DAM REHABILITATION AND IMPROVEMENT PROJECT (DRIP)
Phase II
(Funded by World Bank)

PERIYAR FOREBAY DAM
(PIC: TN12HH0018)

ENVIRONMENT AND SOCIAL DUE DILIGENCE REPORT

OCTOBER 2020

Tamil Nadu Generation and Distribution Corporation (TANGEDCO), Tamil Nadu

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FIGURES

ANNEXURES

ABBREVIATIONS AND ACRONYMS

AIDS	:	Acquired Immunodeficiency Syndrome
CA	:	Conservation Area
CCA	:	Culturable Command Area
COVID	:	Coronavirus Disease
CWC	:	Central Water Commission
DRIP	:	Dam Rehabilitation and Improvement Project
DSRP	:	Dam Safety Review Panel
E&S	:	Environment & Social
EAP	:	Emergency Action Plan
ESDD	:	Environmental and Social Due Diligence
ESF	:	Environmental and Social Framework
ESIA	:	Environmental and Social Impact Assessment
ESMF	:	Environment and Social Management Framework
ESMP	:	Environment and Social Management Plan
ESS	:	Environmental and Social Standard
GBV	:	Gender Based Violence
GIS	:	Geographic Information System
GRM	:	Grievance Redressal Mechanism
HIV	:	Human Immunodeficiency Virus
IA	:	Implementation Agency
IPF	:	Investment Project Financing
MCM	:	Million Cubic Meters
OHS	:	Occupational Health & Safety
PA	:	Protected Area
PDO	:	Project Development Objective
PICC	:	Poly Ironite Ceramic Cementitious Coating
PMF	:	Probable Maximum Flood
PPE	:	Personal Protective Equipment
PST	:	Project Screening Template
RET	:	Rare Endangered and Threatened
SC	:	Scheduled Castes
SCADA	:	Supervisory Control and Data Acquisition
SEA	:	Sexual Exploitation and Abuse
SEAH	:	Sexual Exploitation Abuse and Harassment
SEP	:	Stakeholder Engagement Plan
SF	:	Screening Format
SH	:	Sexual Harassment
SPMU	:	State Project Management Unit
ST	:	Scheduled Tribes
WB	:	World Bank
WQ	:	Water Quality

EXECUTIVE SUMMARY

The Periyar Forebay Dam constructed across Periyar Channel in Tamil Nadu, receives water from Mulla Periyar Dam through an interconnecting tunnel which is owned and maintained by TNWRD but situated in Kerala. The Dam is 88 m long and 37.80 m high. Dam acts as a forebay for Periyar Hydro Electric Project which includes 300 long power tunnel from dam to surge shaft, two numbers of pipes from surge shaft up to valve house and four numbers of Penstock pipes from valve house to Periyar Power House with an installed capacity of 2x35 and 4x42 MW. Dam was constructed to utilize the water share of Tamil Nadu and to supply for Power Generation at Periyar Power House. Water after power generation is utilized for irrigation and drinking water purposes of 5 districts. As per TNWRD 's irrigation demand, water is discharged through Power Tunnel after Power Generation in Periyar Power House and ultimately reaches Vaigai Dam. It has been proposed to undertake rehabilitation measures (structural civil & hydro-mechanical remedial works, electrical works and basic facility enhancement) under the proposed Dam Rehabilitation and Improvement Project (DRIP II) with a view to increase the safety and to strengthen dam safety management.

The Environment and Social Due Diligence has been conducted for decision-making on the sub-project with a view to identify, evaluate and manage the environment and social risks and impacts in a manner consistent with the World Bank ESF. ESDD has been carried out by studying the sub-project information and proposed interventions, assessing the magnitude of E&S risk and impacts with respect to key baseline data in immediate vicinity area. Stakeholder consultations with communities living downstream/vicinity of the dam, could not be held in the current circumstances due to COVID19 and these shall be held as soon as situation is conducive for holding such consultations.

Activity wise environment and social screening has been carried out to identify risks and impacts to classify the sub-project based on risk level (low, moderate or substantial and high) and recommend commensurate plans/measures to meet identified risks and impacts.

As per the ESDD exercise, risk/impacts that have been identified relate to Water Quality, Physical Environment, labour and SEAH/GBV. Environment risks of air, water, noise, land use, soil and resource use for all rehabilitation measures (structural civil & hydro-mechanical remedial works, electrical works and basic facility enhancement) are Low. However, environment and social risk of labour camp and disposal of debris has been identified as moderate. These risks are low to moderate and localised, short term and temporary in nature which can be managed with standard ESMP and guidelines. OHS is a substantial risk activity and is being treated separately through OHS plan in accordance with WB ESHS guidelines.

Since risks and impacts are low to moderate category, a standard ESMP customised to sub-project will be prepared in accordance with the ESMF. The customised ESMP will address the following:

- Gender Based Violence or SEA/SH related actions (ESS1)
- Labour Management Procedure (ESS2)
- Resource Efficiency and Pollution Prevention (ESS3)

- Community Health and Safety (ESS4)
- Stakeholders Engagement Plan (ESS10)

Overall, the proposed activities within this dam sub-project have low to moderate risks resulting in the overall sub-project to be categorized as Moderate risk category. These risks and impacts can be effectively mitigated with effective implementation of mitigation plans by SPMU/IA, Contractors and monitoring by EMC, SPMU and CWC.

Chapter 1 INTRODUCTION

1.1 PROJECT OVERVIEW

The proposed Dam Rehabilitation and Improvement Project (DRIP II) would complement the suite of ongoing and pipeline operations supporting India's dam safety program. The project development objective (PDO) is to increase the safety of selected dams in participating States and to strengthen dam safety management in India. Project Components include:

Component 1: Rehabilitation and Improvement of Dams and Associated Appurtenances (US$ 577.14 million);

Component 2: Dam Safety Institutional Strengthening (US$ 45.74 million);

Component 3: Incidental Revenue Generation for sustainable operation and maintenance of dams (US$ 26.84 million);

Component 4: Project Management (US$ 68.13 million).

Component 5: Contingency Emergency Response Component (US$ 0 million).

The project is likely to be implemented for 300 dams in 18 states across the country. The primary beneficiaries of the project are the communities that live in dam breach flood inundation areas and the communities that depend on water, irrigation and electricity services provided by the dams that could be compromised by poor dam performance or failure. In addition to saving lives, improved dam safety will avoid potential flood damage to houses, farm areas, infrastructure (roads, bridges, other public and private infrastructure) and industrial and commercial facilities. Improved dam safety will also reduce the likelihood of service interruptions due to dam failure as well as potentially improving dam service provision, overall efficiency and storage capacity, including during drought periods.

1.2 SUB-PROJECT DESCRIPTION – PERIYAR FOREBAY DAM

The Periyar Forebay Dam was constructed during the year 1953-58 across Periyar Channel in Tamil Nadu. It receives water from Mulla Periyar Dam through an interconnecting tunnel which is owned and maintained by TNWRD but situated in Kerala. The Dam is 88 m long and 37.80 m high. Dam acts as a forebay for Periyar Hydro Electric Project which includes 300 long power tunnel from dam to surge shaft , two numbers of pipes from surge shaft upto valve house and four numbers of Penstock pipes from valve house to Periyar Power House with an installed capacity of 2x35 and 4x42 MW.

Dam was constructed to utilize the water share of Tamil Nadu and to supply for Power Generation at Periyar Power House. Water after power generation is utilized for irrigation and drinking water purposes of 5 districts. As per TNWRD 's irrigation demand, water is discharged through Power Tunnel after Power Generation in Periyar Power House and ultimately reaches Vaigai Dam. This project is located in Theni District and is 135 km from Madurai.

Schematic plan of Periyar Hydro-electric scheme is shown in **Figure 1.1** below:

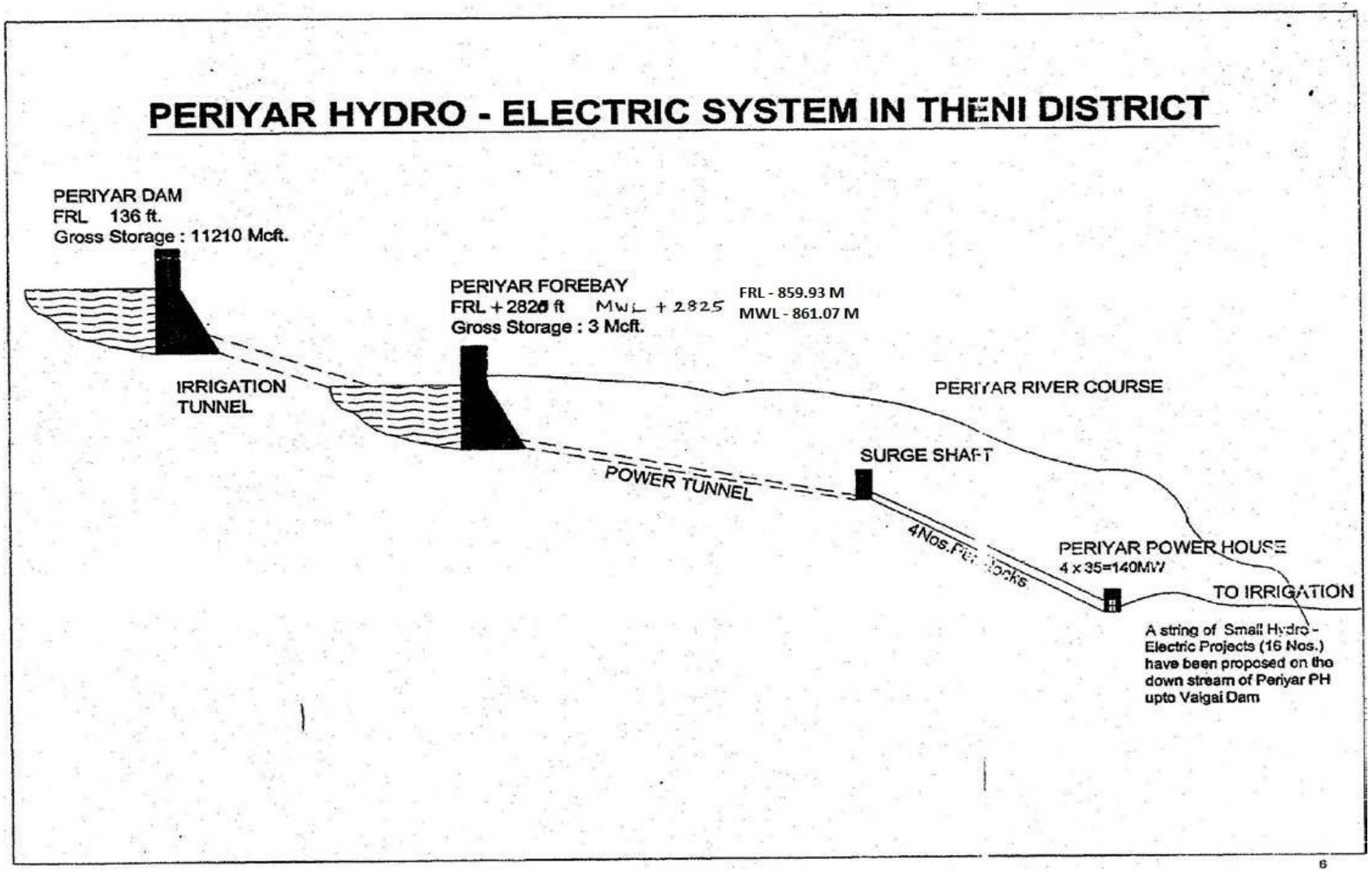


Figure 1.1: Schematic layout of Periyar Hydro-electric System

Salient features of the Periyar Forebay Dam project are reported below:

Project Name	PERIYAR FOREBAY DAM
River Basin	VAIRAVANAR
River/Stream	VAIRAVANAR
District	THENI
Latitude/Longitude	09^0 38’ 45’’ / 77^0 36’ 57’’
Type of Project	Hydro Power generation
Gross Command Area (GCA)	NA
Cultivable Command Area (CCA)	NA
Hydro Power Installed Capacity	2 x 35 MW and 2 x 42 MW
Average Annual Energy Generation (MU):	400 MU
Domestic/Municipal/Industrial Water Supply (Annual)	NA
Dam	
Type	Masonry Gravity
Total length of the Main dam	88 m
Length of Embankment dam	NA
Length of Masonry/Concrete dam	88 m
Top width of Embankment Dam	NA
Top width of Masonry/Concrete Dam	3 m
Elevation of top of Embankment Dam	NA
Elevation of top of Masonry/Concrete Dam	862.29 m
Elevation of top of Upstream Solid Parapet Wall	863.19 m
Height of Embankment Dam above Lowest River Bed Level	NA
Height of Masonry/Concrete Dam above deepest foundation level	37.8 m
Lowest River Bed Elevation	831 m
Deepest Foundation Elevation	824.49 m
Saddle Dam	NA
Spillway	
Type of Spillway	Ogee - ungated
Length of Spillway	13.72 m
Location of Spillway	Central spillway
Spillway Crest Level	859.93 m
Number of bays	3
Total Discharging Capacity at MWL	53.80 cumec
Spillway Gate	Ungated
Type of Hoist for Spillway Gates	NA
Type of Energy Dissipation Arrangement	Stilling Basin
Sluice Arrangement	NA
No. of Sluices & Sill Level (m)	1 No, 832.71 m
Size of Sluice	2.44 width & 3.05 m height
Discharging Capacity of Sluice at FRL	700 cusec
Reservoir	
Catchment Area at Dam site	1.95 sq km

Maximum Water Level	861.07 m
Full Reservoir Level	859.93 m
Minimum Draw Down Level	840.55 m
Gross Storage Capacity at FRL	0.0906 MCM
Live Storage Capacity	0.0906 MCM
Reservoir Spread Area at FRL	NA
Date of Starting the Construction	1953
Date of Completion	1958
Date of first full impoundment	1958
Original Inflow Design Peak Flood	53.80 cumec
Maximum observed flood peak and date	NA
Revised Inflow Design Peak Flood	60 cumec

1.3 PROPOSED INTERVENTIONS/ACTIVITIES AND INTENDED OUTCOMES

The Dam Safety Review Panel (DSRP), constituted for the purpose of inspection of the projects that the TANGEDCO plans to undertake for the repair, rehabilitation and modernization work under World Bank aided DRIP-II schemes, made a visit to Periyar Forebay Dam on 21/01/2020 for inspection purpose and recommended measure to improve the safety and performance of dam and associated appurtenances in a sustainable manner, and also to strengthen the dam safety institutional set-up.

The objectives of the project are to be achieved through investments for physical and technological improvement activities, managerial upgrading of dam operations, management and maintenance, with accompanying institutional reforms. The project will improve the safety and operational performance of dam and mitigate risks to ensure safety of downstream population and property. The following rehabilitation proposals as described in the PST have been formulated based on DSRP recommendations and these proposals form the basis for preparation of present ESDD report.

BASIC FACILITIES

- **Special repairs to**
    - BT road from Dam Junction to Surge shaft
    - Gauge Reader Room
    - Special Repairs to quarters
- **Standby Generators**

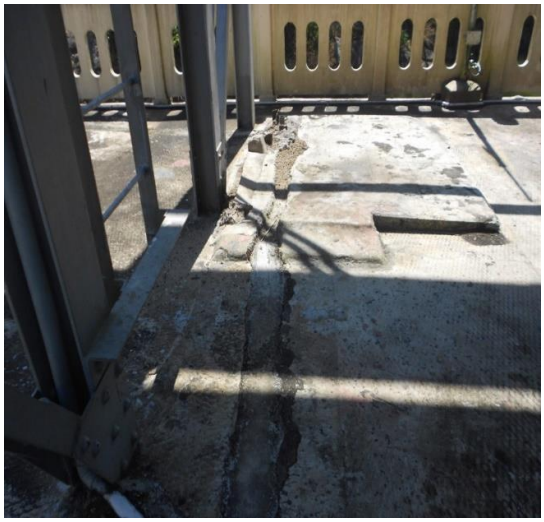
REMEDIAL WORKS

- **Standardization of Earthen bund**
    - Strengthening of earthen bund including weed removal/shrubs clearance
    - Repairs to aprons/ revetment
- **Special repairs to masonry portion of Dam**
    - U/s face treatment using PICC
    - Dam top screeding
    - Reaming the Choked Vertical and drainage shaft
    - Vertical Grouting for Apron
    - Approach Steps

- **Repairs to shutters**
    - Repairs/Replacement of operating Mechanism Platform roof for Tunnel and Scour vent gate.
    - Repairs/Replacement of Scour vent/Power Tunnel trash rack panels
- **Providing electrification to dams**
    - Lights on the approach road, buildings.
    - Electrification and lighting on the Office Maintenance
- **Earth slip Protection works**

Figures 1.3 and **1.4** provide photographs of key infrastructure proposed for rehabilitation works and also major interventions locations.

DSRP teamôs inspection of Periyar Fore bay dam



Screed concrete has been proposed to rectify the defects.

Screed concrete has been proposed to rectify the defects.

Damaged condition of the slope protections on the left flank of the offtake channel from the tunnel

Damaged condition of the slope protections on the left flank of the offtake channel from the tunnel

The left flank D/S earth portion without having protection from the slip

Gallery gate and the V notch fixed in the seepage outlet drain

calcinations deposits at vertical shaft holes

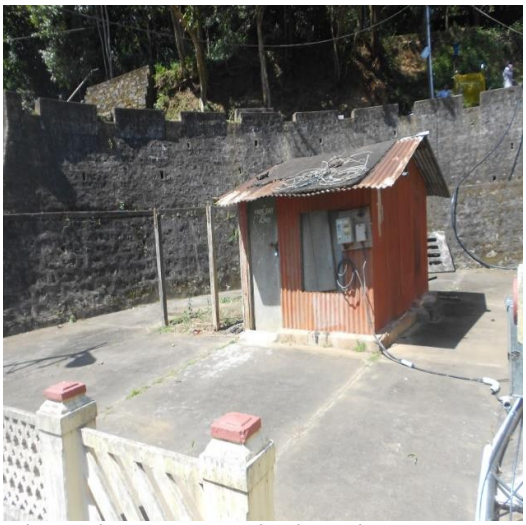
calcinations deposits at vertical shaft holes

The steps leading to scour vent to be constructed up to the scour vent.

Water oozing on left flank downstream side

Steps to be provided to lead up to power vent for regular maintenance and emergency works

The road leading to the surge shaft.



The damaged temperory water level recorder room.

damaged condition of slope protection works of the approach road due to the non-provision of weep holes

The earth slip adjacent to the slope protection work.

The damaged steps leading to the Power House from the valve house

The dilapidated condition of 2 AE type quarters and Civil office at Periyar lower camp

The dilapidated condit
ion of 2 AE type quarters and Civil office at Periyar lower camp

The Police guard room without the provision of wash room.

The DRIP office buildings to be upgraded with all improvements

Figure 1.2: Selected Photographs of Improvement/Intervention area

Figure 1.3: Project Area showing major intervention locations

1.4 IMPLEMENTATION ARRANGEMENT AND SCHEDULE

As can be seen from the list of activities proposed under dam rehabilitation project; these activities can be divided into civil works main package, other package and instrumentation. Civil work will be carried out by contractor(s) as these are labour intensive activities and would be completed over a period of 18 months. Dam Authority will hire contractor(s) based on national open competitive procurement using a Request for Bids (RFB) as specified in the World Bank's – Procurement Regulations for IPF Borrowers, July 2016, Revised August 2018 Procurement Regulations), and is open to all Bidders as defined in the Procurement Regulations. Following is the overall implementation and procurement schedule:

a) Overall Phasing of Project Implementation:

Proposed Starting of implementation (MM/DD/YYYY) : 10/2020
Proposed Ending of implementation (MM/DD/YYYY) : 04/2022
Implementation Duration (months) (MM) : 18 months

b) Timeline phasing of implementation:

Sl. No.	Description	From (month/year)	To (month/year)	Status of Procurement Process
1	Main package C M E works	10/2020	04/2022	Procurement process will be initiated after obtaining approval of the PST from World Bank.
2	Other Packages	NIL		
3	Procurement – instrumentation, goods, inspection vehicles	NIL		

1.5 PURPOSE OF ESDD

The overall project (DRIP II) was categorized as **High Risk** as per the internal Environment and Social Risk Classification of the Bank. The Environment and Social Due Diligence has been conducted to use it as a tool for decision-making on the sub-project with the following specific objectives:

i. To identify, evaluate and manage the environment and social risks and impacts of the sub-project in a manner consistent with the ESSs;
ii. To adopt a mitigation hierarchy approach to the project's E&S risks i.e. a) anticipate and avoid risks and impacts; b) minimize or reduce risks and impacts to acceptable levels, if not avoidable; c) once risks and impacts have been minimized or reduced, mitigate; and (d) where significant residual impacts remain, compensate for or offset them, where technically and financially feasible;
iii. To help identify differentiated impacts on the disadvantaged or vulnerable, if any, and to identify differentiated measures to mitigate such impacts, wherever applicable;
iv. To assess the relevance and applicability of environmental and social institutions, systems, laws, regulations and procedures in the assessment, development and implementation of projects, whenever appropriate; identify gaps, if any exist, and

v. To assess borrower's existing capacity, gaps therein, and identify areas for enhanced capacity towards management of E&S risks.
vi. Based on the categorization of Environment and Social risks and impacts of the Dam sub-project, to determine whether ESIA is to be carried out using independent third-party agency or a generic ESMP customized to mitigate E&S risks and impacts will suffice.

1.6 APPROACH AND METHODOLOGY OF ESDD

The following approach has been adopted for ESDD:

i. Study sub-project information, proposed interventions, their magnitude and locations and carry out assessment of each proposed intervention to identify the magnitude of E&S risk and impacts;
ii. Review relevance and applicability of national and state legal requirements and Bank's ESF policy, standards and directives and preliminary assessment of applicability of legal requirement and ESS framework (2-8)
iii. Conduct site visit to understand baseline environment and social settings, proposed activities under the sub-project, their location and sensitivity, if any.
iv. present key baseline data essential for impact assessment in immediate vicinity area of proposed interventions from secondary sources, such as land-use, protected areas in vicinity, ascertain presence of indigenous (schedule tribe)/vulnerable people, etc.
v. Undertake institutional assessment to identify existing capacities & relevant gaps to manage E&S risks and impacts
vi. Conduct preliminary stakeholder consultations to help identify potential stakeholders; to provide information on the proposed interventions; to identify issues and concerns; and ascertain appropriate mechanisms for continued engagement
vii. Carry out activity wise environment and social screening and identify risks and impacts. Classify the sub-project based on risk level (low, moderate or substantial and high) and recommend commensurate plans/measures to meet identified risks and impacts.

Stakeholder consultations with communities living downstream/vicinity of the dam, could not be held in the current circumstances due to COVID and these shall held as soon as situation is conducive for holding such consultations.

Chapter 2 INSTITUTIONAL FRAMEWORK AND CAPACITY ASSESSMENT

2.1 POLICY AND LEGAL FRAMEWORK

India has well defined environmental and social regulatory framework. The regulation applicability depends on nature of work and location of work. Broadly legislation can be divided into four categories viz environmental, forests, wildlife conservation and social. The applicability analysis of regulations pertaining to all the above four categories was carried out. The applicability of World Bank ESF comprising, 10 ESSs (ESS1 to ESS10) to the proposed rehabilitation proposals and Standard specific requirements were analysed. Further, a comparison of national environmental and social regulations versus World Bank's ESS has been carried out along with the gap analysis. Applicability of Indian regulations, World Bank's ESS along with comparison and gap analysis is discussed in ESMF.

Central Water Commission, Ministry of Jal Shakti, Government of India has prepared "Operational Procedures for Assessing and Managing Environmental Impacts in Existing Dam Projects" and is under publication as a guiding document for the dam owners to systematically address in advance the environmental safeguard requirements and have discussed in detail all applicable legal requirement. Reference has been drawn from this document as well, while carrying out applicability analysis.

Indian environmental regulations requiring environment clearance is for new dam projects specifically for the purpose of hydropower generation and/or irrigation projects and vary with generation capacity for hydropower projects and culturable command area served by irrigation projects. Forest related clearances become applicable, if new or any modification in any existing project requires diversion of forest land for non-forestry purposes. Wildlife Clearance process gets triggered if the project is in proximity to protected area or activities are proposed within protected or conservation areas (CA).

As none of the above discussed clearance requirements are applicable to the proposed dam rehabilitation activities at Periyar Forebay dam, regulatory clearances will not be applicable as per Indian regulation. Another applicable regulatory requirement is discussed in ESMF.

2.2 DESCRIPTION OF INSTITUTIONAL FRAMEWORK

The sub-project will be implemented by Tamil Nadu Generation and Distribution Corporation, Government of Tamil Nadu. TANGEDCO being responsible for power generation, transmission and distribution; have a well-established customer complaint system for power consumer; where they can register their complaints 24x7 on dedicated line (1912). It also has a 24x7 Chairman's complaint cell with phone number and whatsapp numbers. In addition, it has established a Consumer Grievance Redressal Forum, where consumers can register complaints online/manually, directly or through a representative to

be resolved within a period of 60 days; with a provision of filing appeal in next 30 days if the complainant is not satisfied with the redressal.

Tamil Nadu Generation and Distribution Corporation Limited do not have in-house expertise to address E&S issues. As per the suggestions of CPMU/CWC, it is proposed to outsource consultancy services of Environmental and Social experts to assist TANGEDCO in resolving E& S issues. SPMU will designate Nodal Officer(s) (full time in-house engineering staff with E&S expertise) to coordinate and supervise E&S activities. They shall be at the level of Executive Engineer/ Deputy Directors and shall provide commensurate time to comply with E&S related activities. Brief TORs for these Nodal E&S officers is included in ESMF. The SPMU, in case in-house expertise not available, will hire the qualified staffs on need basis to support management of E&S risks including Environmental and Social Experts for ensuring compliance with the Bank's ESF and ESS's and ensuring that these activities shall be implemented as per the procedures.

A Grievance Redress Mechanism (GRM) will be established and operated by the contracted agencies to address Project workers workplace concerns. SPMU will have oversight responsibility on the functioning of the GRM.

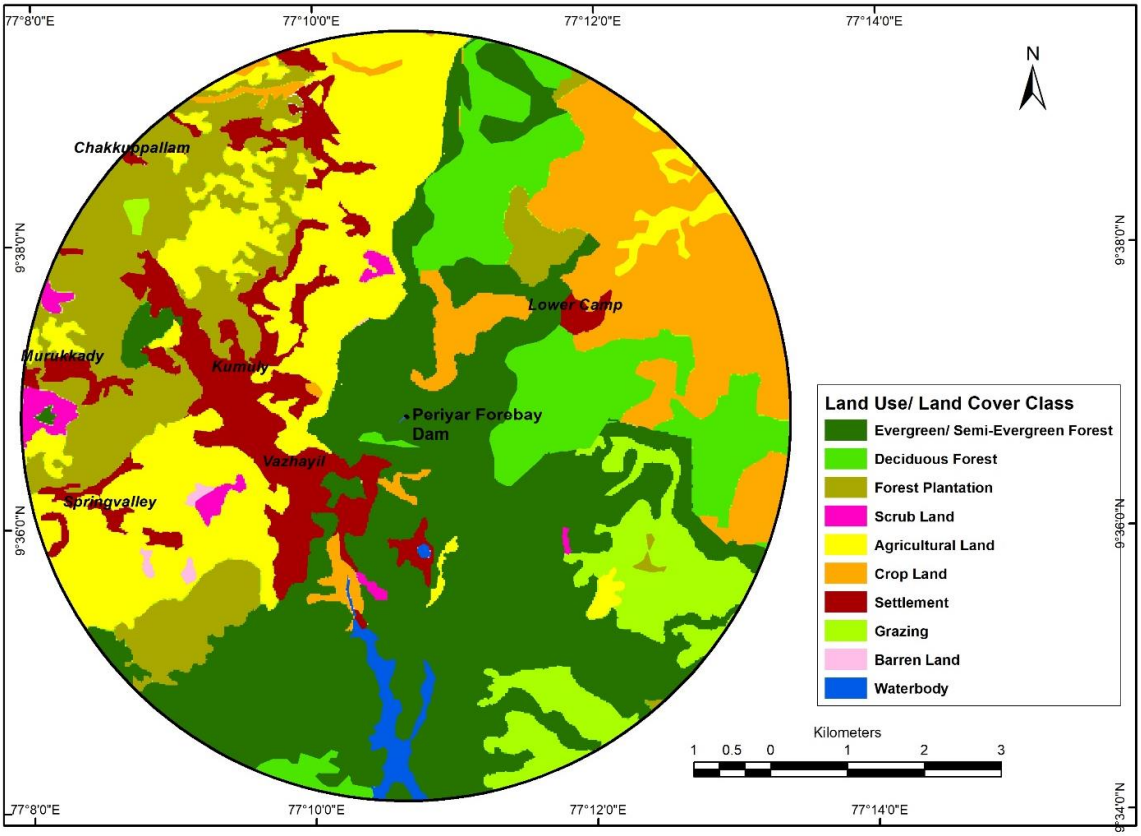
Chapter 3 ASSESSMENT OF ENVIRONMENTAL AND SOCIAL CONDITIONS

Assessment of physical, ecological and socio-economic conditions at dam site and immediate surrounding has been carried out based on secondary information and site observations; as discussed below.

3.1 PHYSICAL ENVIRONMENT

Land Use/Land Cover

The project surrounding area's land use and environmental sensitivity was analyzed using GIS techniques. Land use/ land cover map within 5 km radius of dam is presented at **Figure 3.1**. Present land use is mainly evergreen/Semi-evergreen forest, forest plantation, deciduous forest, agricultural land, crop land, settlements, water bodies and scrub land etc. There are big habitations or villages falling in 5 km of radius of the Periyar Forebay Dam location: Kumily, Vazhayil, Springvalley, Mukukkady, Chakkuppallam & Lower Camp.



[(Source: Digital data on land use/land cover maps using bhuvan prepared by National Remote Sensing Centre (NRSC) with Institute of Remote Sensing College of Engineering Anna University along with further refinement using Google Earth]

Figure 3.1: Land Use and Land Cover Map of 5 km radius around Dam site

Natural Hazards

Potential of natural hazards such as flooding and earthquake has been assessed.

Gross storage capacity of Periyar Forebay Dam is 0.091 MCM and the hydraulic height of dam is 30.07 m (Between 12 m and 30 m), it qualifies for Project Maximum Flood (PMF) as per Indian Standard IS: 11223-1985 criteria for fixing spillway capacity. The Original Design flood is 53.80 cumec at original MWL of 861 m. The revised flood worked out by CWC is 60 cumec. The free board in the original design for MWL condition is 1.29 m (Top of dam 862.29 m - MWL 861 m). As per the flood routing studies carried out for the revised design flood of 60 cumec, the revised MWL is 861.38 m hence, available freeboard in case of revised flood, is 0.93 m which is less than minimum 1.50 m required as per codal provisions. However, elevation of top of Upstream Solid Parapet Wall is 863.19 m thus providing additional 0.9 m above Top of dam.

Project falls in earthquake zone III, and same was considered at the time of design and there is no need for seismic design review. The Bureau of Indian Standards [IS 1893 (Part I):2002], has grouped the country into four seismic zones, viz. Zone II, III, IV and V. Zone II is the least active and Zone V is the most active.

3.2 PROTECTED AREA

Protected areas near Periyar Forebay dam have been reviewed to assess the impact of rehabilitation work on ecologically sensitive habitats. Dam is located in proximity to Periyar tiger reserve, however, it is about half a kilometre (shortest aerial distance) outside the boundary.

Periyar tiger reserve is in Kerala state spread over Idukki, Kottayam and Pathanamthitta Districts of Kerala. The Reserve is spread over an area of 925 square kilometres of which 881 square kilometres are critical tiger habitat and 44 square kilometres are buffer zone. Periyar Tiger Reserve situated in the Cardamom Hills and Pandalam Hills of the Southern Western Ghats forms the catchment of River Periyar and River Pamba. It harbours diverse array of rare, endangered and endemic biodiversity, including 66 species of mammals, 323 bird species, 48 reptile species, 29 amphibian species, 45 fish species, 167 butterfly species, 30 odonate species and nearly 2000 species of flowering plants.

Nearest boundary point of Periyar tiger reserve to the dam is on the hill where the reserve boundary meets the interstate boundary. Dam is located on Periyar channel in Tamil Nadu away from hill at the shortest aerial distance of about 500m. It is also outside the proposed ESZ of Periyar Tiger Reserve and none of the routes to dam cross the tiger reserve, therefore no permission/clearance would be applicable for rehabilitation work.

Further, the proposed rehabilitation activities are very much localized at the existing Dam site only. No rehabilitation work is proposed beyond the dam boundary, which can directly or indirectly impact the tiger reserve. Access road to dam is connected through Kollam Theni Highway in Tamil Nadu and do not cross the reserve area. There is densely populated Vazhayil village located between dam and the boundary of Tiger Reserve.

Keeping the above discussion in view, it is concluded that the rehabilitation work at dam can not directly or indirectly impact the tiger reserve area. Location of Periyar Tiger reserve wrt to Periyar Forebay Dam is given at **Figure 3.2**.

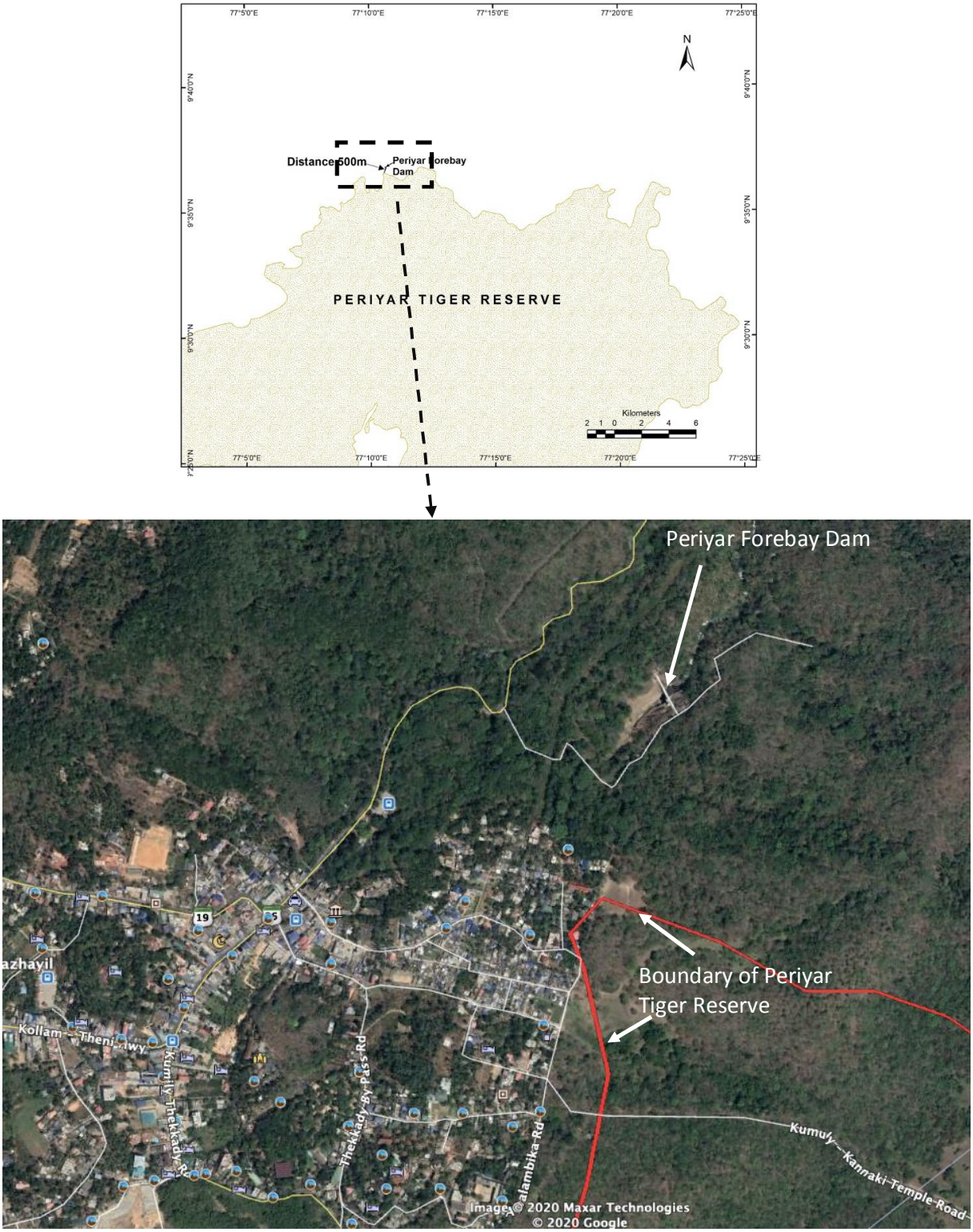


Figure 3.2: Dam location wrt Periyar Tiger Reserve

3.3 SOCIAL ENVIRONMENT

The **Periyar Forebay Dam** is located in the Theni district in the state of Tamil Nadu. The state has no any Schedule V[1] Areas.

The Theni district was enacted after bifurcation from the Madurai district on 25/7/96 and initially it was named as **Veeran Azhagumuthu** district with the headquarters at Theni. Later the district is renamed as Theni district from 01/07/97**.**

The district is divided into two Revenue Divisions namely Uthamapalayam and Periyakulam and five Talukas/Tehsils namely Bodinayakkanur, Periyakulam, Theni, Uthamapalayam and Andipatti. There are six (06) Municipalities and 22 Town Panchayats. The district consists of Eight (08) Community Development Blocks and 98 Revenue Villages, out of which 80 villages are inhabited and remaining 18 villages are un-inhabited.

The economy of the district is dependent on agricultural activities & resources. The climate of the district is favourable for cultivation of Paddy, Sugarcane, Cotton, Vegetables and Spicy products. Major horticulture crops cultivated in the district area mango, banana, grapes, guava and aonla, tropical vegetables like ladies finger, tomato, brinjal, onion, temperate vegetables like cauliflower, beetroot and knol-khol, spices and condiments like pepper and cardamom and plantation crops like coffee and tea.

Apart from agricultural activities, people of the district doing various business or industrial activities like cotton ginning, extraction of oil from various oil seeds, cotton and chilly trading etc. Handloom weaving is the also a major household industry in the district.

The brief demographic characteristic of the district is given in the table below:

No. of Households	**3,38,112**	**Household Size**	**4**
Total Population	**12,45,899**	**Population (0-6 age)**	**1,19,661 (9.60%)**
Male	6,25,683	Boys (0-6 age)	61,873
Female	6,20,216	Girls (0-6 age)	57,788
Sex Ratio	991	Sex Ratio (0-6)	934
Population (SC)	**2,58,200 (20.72%)**	**Population (ST)**	**1,835 (0.15%)**
Male	1,29,900	Male	954
Female	1,28,300	Female	881
Literates	**8,70,080**	**Literacy Rate (in %)**	**77.26**
Male	4,79,403	Male	85.03
Female	3,90,677	Female	69.46
No. of Workers	**5,91,642 (47.49%)**	**Cultivators**	**38,367** (6.48%)
Male	3,68,900 (62.35%)	**Agricultural Labours**	**3,15,161** (53.27%)
Female	2,22,742 (37.65%)	**Household Industrial Workers**	**14,939** (2.53%)
No. of Main Workers	**5,30,591 (89.68%)**	**Other Workers**	**2,23,175** (37.72%)
No. of Marginal Workers	**61,051 (10.32%)**		
			Source: *Census of India, 2011 (District Handbook)*

[1] **Scheduled Areas** are **areas** in India with a preponderance of tribal population subject to a special governance mechanism wherein the central government plays a direct role in safeguarding cultural and economic interests of **scheduled** tribes in the **area**.

According to Census of India 2011, the district has total population of 12,45,899 out of which 50.22% are male and 49.78% are female with sex ratio of 991 which is lower than the state sex ratio (996). The population density in the district is 434 persons per sq km. In the district, 9.60% population belongs to 0-6 age group with the sex ratio of 934 girls per 1000 boys.

The district has literacy rate of 77.26% which is lower than that of the State average of 80.09%. The male literacy rate is 85.03% and female literacy rate is 69.46%, thus a gender gap in literacy rate of 15.57% in the district.

In the district, the Scheduled Caste and Scheduled Tribe population is 20.72% and 0.15% respectively to the total population.

Work participation rate of the district has been observed as about 47.49% and gender gap in work participation rate is 24.70%. Out of the total work force in the district, 89.68% are Main Workers and 10.32% are Marginal Workers. About 6.48% of the workers are cultivators and 53.27% are agricultural labourers. About 40.25% of work force is engaged in other than agricultural activities including 2.53% household industrial workers.

3.4 CULTURAL ENVIRONMENT

List of National Monuments in Tamil Nadu and list of State Protected monuments in Tamil Nadu have been reviewed. There are protected monuments identified by Archaeological Survey of India however none of them are in the vicinity of the project

Chapter 4

ACTIVITY WISE ENVIRONMENT & SOCIAL SCREENING, RISK AND IMPACTS IDENTIFICATION

4.1 SUB-PROJECT SCREENING

The subproject screening is undertaken following a three step screening methodology as described in ESMF. Process of risk /impacts identification is done using screening process considering the proposed interventions at each dam as provided in the Project Screening Template using first screening format (SF-1). Applicable interventions are further classified based on their location i.e. within dam area or outside the dam area. Each activity is reviewed for the applicability under-sub project, location of applicable activity and likely risks and impacts. The SF-1 format is used to ascertain the types of E&S risks for each of the proposed rehabilitation activity e.g. Risk/Impact on Water Quality, Fisheries, Conservation Area, Protected Area, Ecology, Physical Environment, Cultural Environment, Tribal Presence, Private Land/Assets/Encroachers/Squatters, Labor, Migrant Labor and GBV risks – each of these corresponding to the ESS 2-8.

The second format (SF-2) is used to assess the extent of risk/impact intensity for each of the identified E&S risk and is used to categorize the risk level as Low/Moderate/Substantial/ High. Finally, using a third E&S risk summary format (SF-3), the risk categories for all different types of E&S risk and impacts is summarized and the highest of the risk categories is assigned as overall risk category for the given Dam sub-project. Based on the above findings, the ESDD report recommends Risk category of the Dam sub-project – whether it is Low/Moderate/Substantial/High and types of instruments that need to be prepared as part of the ESMP along with the responsibilities and timelines.

Outcome of three stage screening exercise is discussed below.

Step I Screening (using Form SF-1): Sub-Project Component, Construction Support Preparatory Intervention related vs Nature of Risk/Impact

Screening indicated that all project components related activities are limited to within the dam area/premises. Due to nature of these activities, likely impacts will be on physical environment in terms of air pollution, noise pollution and waste generation. None of the proposed structural interventions involve acquisition of private land and/or private assets. These activities in no way cause restriction on access to land or use of resources by local communities and there is no economic displacement envisaged due to the sub-project. Activities interfacing with water bodies – river/reservoir will have risk of spillage of chemicals, construction material, and debris leading to water pollution and impacts on fishes.

Pre-construction and construction stage major auxiliary or preparatory intervention are within dam area as well as beyond dam area. Deployment and haulage of heavy machinery, setting up of workshop, operation of concrete mixture and heavy pumps will be within dam area. Other activities such as labour camp and debris disposal will be beyond dam area. Activities involving machinery and equipment will have impacts on physical environment. Transportation of material, debris disposal and labour camp are likely to generate pollution and impact on physical environment.

Project will involve project managers and supervisors, contracted workers – these would also include migrant workers as all the required labour will not be fully supplied locally for a number of reasons, such as worker's unavailability and lack of technical skills and capacity. Construction contractors are expected to stay at/near dam, set up construction equipment and machinery near work location at pre-determined/approved sites. Influx of skilled migrant labour, albeit few in numbers, for construction works is likely. The labour will stay outside the dam premises; hence risk of SEA/SH is likely.

Output of this screening is enclosed as **Annexure I**.

Step II Screening (using Form SF-2): All applicable activities identified as having potential risks/impacts that were identified through Step I screening, are further screened for associated sub-activity and evaluated for the extent of risk. Sub-activity's Risk/Impact intensity is further categorised as Low (L), Moderate (M), Substantial (S) or High (H) based on following criteria:

Low	:	Localized, Temporary and Negligible
Moderate	:	Temporary, or short term and reversible under control
Substantial	:	Medium term, covering larger impact zone, partially reversible
High	:	Significant, non-reversible, long term and can only be contained/compensated

Each activity may have different type of risks/impacts and magnitude of separate risk may vary, as analysed under SF2. In SF2, each proposed rehabilitation activity is assessed for the nature of risk on various components of environment and social (based on SF1, Column 5) and then each one of these is separately evaluated for level of risk as Low, Moderate, Substantial or High; the highest risk level is recorded in column 5 of SF2 for each activity.

Occupational Health and safety: OHS is a substantial risk activity in almost all cases and is not being considered under screening criteria. Occupational health and safety is considered an important requirement of every project irrespective of size and type of the projects. It will be part of Contractor's ESMP.

Analysis of extent of risk/impact for sub-activities resulted in identification of all rehabilitation activities (structural civil & hydro-mechanical remedial works, electrical works and basic facility enhancement) as having Low Risks/impacts whereas, Labour Camp and Debris Disposal is categorised as Moderate risk.

E&S risks of none of the sub-activities for this sub-project is categorized as either Substantial or High risk. **The outcome of Screening is enclosed as Annexure II.** In case of GBV/SEAH, this site was assessed as Low risk. Based on consideration of all the above, summary of Risk/Impact (as per outcome of SF-2) is summarised for major sub-project activities under **Table 4.1 below.**

Table 4.1: Summary of Identified Risks/Impacts in Form SF-3

Project Activity	Environment Risks						Social Risks				
	Air, water, noise, land use, Soil, Resource use	Pollution downstream and upstream	General Ecology	Protected Area (Wild Life Sanctuaries, National Park and other natural habitat even if not protected)	Other RET species (flora and fauna) outside protected areas	Fish and Aquatic life within dam water body	Land	Tribal	Labour	Cultural heritage	GBV/SEAH
Civil (within Dam Boundary)	L	L	L	None	None	L	L	L	M	None	L
Hydro Mechanical	L	L	L	None	None	L	L	L	M	None	L
Instrumental SCADA, surveillance	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Painting	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Road work	L	L	L	None	None	L	L	L	M	None	L
Safety measures (Siren, Lighting)	L	L	L	None	None	L	L	L	L	None	L
Major Civil Work like Additional Spill Way	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Major Hydraulic Structure (tunnelling)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Major Civil Work extending beyond Dam Area Like training Structure	L	L	L	None	None	L	L	L	M	None	L
Additional activities for Tourism /Solar/Fisheries/ Water recreation enhancement	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Criteria for Risk Evaluation:

Low: Localized, temporary and Negligible

Moderate: temporary, or short term and reversible under control

Substantial: medium term, covering larger impact zone, partially reversible

High: significant, non-reversible, long term and can only be contained/compensated

Occupational Health and safety: OHS is a substantial risk activity in almost all cases and is being treated separately through OHS plan in accordance with WB ESHS guidelines and shall be applicable to all sub-projects. Hence is not being considered under screening criteria.

4.2 STAKEHOLDER CONSULTATION

In light of the COVID 19 pandemic, that constrained holding of consultation meetings; stakeholder consultations could not be carried out. As soon as the situation becomes conducive, stakeholder consultations will be organized and report updated.

4.3 DESCRIPTIVE SUMMARY OF RISKS AND IMPACTS FROM ACTIVITIES BASED ON SCREENING

Based on the above screening analysis, potential impacts and risks from the sub-project are summarised below:

Environmental Impacts and Risks

1. Environment risks and impacts, as assessed above, for various project activities under this sub-project are categorised as Low and Moderate due to localised nature of proposed activities i.e. activities remain limited to dam area except for labour camp and muck/debris disposal.
2. Execution of civil and hydro-mechanical work within dam body will generate localised impacts on physical environment and resource use; pose risk of exposure of workers requiring personal protective equipment (PPE) use.
3. Civil work interfaced with water body pose risk of water pollution and impact on fish fauna.
4. Construction waste and muck from repairs to approach steps, road from dam to surge shaft, repair of quarters, u/s face treatment of dam etc require careful disposal at pre-identified and approved site to minimise the risk of pollution on this count.
5. There may be slight impact due to civil and hydro-mechanical works on ecology especially fauna due to proximity of tiger reserve.
6. Rehabilitation work would require labour to work on various sections of dam involving working at height, working in confined spaces, working on reservoir side, etc; Further, workers will also be exposed to dust and noise and will have to handle chemicals/gases for some of the works; these will lead to occupational health and safety risks.

Social Impacts and Risks

1. As the interventions are within the dam premises and on the dam structure, there shall be no adverse impacts on land and assets due to any sub-component or sub-activities
2. The dam is not located in the Schedule V area. There are no habitations in the vicinity of dam.
3. Influx of migrant labour will be low as these works require only few but very skilled labour. Also, these workers will mostly operate from labour camps within the dam premises/proximity and hence there would be minimal interface with communities and therefore significantly lower SEAH/GBV risks.
4. Waste generation from labour colony can pollute drinking water sources of community, risk is low and can be mitigated by providing adequate sanitation facilities.
5. No impacts are envisaged on cultural heritage as no such sites ate identified in project vicinity.
6. Labour related risk would include:

- Safety issues while at work like injuries/accidents/ fatalities leading to even death, while at work; Occupational health and safety risks due to exposure of workers to unsafe conditions while working at heights, working using lifts, handling of equipment and machinery, exposure to air and noise pollution etc. will be addressed through OHS guidelines.
- Short terms effects due to exposure to dust and noise levels, while at work
- Long term effects on life due to exposure to chemical /hazardous wastes
- Inadequate accommodation facilities at work force camp, including inadequate sanitation and health facilities
- Sexual harassment at work
- Absence or inadequate or inaccessible emergency response system for rescue of labour/workforce in situations of natural calamities.
- Health risks of labour relating to HIV/AIDS and other sexually transmitted diseases
- Non-payment of wages
- Discrimination in Employment (e.g. abrupt termination of the employment, working conditions, wages or benefits etc.)
- Unclear terms and conditions of employment
- Discrimination and denial of equal opportunity in hiring and promotions/incentives/training opportunities
- Denial for workers' rights to form worker's organizations, etc.
- Absence of a grievance mechanism for labour to seek redressal of their grievances/issues

Chapter 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

5.1.1 Risk Classification

As per the ESDD exercise, risk/impacts that have been identified relate to Water Quality, Physical Environment, labour and SEAH/GBV. The summarised environmental and social risks of identified activities with level of risk is presented in previous chapter. Environment risks of air, water, noise, land use, soil and resource use for all rehabilitation measures (structural civil & hydro-mechanical remedial works, electrical works and basic facility enhancement) are Low. However, environment and social risk of labour camp and disposal of debris has been identified as moderate. These risks are low to moderate and localised, short term and temporary in nature which can be managed with standard ESMP and guidelines.

Hence the overall risk of this sub-project Dam is categorized as Moderate. OHS is a substantial risk activity and is being treated separately through OHS plan in accordance with WB ESHS guidelines.

5.1.2 National Legislation and WB ESS Applicability Screening

The applicability analysis of GOI legal and regulatory framework indicates that while, there are various legislation which will have to be followed by the contractor for the protection of environment, occupational health and safety of workers and protection of workers and employment terms. None of Indian legislation is applicable warranting obtaining clearance prior to start of construction/improvement work.

In addition to overarching ESS1, four ESS standards are found relevant to this sub-project as per reasons given in **Table 5.1** below:

Table 5.2: WB ESF Standards applicable to the sub-project

Relevant ESS	Reasons for Applicability of the standard
ESS2: Labour and Working Conditions	Due to engagement of Direct worker, Contracted workers and Community workers (likely for EAP and other non-structural interventions) for rehabilitation work
ESS3: Resource Efficiency, Pollution Prevention and Management	Civil and hydro-mechanical work including resource consumption; requiring protection of physical environment and conservation of resources
ESS 4: Community Health and Safety	Rehabilitation work, although limited to dam complex, can increase community exposure to risk and impacts; directly or indirectly.
ESS 10: Stakeholder Engagement Plan	For engagement of stakeholders in all structural and non-structural measures e.g. implementation of Early flood Warning system, siren systems, broadcasting facilities, Emergency Action Plan etc.

5.2 RECOMMENDATIONS

5.2.1 Mitigation and Management of Risks and Impacts

Since risks and impacts are low to moderate category, a standard ESMP customised to sub-project will be prepared in accordance with the ESMF. It shall cover the following aspects:

a. SPMU shall customise the standard Environmental and Social Management plan (ESMP) that has been provided in the Environmental and Social Management Framework (ESMF) and make it part of bid document for effective adherence by contractors.

b. ESMP will provide due measures for labour management and protection of environment quality and resource conservation (during handling of resources) in line with ESF standard ESS2 and ESS3 respectively. Likewise, due attention will be given to Occupational Health and Safety of workers and community in line with the requirements of ESS4 and World Bank Group guidelines on Occupational Health and Safety (OHS). SPMU/IA shall customise the standard ESMP in line with outline provided in the ESMF and ensure its adherence by contractor. The customised ESMP will address the following:
    - Gender Based Violence or SEA/SH related actions (ESS1)
    - Labour Management Procedure (ESS2)
    - Resource Efficiency and Pollution Prevention (ESS3)
    - Community Health and Safety (ESS4)
    - Stakeholders Engagement Plan (ESS10)

c. Contractor shall submit BOQ as per ESMP of the sub project.

Mitigation plans to meet requirements for relevant Standards with responsibility and stages are given in **Table 5.2** below:

Table 5.3: List of Mitigation Plans with responsibility and timelines

WB-ESS Triggered	Mitigation Instrument	Responsibility	Timelines
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	• Gender Based Violence or SEA/SH related actions	SPMU/IA	Before mobilization of contractor
ESS2: Labour and Working Conditions	• Labour Management Procedure (LMP) including OHS management plan	SPMU/IA	Before mobilization of contractor
ESS3: Resource Efficiency, Pollution Prevention and Management	• Pollution Prevention and Environment Quality Management Plan (PPEQMP)	SPMU/IA	Before mobilization of contractor
ESS 4: Community Health and Safety	• Community Health and Safety Management Plan	SPMU/IA	Before mobilization of contractor

WB-ESS Triggered	Mitigation Instrument	Responsibility	Timelines
	(CHSMP)		
ESS 10: Stakeholder Engagement Plan	• Stakeholder Engagement plan	SPMU/IA	By negotiation

ESDD and ESMP will be placed on the www.damsafety.in website as well as other accessible locations such as the office of Engineer in Charge at Dam site as well at SPMU for reference and record. These documents would be disclosed/disseminated through other appropriate means like project meetings, workshops etc. Each IA will translate these documents in their local language, if required, and will upload in their respective websites and also make available at other accessible locations.

5.2.2 Institutional Management, Monitoring and Reporting

ESMP will be customized for the sub project by SPMU/IA from standard ESMP included in ESMF and shall be shared with CWC by SPMU for their review/endorsement and approval before including in the bid document.

SPMU/IA will designate Nodal Officer(s) (full time in-house engineering staff with E&S expertise) to coordinate and supervise E&S activities. They shall be at the level of Executive Engineer/ Deputy Directors and shall provide commensurate time to comply with E&S related activities. Brief TORs for these Nodal E&S officers is included in ESMF. The SPMU, in case in-house expertise not available, will hire the qualified staffs on need basis to support management of E&S risks including Environmental and Social Experts for ensuring compliance with the Bank's ESF and ESS's and ensuring that these activities shall be implemented as per the procedures.

SPMU/IA shall advise contractors about applicable legislative requirements and ensure that contractors prepare its own ESMP (C-ESMP) as outlined in ESMP for this sub-project and submit compliance reports to SPMU/IA on quarterly basis. SPMUs will share regular implementation status of ESMPs to CWC and The World Bank in line with ESMF on quarterly basis.

SPMU/IA shall establish and operationalize a grievance mechanism to receive and facilitate resolution of complaints and grievances, from the communities and other stakeholders including implementation partners. GRM works within existing legal and cultural frameworks and shall comprise project level and respective State level redressal mechanisms. Most Project related grievances could be minor and site-specific.

EMC (Engineering and Management Consultant) for the project will have sufficient staff with skills on Environment and Social aspects. Awareness raising and capacity building on the new Environmental and Social Framework (ESF) need to be carried out for the environment and social staff engaged and this will be an area of continued focus, with a view to generate awareness at to dam level. EMC will develop formats for regular supervision and monitoring on E&S issues and undertake site visits/ inspections of the dam sites to monitor for compliance; collate and review QPRs and set up a monitoring and

reporting system on E&S issues.

Overall, the proposed activities within this dam sub-project have low to moderate risks resulting in the overall sub-project to be categorized as Moderate risk category. These risks and impacts can be effectively mitigated with effective implementation of mitigation plans by SPMU/IA, Contractors and monitoring by EMC, SPMU and CWC.

Annexure I: Form SF1

Sl. No	Project Component	Applicable (A), Not Applicable (NA)	Environment and Social Risk Associated within dam area (DI), Beyond Dam Area (DE)	Likely Nature of Risk/Impact Water Quality (WQ), Fisheries (F), Conservation Area (CA), Protected Area (PA), Ecological (E), Physical Environment (PE), Cultural (C), Tribal Presence (T), Impact on private land/assets/encroachers/squatters (LA), Labor (L), GBV risks (G), (Write whichever is applicable)
1	**2**	**3**	**4**	**5**
A	**Nature of Project Component and related sub activity Related**			
1	Reservoir Desiltation	**NA**		
2	Major structural changes – Spillway construction (Improving ability to withstand higher floods including additional flood handling facilities as needed.)	**NA**		
3	Structural strengthening of dams to withstand higher earthquake loads	**NA**		
4	Structural Improvement/Repair work - upstream of Dam site (interfacing dam reservoir) (like u/s face treatment etc.)	A	DI	WQ, F, PE, L, G
5	Structural Improvement/Repair work -Downstream of Dam site (with no interfacing with dam reservoir)	A	DI	PE, L, G
6	Re-sectioning earth dams to safe, stable cross sections	A	DI	PE, L, G
7	Hydro-mechanical activities with interface with dam reservoir	**A**	**DI**	**WQ, PE, L, G**
8	Hydro-mechanical activities Downstream of Dam site (with no interfacing with dam reservoir)	**A**	**DI**	**PE, L, G**
9	Instrumentation, General lighting and SCADA systems	**NA**		
10	Basic Facilities (like access road improvement, renovation of office, etc)	**A**	**DE**	**PE, L, G**
11	Utility installation like standby generator, or setting up solar power systems	**A**	**DI**	**PE, L**
12	Painting of dam u/s or d/s or both faces	**NA**		
13	Water recreation activities	**NA**		
14	Tourism Development	**NA**		
15	Installation of Solar power/floating solar	**NA**		
16	List any other component not listed above			

Sl. No	Project Component	Applicable (A), Not Applicable (NA)	Environment and Social Risk Associated within dam area (DI), Beyond Dam Area (DE)	Likely Nature of Risk/Impact Water Quality (WQ), Fisheries (F), Conservation Area (CA), Protected Area (PA), Ecological (E), Physical Environment (PE), Cultural (C), Tribal Presence (T), Impact on private land/assets/encroachers/squatters (LA), Labor (L), GBV risks (G), (Write whichever is applicable)
1	**2**	**3**	**4**	**5**
B	**Pre-construction and construction stage major auxiliary or preparatory intervention**			
1	Acquisition (diversion of forests land for non-forest purposes) of forest land	**NA**		
2	Acquisition of private land Resettlement and Rehabilitation (including physical or economic displacement/impact on livelihood;	**NA**		
3	Temporary loss of business or Damages to crops or trees or structures outside the ROW during Construction activities by Contractor	**NA**		
4	Borrowing earth to meet Borrow materials requirement	**NA**		
5	Sourcing of Quarry materials	**NA**		
6	Blasting	**NA**		
7	Setting up Labour Camps (location within dam premises or outside)	**A**	**DE**	**WQ, PE, L, G**
8	Heavy machinery deployment and setting up maintenance workshop	**A**	**DI**	**PE, L, G**
9	Setting up Hot mix plant	**NA**		
10	Deployment of Concrete mixture and heavy pumps	**A**	**DI**	**PE, L, G**
11	Temporary land acquisition	**NA**		
12	Need of Tree felling/ vegetation clearance	**NA**		
13	Disposal of large amount of Debris	**A**	**DE**	**PE, L, G**
14	Transport of large construction material	**A**	**DE**	**PE, L, G**
15	Utility shifting	**NA**		
16	Discharge of reservoir water (lowering of reservoir water involved)	**NA**		

Note: Occupational Health and Safety aspects / impacts/ risks are considered important part of any dam project and this risk is separately classified. It shall be managed as per defined OH&S plans in every project irrespective of size and type of project.

Annexure II: Form SF2

Sl. No	Applicable Sub-Project Component/ Construction preparatory Work-related Sub activity (As per SF-1)	Nature of Risk (Conforming to Column 5 of SF-1) and nature of sub activity	Elaborate cause (risk) and its effect (Impact) on environment /social	Risk/Impact intensity for each type of risk/impact Low (L) , Moderate (M), Substantial (S), High (H)
1	2	3	4	5
A	Project Component Related			
1.	Structural Strengthening/Improvement/Repair work -upstream of Dam site			
a	Special repairs to masonry portion of dam: U/s face treatment using PICC -	WQ, F, PE, L, G	Air pollution, noise pollution, risk of spillage of wastewater, risk of reservoir water contamination and impact on fishes, generation of construction debris, Labour and GBV risk	L
b	Special repairs to masonry portion of dam: Dam top screeding	WQ, PE, L, G	Risk of reservoir water contamination, generation of construction waste, Labour and GBV risk	L
c	Special repairs to masonry portion of Dam: Reaming the vertical and Drainage shafts	WQ, PE, L, G	Risk of reservoir water contamination, generation of construction waste, Labour and GBV risk	L
d	Earth slip protection measures	WQ, PE, L, G	Air pollution, noise pollution, risk of reservoir water contamination due to construction/excavation debris/muck getting into reservoir, generation of, Labour and GBV risk	L
e	Strengthening of earthen bund including weed removal/shrubs clearance	PE, L, G	Impact on ecology, Generation of biological waste, Labour and GBV risk	L
2.	Structural Improvement/Repair work - Downstream of Dam site (with no interfacing with dam reservoir) (like repair of parapet walls, damage spillway crest, downstream training walls, etc.)			
a	Repairs to aprons/ revetment	WQ, PE, L, G	Impacts on water quality, Generation of construction	L

Sl. No	Applicable Sub-Project Component/ Construction preparatory Work-related Sub activity (As per SF-1)	Nature of Risk (Conforming to Column 5 of SF-1) and nature of sub activity	Elaborate cause (risk) and its effect (Impact) on environment /social	Risk/Impact intensity for each type of risk/impact Low (L) , Moderate (M), Substantial (S), High (H)
1	2	3	4	5
			waste/debris, Labour and GBV risk	
b	Special repairs to masonry portion of Dam: Vertical Grouting for Apron	WQ, PE, L, G	Impacts on water quality, Generation of construction waste/debris, Labour and GBV risk	L
c	Special repairs to masonry portion of Dam: Approach steps	PE, L, G	Generation of construction waste//debris, Labour and GBV risk	L
3.	Hydro-Mechanical activities Down - stream of Dam Site (with no interfacing with dam reservoir)			
a	Repairs to shutters • Repairs/Replacement of operating Mechanism Platform roof for Tunnel and Scour vent gate. • Repairs/Replacement of Scour vent/Power Tunnel trash rack panels	WQ, PE, L, G	Water pollution due to paints, Generation of waste material from packaging etc, noise pollution, Impacts on ecology especially fauna in tiger reserve due to noise, Labour and GBV risk	L
4.	Instrumentation, General lighting and SCADA systems			
a	Lights on the approach road, buildings.	PE, L, G	Generation of waste material from packaging etc, Labour and GBV risk	L
b	Electrification and lighting on the Office Maintenance	PE, L, G	Generation of waste material from packaging etc, Labour and GBV risk	L
5	Basic Facilities Improvement			
a	BT road from Dam Junction to Surge shaft	PE, L, G	Air and noise pollution, Generation of muck and construction debris, Labour and GBV risk	L
b	Special Repairs to quarters	PE, L, G	Air and noise pollution, Generation of muck and construction debris, Generation of waste material from packaging etc Labour and GBV risk	L

Sl. No	Applicable Sub-Project Component/ Construction preparatory Work-related Sub activity (As per SF-1)	Nature of Risk (Conforming to Column 5 of SF-1) and nature of sub activity	Elaborate cause (risk) and its effect (Impact) on environment /social	Risk/Impact intensity for each type of risk/impact Low (L) , Moderate (M), Substantial (S), High (H)
1	2	3	4	5
c	Special repairs to: Gauge Reader Room	PE, L, G	Air and noise pollution, Generation of muck and construction debris, Generation of waste material from packaging etc Labour and GBV risk	L
B.	Pre-construction and construction stage major auxiliary or preparatory intervention			
1	Setting up Labour Camps (location within dam premises or outside)	**WQ, PE, G**	Wastewater generation from domestic activities, waste generation, GBV risk within labour and involving community.	**M**
2	Heavy machinery deployment and setting up maintenance workshop	**PE, L, G**	Heavy machinery will be deployed for repair and maintenance of hoists and for other activities - risk due to machine handling, waste, wastewater and air emissions from machines operations, hazardous waste generation from oil waste	**L**
3	Deployment of concrete mixture and heavy pumps	**PE, L, G**	Concrete mixture and pumps will be deployed for road repair and other civil works and dewatering - risk due to machine handling, waste generation, wastewater and air emissions from operations, hazardous waste generation from oil waste, Labour and GBV risks	**L**
4	Disposal of large amount of Debris	**PE, L, G**	Debris will be generated from various repair activities, risk during debris handling, air and noise emissions from debris handling and transportation, water pollution risk due to debris finding its way to water body, and GBV risk due to labour involvement	**M**
5	Transport of large construction material	**PE, L, G**	Material will be	**L**

Sl. No	Applicable Sub-Project Component/ Construction preparatory Work-related Sub activity (As per SF-1)	Nature of Risk (Conforming to Column 5 of SF-1) and nature of sub activity	Elaborate cause (risk) and its effect (Impact) on environment /social	Risk/Impact intensity for each type of risk/impact Low (L) , Moderate (M), Substantial (S), High (H)
1	2	3	4	5
			transported from various vendors and suppliers to site for civil, hydro-mechanical work and instrumentation, air and noise emissions from transportation, Labour and GBV risk	

Criteria for Risk Evaluation:

Low: Localized, temporary and Negligible

Moderate: temporary, or short term and reversible under control

Substantial: medium term, covering larger impact zone, partially reversible

High: significant, non- reversible, long term and can only be contained/compensated

Occupational Health and safety: OHS is a substantial risk activity in almost all cases and is being treated separately through OHS plan in accordance with WB ESHS guidelines and shall be applicable to all sub-projects. Hence is not being considered under screening criteria.