

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

SHOLAYAR DAM
(PIC: KL29HH0016)

ENVIRONMENT AND SOCIAL DUE DILIGENCE REPORT



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KERALA STATE ELECTRICITY BOARD LIMITED
Chief Engineer (Civil – Dam Safety & DRIP)
Dam Safety Organization, Pallom, Kottayam

Kerala. Email: cedamsafety@gmail.com

CONTENTS

EXECUTIVE SUMMARY	1
INTRODUCTION	3
1.1 PROJECT OVERVIEW	3
1.2 SUB-PROJECT DESCRIPTION – SHOLAYAR DAM	3
1.3 PROPOSED INTERVENTIONS/ACTIVITIES AND INTENDED OUTCOMES	6
1.4 IMPLEMENTATION ARRANGEMENT AND SCHEDULE	10
1.5 PURPOSE OF ESDD	10
1.6 APPROACH AND METHODOLOGY OF ESDD	11
INSTITUTIONAL FRAMEWORK AND CAPACITY ASSESSMENT	12
2.1 POLICY AND LEGAL FRAMEWORK	12
2.2 DESCRIPTION OF INSTITUTIONAL FRAMEWORK	12
ASSESSMENT OF ENVIRONMENTAL AND SOCIAL CONDITIONS	15
3.1 PHYSICAL ENVIRONMENT	15
3.2 PROTECTED AREA	16
3.3 SOCIAL ENVIRONMENT	18
3.4 CULTURAL ENVIRONMENT	20
ACTIVITY WISE ENVIRONMENT & SOCIAL SCREENING, RISK AND IMPACTS IDENTIFICATION	21
4.1 SUB-PROJECT SCREENING	21
4.2 STAKEHOLDER CONSULTATION	25
4.3 DESCRIPTIVE SUMMARY OF RISKS AND IMPACTS FROM ACTIVITIES BASED ON SCREENING	30
CONCLUSIONS AND RECOMMENDATIONS	32
5.1 CONCLUSIONS	32
5.1.1 <i>Risk Classification</i>	32
5.1.2 <i>National Legislation and WB ESS Applicability Screening</i>	32
5.2 RECOMMENDATIONS	33
5.2.1 <i>Mitigation and Management of Risks and Impacts</i>	33
5.2.2 <i>Institutional Management, Monitoring and Reporting</i>	34

TABLES

TABLE 3.1: LAND USE/LAND COVER AREA OF 05 KM. BUFFER ZONE OF SHOLAYAR DAM SITE	15
TABLE 3.2: DEMOGRAPHIC PROFILE OF THRISSUR DISTRICT, KERALA	19
TABLE 3.3: SETTLEMENTS/TRIBAL COLONIES IN IMMEDIATE VICINITY OF SHOLAYAR DAM, KERALA.....	19
TABLE 4.1: SUMMARY OF IDENTIFIED RISKS/IMPACTS IN FORM SF-3.....	24
TABLE 5.1: WB ESF STANDARDS APPLICABLE TO THE SUB-PROJECT	32
TABLE 5.2: LIST OF MITIGATION PLANS WITH RESPONSIBILITY AND TIMELINES.....	33

FIGURES

FIGURE 1.1: MAP SHOWING LOCATION OF SHOLAYAR DAM SUB-PROJECT IN KERALA.....	5
FIGURE 1.2: GOOGLE EARTH SATELLITE IMAGE SHOWING SHOLAYAR DAM & RESERVOIR.....	6
FIGURE 1.3: SELECTED PHOTOGRAPHS OF IMPROVEMENT/INTERVENTION AREA.....	8
FIGURE 1.4: PROJECT AREA SHOWING MAJOR INTERVENTION LOCATIONS	9
FIGURE 3.1: LAND USE AND LAND COVER MAP OF 5 KM RADIUS AROUND DAM SITE.....	15
FIGURE 3.2: DISTANCE OF NEAREST PROTECTED AREAS AROUND SHOLAYAR DAM	17
FIGURE 4.1: CONSULTATION WITH VILLAGERS AT AT SHOLAYAR GIRIJAN COLONY.....	25

ANNEXURES

ANNEXURE I: FORM SF1	36
ANNEXURE II: FORM SF2	38
ANNEXURE III: STAKEHOLDER'S CONSULTATION - LIST OF PARTICIPANTS.....	40

ABBREVIATIONS AND ACRONYMS

AIDS	:	Acquired Immunodeficiency Syndrome
ASI	:	Archaeological Survey of India
BOQ	:	Bill of Quantities
CA	:	Conservation Area
CPMU	:	Central Project Management Unit
CWC	:	Central Water Commission
DRIP	:	Dam Rehabilitation and Improvement Project
DSO	:	Dam Safety Organization
DSRP	:	Dam Safety Review Panel
E&S	:	Environment & Social
EAP	:	Emergency Action Plan
EMC	:	Engineering and Management Consultant
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
GCA	:	Gross Command Area
GIS	:	Geographic Information System
GRM	:	Grievance Redressal Mechanism
HIV	:	Human immunodeficiency virus
IA	:	Implementation Agency
IPF	:	Investment Project Financing
KSEBL	:	Kerala State Electricity Board Limited
LMP	:	Labour Management Procedure
MDDL	:	Minimum Draw down Level
MW	:	Megawatt
MWL	:	Maximum Water Level
OHS	:	Occupational Health & Safety
PA	:	Protected Area
PAP	:	Parambikulam Aliyar Project
PDO	:	Project Development Objective
PPE	:	Personal Protective Equipment
PST	:	Project Screening Template
RET	:	Rare Endangered and Threatened
RFB	:	Request for Bids
SC	:	Scheduled Castes
SCADA	:	Supervisory Control and Data Acquisition
SEA	:	Sexual Exploitation and Abuse
SEAH	:	Sexual Exploitation Abuse and Harassment
SEF	:	Stakeholder Engagement Framework
SF	:	Screening Format
SH	:	Sexual Harassment

SPMU : State Project Management Unit
ST : Scheduled Tribes
WB : World Bank
WQ : Water Quality

EXECUTIVE SUMMARY

The Sholayar dam complex in totality comprises of the Main Dam, the Flanking Dam and the Saddle Dam, to create a reservoir spread out in 8.705 Sq. Km. with a capacity of 153 Mm³ across river Sholayar in Thrissur district. There are two dams constructed as part of Sholayar Hydro Electric Project with a generation capacity of 54 MW. They are, Sholayar Main Dam and Sholayar Flanking Dam. Spillway has been provided in the Flanking Dam. Both the dams are masonry gravity type. One Saddle Dam has also been constructed as part of the project in a valley located on the left periphery of the reservoir. The project has proposed to undertake rehabilitation measures (structural, non-structural & instrumentation) 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, was carried out on 26/05/2020 keeping in view the Covid19 restrictions. Detailed consultation 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. These risks are low to moderate and localised, short term and temporary in nature which can be managed with standard ESMP and guidelines. Environment risks of air, water, noise, land use, soil and resource use for activities are Low whereas social risks of labour to labour/community are Moderate. Environment risks are categorized as Low for all rehabilitation works. Dam is located within the protected area, although no activity is proposed outside the dam area, moderate risk is identified on protected habitat due to labour movement and movement of material through protected area. Environmental risk relating to Labour camp has been flagged as Moderate on environment and land. 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)

- Biodiversity Conservation Plan (ESS6)
- 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.

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 – SHOLAYAR DAM

The Sholayar dam complex in totality comprises of the Main Dam, the Flanking Dam and the Saddle Dam, to create a reservoir spread out in 8.705 Sq. Km. with a capacity of 153 Mm³ across river Sholayar in Thrissur district. There are two dams constructed as part of Sholayar Hydro Electric Project with a generation capacity of 54 MW. They are, Sholayar Main Dam and Sholayar Flanking Dam. Spillway has been provided in the Flanking Dam. Both the dams are masonry gravity type. One Saddle Dam has also been constructed as part of the project in a valley located on the left periphery of the reservoir.

The construction activities of the Sholayar Hydro Electric Project commenced during 1958 and the project was commissioned in 1965. This is the second power project of Kerala State Electricity Board Ltd. (KSEBL) in Chalakudy Basin. Sholayar reservoir receives inflow from its own catchment of 72 Km² and releases from upstream Sholayar Power Station of Tamilnadu as per the PAP agreement.

The project is located in Thrissur district of Kerala state. Geographical coordinates of main dam location are:

Longitude: 76^o 44' 06" East

Latitude: 10° 19' 17" North

The project area is located in the peninsular gneissic complex. Around the main dam, rock mass is represented by biotite gneiss, hornblende-biotite gneiss, granite gneiss etc. At places diopside and hypersthene minerals are also observed. The bed rock is exposed on both the sides is fresh to slightly weathered, grey colored, medium to coarse grained, very hard and compact in nature. The foundation rests on good bed rock after excavation upto a suitable depth. The Flanking dam has been founded above MDDL on hard and compact bed rock. The entire river section in immediate downstream of dam shows rock exposures of gneissic nature. Around the Saddle dam area, no rock crops are seen. The reservoir rim along both flanks in the immediate upstream of main dam, flanking dam as well as saddle dam appear stable, as there are bed rock exposures and very thick vegetation all along up to the reservoir periphery.

Salient features of the project area are reported below:

Salient Features of Sholayar Dam		
A	SHOLAYAR MAIN DAM	In Thrissur District of Kerala State
1	Latitude	10° 19' 17" N
2	Longitude	76°44' 06" E
3	Type of Dam	Masonry Gravity Type
4	Total Length of the Dam at Top (m)	430.53
5	Width of the Dam at Top (m)	7.32
6	No of Blocks	14
7	Top Level of Dam	812.60
8	Maximum Water Level (m)	811.69
9	Full Reservoir Level (m)	811.69
10	Spillway Crest Level (m)	805.28
11	Gross Storage (Mm ³)	153.48
12	Average Bed Level (m)	755.29
13	Deepest Foundation Level (m)	746.45
14	Height above Deepest Foundation Level (m)	66.14
15	Height Above Bed Level (m)	57.31
16	No of Lower Level Outlets	01 No
17	Size of Lower Level Sluice Valve (m)	1.8
18	Elevation of River Sluice Valve (m)	768.09
B	FLANKING DAM	
1	Type of Dam	Masonry Gravity Type
2	Total Length of the Dam at Top (m)	259.08
3	Width of the Dam at Top (m)	4.27
4	No of Blocks	09
5	Height Above Deepest Foundation Level (m)	27.74
6	No of Spillway Gates	05
7	Type of Spillway	Ogee
8	Type of Spillway Gate	Radial
9	Size of Spillway Gate (m)	6.40 X 10.97
10	Spillway Capacity (m ³ /s)	1739

C SADDLE DAM		
1	Type of Dam	Composite with Masonry Wall at U/s and Earth Fill at D/s
2	Length of Dam at Top (m)	109.12
3	Height Above Deepest Foundation Level (m)	18.59
D Hydrological details		
1	River	Sholayar
2	Basin	Chalakudy
3	Catchment Area (Km. ²)	194
4	Revised Design Flood (m ³ /s)	1890

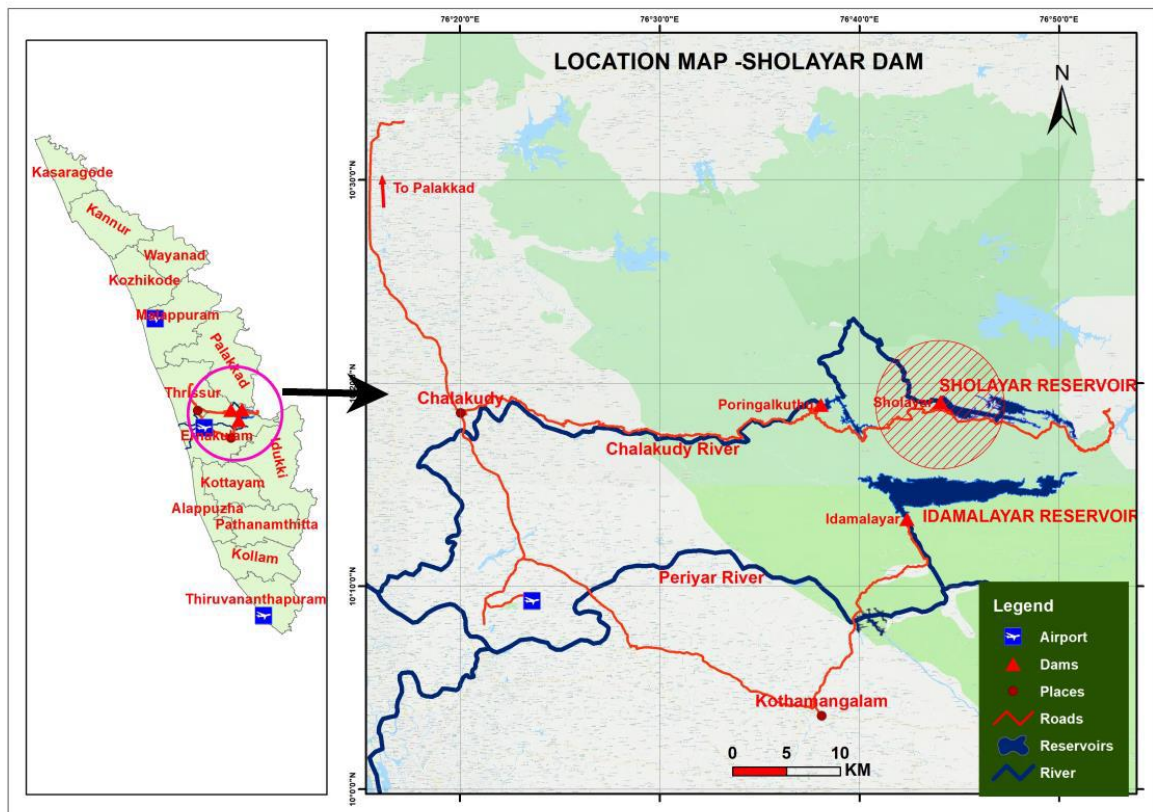


Figure 1.1: Map Showing Location of Sholayar Dam Sub-Project in Kerala

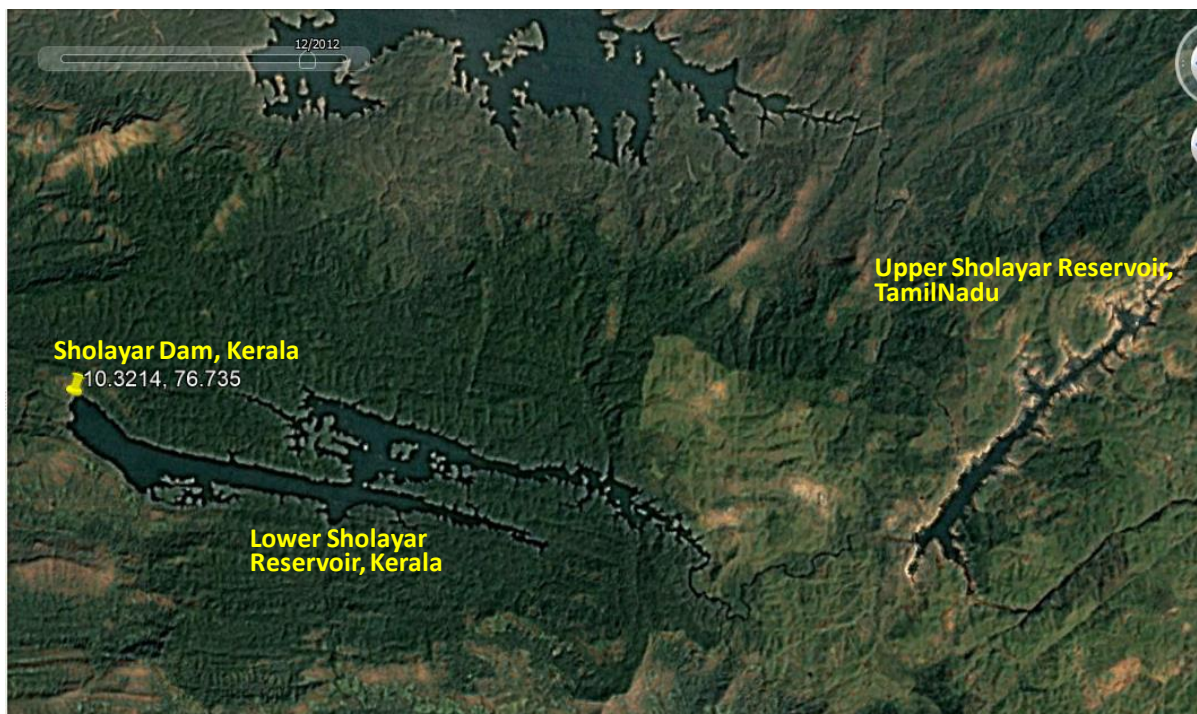


Figure 1.2: Google Earth Satellite Image Showing Sholayar Dam & Reservoir

1.3 PROPOSED INTERVENTIONS/ACTIVITIES AND INTENDED OUTCOMES

Dam Safety Review Panel (DSRP) constituted by CWC for DRIP Phase II, has made a visit to Sholayar dam on 18/12/2019 and recommended measures 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.

A. Structural Rehabilitation Works

1. Grouting of Main Dam & Flanking Dam and Reaming of drain holes
2. Crack Repair of Spillway gate piers
3. Upstream treatment of Main Dam & Flanking Dam

B. Structural Measures for Ensuring Hydrological Safety

Nil

C. Non-structural Measures

1. Installation of Early Warning System
2. Integrated Reservoir Operation
3. Installation of Automatic Weather Station

D. Basic Facilities Improvement

Nil

E. Instrumentation, SCADA, Surveillance system, etc.

1. Installation of Accelerograph, V Notch & Pressure gauges

F. Tourism/Fisheries/Hydropower Development:

1. Construction of a small Hydro project using the tail water

G. Others

1. Hydrographic Survey
2. EAP (Tier II)
3. Testing of materials etc. and other investigation works

The above Tourism/Fisheries/Hydropower Development activities have not been considered as part of present ESDD as feasibility studies including various options and their possible impacts on environment and social are yet to be carried out. ESDD on this sub-component will be conducted separately once the planning/design and feasibility studies have been completed.

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



Wetting at the downstream of dam body



Crack near Spillway Gate pier – Inspection by DSRP



Figure 1.3: Selected Photographs of Improvement/Intervention area



Figure 1.4: 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 24 months. SPMU/IA 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) : 01/06/2020

Proposed Ending of implementation (MM/DD/YYYY) : 30/07/2022

Implementation Duration (months) (MM) : 24 Months

b) Timeline phasing of implementation:

Sl. No.	Description	From (month/year)	To (month/year)	Status of Procurement Process
1	Civil Works – main package	August 2020	July 2022	Procurement process will be initiated after obtaining approval of the PST from World Bank.
2	Other Packages	June 2020	July 2022	Procurement process will be initiated after obtaining approval of the PST from World Bank.
3	Procurement – instrumentation, goods, inspection vehicles	August 2020 – January 2022		
4	Consultancy Contracts	September 2020 – September 2021		

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, have been carried out in a limited way under the current circumstances due to COVID and these shall held as soon as situation is conducive for holding such consultations.

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 areas (CA).

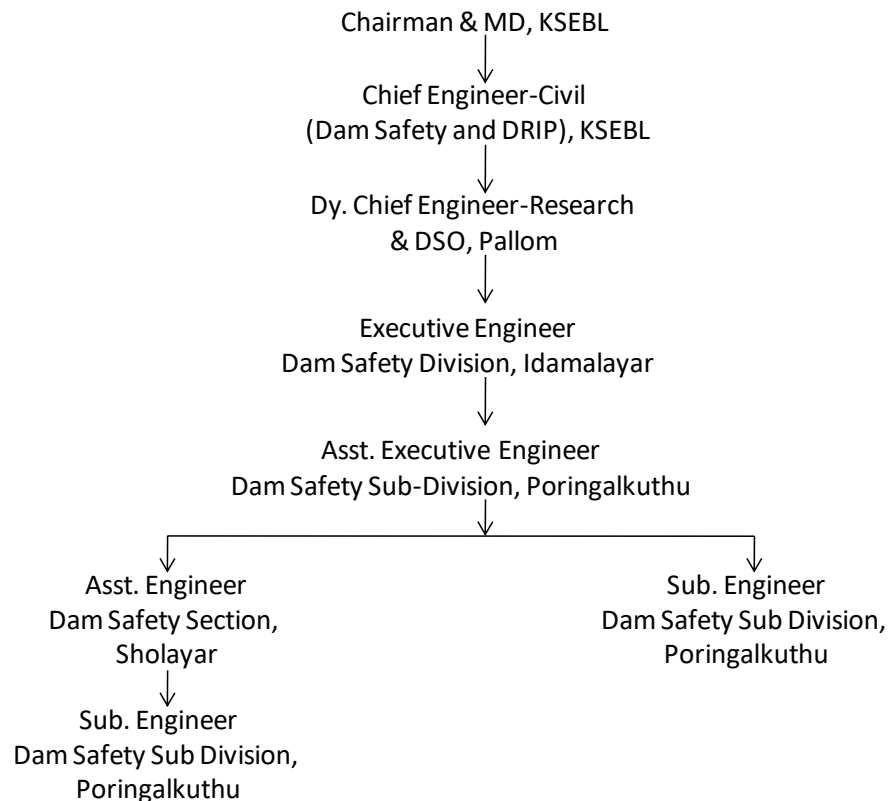
Therefore, for the proposed dam rehabilitation activities at Sholayar dam, which are limited to dam area and do not require any additional private or forest land and do not fall within any protected area; regulatory clearances will not be applicable as per Indian regulation.

2.2 DESCRIPTION OF INSTITUTIONAL FRAMEWORK

The organizational structure for project coordination, management and monitoring of DRIP 2, consists of a Central Project Management Unit (CPMU) at the central level in CWC and one State level SPMU. The sub-project will be implemented by the Kerala State Electricity Board Ltd. (KSEBL), Kerala. Institutions at the national and state level, along with roles are presented below:

- Dam Safety Review Panel (DSRP): Each implementing agency will constitute Multi-disciplinary DSRP teams.

- SPMU: At the state level, SPMUs, will have overall responsibility for the coordination of the project activities at the state level, both technically and qualitatively and will monitor the physical and financial progress including safeguards issues. Each IA will appoint a Project Director (PD) and Project Management Unit (PMU) attached to the Chief Engineer / Superintending Engineer in charge of the DSO. The PD and its team of government staff and consultants/experts including the Environmental and Social experts will have direct responsibility for the coordination and management of the project at the State level and for Central organizations.
- In Kerala the organizational structure for Sholayar Dam Sub-Project is as follows:



The sub-project will be implemented by the Dam Safety Organization of KSEBL. Chief Engineer (Civil - Dam Safety & DRIP) is responsible for the operation and maintenance of existing dams of KSEBL and to arrange necessary rehabilitation works in time to improve safety performance of dam and for ensuring the safety of people downstream. Works required improving the operational performance of the existing dams & their modernization etc. under KSEBL is also carried out by dam safety wing. Chief Engineer is assisted by a team of Engineers under the Project Director, SPMU. The field crew includes Executive Engineers, Assistant Executive Engineers, Assistant Engineers & Sub Engineers. For the rehabilitation works whose estimate amount is beyond the delegation of the Chief Engineer, administrative sanction for the same is to be obtained from Board of Directors of KSEBL.

KSEBL do not have in-house expertise to address E&S issues. Presently, Chief Engineer at SPMU and Executive Engineer at field level look after these aspects. It is proposed that need based appointment of Environment and Social Experts to enable preparation of Environment Management Plans as well as for support in implementation of mitigation measures will be

taken up. KSEBL will hire experts from outside department or seek deputation of staff with relevant experience to facilitate issues related to the environment and social aspect during implementation of the sub-project, under DRIP II.

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.

Presently, GRM & Internal complaint committee as per Sexual Harassment Act is there in KSEBL but not specific to SPMU or the Dam Safety Organization. A system specific to DSO will be introduced before commencing the execution of works at site. There is no internal complaint committee as per Sexual Harassment Act either at dam level, which will be implemented before start of work. A Grievance Redress Mechanism (GRM) will be established and operated by the contracted agencies to address Project workers workplace concerns before start of the work. SPMU will have oversight responsibility on the functioning of the GRM.

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 Land use/Land cover map, prepared from medium resolution satellite imagery (IRS AWiFS) in GIS environment, has been presented at Fig. 3.1 and the derived area statistics has been produced at Table 3.1. The analysis reveals that forest area predominates the land use/land cover. There is no habitation in dam surrounding i.e. within 5 Km except for powerhouse colony and few tribal hamlets as discussed under section 3.3.

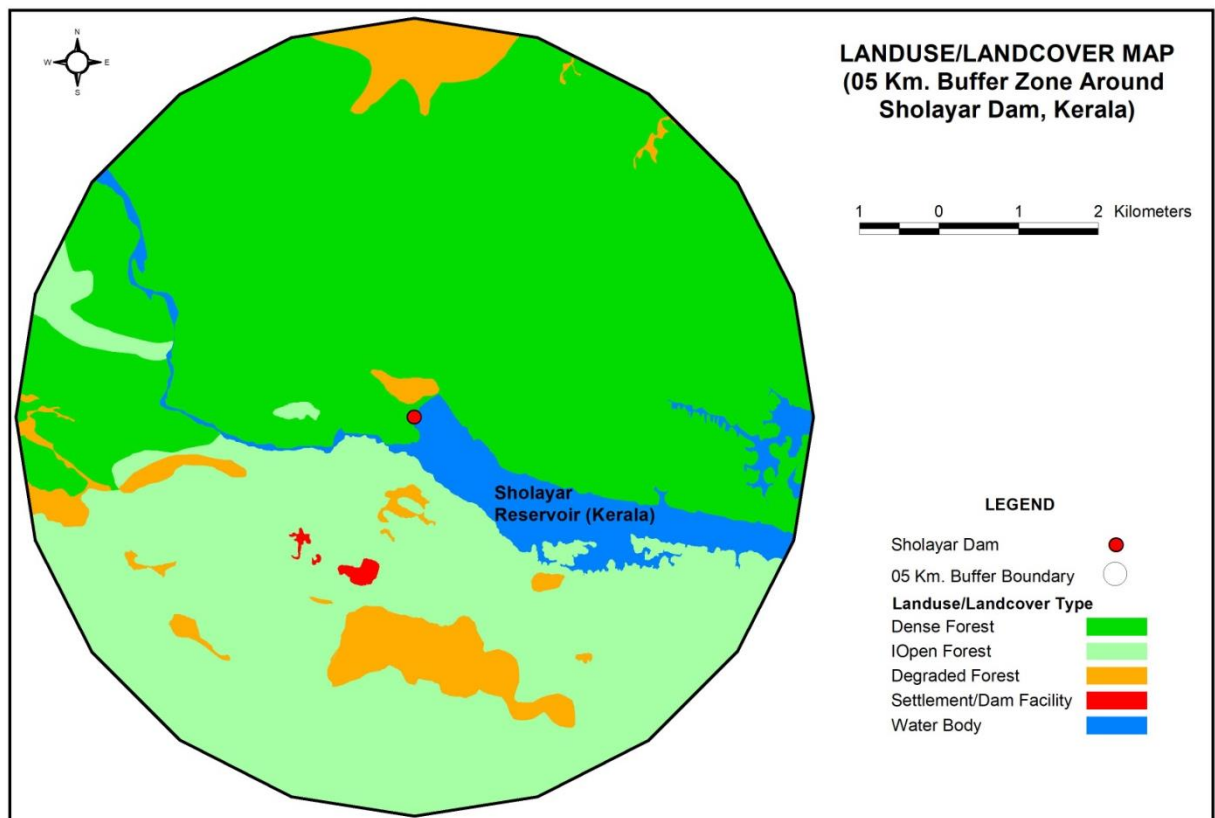


Figure 3.1: Land Use and Land Cover Map of 5 km radius around Dam site

Land use Class	Area in Sq. Km.	% of Total Area
Settlement/Dam Facility	0.15	0.19
Dense Forest	40.55	51.66
Open Forest	28.60	36.43
Degraded Forest/Rock Exposure	4.93	6.28

Water Body	4.27	5.44
Total Area	78.50	100.00

Natural Hazards

The Bureau of Indian Standards has categorized India into 4 seismic zones depending upon the degree of vulnerability to earthquakes. The Zone II signify a lesser degree, while Zone V is of highest order. The subproject falls under earthquake risk Zone-III (Moderate damage risk zone) of India. The significant earthquake event in near vicinity includes that on 12th December 2000 at epicenter 'Erattupetta' with magnitude 5.

The Sholayar Dam is located on river Sholayar, a tributary of Chalakudy River in Thrissur district of Kerala. The Sholayar reservoir is formed by three dams. They are Main Dam, Flanking Dam with Spillway section and Saddle Dam. The catchment area of Sholayar river up to the dam site is 194 Sq. Km. The catchment area is intercepted by Upper Sholayar dam lying in state of Tamil Nadu. The catchment area up to Upper Sholayar dam is 121.72 Sq. Km., while the catchment area below Upper Sholayar dam till sub-project Sholayar dam is 72 Sq. Km. Thus, the catchment area of subproject Sholayar dam in Kerala is divided into two parts, i.e. catchment up to Upper Sholayar dam and free catchment below Upper Sholayar dam. The peak design flood (as per latest review) at Sholayar dam in Kerala has been worked out as 1455 m³/sec, which is less than spillway capacity of 1739 m³/sec. However, the revised design flood approved is 1890 m³/sec, which is only 8% more than the spillway capacity.

3.2 PROTECTED AREA

Sholayar dam is located in a protected area i.e. within the buffer zone of the Parambikulam Tiger Reserve in Vazhachal Forest Division of Kerala. The other nearby protected areas include Chimmony WLS, Peechi-Vazhani WLS, Chulannur WLS on North-West; Indira Gandhi (Annamalai) WLS of Tamil Nadu on East; Pambadum Shola NP, Eravikulam NP, Chinnar WLS, Kurinjimala WLS, Anamudi Shola NP, Mathikettan Shola NP on South-East and Idduki WLS, Thattekaddu WLS on South (Figure 3.2).

The Parmabikulam Tiger Reserve supports a healthy population of several endangered wild animals. As per the 2016 census, 25 tigers were recorded in the reserve, which underscores the healthiness of this ecosystem. The buffer zone of the Tiger Reserve in Vazhachal Forest Division spread over 155.22 Km². Habitat wise, the buffer zone of the Tiger Reserve is very important, as it is a continuum to the core and forms a highly critical habitat for Tiger. Thus, the management of buffer zone also warrants priority to sustain a viable population of both tigers and their prey species. The habitat of buffer area of the Tiger Reserve is in a good condition and support sound population of herbivores such as Gaur, Sambar, Deer and other prey species of the Tiger. The buffer areas peripherals to critical Tiger habitat or Core area, act as a shock absorber, where a lesser degree of habitat protection is required to ensure the integrity of the critical Tiger habitat with adequate dispersal of tigers and its prey species.

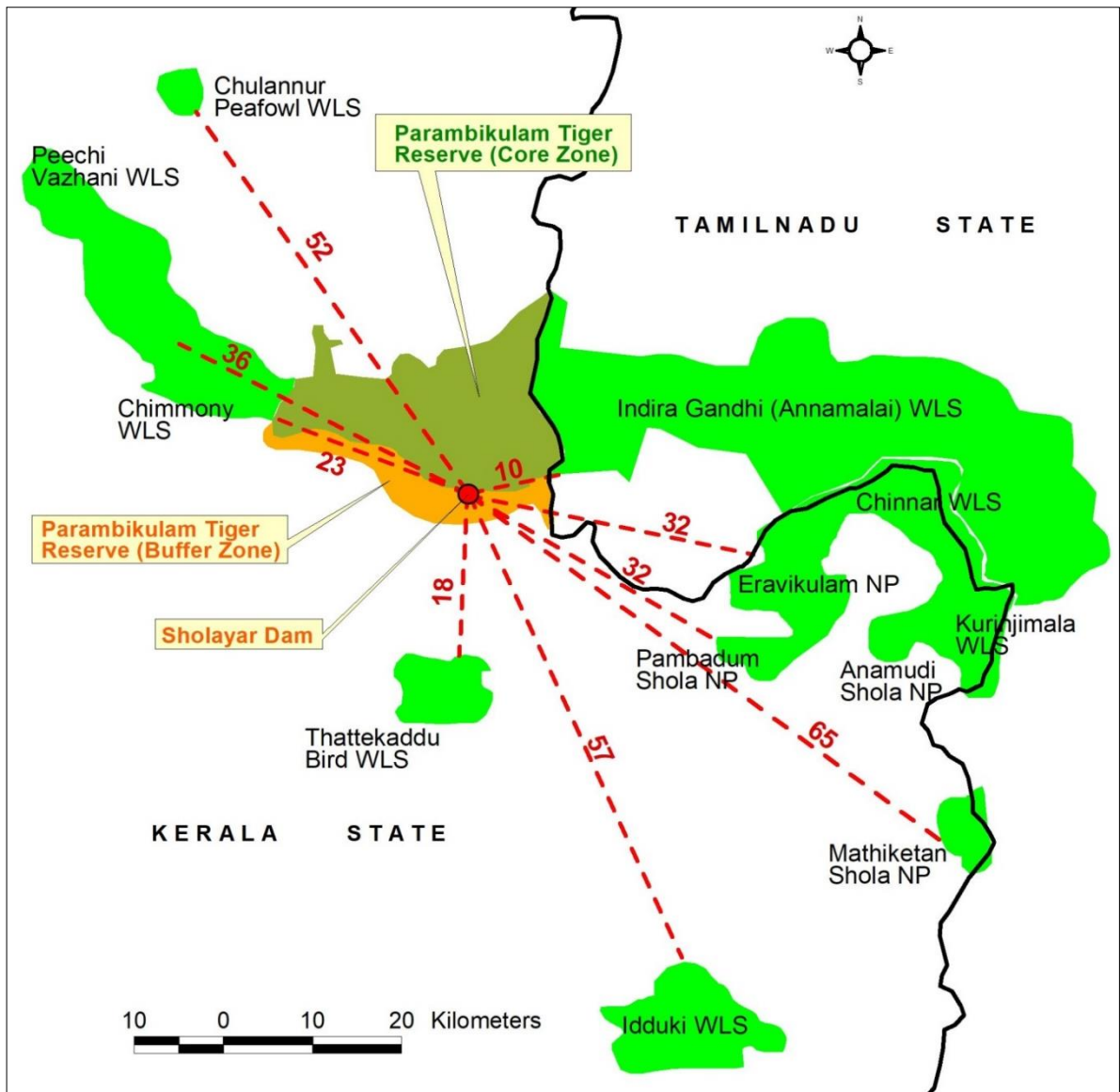


Figure 3.2: Distance of Nearest Protected Areas around Sholayar Dam

The important cash crop estates like Rubber, Coffee, Tea, Areca nut and Pepper, existing within buffer zone of the Tiger Reserve, are important from creation of employment opportunities, livelihood and local economy. At the same time, they also provide vegetation cover and help in soil and moisture conservation. These areas are also often observed to be frequented by tigers as well as the prey species, thus perform a very important role. Most importantly they form a protection shield to the Core of the Tiger Reserve. The above-mentioned production landscapes, settlement areas, tourism areas and reservoir in buffer areas influences the Tiger Reserve directly or indirectly. Buffer area with its continuum with core area, is crucial for tiger dynamics as these areas foster sub adults, transients and old members of the population. The Sholayar Dam is located adjacent to the core zone Southern boundary of Parambikulam Tiger Reserve and within its buffer zone. The buffer area promotes the co-existence between wildlife and human activity with due recognition of the livelihood, development, social and cultural rights of the people.

Tiger is the flagship species whose territory expands beyond the core area to the buffer area. The other important Schedule –I, species are Elephants, Gaur, Mouse Deer, Nilgiri tahr, Nilgiri langur, Lion tailed macaque, Sloth bear and Schedule-II species like Bonnet macaque and Wild dog. Apart from this the other wild life encountered are Sambar, Barking Deer, Spotted Deer, Wild boar, Indian porcupine.

Government of Kerala notified an extent of 390.89 square kilometres as core area of Parambikulam Tiger Reserve vide notification No. GO (P) 53/2009/F& WLD, dated the 16 December 2009, which includes 245.12 square kilometres of Parambikulam Wildlife Sanctuary and an extent of 252.77 square kilometre was notified as buffer of Parambikulam Tiger Reserve vide notification No. GO (P) 54/2009/F & WLD, dated the 17 December, 2009 which includes an area of 39.87 square kilometre of the Parambikulam Wildlife Sanctuary.

Sholayar dam was commissioned in 1965. Repair, maintenance and operation of the dam is a routine work. State Forest Department has not insisted to obtain any specific clearance for the rehabilitation works carried out at Sholayar Dam so far. The dam and appurtenant structures are located within the area diverted from forest department to KSEBL for the construction of dam. The proposed rehabilitation activities under the sub-project are very much localized at the existing Sholayar Dam site only.

Impacts like transportation of construction materials, manpower and Equipment through Protected areas will be mitigated by adoption of standard ESMP and Biodiversity Conservation Plan in line with ESS6 of the World Bank ESS. Any stipulated guidelines by Forest/Wildlife department shall be followed including that for transportation of man and material through the protected area and any permissions/clearances required shall be obtained before start of work.

3.3 SOCIAL ENVIRONMENT

The Sholayar Reservoir in Kerala has a water spread area of around 8.7 Sq. Km. The Sholayar Dam is located at Sholayar in Athirappilly village of Thrissur District in Kerala. There are no Schedule V¹ areas in Kerala.

As per the Census 2011, the total population of Kerala state is 3,34,06,061 with a growth rate of 4.91% while Thrissur district has a total population of 31,21,200 with a growth rate of 4.94%. The total area of Thrissur district is 3,027 km². The population density of Kerala state is 860 per Sq. Km. whereas that in Thrissur district is 1031 per Sq. Km. As per Census 2011 out of total population in Thrissur district, 67.2% people lives in Urban areas while 32.8% lives in the Rural areas. The brief demographic profile of the Thrissur District is presented in Table 3.2 below.

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**.

Table 3.2: Demographic Profile of Thrissur District, Kerala

No. of Households	Vacant - 11,89,144 Occupied-1,00,28,709	Population Growth	4.94%
Total Population	31,21,200	Population (0-6 age)	3,03,950
Male	14,80,763	Boys (0-6 age)	1,55,862
Female	16,40,437	Girls (0-6 age)	1,48,088
Sex Ratio	1108	Sex Ratio (0-6)	950
Population (SC)	324,350	Population (ST)	9,430
Male	156,480	Male	4,362
Female	167,870	Female	5,068
Literates	2,678,548	Literacy Rate	95.08
Male	1,282,261	Male	96.78
Female	1,396,287	Female	93.56
No. of Total Workers	1,095,727	Cultivators	34,791
Male	7,89,511	Agricultural Labours	54,538
Female	3,06,216	Household Industrial Workers	21,883
No. of Main Workers	929,506	Other Workers	818,294
No. of Marginal Workers	166,221		
<i>Source: Census of India, 2011. (Labour Statistics At a Glance, Kerala 2015)</i>			

The sub-project i.e. Lower Sholayar dam in Kerala is located more than 60 km from Chalakudy town. There is no settlement inside the Core zone of Parambikulam Tiger Reserve, which is spread on the North side of the Sholayar Dam sub project. However, there are few tribal colonies in the vicinity on the west and south side of the sub-project, which include Anakkayam, Malakkapara, Sholayar Power House colony and Thavalakkuzhipara. The features of these colonies are:

Sl	Name of Settlement	Tribe	No of House Holds	Population
1	Anakkayam	Kadar	13	42
2	Malakkapara	Kadar	43	146
3	Sholayar Power House colony	Kadar	22	65
4	Thavalakkuzhipara	Malayan	39	133

The populations of these four settlements are predominantly tribal. They depend on the forest for collection of Non-Wood Forest Produce such as Reeds, Bamboos, Honey, and Medicinal Plants etc. They also do fishing in the reservoir. The nearby cash crop estates like Rubber, Coffee, Tea, Areca nut and Pepper also provide employment opportunity for them. There are no physical interventions planned beyond dam site complex. These tribal households will neither be involved nor impacted in any manner due to rehabilitation work. These areas and the ST households will be taken into account during the preparation and implementation of Emergency Action Plan for Sholayar Dam. The tribal population in dam

surrounding is very small and they are mainstreamed into the area, therefore, ESS7 is not triggered.

3.4 CULTURAL ENVIRONMENT

There are no religious place, monument or pilgrimage center within the sub-project area which are likely to be impacted by the rehabilitation activities of the sub project. There are no national or state archaeological or heritage sites in the vicinity of the sub-project area.

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 most 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.

Emergency Action Plan, Early Warning System and Flood Forecasting System, etc. would be required to be prepared. In that case, project will reach out to the disadvantaged and vulnerable persons and groups and involve them mainly during implementation. During implementation of EAP, population in vulnerable areas under different release scenario will be identified and contacted through public consultation meetings. Communities will be made aware about the warning systems and do’s and dont’s during such scenarios.

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 general rehabilitation work as Low risk activities, whereas Labour Camp, 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 4.4: 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	M	None	L	L	L	M	None	L
Hydro Mechanical	L	L	L	M	None	L	L	L	M	None	L
Instrumental SCADA, surveillance	L	L	L	L	None	L	L	L	L	None	L
Painting	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Road work	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safety measures (Siren, Lighting)	L	L	L	L	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	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
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

Stakeholder consultation was conducted as part of environmental and social impact assessments. The purpose was to;

- a) provide initial information to the communities on the proposed project interventions and particularly the non-structural interventions;
- b) help identify potential stakeholders who are involved at this stage and will be involved a later stage.
- c) ascertain if there are any legacy issues relating to displacement, resettlement, etc.
- d) elicit their responses in relation to key non-structural interventions such as early warning systems, emergency action plans.
- e) identify mechanisms that would be deployed to engage with different stakeholders and particularly communities living downstream.

Stakeholder consultation was conducted on 26th May 2020. It was attended by permanent staff of KSEBL working at dam, local people living in the nearby area, workers of contractor executing certain rehabilitation works at dam site etc. The work proposed to be carried out for the dam was explained to them. List of participants is given as Annexure III.



Figure 4.1: Consultation with Villagers at at Sholayar Girijan Colony

Following is the outcome of the stakeholder consultation meeting:

1. Agriculture, Fishing, Collection of forest produces etc. are the main occupation of people in the nearby area.

2. Contract workers generally work for 3-4 months on dam in a year and carry out repair and maintenance activities
3. All the participants welcomed the proposed interventions relating to dam safety.
4. The dam was constructed in 1965. There are no pending issues regarding dam construction related resettlement.
5. The participants explicitly mentioned that the dam is their lifeline and strengthening works will help their long-term livelihood and therefore welcomed such information
6. Participants have expressed that they do not have any grievances and as such no grievances were ever reported from their communities/neighbourhood.

Communities welcomed such interactions and indicated that they would prefer Dam authorities conduct one such face-to-face meeting, once a month at a convenient location to inform of developments/interventions relevant to them. They welcomed other means of information such as advertisements in the local papers etc, but preferred to have face to face interactions at least once a month.

Interactions made with Engineers and local communities is tabulated below;

A. Interaction with Dam Engineers/Staff

Questions	Responses provided / Observations
1. Please confirm whether all proposed structural rehabilitation activities for this dam are limited to dam compound only or any activities are proposed beyond dam complex like catchment area treatment plan, stabilization of reservoir rim area, slope stabilization, de-silting etc.? Please specify if any possibility of local community interference exist during the implementation of rehabilitation measures; including stakeholders consultation meetings planned for dissemination of emergency action plans which is a non-structural measure.	Proposed rehabilitation activities lie within dam premises. There is no possibility of local community's interference. Emergency action plans are prepared and published in the website of CWC.
2. Is there any unsettled issues (legacy) related to displacement or resettlement, pending since time of dam construction? If yes, please give a brief detail.	There are no unsettled issues regarding displacement or resettlement.
3. Any unauthorized encroachers or squatters living within the dam premise? If yes, are these not a threat for dam security and dam premise, any official action taken in the past, does the state government have legalized these squatters and these have full right in the property of dam authorities.	There is neither encroachment nor squatters living within dam premises.

4. What is the proposed institutional arrangement to deal the Environment and Social activities within the scheme i.e. in-house team of experts/hired agency or individual experts?	The project authority would be dealing the issues of environment and social activities.
5. Who will be in charge of E&S related activities at dam site and at SPMU level?	Sri Suresh Kumar P, Assistant Executive Engineer posted at dam site shall be in charge for E&S at dam site. At SPMU level, Sri James Willson, Assistant Executive Engineer is the in charge officer.
6. How do communities contact dam officials? Is there any existing mechanism known to communities to contact dam officials (through telephone/mobile/e-mail/official website)?	Communities contact dam officers in person as the concerned officers reside near the dam premises.
7. What is existing mechanism to communicate with downstream communities/public on unregulated releases of water during high flood time siren/written communication to district authorities/ telephone/mobile/text messages or any other mode of communication?	Written communication with district revenue authorities is made and with mobile messages. Siren is used to alert at dam site.
8. How do you ensure that downstream community is fully aware of the above existing mechanism?	As the construction of dam is 55 year old and downstream community is now accustomed with the procedure.
9. Are there women employees at the dam site?	Yes.
10. Is there any existing Grievance Redressal Mechanism (GRM) within the department to address any kind of grievance/complaints by general public?	Yes. any public grievance brought to the notice of the project authorities is promptly dealt with.
11. Details of any grievances received lately related to this new Scheme?	None.
12. Is dam premise a restricted area or has open access to general public?	Access is restricted.
13. Are there tribal's living in the surrounding area of dam complex? Which tribes are these? Please give brief detail.	No.
14. Does the dam have any tourism/water recreation facilities? If yes, how many approximate tourist visits annually,	No.

annual revenue generated, whether any portion of this generated revenue is diverted to regular O&M of this dam.	
15. Do you engage any local labourers for routine dam maintenance work? If yes, what is the process of engaging these locals for work at dam, whether through Government approved contractor or hired individually?	Yes. On contract basis.

B. Interaction with Local Community

Questions	Responses provided / Observations
1. How many villages are in immediate downstream vicinity?	One village is in immediate D/S vicinity.
2. Are they dependent on dam in any way for their livelihood?	No.
3. Does any of these villages were displaced and rehabilitated during the construction of the Dam. Is there any pending compensation issues?	No
4. Is there any R&R affected person known to you who is currently working with the dam authorities? If so, in what capacity (employee/direct worker/contractor)	No.
5. Are you aware of any fishing communities living immediately downstream of dam whose livelihood are directly linked with the fishing activities of this dam?	No.
6. Are you aware of fishing working seasons, revenue earning, any access to general public for fishing, any suggestion etc.	KSEBL is not concerned with fishery activities.
7. Are you aware of local women affected in any way by dam operations?	No such issue has arisen.
8. Are you aware of any early flood warning system for this dam, or any other system wherein downstream communities getting regular update during flood season for any uncontrolled release of water?	Siren of high amplitude is available and regular updates to D/S with the help of revenue department.
9. Are you aware of any dam related incident happened in the past wherein some loss of life encountered? If yes, brief summary may be given	No such Incident occurred.

<p>10. If you have to contact the dam authorities; how will you contact, through telephone/mobile/e mail/personally?</p> <p>11. In the past, on any occasion, did you contact dam authorities for any specific reason affecting public in general? If so, how did you contact and how was the response of dam authority?</p>	<p>Through Telephone, mobile or by personal means.</p> <p>No such occasion occurred.</p>
<p>12. Give your views about the dam, how this dam is helping Country, State, district or local communities in meeting its objectives, any specific concern can also be given?</p>	<p>The dam is constructed as part of Sholayar Hydro Electric Project generating 54 MW of Power to Kerala Grid. In addition to it, the tail water is utilised for Power Generation, irrigation and drinking water supply.</p>
<p>13. (a) Are you aware of any document named Emergency Action Plan (EAP) of the dam?</p> <p>(b) If yes, do dam authorities conduct any annual mock drill or consultation meeting on dam site and invite all stakeholders to inform about various protocols in place and consequences in case dam fails?</p> <p>(c) In future, during stakeholder's consultation meeting, would you like to be a part of these consultation and mock drill activities to be conducted by dam authorities?</p> <p>(d) If yes, how to contact you, please give the corresponding address along with all details to receive the official communication.</p>	<p>Yes.</p> <p>Yes, consultation meeting conducted.</p> <p>Yes</p> <p>Through mobile phone.</p>
<p>14. Are you a regular follower of official website of dam authorities as a general public, in case you are a contractor, do you follow various tenders notices being invited for various maintenance of this dam?</p>	<p>No, Occasionally.</p>
<p>15. Any suggestion to improve overall system by dam authorities in any way, please give in brief?</p>	<p>Measures to arrest seepage shall be carried out.</p>

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. Dam is located within the protected area, although no activity is proposed outside the dam area, moderate risk is identified on protected habitat due to labour movement and movement of material through protected area.
2. Environment risks and impacts, as assessed above, for various project activities under this sub-project are categorised as Low due to localised nature of proposed activities i.e. activities remain limited to dam area except for labour camp and muck/debris disposal.
3. Execution of civil 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.
4. Civil work interfaced with water body may pose risk of water pollution and impact on fish fauna.
5. Construction waste and debris/muck from development, require careful disposal at pre-identified and approved site to minimise the risk of pollution on this count.
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. Though there are Scheduled Tribes households in the vicinity, these are mainstreamed into the overall society and do not meet the characteristics outlined in ESS 7. There will be no physical interventions.
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 are 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 term 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

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. These risks are low to moderate and localised, short term and temporary in nature which can be managed with standard ESMP and guidelines. Environment risks of air, water, noise, land use, soil and resource use for activities are Low whereas social risks of labour to labour/community are Moderate. Environment risks are categorized as Low for all rehabilitation works. Environmental risk relating to Labour camp has been flagged as Moderate on environment and land.

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, five ESS standards are found relevant to this sub-project as per reasons given in **Table 5.1** below:

Table 5.5: 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 6: Biodiversity conservation and Sustainable Management of Living Natural resources	Dam falling adjacent to core zone and within buffer zone of Parambikulam Tiger Reserve. As no interventions are planned outside the dam, no direct impacts have been identified on natural habitat, however, to eliminate risks of indirect impacts due to outside labour and transportation of man and material, Biodiversity Plan will be prepared.

Relevant ESS	Reasons for Applicability of the standard
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)
 - Biodiversity Conservation Plan (ESS6)
 - 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 5.6: 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	<ul style="list-style-type: none"> • Gender Based Violence or SEA/SH related actions 	SPMU/IA	Before mobilization of contractor
ESS2: Labour and Working Conditions	<ul style="list-style-type: none"> • Labour Management Procedure (LMP) including OHS management plan 	SPMU/IA	Before mobilization of contractor
ESS3: Resource Efficiency, Pollution Prevention and Management	<ul style="list-style-type: none"> • Pollution Prevention and Environment Quality Management Plan (PPEQMP) 	SPMU/IA	Before mobilization of contractor

WB-ESS Triggered	Mitigation Instrument	Responsibility	Timelines
ESS 4: Community Health and Safety	<ul style="list-style-type: none"> Community Health and Safety Management Plan (CHSMP) 	SPMU/IA	Before mobilization of contractor
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural resources	<ul style="list-style-type: none"> Biodiversity Conservation Plan 	SPMU/IA	Before mobilization of contractor
ESS 10: Stakeholder Engagement Plan	<ul style="list-style-type: none"> 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 ESMF 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 restoration of right bank training wall up to bucket portion etc.)	A	DI	WQ, PE, L, G
5	Structural Improvement/Repair work -Downstream of Dam site (with no interfacing with dam reservoir) like construction of control room, improvement of access road to dam top etc	NA		
6	Re-sectioning earth dams to safe, stable cross sections	NA		
7	Hydro-mechanical activities with interface with dam reservoir	A	DI	PE, L, G
8	Hydro-mechanical activities Downstream of Dam site (with no interfacing with dam reservoir)	NA		
9	Instrumentation, General lighting and SCADA systems	A	DI	PE, L, G
10	Basic Facilities (like access road improvement, renovation of office, etc)	NA		
11	Utility installation like standby generator, or setting up solar power systems	NA		
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	Upstream treatment of Main Dam & Flanking Dam	WQ, F, PE, L, G	Air pollution, noise pollution, risk of reservoir water contamination, Impacts of fish, generation of construction debris, Labour and GBV risk	L
b	Grouting of Main Dam & Flanking Dam and Reaming of drain holes	WQ, PE, L, G	Air pollution, noise pollution, risk of reservoir water contamination, generation of construction debris, 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.)			
3.	Hydro-Mechanical activities Down - stream of Dam Site (with no interfacing with dam reservoir)			
a	Crack Repair of Spillway gate piers	PE, L, G	Generation of waste material from packaging etc, noise pollution, Labour and GBV risk	L
4	Instrumentation, General lighting and SCADA systems			
a	Installation of Accelerograph, V Notch & Pressure gauges	PE, L	Waste from packing material, Labour risk	L
5	Non-structural Measures			
a	Installation of Early Warning System	PE, L	Waste from packing material, Labour risk	L
b	Installation of Automatic Weather Station	PE, L	Waste from packing material, Labour risk	L
6	Basic Facilities Enhancement			
7.	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	M

			generation, GBV risk within labour and involving community.	
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 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	L

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.

Annexure III: Stakeholder's Consultation - List of Participants

(Consultation for Sholayar Dam on 26th May 2020 held at dam premises)

S. No.	Name of Participant	Address
1	Sri Abbas	Girijan Colony Sholayar Thrissur Dist.-680721
2	Sri Mani	Girijan Colony Sholayar Thrissur Dist.-680721
3	Sri Ravi	Girijan Colony Sholayar Thrissur Dist.-680721
4	Sri Karunakaran	Girijan Colony Sholayar Thrissur Dist.-680721
5	Sri Ajeesh	Girijan Colony Sholayar Thrissur Dist.-680721
6	Smt. Vilasini	Girijan Colony Sholayar Thrissur Dist.-680721
7	Smt. Jalaja	Girijan Colony Sholayar Thrissur Dist.-680721
8	Smt. Ammini	Girijan Colony Sholayar Thrissur Dist.-680721
9	Sri Dhanesh K A, Assistant Engineer, KSEBL	Dam Safety Section, Sholayar
10	Sri Sasi A, Sub Engineer Engineer, KSEBL	Dam Safety Section, Sholayar