Tribal population of 27.5% .

4.A.2.3 Dharoi Dam

The dam is situated on Sabarmati River in Mahesana District of Gujarat. Built in 1978, the dam is meant for drinking water supply and irrigation. Sketch of the dam is given as **Fig 4.12**. The area has typical semi-arid climate with annual average rainfall of about 600 mm and the temperature varies from 10^{o}C in winter to 47^{o} C in summer. The nearest meteorological station is located at Kheroi, about 22 km away.

View of Dharoi Dam

Predominant geological feature includes granite and the area is surrounded by hills. It falls in the seismic zone-IV, which means it is prone to earthquake. Water quality of the reservoir appears to be good and is used for drinking water purpose. The main rivers of the district are Sabarmati, Rupen, Sarawati, Khari and Pushpawati.

The district has only 2.58 percent Forest cover. Major vegetation in the area includes Khejri (*Prosopis juliflora),* Neem *(Azadirachta indica),* Aak *(Calotropis procera),* Sullu *(Euphorbia royleana),* Dudhi *(Euphorbia hirta),* etc.

Table 4.7: Distribution of Forest cover in the Subproject State & District

Place	Area (km^2)	Very dense forest (km^2)	Moderately dense forest (km^2)	Open Forest (km^2)	Total Forest Area (km^2)	% of Forest Area
Gujarat state	196,022	114	6,024	8,577	14,715	7.52
Mehsana district	8540	0	25	195	220	2.58

Source: State of Forest Report, Forest Survey of India, 2005

Thol Wildlife Sanctuary in located in Mehsana district. The sanctuary mainly houses wide variety of waterfowls, the important fauna consist of Trumpeting Crane, Honking Goose, Bar headed goose, Greater and Lesser Flamingo.

The soil quality is alluvial in nature and varies from sandy loam to loam. The main crops are potato, tobacco, cotton, pulses, oilseeds and citrus. Mehsana is largest producer of lemon in Gujarat. Asia's second largest dairy 'Dudh Sagar' is situated in Mehsana. The detail of dairy animals in district is given below.

Table 4.8: Dairy Animals in Mehsana District

S.No	Types	Number

1	Dairy animals	7,32,918
2	Buffaloes	4,78,161
3	Sheep/ Goat	97,467
4	Poultry	55,468

Source; http://www.kvkmehsana.org

Land use is predominantly agriculture and plantation, which is the main occupation of the local people. About 10 % of the population is from backward communities.

Pasture land covers 30,442 ha and total cultivated area is 365,282 ha. Food and agro processing are major investment in the district.

The population of district is 18,37,696 (census 2001). The socio economic profile of the district is given below:

Table 4.9: Social Status of Subproject State and District

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR**	**MnW %**	**MlW %**	**NW %**
State								
Gujarat	920	69.1	7.1	14.8	41.9	33.6	8.3	58.1
District								
Mehsana	927	75.2	8.1	0.5	45.1	36.2	8.9	54.9

Source: Primary Census Abstract, 2001

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

4.A.3 MAHARASHTRA

Maharashtra, the third largest State of the country is located in the western part of India,. It has an area of 30,771 km^2 which is 9.36% of the country's total area. It lies between lat 15°35' and 22°02' N and long 72°36' and 80° 54' E. The State has five distinct physiographic regions, namely, Deccan plateau, Central Highlands, Eastern Chhotanagpur Plateau, Western Ghats and Coastal Plains. Fluvial action by the Krishna, Bhima, Godavari, Tapi-Purna and Wardha-Wainganga river system has worked to form broad open river valleys alternating with plateau interfluves.

The State enjoys a tropical monsoon climate. The average annual rainfall of the State ranges between 1,600 mm and 2,000 mm.

The recorded forest area is 61,939 km^2, which is 20.13 % of the State's total geographic area. Major forest types occurring in the State are Tropical Semi Evergreen, Tropical Moist Deciduous, Tropical Dry Deciduous, Tropical Thorn, Subtropical Broadleaved Hill, and Littoral and Swampy Forest. Among the non-wood forest product, bamboo and Tendu leaves constitute the important resource. There are 6 National Parks and 35 Wildlife Sanctuaries. There are 3 Tiger Reserves namely Melghat, Tadoba-Andhari and Pench in the state.

The total population of the State is 96.87 million (Census 2001), which constitutes 9.4% of the country's population. The rural population is 57.6% and urban 42.4%. The Scheduled Tribes constitutes 8.9% of the population. The population density is 314 per km^2. The State has a livestock population of 36.76 million (Livestock Census 2003). It is India's leading industrial state, major industries include chemical and allied products, electrical and non-electrical machinery, textiles, petroleum and allied products. Other important industries include metal products, wine, jewellery, pharmaceuticals, engineering goods, machine tools, steel and iron castings and plastic wares. Food crops include mangoes, grapes, bananas, oranges, rice wheat and pulses. Cash crop includes groundnut, cotton sugarcane, turmeric and tobacco.

4.A.3.1 Bhatsa Dam

The dam on the river Bhatsa is in Thane District of Maharashtra. It was built in 1969 for drinking water supply, irrigation and hydro power generation.

Thane, the northern-most district of Konkan, lies adjoining the Arabian sea in the north-west of Maharashtra State. Geographically, forming part of the Konkan lowlands, it comprises the wide amphitheatre like basin of the Ulhas and the hillier Vaitarna Valley. The hill ranges in the area are predominantly aligned north-south, and have more or less steep escarpments. The area falls in seismic zone – III. A mild earthquake struck parts of Thane and Mumbai districts, on 16 November 2001 at 01:38 AM local time. It had a magnitude of ML 2.9 and was felt distinctly in parts of the district.

View of Bhatsa Dam

This is the highest rainfall area with average annual rainfall is around 2300 mm. Temperature varies from 17^o C. in winter to 37^o C. In summer Flush flood is common in the catchment area and occurs

almost every year. The two main rivers flowing through the district are the Ulhas and the Vaitarna. The Ulhas originates from the north of Tungarli near Lonavala, flows for a short distance before descending near Bhor ghat. The river has many tributaries; two important of them (within the boundaries of this district) are Barvi and Bhatsa. Vaitarna, the largest of Konkan Rivers rises in the Tryambak hills in Nashik district. The River flows across Shahapur, Vada and Palghar talukas and enter the Arabian Sea. It has also a number of tributaries; the most important of them are Pinjal, Surya, Daherja and Tansa

The Thane forests are one of the valuable and well-preserved forests in Maharashtra. The forest areas occurring in the district do not consist of single block, but are scattered all over the district. They are mainly situated on the steep Western Ghats on the spurs, ridges and outlayers extending from the ghats. More than 90 per cent of the forests of Thane district fall under the type Tropical moist (mixed) deciduous forest. Major vegetation in the area include Teak (*Tectona grandis),* Ain (*Terminalia tomentosa),* Khair (*Acacia catechu),* Hed (*Adina cordifolia),* Kadamb (*Stephegyne parvifolia),* Palas (*Butea frondosa),* Karvi (*Stribilanthus grahamianus),* Dhavada (*Anogeiessus latifolia*) and Savar (*Bombax malabaricum).* The forest cover of the subproject district and state is given below.

Table 4.10: Forest Cover of Subproject District & State

Place	Area (km^2)	Very dense forest (km^2)	Moderately dense forest (km^2)	Open Forest (km^2)	Total Forest Area (km^2)	% of Forest Area
Thane District	9558	0	1230	1627	2857	29.89
Maharashtra	307713	8171	20198	19092	47476	15.43

Source: State of Forest Report, 2005

Plantation species consist of Rain tree (*Samnea saman),* Copper pod (*Peltophorum ferrugimun),* Gulmohar (*Delonix regia),* Silver Oak (*Greviella robusta),* Asoka (*Polyanthia longifolia),* Sayami cassia (*Cassia siamea),* Neelmohor (*Jacaranda mimosaefolia)* and Cork **(***Millingtonia hortensis)*

The fauna consist of Tiger (*Panthera tigris),* Hyaena (*Hyaena hyaena),* Wild cat (*Felis chaus),* Wild dog (*Cuon alpinus),* Wolf *(Canis lupus),* Sambhar(*Cevrus unicolor),* Spotted Deer (*Axis axis),* Barking Deer (*Muntiacus muntjak),* Monkey (*Macaca mulata)* Peafowl *(Pavo cristatus)* and Grey Jungle fowl *(Gallus sonnerali).*

Among birds, the commonly seen are Red vented bulbul (*Moipastes cafer cafer),* Red whiskered bulbul (*Joacosus fuscicandata),* Spotted babbler (*Pellorneum ruficeps),* Yellow eyed babbler (*Chrysomma, sinensis),* Indian tree pie (*Dendrocitta vagabunda),* Indian Shama(*Kittacincla malabarica*), Black Drongo (*Dicrurus macrocercus),* Tailor bird (*Orthotomus, sutorius guzerata)* and Common Myna (*Acridotheres tristis)*

The soil type is black cotton and has loam texture. There is considerable soil erosion increasing siltation in the reservoir. The important kharif crops of the district are rice, bajra and nachani (finger millet). The pulses like urad, moong and kulith are also grown in this season.

About 85 % of the population in the region live in rural area of which about 37% populations belong to backward communities. There are industries in the region and major occupation of the local population is agriculture, industrial works and white collar jobs. Social status of subproject state, district and tehsil is given below.

Table 4.11: Social Status of Subproject State, District and Tehsil

Location	SR (out of 1000)	LR %	SC %	ST %	WPR	MnW %	MlW %	NW %
State								
Maharashtra	922	76.9	10.2	8.9	42.5	35.9	6.6	57.5
District								
Thane	858	80.7	4.2	14.7	39.1	34.2	4.9	60.9
Tehsil								
Shahapur	945	69.3	4.1	1.9	47.1	36.8	10.3	52.9

Source: Primary Census Abstract, 2001

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe, **WPR** – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

4.A.3.2 Bhatghar Dam

This dam on Yelwandi River is in Pune District of Maharashtra. It is one of the highest dams in India Built in 1969. The dam is 1,625 m long, FRL is 623.28 m and storage capacity, 672.58 million m^3. The dam is used for irrigation, drinking water supply and hydro power generation. Sketch of the dam is given as **Fig 4.18**. The river at the dam site has a catchment area of 336 km^2. Maximum length of the reservoir and the mean depth are 45km and 24.02 m respectively.

View of Bhatgar Dam

Pune district lies in the Western Ghats or Sahyadri mountain range and it extends on to the Deccan Plateau on the west. Pune stands on the leeward side of the Western Ghats. The climate of this district is characterized by high humidity nearly all the year round, an oppressive summer season, and well-distributed and heavy rainfall during the south-west monsoon season. Average annual rainfall in this area is around 700 mm. Highest temperature of 41° C in summer and the minimum temperature is 8°C is recorded winter. The nearest meteorological station is in Pune, which is 60 km from the dam.

The geological formation consists of recent-shores sand, Pleistocene-laterite and eocene- basalt flows. Basalt flows form the predominant formation capped at a few places by laterite at higher levels and covered by shore sands along the coast. Seismically Pune district lies in the Zone –III, Moderate Hazard Zone

Major rivers of the district are Pushpavati, Krushnavati, Kukadi, Meena, Ghod, Bhima, Bhama, Andhra, Indryani, Pavna, Mula, Mutha, Ambi, Mose, Shivganga, Kanandi, Gunjavni, Velvandi, Neera, Karha etc.

The flora of the area consists of Teak (*Tectona grandis*), Ain (*Terminalia tomentosa*), Khair (*Acacia catechu*), Hed (*Adina cordifolia*), Kadamb (*Stephegyne parvifolia*), Palas (*Butea frondosa*), Karvi (*Stribilanthus grahamianus*), Dhavada (*Anogeiessus latifolia*) and Savar (*Bombax malabaricum*). Plantation species consist of Rain tree (*Samnea saman),* Copper pod (*Peltophorum ferrugimun),* Gulmohar (*Delonix regia),* Silver oak (*Greviella robusta),* Ashoka (*Polyanthia longifolia),* Sayami Cassia (*Cassia siamea),* Neelmohor (*Jacaranda mimosaefolia)* and Cork (*Millingtonia hortensis).* The distribution of forest cover of district is given in the table below

Table 4.12: Forest Cover of Subproject district

Place	Area (km^2)	Very dense forest (km^2)	Moderately dense forest (km^2)	Open Forest (km^2)	Total Forest Area (km^2)	% of Forest Area
Pune	15643	0	702	659	1361	8.70

Source: State of Forest Report, 2005

The soil of Bhatghar reservoir is sandy and neutral to alkaline in reaction. The soil quality is poor in terms of organic carbon, available phosphorus and available nitrogen There is not much agriculture activity in the area.

The Nira Right Bank Canal system is fed by Bhatghar dam. This canal system provides irrigation facilities to the Malshiras taluka and irrigates about 50,000 acres in the district. The important crops irrigated by this system are sugarcane, cotton and wheat.

Almost 90 % of the population is in the rural area. Backward communities account for about 6 % of the population. There are industries in the region. Majority of the local people are involved in agriculture and / or work in the industries. The Social status of subproject district and tehsil is given below.

Table 4.13: Social Status of Subproject District and Tehsil

Location	SR (out of 1000)	LR %	SC %	ST %	WPR	Mn W %	MlW %	NW %
District								
Pune	919	80.5	10.5	3.6	40.8	36.6	11.1	51.3
Tehsil								
Bhor	1011	75.2	4.4	32.9	48.7	37.6	11.1	51.3

Source: Primary Census Abstract, 2001

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe,
WPR – Work Participation Rate, **Mn W** – Main Worker, **Ml W** – Marginal Worker, **NW** – Non Worker

4.A.3.3 Pawana Dam

This dam of Pawana river was built in 1976 for drinking water supply, irrigation and hydro power generation and is located in Pune District of Maharashtra. Sketch of the dam is given as **Fig 4.19**. Pavana river is a major tributary of Mula Mutha river flowing through Pimpri Chinchwad Muncipal corporation of Pune District. Pimpri Chinchwad is an industrial area having a number of manufacturing industries automobiles, antibiotics, paper, medicine, electrical and nylon and many small scale industries.

View of Pawana Dam

Average rainfall is around 700 mm. Highest temperature recorded is 41° C. in summer and the lowest temperature is 8ºC in winters. The nearest meteorological station is in Pune city. The area is surrounded by hills and basalt is the major underlying rock. This region falls in seismic zone – III. The soil is typical black cotton with silt loam texture. Lands surrounding the river bed are flooded almost every year during monsoon

The area is hilly and there are forests in the catchment and along the reservoir. In the downstream region, land use pattern is changing, agriculture land is converted to residential and commercial land.

The forest cover of Pune district is low (8.7%) Large variety of flora is found which consist of forest and planted trees. The commonly found trees are Mango (*Mangifera indica*), Jamun (*Syzygium cumini*), Bargad (*Ficus benghalensis*), Gular (*Ficus glomerata*), Karanj (*Pongamia pinnata*) and Amaltas (*Cassia fistula*) that inhabit most habitat types and localities. Dominant forest species include Teak (*Tectona grandis*), Odina (*Odina wodier*), Hardad (*Terminalia bellerica*), Chironji (*Buchanania lanzan*), Gamhar (*Gmelina arborea*), Cotton tree (*Cochlospermum gossypium*), Kendu (*Diospyros melanoxylon*), Acacia (*Acacia leucophloea*) and Ber(*Zizyphus mauritiana*).

Plantation and habitation dwelling trees are exotic and include Rain tree (*Samnea saman*), Copper pod (*Peltophorum ferruginum*), Gulmohar (*Delonix regia*), Silver Oak (*Grevillea robusta*), Bottle palm (*Roystonea regia*), Asoka (*Polyalthia longifolia*) Fountain tulip (*Spathodea companulata*) Sayami Cassia (*Cassia siamea*) Neelmohor (*Jacaranda mimisaefolia*) and Cork (*Millingtonia hortensis*).

Wildlife consist of Leopard Cat (*Felis bengalensis*), Jungle Cat (*Felis chaus*), Panther (*Panthera pardus*), Chinkara (*Gazella bennetti*), Spotted Deer (*Axis axis*), Grey Musk Shrew(*Suncus murinus*), Bats (*Rousettus leschenauti*), Bonnet monkey (*Macaca radiata*), Hyaena (*Hyaena hyaena*), Jackal (*Caneus aurus*) etc.

Avifauna of the area consist of House Sparrow, Blue Rock Pigeon, Roseringed Parakeet, Common Myna, Jungle Myna, Dusky Crag Martin, House Swift , Barn Swallow, Cliff Swallow, Myna, Indian Robin, Magpie Robin, Warbler , Bulbul, Koel and Crow. Fish species found in the area are - Labeo, Catla, Channa, Puntius, Barilius, Mystus etc.

Three categories of crops are grown in Pune District.

- Kharif Crop (Rice, Bajra, Tur, Moong, Urad, Groundnut, Soyabean)
- Rabi Crop (Jowar, Wheat, Pulses, Sunflower)

- Annual Crop (Sugarcane)

About 58% of the population lives in rural area and more than 12% of the population belong to backward communities. Major occupation of the people in the area is agriculture and industrial works. Social status of subproject district and tehsil is given below.

Table 4.14: Social Status of subproject District and Tehsil

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR %**	**Mn W %**	**MlW %**	**NW %**
District								
Pune	919	80.5	10.5	3.6	40.8	36.6	11.1	51.3
Tehsil								
Mawal	903	76.0	5.3	7.1	41.6	35.5	6.3	58.4

Source: Primary Census Abstract, 2001

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe,
WPR – Work Participation Rate, **Mn W** – Main Worker, **Ml W** – Marginal Worker, **NW** – Non Worker

4.A.4 WEST BENGAL

West bengal is located in the eastern part of India, bordering Bangladesh, Nepal & Bhutan. The geographic area of the state is 88,752 km². The state lies between latitude 21°29' and 27°13' N and longitude 85°50" and 89°52' E.The State has two natural divisions: the North Himalayan and the South Alluvial Gangetic Plain. The three main rivers in the northern part of the State namely Teesta, Torsa and Jaldhaka drain into Brahmaputra. The other two important rivers passing through the central part of the State are the Ganges and the Hooghly, which drain into the Bay of Bengal forming the famous delta of Indian Sunderbans - which is one of the largest deltas in the world and home to the Royal Bengal Tiger.

Climate varies from moist tropical in the southeast to dry tropical in the southwest and from subtropical to temperate in the mountains of north. Annual rainfall varies from 900 mm in southwest to about 5000 mm in parts of the north. The temperature range is from sub zero in the hills during the winter to about 46°C in southern parts during the summer.

The recorded forest area is 11,879 km^2, which is 13.38% of the geographic area of the State. Major forest types occurring in the State are Northern Tropical Wet Evergreen Forests, Northern Sub Tropical Semi Evergreen Forests, North India Moist Deciduous Forests, Littoral and Swamp Forests (Mangroves), Northern Tropical Dry Deciduous Forests, Northern Sub Tropical Broad Leaved Wet Hill Forests, Northern Montane Wet Temperate Forests, East Himalayan Moist Temperate Forests and Sub Alpine Forests.

There are 5 National Parks and 15 Wildlife sanctuaries. The state has two Tiger reserves namely Sunderban and Buxa. Two Elephant reserves namely Eastern Duars Elephant reserves and Mayur Jharna are also present in the state.

The population of West Bengal is 80.18 million (*Census 2001*) of which, rural population is 72% and urban 28%. The Scheduled Tribes population in the State is 5.5%. West Bengal has the highest population density (903 persons per km^2) in the country. The livestock population is 41.62 million (*Livestock Census 2003*). West Bengal is well known for its textile industry. Other industries that are located in West Bengal are coal production, automobiles, railway equipment, heavy electrical equipment, industrial machinery, heavy machinery, electric motors, household electrical appliances, paper & paper board industry, leather and heavy organic chemicals industry.

4.A.4.1 Sali Dam

The dam is situated at the origin of river Sali in Bankura District of West Bengal. The dam was built in 1978 for irrigation. A drinking water supply scheme is under construction.

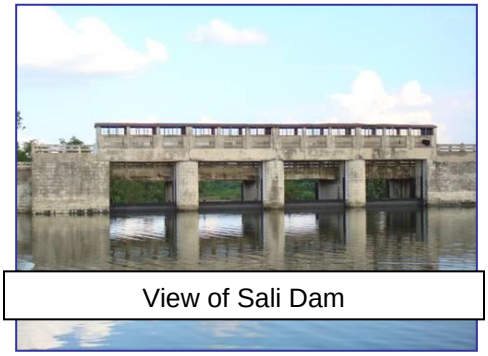
The topography of the area is plain. The soil texture is quartzite. Sali Dam is in Zone III (Moderate) of seismic zones of India. The district experience tropical climate with the hottest summer and the coldest winter. The four distinct seasons are:

Summer: March to June, May is the peak of summer season with an average maximum temperature of 43°C

Monsoon: June - September, Annual rainfall varies between 765 and 1607 mm

Post Monsoon: September to Oct

Winter: Nov to Feb, Temperatures during winter fall below 4°C



View of Sali Dam

The flora of Bankura district consist of Sal (*Shorea robusta),* Bahera (*Terminalia bellerica), Kend* (*Torquigener oblongus),* Palash (*Butea frondosa),* Mango (*Mangifera indica),* Jamun (*Syzygium cumini),* Haritaki (*Terminalia chebula),* Sisu (*Dalbergia sissoo),* Neem (*Azadirachta indica),* Siris (*Albizzia lebbeck),* Amlaki (*Embelica officinalis),* Bel (*Aegle marmelos),* Arjun *(Terminalia arjuna) and* Teak (*Tectona grandis*). The distribution of forest cover in project state and district is given below.

Table 4.15: Forest Cover of subproject District and State

Place	Area (km^2)	Very dense forest (km^2)	Moderately dense forest (km^2)	Open Forest (km^2)	Total Forest Area (km^2)	% of Forest Area
Bankura District	6882	100	315	612	1027	14.92
West Bengal	88752	2303	3777	6334	12413	13.99

Source: State of Forest Report, 2005

The fauna of the area comprise of Leopard (*Panthera pardus),* Wolf (*Canis lupus),* Hyaena (*Hyaena hyaena),* Jackal (*Canis aureus),* Wild boars (*Sus scrofa),* Monkey (*Macaca mulata),* Langur (*Presbytis entellus),* Russell's viper (*Daboia resselii)* and Cobra (*Naja naja).* The common

avifauna of the area are pea-fowl, jungle-fowl, jungle crow, house crow, treepie, common babbler, common jora, , babul, bluethroat, brown-backed robin, flycatcher, wood shrike, black drongo, tailor bird, streaked fantail warbler, golden oriole, common mayna, pied mayna, white-backed munia, white-throated munia, spitted munia, red munia, yellow-throated sparrow, house sparrow, woodpecker, India cuckoo, pied crested cuckoo , koel, brahminy kite, pariah kite, sparrow hawk, dove, goose, duck, teal, lapwing, white necked stork and several varieties of egret and heron

The predominant land use is agriculture. This is typical rural area and about 41 % of the population belongs to backward communities. Rice, wheat, corn (maize), and sugarcane are the chief crops. Social status of the region is given in the table below.

Table 4.16: Social Status of Subproject State, District and Tehsil

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR %**	**Mn W %**	**Ml W %**	**NW %**
State								
West Bengal	934	68.6	23	5.5	36.8	28.7	8.1	63.2
District								
Bankura	952	63.4	31.2	10.4	44.7	29.6	15.1	55.3
Tehsil								
Gangajalghati	949	60.6	33.6	4.1	40.7	25.8	14.9	59.3

Source: Primary Census Abstract, 2001

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe,
WPR – Work Participation Rate, **MnW** – Main Worker, **MlW** – Marginal Worker, **NW** – Non Worker

4.A.4.2 Bara Mandira Dam

This is a small dam on a stream called Mandira and is situated at Burdwan District of West Bengal. It was built in 1977 for irrigation purpose.

The average temperature in hot season is 30ºC while in the cold season is 20ºC, average rainfall is 1500 mm. The cold season starts from the middle of November and continues till end of February. March to May is dry summer intervened by tropical cyclones and storms. June to September is wet summer while October and November is autumn.

View of Bara Mandira Dam

The topography of the area is plain and consists of alluvium and rocks of Rajmahal Plateau. The region is extension of coal mines of Jharia. Soil is of reddish colour, medium to coarse in texture, acidic in reaction, low in nitrogen, calcium, phosphate and other plant nutrients. Water holding capacity of this soil increases with depth as well as with the increase of clay portions.

Geological feature of Burdwan district is a transitional zone between the Jharkhand plateau which constitutes a portion of peninsular shield in the west and Ganga-Brahamaputra alluvial plain in the north and east. In general the Jharkhand plateau consists of the meta-sedimentary rocks of precambrian age, Gondwana sedimentary rocks, Rajmahal basalts and upper tertiary sediments. Laterite has developed on these older rocks as well as on early Quaternary sediments. The Bara Mandira Dam falls in Zone II (least of moderate) seismic zone.

Forest areas are interspersed with paddy fields The flora is characterized by species such as Simul (*Bombax ceiba*), Neem (*Azadirachta indica*), Amlaki (*Embilica officinalis*) Narikel (*Cocos nucifera*), Khejur (*Phoenix humilius*), Tal (*Borassus flabellifer*), Bat (*Ficus bengalensis*), Asvattha (*Ficus religiosa*), Palas (*Butea frondosa*) , Krishnachuda (*Caesalpinia pulcherrima*), Am (*Mangifera indica*) Sal (*Shorea robusta*), Palas (*Butea monosperma*), Bans (*Bambusa arundinacea*), Shireesha (*Albizzia lebbek*), Arka (*Calotropis gigantea*), Kend (*Diospyros melanoxylon*), Arjun (*Terminalia arjuna*) and Ashan (*T. tomentosa*). Shrubby species such as Ashsheoda (*Glycosmis pentaphylla*), Rajanigandha (*Polyanthes tuberosa*), Ghentu (*Clerodendron infortunatum*), Kurabaka (*Barleria cristata*), Gulancha (*Tinospora cordifolia*), Tulsi (*Ocimum sanctum*) and *Dumur* (*Ficus hispida*).The distribution of forest cover of the district and state is given in the table below.

Table 4.17: Forest Cover of Subproject District & State

Place	Area (km^2)	Very dense forest (km^2)	Moderately dense forest (km^2)	Open Forest (km^2)	Total Forest Area (km^2)	% of Forest Area
Burdwan district	7024	16	80	143	239	3.4
West Bengal State	88752	2303	3777	6334	12413	13.99

Source: State of Forest Report, 2005

Fauna comprise of Leopard, Wolf, Hyaena, Jackal, Wolf, Wild pig and Monkey. In the hilly areas poisonous snakes are common and include several kinds of cobra, karait and deadly Russell's viper. Other most frequently seen varieties are the Dhamna and various species of harmless grass snakes. The avifauna of the district are pea-fowl, jungle-fowl, jungle crow, treepie, babbler, babul, robin, flycatcher, black drongo, tailor bird, , golden oriole, common mayna, munia, sparrow, woodpecker, cuckoo, koel, parakeet, nilkantha, kingfisher, hornbill, hoopoe, horned owl, spotted eagle, kite, pariah kite, sparrow hawk, pigeon, dove, goose, duck, teal, lapwing, white necked stork, egret and heron.

Fish species found in the area are Rohu (*Labeo .rohita*), Mrigle (*C. mrigala*), Katla (*Catla catla*), Kharke Bata (*C. reba*), Bhangan Bata (*L. bata*), Shrimps (*Metapeneus spp*.) Maural (*A. mola*), Pabda (*C. pabda*), Tengra (*Mystus spp*.), Bele (*G. gurius*), Chela (*C. bacaila*), Puntis (*Barbus app*.), Boal (*Wallage attu*.), Aid (*Mystus seenghala*), Galda (*Palaomen spp*.), Vacha (*E. vacha*), Chital (*N. chitala*), Pholoi (*N. notopterus*), Khaira (*Gadusia chapra*), Fensa (E. telara), Silon (*S. silondia*), Bhola (*Sciaena coitor*) etc.

Major land use in the area is agriculture. The agricultural production is so high that the district is called the granary of Bengal. Rice, Wheat, Barley, Maize, Gram, Tur, Rape Seed, Mustard, Linseeds, Jute, Sugarcane, Potato, Ginger and Chillies are major agricultural produce. The district

has a very good network of Irrigation facilities. The main sources of irrigation are Government canals, tanks, wells and tube wells.

Mining primarily for coal, is another activity in the district. Burdwan is one of the premier districts in India in terms of value of mineral. The Raniganj coalfield was the birth place of the Indian coal industry. Besides coal, important minerals found in the district are iron ores, calcium carbonate, abrasives, silica bricks, moulding sands, glass sands, building materials, manganese, bauxite and laterite. Rice and oilseed milling and hosiery, cutlery and tool manufacturing are the other important industries. Almost 42 % of the population belongs to backward community. Most of the local people work in agriculture or workers in the industries and coal mines. Socio economic status is given in the table below for subproject district and tehsil.

Table 4.18: Social Status of Subproject District and Tehsil

Location	**SR** (out of 1000)	**LR %**	**SC %**	**ST %**	**WPR %**	**Mn W %**	**Ml W %**	**NW %**
District								
Burdwan	922	70.2	27.0	6.4	35.5	27.6	8	64.5
Tehsil								
Barabani	911	63.6	29.4	13.9	30.4	21.1	9.3	69.6

Source: Primary Census Abstract, 2001

Note: **SR** – Sex Ratio, **LR** – Literacy Rate, **SC** – Schedule Caste, **ST** – Schedule Tribe,
WPR – Work Participation Rate, **Mn W** – Main Worker, **Ml W** – Marginal Worker, **NW** – Non Worker

ANNEXURE-II: STAKEHOLDER CONSULTATIONS

Public Consultation and Meeting with stakeholders: Mohini Pickup Weir

Consultation withDam Officials

Consultation at Panghata Village

Place : Narwar
Venue: Guest house and dam surroundings
Date : 12th August, 2007 and 17 th January, 2008
Participants:
Mr. G. S. Shrivastava
Superintending Engineer, Mohini Pickup wire
Mr. P.N. Nayak
Executive Engineer, Gwalior,
Mr. R. K. Shrivastava
Sub Divisional Officer, Mohini Pickup wire , Sub Division Narwar (in August 2007)
Mr. O.P Jain
Sub Divisional Officer, Mohini Pickup wire , Sub Division Narwar (in August 2007)
Mr. R.D.Tyagi
A.En, Mohini Pick Up weir
Mr. D. S. Kushbah
Additional Director Agriculture
Mr. Harpal Singh Sidhu
Director,State Fisheries Dept.

Mr. P. C. Kol
Assistant Director, Shivpuri Division,
State Fisheries Dept.
&
Villagers
Panghata village (Downstream)

Issues Discussed:

- Intensity of rainfall and inflow from the upstream.
- Siltation Problem
- Meteorological data recording system
- Catchment treatment
- Livelihood of local people
- Alarm system
- Tourism potential and tourism development
- Revenue generation and sustainability of the dam

Findings of the meetings and consultation:

- The inflow in the dam has decreased.
- Previously siltation rate was quite high but now the siltation has also decreased due to construction of Madikheda dam in the upstream

- No meteorological data recording system present at the dam site. The catchment between the feeder dam Madikheda and Mohini pick up weir has no rain gauge station and water level recording system to combat any emergency situation arises due to sudden cloud burst.
- Grazing predominantly by goats on the dam embankment and peripheral hills have been observed, which degrades the vegetation and leads to soil erosion.
- No catchment treatment program is framed for the area.
- The local residents especially the rehabilitated people have sense of deprivation as livelihood support was extended to them. However, the downstream population is well aware of the water release system and do not feel any fear of flooding due to sudden water release.
- The Alarm system for water release from the dam did not seem well built, as systematic forecasting system is absent. The warning system is predominantly dependant on the mobile service and hence depends on external agency's efficiency. In lack of an internal system for message any emergency consequences may not be fought properly.
- The Mohini Pick Up weir being in close vicinity of Gwalior and being connected well with Shibpuri town has high potential of tourism development. But, the law and order problems and bad road quality put hindrance on the tourism development.
- The dam has started generating funds from the orchard developed at its land, which is a positive sign. Dam authority has also taken initiative to develop the dam site as a tourist place. To promote tourism they have constructed a jetty for boating activity.

Recommendations & Suggestions:

- Adequate amount of water supply is not there to fill the reservoir upto its highest reservoir level in most of the years. Inter basin water transfer of linking of river may solve the problem.
- Adequate number of rainfall monitoring station and proper information system should be developed to assess the inflow from the upstream in advance. Simultaneously proper Alarm system should be developed to minimize the impact of any type of disaster caused by the weir and related activities.
- Hydropower project can be installed for optimum use of resources.
- Weir site can be developed as an ecotourism site. Its panoramic view and advantageous position will help a lot to promote such place. Apart revenue generated from tourism can also be used in dam maintenance.
- Catchment area management plan may be developed to stop the degradation of the catchment area and simultaneously to develop the catchment area.
- Promotion of fishing activities should be taken up within the reservoir. A part of revenue generated from the fishing activity should go to the Water Resource Dept. for maintenance purpose of the weir.
- Training and awareness programme required to make people aware about the various aspects related to the dam and train them for optimum utilization of water.

Meetings with Stakeholders and Public consultation Kolar Dam

Place: Bhopal

Venue: Guest house and dam surroundings

Date: 11th August, 2007 & 15th& 16th January, 2008

Participants:

Mr. J. H. Gandhi
Superintending Engineer, Kolar Project

Mr. Bharat Kandwal
Sub Divisional Engineer, Kolar project

Mr. D. S. Kushbah
Additional Director Agriculture

Mr. Harpal Singh Sidhu
Director,State Fisheries Department

Mr. P. C. Kol
Assistant Director, Shivpuri Division,
State Fisheries Department

Mr. V. Roy,
Dy. Director, MatsyaMahasangh, Bhopal

Mr. S. Chhabaria
Director, Dam Safety Organisation,

Dam Operators
At Kolar dam
And
Villagers at Gularchhabri

Consultation with Dam official

Meeting with local people

Meeting with Director, SDSO

Issues Discussed:

- Intensity of rainfall and inflow from the upstream.
- Flooding problem in the downstream due to uncontrolled release of water from the dam.
- Embankment and carrying capacity of the river in the downstream.
- Structural aspects of the dam.
- Water Quality and Siltation Problem.
- Distribution of water and water resource management.
- Canal system of the dam
- Tourism potential at dam site.
- Hydro electric power generation.
- Land use pattern.
- Nature of the Catchment Area and catchment treatment plan.
- Rainfall monitoring stations and Alarm system.
- Environmentally sensitive areas in and around the dam site.
- Fishing activity within the dam.

Stakeholder's Response:

- Rainfall intensity is moderate in the dam site and in catchment area. Dam does not have sufficient water to supply as per requirement, most of the years it is filled upto 70% of its capacity.
- After construction of the dam till date flood situation has not taken place in the downstream due to sudden release of huge quantity of water from the dam. This dam hardly fills up to its full reservoir capacity so flooding situation is not expected. If flooding occurs there will be negligible loss as in the downstream river is passing through hilly forest area and only three villages are there in the downstream.
- As per discussion held with dam officials no major structural problem was found in this dam.
- According to Engineers and local people present at dam site alternate road is required to connect the villages situated on the opposite side of the dam instead of using dam inspection road. Because frequent heavy vehicular movement may damage the dam structure.
- The alarm siren at the time of water release reaches nearly 3kms, which may not be enough for a higher rate of discharge.
- Siltation is not a serious matter of concern and water quality of the reservoir is good and is used for drinking purpose.
- Dam water is mainly used to meet up the drinking water requirement of the Bhopal city and surrounding area, it also meets up industrial requirement of the city. No major issue was revealed regarding distribution of water for irrigation purpose. The potential command area of the dam is 228,708 ha, out of which at present 102,575 ha is being irrigated. Only one time irrigation is possible using dam water.
- No canal is constructed from this dam. There is a barrage in the downstream from where canal emerges for irrigation purpose. Both the Canals are lined.
- Water distribution system through canal is not proper. There is considerable amount of transmission and evaporation losses from minors and distributaries. Canal water is not distributed properly amongst the farmers.
- This place has a lot of potential which can be developed as a tourist place; Natural Scenic beauty of this place and well connectivity with Bhopal city can play a significant role to develop this place as a well known tourist place.
- There is no Hydropower generation from the dam presently, but a proposal has been made to install a small scale hydropower generation unit in the dam.
- In the downstream of the dam predominant land use is forest land, however, very few agricultural fields and some village settlements are also there.
- Entire catchment area of this reservoir falls within Hilly region and covered by dense forest. No catchment treatment plan is there for improvement of the catchment area.
- Occasional forest fire and grazing of goats at the catchment contributes in degradation of the catchment.
- The Forest department although do not have any definite scheme of catchment treatment, but forest protection committee has been formed to protect the forest.
- Only one rainfall monitoring station is present on the upstream. Hence, any data acquisition system for final inflow measurement is weak and consequently any forecasting procedure for final reservoir inflow is lacking.
- Organized fishing under government led organization MatsyaMahasangh is going on, which involves the local people too. Though the reservoir is a natural habitat of Mahasheer(*Tor tor*) fish, but the major fishing activity is centered to Carp fishing. Water Resources Dept. doesn't receive any revenue from Fisheries department from fishing activity within dam.
- Protected Area – Ratapani Reserve Forest is situated near vicinity of the dam.
- The social rehabilitation activities, as it was done during construction of the dam and as it is planned to be done as per the provisions laid in policy emphasize on the compensation amount

and not in making the livelihood sustainable. The rehabilitated people at local villages have grievances against the dam authority regarding the issue.

- The involvement of local people in dam rehabilitation and other work is not yet ensured.

Recommendations & Suggestions:

- The water inflow does not remain adequate every year. Inter basin water transfer by linking of river can solve the problem. However, efforts are being made to transfer some water from the nearby Sip river.
- Optimum number of rainfall monitoring stations and its network may be developed in catchment to assess the inflow from the upstream in advance.
- Proper information dissipation and Alarm system should be developed.
- Alternate road may be constructed to minimize the impact of heavy vehicular movement on the dam inspection road as well as dam structure.
- Hydropower project to be installed for the wise use of resources and better sustainability of the dam may be explored. Local requirements may be considered in the area for direct revenue generation.
- Dam site can be developed as an ecotourism site. Its panoramic view and advantageous position will help a lot to promote such place. Some process of inter-departmental fund transfer may be developed, so that the revenue generated from tourism can be used in dam maintenance.
- Most of the catchment of Kolar dam is forested area, hence comes under jurisdiction of the Forest Department. Interdepartmental co-ordination is necessary to built up with the forest department for catchment treatment. The work force available with that department, in the form of Forest Protection Committee, may be used in catchment management.
- Promotion of fishing activities should be taken up within the reservoir. A part of revenue generated from the fishing activity should go to the Water Resource Dept. for maintenance purpose of the dam.
- Training and awareness programme required to make people aware about the various aspects related to the dam for optimum utilization of water.
- As it seemed during the public meeting at local villages in downstream of the dam that no disaster perception is prevailing in the area. Conscious efforts may be made to draw a disaster preparedness programme and penetrate the same within the local people.

ii ***Gujarat***

There are three subprojects in Gujarat, Panam and Kadana Dam in Panchmahal district and Dharoi Dam in Mehasana district. The public consultation involved discussion with Water Resources Department and Water Users in the area.

Public Consultation and Meeting with Stakeholders: Panam Dam

Place: Godhra
Venue: Dam Site & Downstream Villages
Date: 26th& 28th July 2007
9th January, 2008

Participants:

- **DR. R C TANK**
  Superintending Engineer
- **MR. H M SHAH**
  Executive Engineer
- **MR. N D SOLANKI**
  Executive Engineer
- **MR. JITENDRA D SHUKLA**
  Dy. Executive Engineer
- **VILLAGERS OF MEERPUR VILLAGE**
- **VILLAGERS OF HAREDA VILLAGE**
- **VILLAGERS OF AMALIYAT VILLAGE**

in downstream

Issues Discussed:

- Resettlement and Rehabilitation
- Alarm system
- Rainfall and water gauging stations
- Potential for Tourism
- Fish Production
- Structural aspects of the dam
- Hydro electric power generation
- Catchment Area Treatment

Findings of the meetings and Consultation:

- Intimation is given 3 – 4 hours before the release of water, villagers are informed via siren and telephone and television.
- Catchment has only one river guage station and six rainguage stations situated outside but close to catchment area. The other station which records rainfall is situated in Dharoi colony. The wireless set is in operation only for 5 months (June to November).
- Resettled people in Meerpur and Hareda have been given facilities like school, dispensary, market, community centre etc. apart from land. Also provision for lift irrigation is given. But the major grievance of the locals is that no drinking water is provided and no major benefit is being obtained from the dam in the downstream villages.
- Water quality is monitored by State Pollution Control Board once a year. Drinking water is supplied from the reservoir to Godhra and Shehera city after being treated in a nearby village.
- Water is released for the people of the downstream as per the Riparian Act.
- Original capacity has been reduced by 15-18% due to siltation. Minor leakage which is observed in the spillway of the dam. Also leakage is observed in the overhead aqueduct.

- The 2MW canal bed power house is in use for 3 – 4 months when there is requisite water. During this time it meets the complete requirement for Shehera district.
- There is good potential for tourism, even though tourism development planning is under process and is not yet materialized.
- Fishery is done in the reservoir and there exists a 5 year contract with the Fishery department and the locals. 50% revenue goes to both the Irrigation and the Fishery department.
- In most of the cases, any activities in the catchment is done by the Forest Department, irrigation department remain usually unaware of these. Separate schemes are undertaken in the state programmes for any development in the catchment without consulting the dam authorities.

Recommendations & Suggestions:

- Alarm system can be strengthened as siren reaches only about 2-3 kms, while the remaining villages are informed via telephone and television, which might fail.
- Provision for a 12 – monthly operating wireless river gauging station should be considered. As in case of any untimely inflow of water or flood, there might be dire consequences.
- De-siltation is required urgently as increased siltation rate has already reduced the original capacity of the dam. This study is carried out by Gujarat Engineering Research Institute and the suggestions given by them regarding the structural aspects of the dam should be followed as it is directly proportional to the dam safety.
- Augmentation of hydro power on public private participation is one of the possible improvements.
- Tourism development will be beneficial as it would help in income generation for the locals and resettled people and also help in some revenue generation for the dam.
- As the favorable water quality of the reservoir provides great opportunity for fishery development, it should be more enhanced. The model of public participation in fisheries development has tremendous potential of employment generation and can be replicated with further enhancement measures integrating suitable environmental and social management framework.
- Catchment area treatment may be prioritizedTribal population is present in the catchment area and also the surrounding area. The tribal, if any I the area, may be sensitized regarding the importance of catchment area in relation to the dam, dam surroundings and dam environment. As deficiency is observed in interdepartmental co-ordination, better coordination among the Forest Department and Irrigation Department may be ensured.

Public Consultation and Meetings with Stakeholders: Kadana Dam

Place: Kadana Dam
Venue: Dam Site & Downstream Villages
Date: 26th& 29th July 2007
10th and 11th January, 2008
Participants:

- **P.B. MAKWANA**

  EX ENGINEER
- **G. M ASARI**

  DY. EX. ENGINEER
- **V. S. PATEL**

  DY. EX. ENGINEER
- **VILLAGERS OF TAKTAJINAPALLAYA VILLAGE**
- **VILLAGERS OF KADANA GAM VILLAGE**
- **VILLAGERS OF DIWADA VILLAGE**

Consultation with Villagers in downstream

Issues Discussed:

- Resettlement and Rehabilitation
- Alarm system
- Rainfall and water gauging stations
- Potential for Tourism
- Fish Production
- Erosion in Embankment and flooding in downstream
- Structural aspects of the dam
- Hydro electric power generation
- Catchment Area Treatment

Findings of the meeting and consultations:

- Even though various facilities have been given to the people who have been resettled in 27 different sites, they have grievances regarding the compensation
- Sufficient time is given to the villagers before release of water. The Siren is effective for about 2-3km, rest of the people are informed via radio and television
- Interstate information exchange doesn't happen timely, between Mahi Bajaj Sagar dam (Rajasthan) and Kadana Dam (Gujarat)
- This dam has great potential for tourism and has good fish production
- Release of huge quantity of water and flooding in 2006 have caused erosion of canal embankment. Minor leakage observed is to be fixed (as per planning) during summer of 2008.
- Kadana dam presents ideal example of harnessing environmental friendly hydel power despite less availability of water in reservoir by recirculating d/s water with the energy generated during non-peak hour
- No catchment treatment is done / considered after the construction of dam. No plans are devised/ thought about for the protection of catchment area of the dam.

Recommendations & Suggestions:

- Need for a sustainable livelihood maintenance strategy was felt, so that the grievances of the locals are minimized
- A stronger Alarm system may be developed so that need of radio and television can be minimized as the siren and direct telephonic intimation is the best method of informing
- Interstate policies need to be developed for information sharing

- Tourism can be developed, which would also generate a source of income for the locals and generate revenue for the dam
- Gujarat Engineering Research Institute (GERI) does pre and post monsoon visit every year and the suggestions are given regarding the structural aspect of the dams. These suggestions are being implemented.
- Catchment treatment is not prioritized even though it is an important aspect. Inter-departmental communication may be strengthened. Better coordination among the Forest Department and Irrigation Department is likely to facilitate the condition.

Public Consultation and Meetings with Stakeholders: Dharoi Dam

Place: Dharoi
Venue: Dam Site & Downstream Villages
Date: 27th July 2007
8th January, 2008
Participants:

- **MR. J. G. CHOUDHURY**
  Executive Engineer
- **MR. B. K. PATEL**
  Dy. Executive Engineer
- **Mr. M. M. Patel**
  Dy. Executive Engineer
- **Villagers of Dharoi Village**
- **Villagers of Chandop Village**
- **Villagers of Devdarshan Village**

Consultation with Villagers in downstream

Issues Discussed:

- Alarm system
- Rainfall and water monitoring stations
- Resettlement and Rehabilitation
- Distribution of Water, Water Quality and Siltation Problem
- Hydro electric power generation.
- Tourism potential of the dam site
- Fishing activity.
- Catchment Area

Findings of the meeting and consultations:

- Intimation is given 1 hour before the release of water, villagers are informed via siren and telephone by the collectorate office.
- Catchment has only one river guage station. The other station which records rainfall is situated in Dharoi colony. Half the Catchment of Dharoi Dam is in Rajasthan and timely report of forecasts of rainfall, weather phenomenon etc. from Rajasthan does not reach on time.
- Resettled people have been given facilities like drinking water, school, road electricity apart from land but still have grievances regarding compensation.
- Water quality is monitored by State Pollution Control Board once a year. Drinking water is supplied from the reservoir to Ahmedabad and Gandhinagar city after being treated in Vav village. High Fluoride content in ground water was observed in downstream and command area.
- Water is released for the people of the downstream as per the Riparian Act.
- Live storage values shows high fluctuation due to droughts, poor rainfall etc. The reducing dead storage value indicates that de-siltation of reservoir is required.
- Preliminary hydropower was proposed but due to shortage of water, it is considered to be techno-economically non – feasible.
- There is good potential for tourism, even though boating is restricted in the reservoir. On an average about 300 people visit the dam per day on the way to Ambaji temple in Banaskantha district.
- Fishery is done in the reservoir and tribal cooperatives are formed, the whole activity is being taken care of by the Fishery department. Irrigation department gets royalty.

- The protection of the forest in the catchment is vested on the Forest Department. This forest has tribal population and no industrialization / urbanization has taken place yet. There are no environmentally sensitive areas around the dam.

Recommendations & Suggestions:

- Alarm system needs to be strengthened as siren reaches only about 2-3 kms, while the remaining villages are informed via telephone, which might fail.
- More number of monitoring stations for river gauging, rainfall etc. needs to be established. Interstate matters and policies may be framed in consultation with the Central Govt.
- Desiltation is required as increased siltation rate is likely to reduce the original capacity of the dam. Also it is observed that the initial waters are silty, polluted and manure filled, which is going to the field. This needs to be addressed.
- Augmentation of hydro power on public private participation is one of the possible improvements.
- Tourism development will be beneficial as it would help in income generation for the locals and resettled people and also help in some revenue generation for the dam.
- As the favorable water quality of the reservoir provides great opportunity for fishery development, it should be more promoted. The model of public participation in fisheries development has potential for employment generation and can be replicated with further enhancement measures integrating suitable environmental and social management framework.
- Catchment area treatment may be prioritized. The catchment has forests which are inhabited by tribal population. The tribal may should be sensitized regarding the importance of catchment area in relation to the dam, dam surroundings and dam environment.

iii Maharashtra

There are three subprojects in Maharashtra, Bhatsa dam in Thane district, Bhatghar and Pawana dam in Pune district. The public consultation involved discussion with Water Resources Department and Water Users in the area.

Public Consultation and Meeting with Stakeholders: Bhatsa Dam

Place: ShahapurTaluka, Thane
Venue: Dam site and Downstream villages
Date: 29th&30th January, 2008
Participants:

- **Mr. A.K. Deshai**
  Sub Divisional Engineer
  Bhatsa Dam. Div. 1
- **Mr. S.D. Sinde**
  Assistant Engineer Grade I
  Bhatsa Dam Sub. Div. 1c
- **Mr. Mahindra Patil**
  Assistant Engineer Grade II
  Bhatsa Dam Sub. Div. 1c
- **Local People**
  Mr. KashinathDajivide, Mr. Ramesh & Others
  Palovide :Shavli Village

Consultationwith Villagers in Downstream

Issues Discussed:

- Intensity of rainfall and inflow from the upstream.
- Flooding problem in the downstream due to uncontrolled release of water from the dam.
- Structural aspects of the dam.
- Water Quality and Siltation Problem.
- Distribution of water.
- Canal system of the dam
- Local people and their livelihood
- Tourism potential at dam site.
- Hydro electric power generation.
- Land use pattern.
- Nature of the Catchment Area and catchment treatment plan.
- Rainfall monitoring stations and Alarm system.
- Environmentally sensitive areas in and around the dam site.
- Fishing activity within the dam.

Major findings of the meetings and consultation:.

- Leakages in masonry work and choking of drains are major problems of the dam. Opening of the Left Bank Canal Is also damaged.
- Major rehabilitation work done by the Dept. Recently
  a. Increase in the height of the dam
  b. Cement grouting of dam top and repair of the Dam road

- Siltation rate is quite high. The catchment area of this dam has a lot of forest cover, but it receives a lot of silt from the catchment during monsoon period. The siltation rate is quite high and it is almost 10 times higher than expectation. Assumed siltation rate was 3.60 Ha Meter / $100Km^2$ / Year but the actual rate is 30.20 Ha Meter / $100Km^2$ / Year. Domesticated animal grazing and Jhum Cultivation reduce organic materials in the soil making a cut in the water-holding capacity and of the same. Fast developmental activity in the upstream is another reason behind high siltation rate.
- Two canal emerges from this dam viz. Left Bank Canal and Right Bank Canal for meeting the irrigation requirement of the command area, This dam also meets up the drinking water requirement of Mumbai band Thane city.
- Land acquisition for the Bhatsa project was done in late 1960s. Now third generations of rehabilitated families are there. It is difficult to get the proper feedback to evaluate the improvement in livelihood. According to local people they got compensation for their house structures and agricultural land but no further assistance for livelihood has been provided by Govt.
- Local fishermen catching fishes from reservoir which are growing naturally within the reservoir. Fisheries dept. and water resource Dept. both has to take initiative for development of fisheries in a organized way. This can be helpful in both ways for economic and social point of view.
- There are few tribal villages in the downstream of the dam. According to the existing Acts and Policies they should be treated as a vulnerable group and proper rehabilitation and better assistance of livelihood is required for them.
- This place has a lot of potential which can be developed as a tourist place; Natural Scenic beauty of this place and well connectivity with Mumbai city can play a significant role to develop this place as a well known tourist place.
- Establishment of 10 KW Hybrid wind solar system at dam site has been proposed in DRIP.
- Entire catchment area of this reservoir falls within platue region of and mostly covered by Reserve forest. No catchment treatment plan is there for improvement of the catchment area. Forest Dept. and Water resource Dept. have to work together for development and protection of forest land in catchment area.
- No rainfall monitoring station is there in the catchment for measurement of the inflow from the upstream and prior information about inflow .

Recommendations & Suggestions:

- Structural Strengthening of the dam is required from safety point of view and better survival of the dam.
- Adequate number of rainfall monitoring station and proper information system should be developed to assess the inflow from the upstream in advance. Simultaneously proper Alarm system should be developed to minimize the impact of any type of disaster caused by the dam and related activities.
- Catch treatment is very much required to protect the forest and reduce the surface runoff. Improvement of the forest in the catchment area will improve the water quality.
- Proper system should be developed to maintain regulated release of water from the dam which can minimise flooding of areas located on the downstream.
- Strengthening of Alarm system is required for least impact on the downstream people due to flood.
- In the downstream of the dam there are few tribal village. Maharashtra Govt has declared these villages as tribal village so special care should be taken for upliftment of their livelihood as vulnerable group.

- Dam site can be developed as an ecotourism site. Its panoramic view and advantageous position will help a lot to promote such place. A part of revenue generated from tourism activity can also be used in dam maintenance.
- Promotion of fishing activities should be taken up within the reservoir. A part of revenue generated from the fishing activity should go to the Water Resource Dept. for maintenance purpose of the dam.
- Training and awareness programme required to make people aware about the various aspects related to the dam for optimum utilization of water.

Public Consultation & Meeting with Stakeholders: Bhatghar Dam

Place: BhorTaluka, Pune District

Venue: Dam siteand downstream villages

Date: 7th August, 2007 & 25 January 2008

Consultationwith Dam officials

Participants:

- **Mr. HinduraoTubaram**
  Sub Divisional Engineer

Nira Irrigation Sub Divission

- **MR. Y. K. CHOUGULE**
  Sectional Engineer, Bhatghar dam
- **MR. V. D. YADAV**
  Sub divisional Engineer

Baramati Irrigation Sub Division

- **Mr. P. R. Kulkarnin**
  Assistant Engineer

  Irrigation Research sub Division,
- **Mr. GorabhSawant**
  Sectional Engineer, Indrabati

  And
- **Local Villagers**
  Ms. S.S. Mahangre (Gram Sebak) and Others,

Hartari village

Consultationwith Villagers in Downstream

Issues Discussed:

- Intensity of rainfall and inflow from the upstream.

- Flooding problem in the downstream due to uncontrolled release of water from the dam.
- Embankment and carrying capacity of the river in the downstream.
- Structural aspects of the dam.
- Water Quality and Siltation Problem.
- Livelihood of the local people
- Distribution of water.
- Canal system of the dam
- Tourism potential at dam site.
- Hydro electric power generation.
- Land use pattern.
- Nature of the Catchment Area and catchment treatment plan.
- Rainfall monitoring stations and Alarm system.
- Environmentally sensitive areas in and around the dam site.
- Fishing activity within the dam.

Major findings of the meetings and consultation:

- Sudden release of water or heavy rainfall causes flood situation in relatively lower areas adjacent to the downstream. Loss of crops, property is a rare. Sometimes bridges in the immediate downstream are getting submerged due to huge release from the dam.
- This is a very old dam established almost 80 years before so technological aspect should be upgraded and strengthening is required for survival of the dam. Old gates needs to be replaced strengthening of the dam is required.
- Previously there was a smaller dam after construction of Bhatghar dam there is gradual deposition of debris between old and new dam.
- No canal is constructed from this dam. There is storage dam in the downstream from where canal is constructed for irrigation purpose. In the immediate downstream there is no canal network. People residing here have sense of deprivation that they are not getting sufficient water to maintain their livelihood.
- In immediate downstream of the dam irrigation facility has bee provided by lift system from the river but it is not adequate to meet the irrigation requirement.
- Water distribution system through canal is not proper. There is considerable amount of transmission and evaporation losses. Seepage problem is also there from the canal. Canal water is not distributed properly amongst the farmers.
- This place has a lot of potential which can be developed as a tourist place; Natural Scenic beauty of this place and well connectivity with Mumbai and Pune city can play a significant role to develop this place as a well known tourist place.
- Entire catchment area of this reservoir falls within Platue region and partially covered by forest. No catchment treatment plan is there for improvement of the catchment area.
- Inadequate number of rainfall monitoring station present on the upstream. Proper measurement of the inflow from the upstream and prior information about receiving of inflow is lacking.
- Fishing activity is carried out in the dam which is through lease system by Fisheries Dept. According to the potential It can be improved upto several times.

Recommendations & Suggestions:

- Structural Strengthening like cement grouting, Cleaning of sluices, Repair of old gates, Extension of guidewalls etc. are very much required. This is a very old dam proper rehabilitation measures need to be taken.
- Proper system should be developed to maintain regulated release of water from the dam which can minimise flooding of areas located on the downstream.

- Adequate number of rainfall monitoring station and proper information system should be developed to assess the inflow from the upstream in advance. Simultaneously proper Alarm system should be developed to minimize the impact of any type of disaster caused by the dam and related activities.
- Involvement of the local people is very much required in various activities related to the dam. This will facilitate the overall upliftment of the socio-economic condition.
- Dam site can be developed as an ecotourism site. Its panoramic view and advantageous position will help a lot to promote such place. A part of revenue generated from tourism activity can also be used in dam maintenance.
- Catchment area monitoring system and treatment plan should be developed to stop the degradation of the catchment area and simultaneously to develop the catchment area. Forest Dept. and Water resource Dept. have to work together for development and protection of forest land in catchment area.
- Promotion of fishing activities should be taken up within the reservoir. A part of revenue generated from the fishing activity should go to the Water Resource Dept. for maintenance purpose of the dam.
- Training and awareness programme required to make people aware about the various aspects related to the dam for optimum utilization of water.

Public Consultation & Meeting with Stakeholders: Pawana Dam

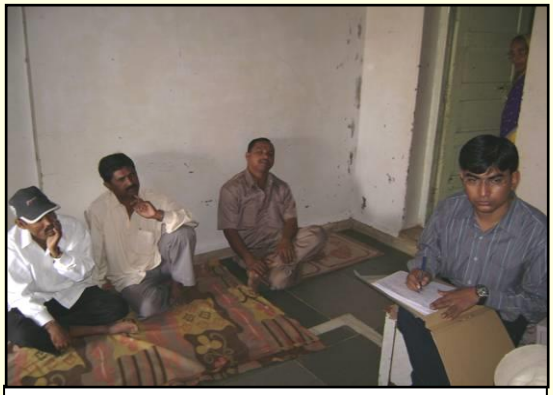
Place: Pune

Venue: Pawana Dam site and Downstream Villages

Date: 6th August, 2007 & 24th January 2008

Participants:

- **MR. ER. AVINASHSURVE**
  Superintending Engineer
- **Mr. Vijay Ghogore** Executive Engineer, (Pawana Dam)
- **V. G. PAGE**
  Junior Engineer And
- **Mr. Galial**
  Sub Divisional Engineer
- **Mr. Memane**
  Sectional Engineer
- **Local Villagers & farmers**



Consultationwith villagers in the downstream

Consultationwith the local people in the downstream

Mr. A.G. Kalekar, Mr. VitthalGovindKalekar, PanduRaoGovindKalekar, Village SavetiVashet,Mr. BaluRamji, **Village Mahagaon**

Issues Discussed:

- Intensity of rainfall and inflow from the upstream.
- Flooding problem in the downstream due to uncontrolled release of water from the dam.
- Embankment and carrying capacity of the river in the downstream.
- Structural aspects of the dam.
- Water Quality and Siltation Problem.
- Distribution of water.
- Canal system of the dam
- Livelihood of the local people
- Tourism potential at dam site.
- Hydro electric power generation.
- Land use pattern.
- Nature of the Catchment Area and catchment treatment plan.
- Rainfall monitoring stations and Alarm system.
- Environmentally sensitive areas in and around the dam site.
- Fishing activity within the dam.

Major findings of the meetings and consultation:

- River embankment is not so high so carrying capacity of the river is on lower side. Areas surrounding the river bed are often flooded during release of water from dam. Flood situation is restricted within small pockets which are lying adjacent to the river and relatively low land. Flood situation doesn't last for longer period.
- The maximum flood that can pass over the spillway is 44200 cusecs. Normally the bridges in the downstream are under the flood water when the discharge releases 5000 cusecs onwards.
- Consultation with the dam official some major structural problem of the dam has been identified, those are
  a. It is not possible to fill the reservoir upto its FRL due to heavy leakages in the dam
  b. Dam height was increased by 0.5 meter for more storage but height of the parapet wall was not increased subsequently. From safety point of view it is required to increase the parapet wall height.
  c. Increase the height of the sill, and extension of the guidewall is required.
- Siltation rate is very low i.e. less than 5% and Water quality of the reservoir is quite good which is used as a source drinking water.
- People in the downstream have a sense of deprivation. Their grievance is that they are not getting adequate water for irrigation in spite of residing immediate downstream of the dam. Agricultural requirement of water of the local people is fulfilled by lift irrigation from the river but this system is costlier and connections are not adequate to meet the irrigational requirement.
- Consultation with the local people reveals that project affected families received only compensation that time for displacement. Further assistance for better livelihood has not been provided by the Govt. After displacement occupational pattern has changed drastically. Due to scarcity of land and other leagal problem govt. is unable to provide agricultural land to most of

the displaced people. Now most of them are maintaining their livelihood as labour in different sectors.

- This place has a lot of potential which can be developed as a tourist place; Natural Scenic beauty of this place and well connectivity with Mumbai and Pune city can play a significant role to develop this place.
- Land use pattern of the downstream is changing drastically due to fast development and extension of the Pune city. Local people are more keen to sell their land at a high price instead of continuing agricultural activity on their land
- Alarm system is not satisfactory. During monsoon, many times it has been found round 'O' clock telephone communication, can't be possible due to higher intensity of rainfall and heavy winds, Thus for 'Alert' communication wireless set from poliece Dept. is requested each year to be installed in colony during monsoon.
- Entire catchment area of this reservoir falls within platue region of Pune district and mostly covered by forest. No catchment treatment plan is there for protection and improvement of the catchment area.
- No rainfall monitoring station present in the catchment from where rainfall date can be received in advance for better emergency preparedness.
- Fishing activity is carried within the dam facilitated by Fisheries Dept. through lease system. Local people or project affected persons don't have any sort of involvement in fishing activity.

Recommendations & Suggestions:

- Cement grouting and drilling of the dam is very much required to minimize the leakages and fill the dam upto its FRL. It will be helpful from safety point of view also.
- Extension of the guidewall and increase in the height of the sill is required to minimize the flooding effect in the immediate downstream and to protect the scouring of the stilling basin subsequently.
- Proper system should be developed to maintain regulated release of water from the dam which can minimise flooding of areas located towards the downstream.
- Roads and bridges in the downstream are getting submerged during flood situation. Height of the road and bridges in the downstream nee to be increased for uninterrupted communication during flood situation.
- Wireless station need to be established for better emergency preparedness and overall Alarm system should be developed to minimize the impact of any type of disaster caused by the flood.
- Adequate number of rainfall monitoring station and proper information system should be developed to assess the inflow from the upstream in advance.
- Land use in the downstream areas is changing rapidly. Agricultural lands are being converted into residential and commercial uses. To minimize flooding impact and loss of life, the potential hazard zone needs to be designated and taken care of during such development.
- Dam site can be developed as an ecotourism site. Its panoramic view and advantageous position will help a lot to promote such place. Part of the generated revenue from this tourism can also be used in dam maintenance.
- Catchment area monitoring system and treatment plan should be developed to stop the degradation of the catchment area and simultaneously further development of the catchment area. This will be helpful in both ways it will improve the water quality of the reservoir and will generate employment.
- Local people should get priority in use of dam water for their livelihood. Requirement for drinking water and agricultural use has to be fulfilled for their sustained livelihood.
- Promotion of fishing activity within the dam. Policy should be developed to facilitate the displaced people by involving them in the fishing activity within dam. A part of revenue generated

from the fishing activity should go to the Water Resource Dept. for maintenance purpose of the dam.

iv West Bengal

There are two projects in West Bengal, Sali Reservoir in Bankura district and BaraMandira Reservoir in Burdwan district. The public consultation involved discussion with Water Resources Department.

Issues Discussed:

- Data Availability, status of data acquisition and documentation
- Structures affected and/or situated at the potential hazard zones of the dam
- Forecasting and Alarm systems
- Environmental and Social issues and Resettlement and Rehabilitation at dam surrounding
- The dam safety issues related to the dam operation
- Problems regarding the O&M Matters of the dam
- Tourism Potential Around the Dam

Fishing Potential in the Reservoir .

Findings from the stakeholders Response and public consultation:

- The dam is situated at the origin of Saliriver, where three different streams of catchment meet and presently at the downstream the river Sali originates.
- The dam releases water to the d/s almost throughout the year and maintain the environmental flow, even in dry season, on demand from the villagers, water is released to facilitate cattle drinking,
- Three types of irrigation is provided by the dam – irrigation through canal system, Lift irrigation from the reservoir and River lift scheme at kankua village and Flooding through an additional outlet gate.
- Lift irrigation practices utilize even dead storage of the dam.
- The dam is a preferred habitat of waterfowls and has high potential of tourism development
- No Alarm system is present there at the dam site, although every year emergency dam release happens 5 to 7 times, due to sudden inflow.
- Even, the information dissipation system through local administration too has been found ineffective in the D/S during consultation with the villagers.
- No meteorological or any other data acquisition system except the water level gauging is present. The rainfall data is acquired from the raingauge of agriculture department at the nearest dam,
- There are 8 d/s and 3 peripheral villages,
- There is an uncontrolled outlet at FSL which opens at a peripheral village.
- There are areas of the embankment which needs strengthening,
- The spillway gates are operated manually,
- Fishing is not allowed for local people, until and unless there is a lease of fishing,
- Being at the higher side, although the peripheral people do not perceive any threat of flooding, but the residents at the D/S villages are scared of the same.
- High potential of tourism development is there due to the scenic beauty and position of the dam.
- Index map, DPR, Emergency Action Plan, dam break analysis, O&M Plan etc are not in order, hence it seems difficult to make any rapid action for planning
- WUA in the command in ineffective or absent.

- Any disaster preparedness training has been given neither to dam staffs and nor to local people residing at potentially high risk zone.

Recommendations & Suggestions:

- Electrification of the dam site is necessary for proper operation and maintenance of gates,
- The dam embankment needs to be strengthened and regular inspection of the same is most necessary,
- An well framed Alarm system should be installed for dam release intimation,
- Hydro-meteorological data acquisition system needs to be developed at the dam site,
- Disaster preparedness training should be given to the villages at potential hazard zones including dam peripheral villages and d/s villages,
- Tourism should be developed through a public private participation model in collaboration of irrigation and tourism department.
- The SAE of the dam is posted at Sonamukhi – 55 kms away of the dam site, which weakens the institutional working. This needs strengthening.

Meetings with Stakeholders and Public Consultation: Bara Mandira Reservoir

Place: Durgapur and Dam site

Venue: Offices at Durgapur and Bara Mandira Reservoir

Date: 9th August 2007, 20th February, 2008

Participants:

- **Mr. Abani Roy**
  ExecutiveEngineer
- **Mr. Shibojyoti Raja**
  SDO
- **Mr. SudiptoDutta**
  Sub-AssisstantEngineer
- **Mr. A.K. Gandhi**
  Gauge Operator,
- **Mr. MadhusudanGhosh&**
  Mr. NarahariGhosh

  Dam Operator (Khalasi)

- **Villagers**
  Kashkhuli village
- **Villagers**
  Rangabhitatribal village

Meeting with SDO, Baramandira dam

Consultation with SAE,& Dam operator

Public Consultation at Kashkhuli village

Public Consultation at Rangabhita village

Issues Discussed:

- Data availability, status of data acquisition and documentation
- Structures affected and/or situated at the potential hazard zones of the dam
- Forecasting and Alarm systems
- Environmental and Social issues and Resettlement and Rehabilitation at dam surrounding
- The dam safety issues related to the dam operation
- Problems regarding the O&M Matters of the dam
- Tourism Potential and Fishing Potential in the Reservoir and surroundings.

Findings from the stakeholders Response and public consultation:

- The dam has a very short command area no further extension of command is possible,
- The dam have very limited potential hazard zones,
- There are effective fishing practices in the dam reservoir, and the revenue is collected by the water resource department by leasing out the reservoir to fishing cooperative.
- There are peripheral villages at a higher elevation, hence no fear of submergence was observed.
- The spillway do not have any gate, hence the water pass out of the reservoir when ever the level reaches spillway crest level.
- But, not measurement of water release is possible.
- Seepage was found in the countryside of the dam embankment near LBMC.
- There are scouring in the country side of the dam embankment,
- The boulder walls need maintenance,
- High rates of weed growth was found in the embankment in reservoir side,
- Too little staff strength, only two Khalasi (unskilled dam operators) are deployed. The SAE and gauge operator are in charge of another dam called Puinnala.
- No Alarm system available
- No data acquisition and recording system is there,
- No communication system other than personal mobile of the Khalasi,
- Cattle cart movement on the earthen embankment threatening the dam safety is observed,

- No coordination with forest department. Lack of coordination between Forest, ZelaParishad and water resource department is a hurdle before proper tourism development, although the site has high potential for the same,
- The approach road condition is very bad,
- There is no alternative livelihood promotion schemes for the peripheral villages,
- No electrification at the dam,
- The JEN (SAE) of the dam is posted at Durgapur, 80 km from the dam,
- The local PS is situated at a distance of 20 km.
- There is a demand for winter irrigation, which can be done only if the height is enhanced by 2 to 4 ft. this enhancement will lead to inundation of several agricultural fields.
- No document including reservoir contour map, index map, reservoir boundary map, DPR etc is available for the dam, which is a massive constraint for improvement and rehabilitation of the dam.

Recommendations & Suggestions:

- People will benefit if lock gates of 3 feet are installed
- Training should be imparted to people for the formation of Water User's Association.
- The potential of fishery development should be explored as it would help in income generation of the local people.
- The potential of building up tourism around the around the dam sites needs to be examined further