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

KAKKAYAM DAM
(PIC: KL29HH0025)

ENVIRONMENT AND SOCIAL DUE DILIGENCE REPORT

JANUARY, 2022

KERALA STATE ELECTRICITY BOARD LIMITED
Chief Engineer (Civil – Dam Safety & DRIP)
Dam Safety Organization, Pallom, Kottayam
Kerala. Email: cedamsafety@gmail.com

CONTENTS

EXECUTIVE SUMMARY **5**

INTRODUCTION **7**

1.1 PROJECT OVERVIEW 7
1.2 SUB-PROJECT DESCRIPTION – KAKKAYAM DAM 7
1.3 PROPOSED INTERVENTIONS/ACTIVITIES AND INTENDED OUTCOMES 10
1.4 IMPLEMENTATION ARRANGEMENT AND SCHEDULE 13
1.5 PURPOSE OF ESDD 13
1.6 APPROACH AND METHODOLOGY OF ESDD 14

INSTITUTIONAL FRAMEWORK AND CAPACITY ASSESSMENT **15**

2.1 POLICY AND LEGAL FRAMEWORK 15
2.2 DESCRIPTION OF INSTITUTIONAL FRAMEWORK 15

ASSESSMENT OF ENVIRONMENTAL AND SOCIAL CONDITIONS **18**

3.1 PHYSICAL ENVIRONMENT 18
3.2 PROTECTED AREA 19
3.3 SOCIAL ENVIRONMENT 21
3.4 CULTURAL ENVIRONMENT 22

ACTIVITY WISE ENVIRONMENT & SOCIAL SCREENING, RISK AND IMPACTS IDENTIFICATION **23**

4.1 SUB-PROJECT SCREENING 23
4.2 STAKEHOLDER CONSULTATION 27
4.3 DESCRIPTIVE SUMMARY OF RISKS AND IMPACTS FROM ACTIVITIES BASED ON SCREENING 32

CONCLUSIONS AND RECOMMENDATIONS **34**

5.1 CONCLUSIONS 34
5.1.1 Risk Classification *34*
5.1.2 National Legislation and WB ESS Applicability Screening *34*
5.2 RECOMMENDATIONS 35
5.2.1 Mitigation and Management of Risks and Impacts *35*
5.2.2 Institutional Management, Monitoring and Reporting *36*

TABLES

TABLE 1.1: SALIENT FEATURES OF THE PROJECT 8
TABLE 1.2: TIMELINES PHASING OF IMPLEMENTATION 13
TABLE 4.1: SUMMARY OF IDENTIFIED RISKS/IMPACTS IN FORM SF-3 26
TABLE 5.1: WB ESF STANDARDS APPLICABLE TO THE SUB-PROJECT 34
TABLE 5.2: LIST OF MITIGATION PLANS WITH RESPONSIBILITY AND TIMELINES 36

FIGURES

FIGURE 1.1: PROJECT LAYOUT 8
FIGURE 1.2: DOWNSTREAM AND UPSTREAM VIEW OF THE DAM 9
FIGURE 1.3: SELECTED PHOTOGRAPHS OF IMPROVEMENT/INTERVENTION AREA 11
FIGURE 1.4: PROJECT AREA SHOWING MAJOR INTERVENTION LOCATIONS 12
FIGURE 3.1: LAND USE AND LAND COVER MAP OF 5 KM RADIUS AROUND DAM SITE 18
FIGURE 3.2: PROTECTED AREA VIS-À-VIS DAM 21

ANNEXURES

ANNEXURE I: FORM SF1 38
ANNEXURE II: FORM SF2 40
ANNEXURE III: LIST OF PARTICIPANTS IN THE STAKE HOLDERS' CONSULTATION FOR KAKKAYAM DAM ON 28TH DECEMBER 2021 45

ABBREVIATIONS AND ACRONYMS

AIDS	:	Acquired Immunodeficiency Syndrome
BOQ	:	Bill of Quantities
CA	:	Conservation Area
COVID	:	Coronavirus Disease
CWC	:	Central Water Commission
DE	:	Beyond Dam Area
DI	:	Within Dam Area
DRIP	:	Dam Rehabilitation and Improvement Project
DSRP	:	Dam Safety Review Panel
DSO	:	Dam Safety Organization
EAP	:	Emergency Action Plan
ESCP	:	Environmental and Social Commitment 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
ESZ	:	Eco-Sensitive Zones
GBV	:	Gender Based Violence
GIS	:	Geographic Information System
GRM	:	Grievance Redressal Mechanism
HIV	:	Human Immunodeficiency Virus
IA	:	Implementation Agency
IPF	:	Investment Project Financing
LMP	:	Labour Management Procedure
MCM	:	Million Cubic Meters
MDDL	:	Minimum Draw Down Level
MW	:	Megawatt
MWL	:	Maximum Water Level
OHS	:	Occupational Health & Safety
PA	:	Protected Area
PAP	:	Project Affected Person
PDO	:	Project Development Objective
PE	:	Physical Environment
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

Kakkayam dam is constructed as part of Kuttiyadi Hydro Electric Project (231.75 MW). This dam is located in Kozhikode District of Kerala. It is a masonry dam constructed across Kuttiyadi River. The project was commissioned in 1972. It has been proposed to undertake rehabilitation measures (structural civil & hydro-mechanical remedial 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.

Preliminary Stakeholder consultation was conducted on 28th December 2021 ensuring social distancing in view of COVID19 restrictions. The meeting was attended by local people living in the nearby area, workers of contractor executing certain rehabilitation works at dam site, permanent staff of KSEBL working at dam etc.

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 repairs to the spillway glacis and construction of building at dam premises to accommodate security personnel and operating staff are considered moderate. Due to dam location within protected area (Malabar Wildlife Sanctuary), hydro-mechanical activities such as maintenance to the emergency/service gates of scour sluice and overhauling of hoist mechanism and maintenance to the Intake gate & hoist mechanism are also considered moderate due to impact on ecology and sensitive habitat. Similarly, environment and social risk of labour camp and disposal of debris has also been identified as moderate. Risk of all other activities has been identified as Low. 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.

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)

- Bio-diversity Conservation Plan (ESS6)
- Stakeholders Engagement Plan (ESS10)

Overall, the proposed activities within this dam sub-project have low to moderate risks resulting in the 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 – KAKKAYAM DAM

Kakkayam dam is constructed as part of Kuttiyadi Hydro Electric Project (231.75 MW). This dam is located in Kozhikode District of Kerala. It is a masonry dam constructed across Kuttiyadi River. The project was commissioned in 1972.

The water stored in Kakkayam reservoir is diverted to Power Station of KHEP. After generating power, the tail water is stored in a downstream reservoir of Kuttiyadi Irrigation Project for irrigation and drinking purposes.

The project lay out and downstream& upstream view are shown in the **Figure 1.1 and Figure 1.2** respectively. Salient features of the project are given in the **Table 1.1.**

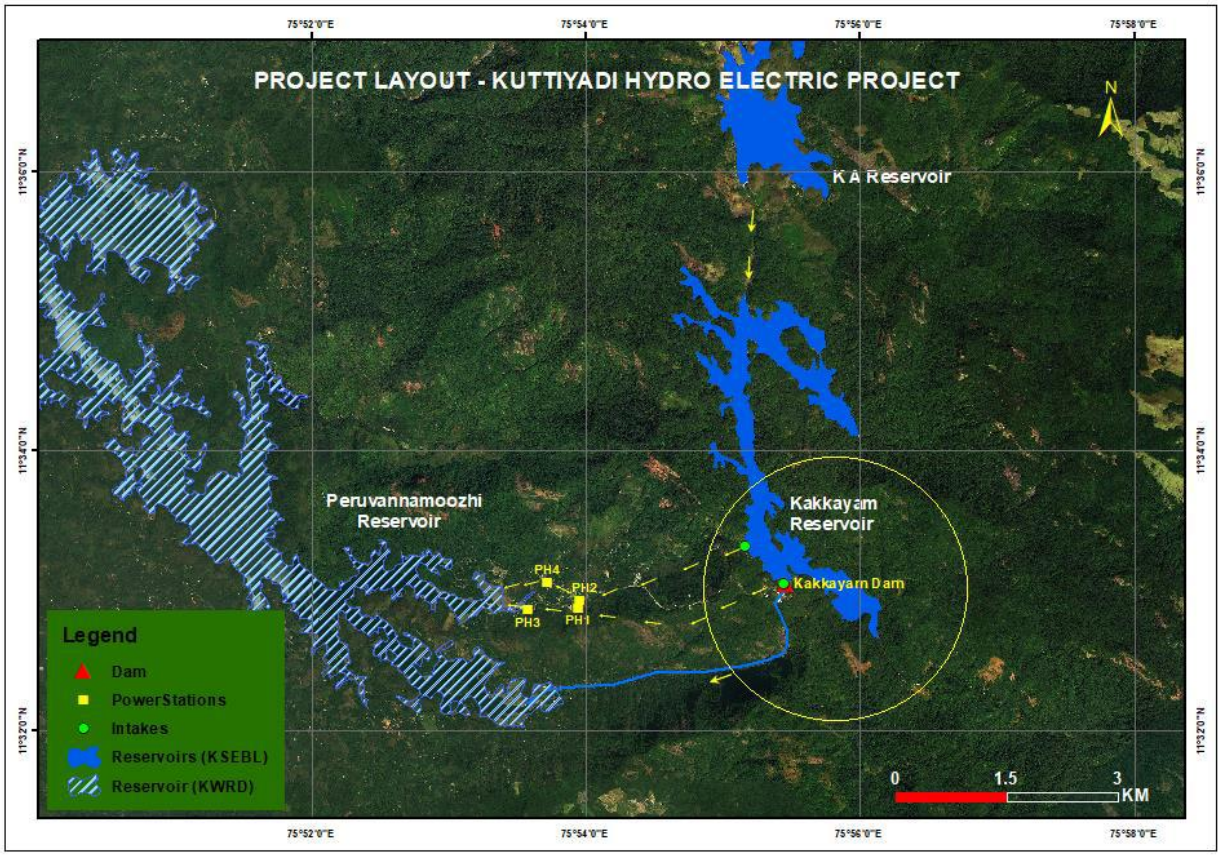


Figure 1.1: Project Layout

Table 1.1: Salient features of the project

Location	
State	Kerala
District	Kozhikode
River/ Basin	Kuttiyadi
Nearest city and airport	Kozhikode, Calicut International air port
Nearest railway station	Kozhikode
Lat/Long	11^0 33’ 04’’ N /75^0 55’ 29’’E
Type of project	Hydropower
Installed Capacity (MW)	231.75 MW
Dam Details	
Type	Masonry Gravity
Total length of dam	228.60 m
Top width of Dam	5.18 m
Elevation of top of dam	+ 759.56 m
Height of Masonry Dam above deepest foundation level	39.51 m
Outlets	
Number	1
Elevation	+725.12
Size	1.5m X 1.5 m
Spillway	
Type of Spillway	Ogee

Spillway Crest Level	+ 751.64 m
Number of Bays	2
Type of Spillway Gate	Radial gates
Size of Spillway Gate	10.97m X 6.4m
Discharging Capacity at FRL	736.20 cumec
Reservoir	
Catchment Area at Dam site	38.20 sq km
Full Reservoir Level	+758.04 m
Minimum Draw Down Level	+737.62 m
Gross Storage Capacity	38.40 MCM
Reservoir Spread Area	2.79 sq.km
Date of Completion	In 1972
Original Inflow Design Peak Flood	736.20 cumec
Maximum observed flood peak	246 cumec
Revised Inflow Design Peak Flood	878 cumec

Figure 1.2: Downstream and upstream view of the dam

1.3 PROPOSED INTERVENTIONS/ACTIVITIES AND INTENDED OUTCOMES

Dam Safety Review Panel (DSRP) constituted for DRIP Phase II, has made a visit to Kakkayam dam on 07.07.2020 and recommended measures to be taken 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 Project Screening Template have been formulated based on DSRP recommendations and these proposals form the basis for preparation of the present ESDD report.

Major rehabilitation works proposed include;

A. Structural Rehabilitation Works

1. Maintenance to the emergency/service gates of scour sluice and Overhauling of hoist mechanism
2. Maintenance to the Intake Gate & Hoist mechanism
3. Repairs to the spillway glacis
4. Construction of catwalk bridge to access the trunnions of spillway gate
5. Replacing Collapsible Gate at intake tower with Rolling shutter
6. Replacing Gratings on Intake Tower above FRL
7. Replacing Rolling Shutter of Scour Gate Tower

B. Non-Structural Measures

8. Preparation of Tier II EAP of Dam
9. Integrated Reservoir Operation
10. Installation of Early Warning System

C. Basic facilities enhancement

11. Maintenance of Bye pass road to dam site
12. Maintenance of access road to surge
13. Construction of building at dam premises to accommodate security personnel and operating staff
14. Purchasing Four-wheel drive vehicle with hard top

D. Instrumentation

15. Installation of Accelerographs

E. Other activities

16. Pressure washing on the dam body
17. Hydrographic survey
18. Detailed examination of Spillway radial shutter No 2

19. Estimation of site-specific seismic parameters
20. Development of Project specific Unit Hydrograph
21. Integrated Reservoir Operation
22. Investigation of the cause / Seepage path in the blocks near Left abutment with the assistance of GSI

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

Rectification of pitting in spillway glacis

Hoist of Emergency/Service Gate- needs overhauling

Intake Tower– Shutters to be replaced

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, Hydro Mechanical works and Instrumentation and certain studies. Civil/Hydro Mechanical works will be carried out by contractor(s) as these are labour intensive activities and would be completed over a period of 21 months. Consultancy contract for various studies and investigations, which does not involve site interventions are scheduled to complete by 36 months from the start of the project. 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:

Overall Phasing of Project Implementation:

Proposed Starting of implementation: 01/01/2022

Proposed Ending of implementation : 31/12/2024

Implementation Duration (months) : 36

Table 1.2: Timelines phasing of implementation

Sl. No.	Description	From (Month/Year)	To (Month/Year)
1	Civil Work – Main Package	01/2022	11/2023
2	Other Packages	01/2022	05/2023
3	Procurement of Goods	05/2022	05/2024
4	Consultancy Contracts	07/2022	12/2024

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 standard 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.

Detailed consultations with communities living downstream/vicinity of the dam, could not be held in the current circumstances due to COVID and these shall be held as soon as situation is conducive for holding such consultations. However, limited direct workers included Engineers/staff working at dam (full time or contracted) and community stakeholders included local people from vicinity villages have been questioned using two sets of questionnaires, one for each category of stakeholders – direct workers and community stakeholders.

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 areas (PA).

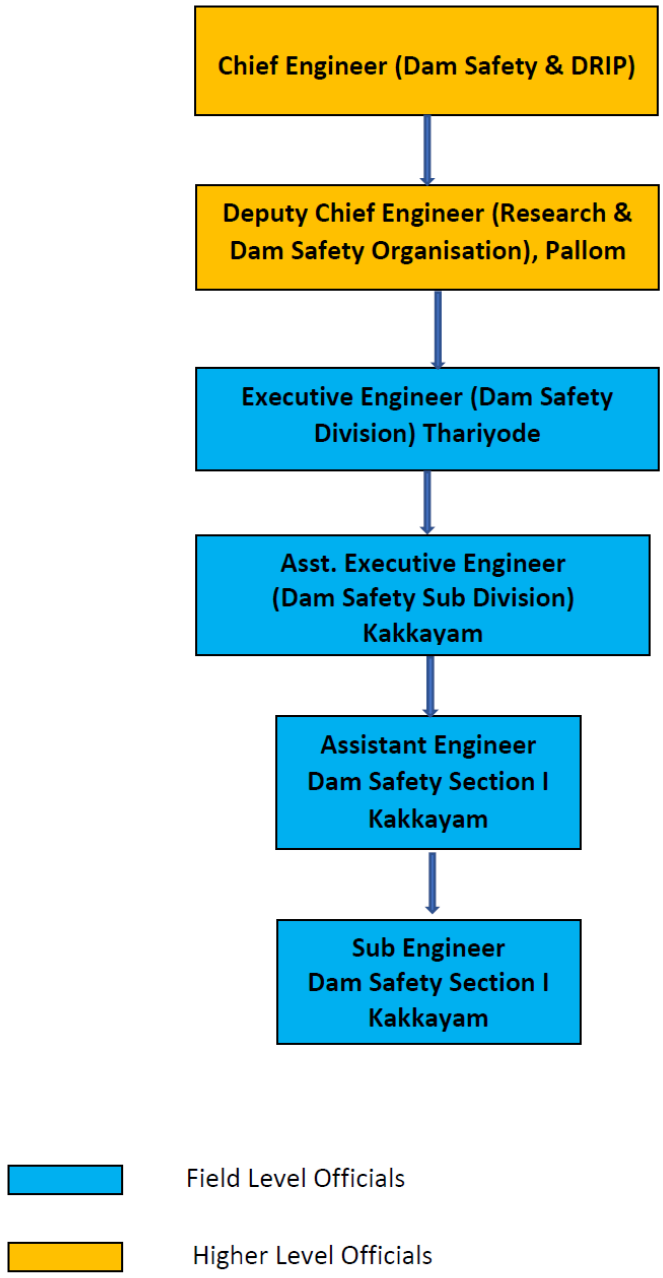
For the proposed rehabilitation activities at the dam, regulatory clearances will not be applicable as neither it is a new dam project nor any forest land required for the rehabilitation work. Dam falls within Malabar Wildlife Sanctuary. Rehabilitation works are proposed on the existing dam structures only, therefore wildlife clearance will not be applicable. Project authorities will intimate the wildlife department and park authorities before start of rehabilitation work and follow their guidelines for transportation of man and material on the routes passing through Malabar Wildlife Sanctuary or its eco-sensitive zone. Other applicable regulatory requirements are discussed in ESMF.

2.2 DESCRIPTION OF INSTITUTIONAL FRAMEWORK

The sub-project will be implemented by the Dam Safety Organization of KSEBL. The 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 after ensuring the safety of people downstream. Works required for improving the operational performance of the existing dams & their modernization etc. under KSEBL is also carried out by Dam Safety wing. The Chief Engineer is assisted by a team of Engineers under the Deputy Chief Engineer, 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.

In KSEBL the organizational structure for the operation and maintenance of Kakkayam Dam Sub-Project is as follows:



The project Implementing Agency is KSEBL and the Dam in Charge is Executive Engineer, Dam Safety Division, Thariyode.

KSEBL do not have in-house expertise to address E&S issues. Presently, The Chief Engineer at SPMU and Executive Engineer at field level look after these aspects. It is proposed to

appoint E&S expert in SPMU to assist KSEBL in E&S activities of DRIP Phase II. The Board of Directors has accorded sanction for the appointing an E&S Expert in SPMU.

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. As committed in ESCP, 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.

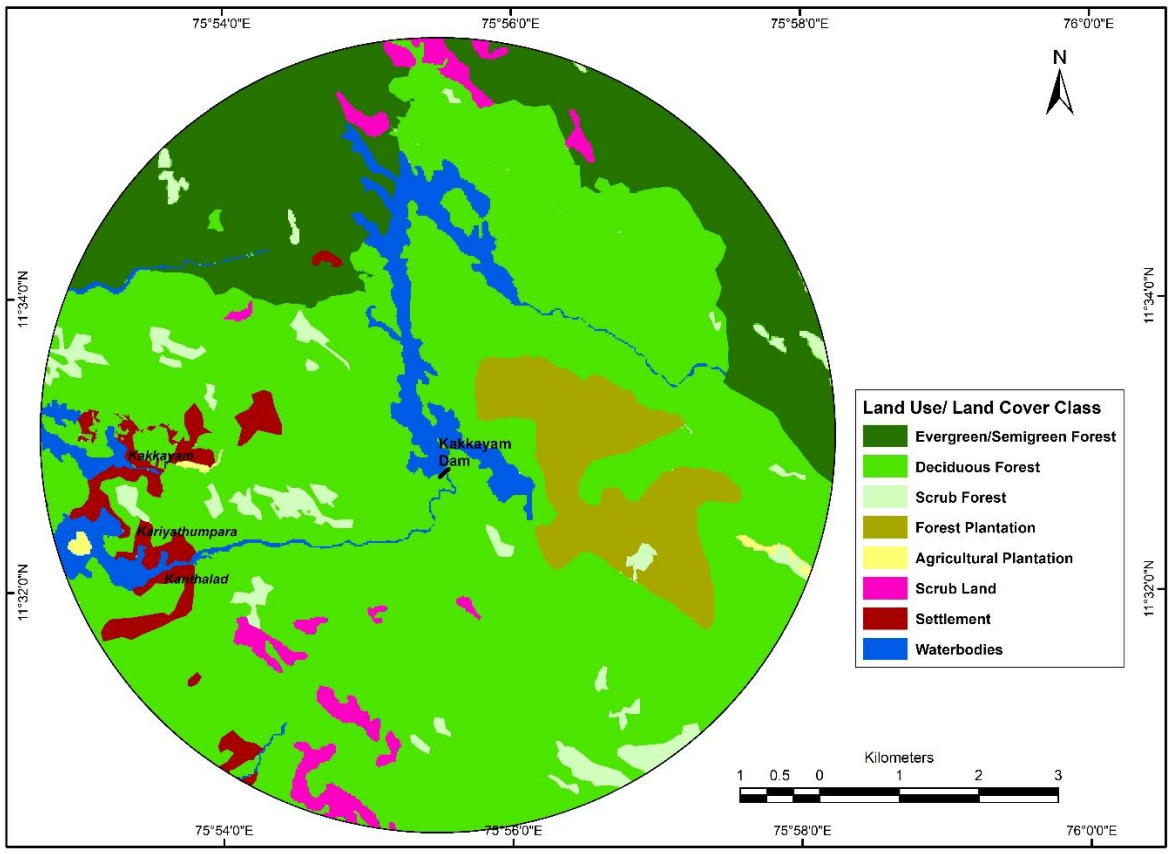
Chapter 3 ASSESSMENT OF ENVIRONMENTAL AND SOCIAL CONDITIONS

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 deciduous forest, evergreen/semi-evergreen forest and forest plantation followed by scrub forest, scrub land, agricultural plantation, settlement and water bodies (mainly reservoirs and river). There are three habitations or villages falling in 5 km of radius of the dam; they are Kakkayam, Kariyathumpara and Kanthalad.



[(Source: Digital on land use/land cover maps using bhuvan prepared by National Remote Sensing Centre (NRSC) with Kerala State Remote Sensing and Environment Centre, Thiruvananthapuram, Kerala 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.

Original design flood of the project was 736 cumec. The largest flood recorded since the construction of Dam (in 1972) was in 2018. The design flood is reviewed by CWC in 2020 and design flood is revised as 878 cumec. Flood routing studies are carried out and found that the existing spillways can handle the revised flood without encroaching the FRL with revised operating levels. Highest rate of release through the spillway was required during 2018 floods and was 246 cumec.

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 Kakkayam dam have been reviewed to assess the applicability of ESS6. The dam is located within Malabar Wild Life Sanctuary. It was constructed in 1972, and is in operation for the past five decades, the natural ecological system is flourished exceedingly due to the continuous availability of water in the river system. Location of dam has been within Peruvannamoozhy Forest range under Kozhikode Forest Division. In 2009, 74 sq km of forest land in this region which include dam area was declared as Malabar Wild Life Sanctuary.

Malabar Wildlife Sanctuary is an integral part of the Western Ghats. The Sanctuary is characterised with high diversity of flora and the vegetation of the region varies from hill top evergreen forests to tropical evergreen forests, semi evergreen forests and moist deciduous forests. The major flora available in the Sanctuary are Kunnivaka (*Albizia procera),* ezhilampaala (*Alstonia scholaris),* eetti (*Dalbergia latifolia),* venthekku (*Largerstomia lanceolata),* teak *(Tectona grandis),* kanikonna (*Cassia fistula),* pezhu (*Carreya arborea),* pepper *(Piper nigrum),* mula (*Bamboosa bamboos),* banana *(Musa paradisica),* maavu (*Mangifera indica),* kasumavu (*Aanacardium occidentale),* thengu (*Cocos nucifera),* puli (*Tamarindus indica),* maruth (*Terminalia paniculata),* plavu (*Artocarpus heterophyllus),* mazhavaaka (*Samaniasaman),* chemparavalli (Ampelocissus indica), mulluvenga (*Bridelia retusa),* arana maram (*Polyalthia longifolia),* arasu (*Ficus religiosa),* arayal (*Ficus banghalensis),* kudampuli (*Garciniagummi-gutta),* eeranpana (*Caryo taurens),* kavungu (*Areca catechu),* mylellu (*Vitex altissima),* kattupunnuthu (*Stachytarpheta jamaicensis),* arippu (*Lantana camara),* amarathi (*Trema orientalis),* chadachi (*Grewia tiliifolia),* vakkanarumaram (*Sterculia villosa),* chandanam (*Santalum album),* kattapitalavam (*Morinda pubescens),* kadambu (*Mitragyna parvifolia),* soochimulla (*Ixora pavetta),* manjakadambu (*Haldina cordifolia),* naikambagam (*Prunus ceylanica),* kotta (*Ziziphus xylopyrus),* kodangal (*Centella asiatica),*etc;

The reported faunal diversity of Malabar Wildlife Sanctuary includes 41 species of mammals, 180 species of birds, 35 species of reptiles, 38 species of amphibians 52 species of fishes, 181species of butterflies and dragonflies, etc. Malabar Wildlife Sanctuary is part of the Wayanad Elephant Reserve and supports diverse fauna including threatened mammal species such as Asian elephant (*Elephas maximus),* tiger (*Panthera tigris),* leopard (*Panthera pardus),* leopard cat (*Felis bengalensis),* spotted deer (chital) *(Axis axis*), barking (muntjac) deer (*Muntiacus muntjak*), mouse deer (Indian chevrotain) (*Tragulus meminna*), jungle cat (*Felis chaus),* bonnet macaque (*Macaca radiata),* jungle palm squirrel (*Funambulus tristiatus),* malabar giant squirrel (*Ratufa indica),* little Indian field mouse (*Mus booduga),* Indian crested porcupine (*Hystrix indica),* black napped hare (*Lepus nigricollis),* lesser dog faced fruit bat (*Cynopterus brachyotis),* Indian pangolin (*Manis crassicaudata),* grey mongoose (*Herpestes edwardsi),* small Indian civet (*Viverricula indica),*wild boar (*Sus scrofa),* etc;

The Sanctuary harbours several endemics and many re-discovered species with a few species occurring only within the Sanctuary. Endemic species reported from the Sanctuary includes 6 mammalian species, 26 species of amphibians, 21 species of fishes etc.

Figure 3.2 gives location of the dam with respect to Malabar Wildlife Sanctuary and its ESZ.

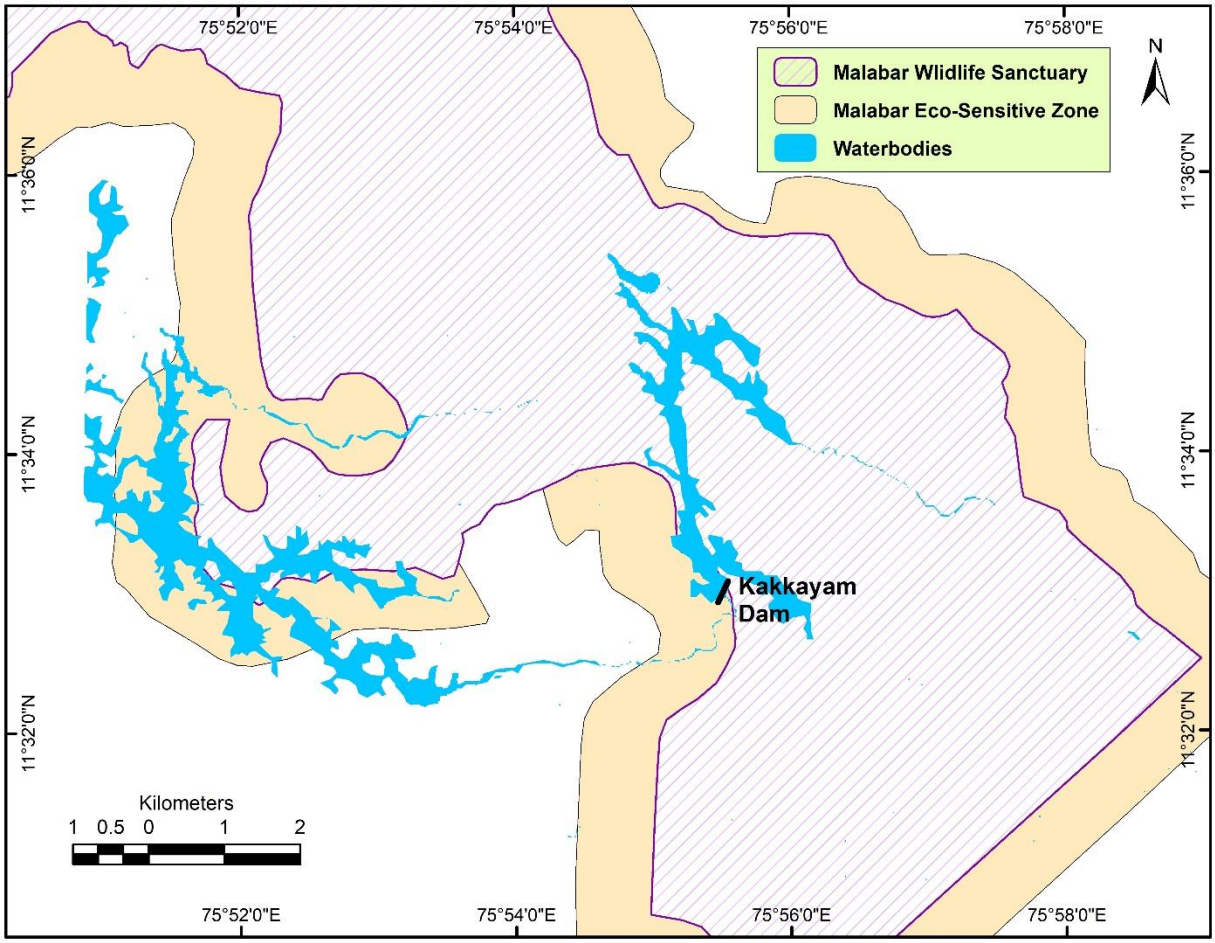


Figure 3.2: Protected area vis-à-vis dam

3.3 SOCIAL ENVIRONMENT

The Kakkayam dam is located in Kozhikode district in the state of Kerala. The dam is in forest area. No habitations/settlements are there in the immediate vicinity of dam. Nearest settlement is outside the forest periphery. The project colony is located at Kakkayam and is at about 3 km radial distance (14 km road distance) from dam in the adjacent valley. A tribal settlement is there at Ambalamkunnu near the project colony. About 15 families are there in the settlement and number of members is 63. Human settlement is there in the downstream reaches of the dam along the banks of the river at Kariathumpara about 3 km radial distance (18 km road distance) from the dam location.

There are no Schedule V[1] areas in Kerala.

The brief demographic characteristic of the district is given in the table 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**.

No. of Households	**697710**	**Household Size**	**04**
Total Population	**3086293**	**Population (0-6 age)**	**335645**
Male	1470942	Boys (0-6 age)	170429
Female	1615351	Girls (0-6 age)	165216
Sex Ratio	1098	Sex Ratio (0-6)	969
Population (SC)	**199191(6.45%)**	**Population (ST)**	**15228 (0.49%)**
Male	97279	Male	7429
Female	101912	Female	799
Literates	**2615443**	**Literacy Rate (in %)**	**95.08**
Male	1266939	Male	97.42
Female	1348504	Female	92.99
No. of Workers	**948981**	**Cultivators**	19,905 (2.09%)
Male	752333	**Agricultural Labours**	37555 (3.95%)
Female	196648	**Household Industrial Workers**	9228 (0.97%)
No. of Main Workers	**754187**	**Other Workers**	882293 (92.97%)
No. of Marginal Workers	**194794**		
Source: *Census of India, 2011 (District Handbook)*			

There are very few scheduled tribe households in the district (0.49%). They are mainstreamed in the area and do not possess any characteristics as outlined in ESS7. There are no physical interventions planned outside the dam. Any households in the downstream area will be taken into account during the preparation of Emergency Action Plan for Kakkayam Dam.

3.4 CULTURAL ENVIRONMENT

List of National Monuments in Keara and list of State Protected monuments in Kerala have been reviewed along with the local knowledge available with the project team. There are protected monuments identified by Archaeological Survey of India in the district however none of them are in the vicinity of the project. Similarly, no tangible or intangible heritages have been identified to be impacted by the rehabilitation work.

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, Labour, Migrant Labour 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. There will be no change in the flow behaviour upstream of dam as there is no increase in dam height or no increase in storage or no increase in submergence area.

Pre-construction and construction stage major auxiliary or preparatory intervention are within dam area. Deployment and haulage of heavy machinery, setting up of workshop, operation of concrete mixture and heavy pumps will be within/outside the dam area. Other activities such as labour camp and debris disposal will be kept outside the 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 and biological 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, though low.

Proposed non-structural interventions include Emergency Action Plan, Early Warning System etc. 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 following activities as having Moderate Risks/impacts.

- Maintenance to the emergency/service gates of scour sluice and Overhauling of hoist mechanism
- Maintenance to the Intake Gate & Hoist mechanism
- Repairs to the spillway glacis
- Construction of building at dam premises to accommodate security personnel and operating staff
- Labour Camps involved
- Major Debris Disposal involved

All other activities are categorized as low risk activities. 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 4.3: 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)	M	M	L	M	L	L	M	L	M	None	L
Hydro Mechanical	M	L	L	M	L	L	L	L	M	None	L
Instrumental SCADA, surveillance	L	L	L	L	L	L	L	L	L	None	L
Painting	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Road work	L	L	L	L	L	L	L	L	L	None	L
Safety measures (Siren, Lighting)	L	L	L	L	L	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 due diligence. 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 28.12.2021. 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 works proposed to be carried out for the dam were explained to them. Formal consultations will be held and outcomes documented.

Consultation with villagers from downstream village

Following is the outcome of the stakeholder consultation meeting:

1. Inhabitation is not there in the close proximity of the dam as the dam is located in forest land.
2. Farming is the main source of livelihood of people in the nearby area. They are planting crops like Coconut, Arecanut, Plantain, Cocoa etc. They also keep livestock and used to sell the milk of cows, buffalo or goats, etc.

3. The people nearby are engaged in the power station and power project colony for unskilled job.
4. 4 numbers of contract workers are working at the dam for the entire period for security and operation & maintenance works of the dam. Special maintenance works of the dam are arranged through local contractors and workers.
5. All the participants welcomed the proposed interventions relating to dam safety.
6. The dam was commissioned in 1972. There are no pending issues regarding dam construction related resettlement.
7. The participants explicitly mentioned that the rehabilitation works of the dam will no way affect them and instead they will be getting some earnings by engaging as unskilled labour for the works.
8. Participants have expressed that they do not have any grievances as far as the rehabilitation works proposed by the KSEBL for the dam.

Based on these findings relating to both structural and non-structural interventions, potential stakeholders were categorized as affected stakeholders, other interested stakeholders and disadvantaged & vulnerable stakeholders.

Affected Stakeholders: There are no affected persons who shall be directly or indirectly adversely affected by the proposed interventions.

Other interested stakeholders: In relation to structural interventions, these would be contractors, regulatory bodies/institutional stakeholders such as revenue, environmental authorities, people living in downstream reaches etc. In relation to non-structural interventions, these would be communities living downstream including farmers; community leaders; district administration, police, state disaster management authority, revenue department, electronic and print media, etc. These communities would be key stakeholders requiring to be involved in the preparation and implementation of Emergency Action Plan (EAP).

Communities welcomed such interactions and indicated that they would prefer Dam authorities conduct such face-to-face meeting periodically at a convenient location to inform about the developments/interventions relevant to them. They welcomed other means of information such as advertisements in the local papers, formation of whatsapp group etc.

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	Proposed rehabilitation activities lie within dam premises. There is no possibility of local community's interference. Emergency action plans are prepared disseminated and published in the website of CWC.

emergency action plans which is a non-structural measure.	
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 Abdul Raheem, 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 done 5 decades past and therefore downstream community is accustomed with the existing mechanism
9. Are there women employees at the dam site?	No
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, annual revenue generated, whether any portion of this generated revenue is diverted to regular O&M of this dam.	Yes; there are hydel tourism activities. Annual visitors: 60,000 persons. Annual revenue from tourists: 40 Lakhs. No share is getting for O&M works and action will be initiated for allocating 10% of income from hydel tourism for O&M.
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; through open tender from experienced persons.

B. Interaction with Local Community

Questions	Responses provided / Observations
1. How many villages are in immediate downstream vicinity? 2. Are they dependent on dam in any way for their livelihood?	One village in the downstream reaches. There is another project in the same river within 5 km radius from the Kakkayam dam owned and operated Kerala Water Resources Department. A few are engaged as unskilled labour for seasonal jobs
3. Does any of these villages were displaced and rehabilitated during the construction of the Dam. Is there any pending compensation issues?	No displacement and hence np pending issues.
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.	N.A
7. Are you aware of local women affected in any way by dam operations?	No
8. Are you aware of any early flood warning system for this dam, or any other system	Siren of high amplitude, mike announcement is available and

wherein downstream communities getting regular update during flood season for any uncontrolled release of water?	regular updates to downstream 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
10. If you have to contact the dam authorities; how will you contact, through telephone/mobile/e mail/personally? 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?	Both telephone, mobile, email and Whatsapp. No such incidents.
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?	The dam is constructed as part of Kuttiyady Hydro Electric Project for generating electricity. This reservoir also helps to ensure drinking and irrigation water at Peruvannamuzhy reservoir.
13. (a) Are you aware of any document named Emergency Action Plan (EAP) of the dam? (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? (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? (d) If yes, how to contact you, please give the corresponding address along with all details to receive the official communication.	Yes; EAP is available for this dam. Consultation meeting was held during year 2019 and 2020. Due to Covid 19, no meeting was held during 2021. No mock drill conducted. Yes. Executive Engineer, Research & Dam Safety Division, No.V, Thariode, Wayanadu, Kerala
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?	Follow tender notices invited for maintenance of the dam.
15. Any suggestion to improve overall system by dam authorities in any way, please give in brief?	Access road from Kakkayam to Dam site (about 13 Km) is to be improved.

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. Due to location of the dam within protected area; impacts on physical and biological environment due to rehabilitation work are more pronounced especially that of works on dam like maintenance to the emergency/service gates of scour sluice and overhauling of hoist mechanism, maintenance to the intake gate & hoist mechanism, repairs to the spillway glacis and Construction of building at dam premises to accommodate security personnel and operating staff etc.
3. Construction work at night time, transportation through protected area and ESZ, will impact flora and fauna in the protected area due noise and air emissions, and therefore need to be controlled and minimized.
4. Labour camp location and setting up of machinery and equipment for construction need to be kept outside the protected area and ESZ to minimize impact on sensitive habitat.
5. 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.
6. Civil works interfaced with water body especially like construction of catwalk bridge to access the trunnions of spillway gate etc may pose risk of water pollution and impact on fish fauna as well as impacts on land environment due to disposal of same on ground.
7. Construction waste, muck etc from above and repairs to the spillway glacis, maintenance of bye pass road to dam site, maintenance of access road to surge, construction of building at dam premises to accommodate security personnel and operating staff etc require careful disposal at pre-identified and approved site to minimise the risk of pollution on this count.
8. 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 is a small (0.49%) scheduled tribe population in the district and there are very few scheduled tribe households in vicinity and downstream areas. These households shall not be directly impacted by project in any manner.

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, Ecology, 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 repairs to the spillway glacis and construction of building at dam premises to accommodate security personnel and operating staff are considered moderate. Due to dam location within protected area, hydro-mechanical activities such as maintenance to the emergency/service gates of scour sluice and overhauling of hoist mechanism and maintenance to the Intake gate & hoist mechanism are also considered moderate due to impact on ecology and sensitive habitat. Similarly, environment and social risk of labour camp and disposal of debris has also been identified as moderate. Risk of all other activities has been identified as Low. 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 5.4: 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

Relevant ESS	Reasons for Applicability of the standard
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 is in within Malabar Wildlife Sanctuary. To minimise risks due to rehabilitation works within protected area especially because of waste and noise generation, Biodiversity Conservation Plan will be prepared.
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 5.5: 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 (CHSMP)	SPMU/IA	Before mobilization of contractor
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural resources	• Biodiversity Conservation Plan	SPMU/IA	Before mobilization of contractor
ESS 10: Stakeholder Engagement Plan	• Stakeholder Engagement Plan	SPMU/IA	By negotiation

ESDD and ESMP will be placed on the 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 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), Labour (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, E, PA, PE, L, G**
5	Structural Improvement/Repair work -Downstream of Dam site (with no interfacing with dam reservoir)	A	DI	PE, PA, E, L, G
6	Re-sectioning earth dams to safe, stable cross sections	NA		
7	Hydro-mechanical activities with interface with dam reservoir	**A**	**DI**	**WQ, PA, PE, L, G**
8	Hydro-mechanical activities Downstream of Dam site (with no interfacing with dam reservoir)	**A**	**DI**	**PA, PE, L, G**
9	Instrumentation, General lighting and SCADA systems	**A**	**DI**	**PE, L**
10	Basic Facilities (like access road improvement, renovation of office, etc)	**A**	**DI/DE**	**PE, PA, E, L, G**
11	Utility installation like standby generator, or setting up solar power systems	**NA**	**CX**	
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			
a				
B	**Pre-construction and construction stage major auxiliary or preparatory intervention**			

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), Labour (L), GBV risks (G), (Write whichever is applicable)
1	**2**	**3**	**4**	**5**
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, PA, PE, E, L, G**
8	Heavy machinery deployment and setting up maintenance workshop	**A**	**DI**	**PE, PA, L, E, 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	Construction of catwalk bridge to access the trunnions of spillway gate	WQ, F, PA, E, PE, L, G	Air and noise pollution, Risk of increase in reservoir water turbidity, Impacts on fish, Impact on ecology especially flora and fauna due to proximity of protected area, Land pollution due to disposal of waste, Labour and GBV risk	L
b	Pressure washing on the dam body	WQ, F, PE, L	Air and noise pollution, Risk of increase in reservoir water turbidity, Impacts on fish, Labour 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 the spillway glacis	WQ, F, PA, E, PE, L, G	Air and noise pollution, Risk of water pollution in river due to increased water turbidity, Impacts on fish, Impact on ecology especially flora and fauna due to proximity of protected area, Land pollution due to disposal of waste, Labour and GBV risk	M
b	Gratings on Intake Tower above FRL	WQ, PE, L, G	Air and noise pollution, Risk of water pollution, Land pollution due to disposal of waste, 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
3	Hydro-Mechanical activities up - stream of Dam Site (with interfacing with dam reservoir)			
a	Maintenance to the emergency/service gates of scour sluice and Overhauling of hoist mechanism	WQ, PA, PE, L, G	Air and noise pollution, Impact on fauna due to noise and proximity to protected area, Risk of water pollution, Land pollution due to disposal of waste/debris, Generation of waste material from packaging etc, Labour and GBV risk	M
b	Maintenance to the Intake Gate & Hoist mechanism	WQ, PA, PE, L, G	Air and noise pollution, Impact on fauna due to noise and proximity to protected area, Risk of water pollution, Land pollution due to disposal of waste/debris, Generation of waste material from packaging etc, Labour and GBV risk	M
c	Replacing Collapsible Gate at intake tower with Rolling shutter	WQ, PA, PE, L, G	Air and noise pollution, Impact on fauna due to noise and proximity to protected area, Risk of water pollution, Land pollution due to disposal of waste/debris, Generation of waste material from packaging etc, Labour and GBV risk	L
d	Replacing Rolling Shutter of Scour Gate Tower	WQ, PA, PE, L, G	Air and noise pollution, Impact on fauna due to noise and proximity to protected area, Risk of water pollution, Generation of waste material from packaging etc, Labour and GBV risk	L
4.	**Instrumentation, General lighting and SCADA systems**			

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	Installation of Accelerographs	PE, L, G	Generation of waste material from packaging etc, Labour and GBV risk	L
5.	Basic Facilities Improvement			
a	Maintenance of Bye pass road to dam site	PE, PA, E, L, G	Air and noise pollution, Impact on ecology, flora and fauna due to proximity to protected area, Land pollution due to disposal of waste/debris, Labour and GBV risk.	L
b	Maintenance of access road to surge	PE, PA, E, L, G	Air and noise pollution, Impact on ecology, flora and fauna due to proximity to protected area, Land pollution due to disposal of waste/debris, Labour and GBV risk.	L
c	Construction of building at dam premises to accommodate security personnel and operating staff	PE, PA, E, L, G	Air and noise pollution, Impact on ecology, flora and fauna due to proximity to protected area, Land pollution due to disposal of waste/debris, Labour and GBV risk.	M
d	Purchasing Four-wheel drive vehicle with hard top	PE, L	Air pollution, Labour 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, PA, E, PE, G	Wastewater generation from domestic activities, waste generation, Impacts on ecology due to proximity to protected area, GBV risk within labour and involving community.	M

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
2	Heavy machinery deployment and setting up maintenance workshop	**PA, PE, E**	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, Impacts of ecology (flora and fauna) due to protected area vicinity	**L**
3	Deployment of concrete mixture and heavy pumps	**PA, PE**	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	**L**
4	Disposal of large amount of Debris	**PE**	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	**M**
5	Transport of large construction material	**PA, PE, L**	Material will be transported from various vendors and suppliers to site for civil, hydro-mechanical work and instrumentation, air and noise emissions from transportation	**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: List of Participants in the Stake Holders' Consultation for Kakkayam Dam on 28th December 2021

S. No.	Name of Participants	Place
1	Sri.Thomson, Etattukunnel – Mooppan	Kakkayam Colony
2	Sri.Johnson, Thekkanath	-do-
3	Sri.Irshad, Muthukadu	-do-
4	Sri. Biju Joseph, Kanicherry	-do-
5	Sri. Saji, Kochupurackal	-do-
6	Sri.Jinu John,Nochumanil	-do-
7	Sri.Benny, Kattikkana	-do-
8	Sri.Rajan, Ambady	-do-
9	Sri. Baby John, Ikulappil	-do-
10	Sri.Sinesh, Kizhakkarakkattu	-do-
11	Sri. Biju P.V, Poovathinkal	-do-
12	Sri. Kasim, Poonthuruthi	-do-
13	Sri.Mammad.P.K,Pichanveedu	-do-
14	Sri. Joseph, Thottunkal	-do-
15	Sri. Saji, Kuzhivelil	-do-
16	Sri.Andrews, Kattikkana	-do-
17	Smt.Rini George, Kizhakkarakkattu	-do-
18	Smt.Beena Santhosh,Marutholil parambil	-do-
19	Smt.Daisy Sunil,Parappuram	-do-
20	Smt.Biji S,Naduvilathara	-do-
21	Smt.Sindhu Johnson	-do-
22	Sri.Biju Moopan,	Ambalakunnel Colony, Kakkayam
23	Sri. Mani	-do-
24	Sri. Sreedharan	-do-
25	Smt.Geetha	-do-
26	Smt.Anitha	-do-
27	Smt.Sarada Krishnan	-do-
28	Smt.Ammini	-do-
29	Sri.Benny Veliyath,	Kariyathumpara, Kakkayam
30	Sri.Jose, Pandamana	-do-
31	Sri.Sunny, Kochumalayil	-do-

32	Sri.Vinil, Kanicheri	-do-
33	Sri. Chacko, Kochumalayil	-do-
34	Sri.M.C. Baburaj, Executive Engineer, R&DS Division No.V, Tahriode	KSEBL
35	Sri.Abdul Rahim.C, Assistant Executive Engineer, Kakkayam	KSEBL
36	Sri.Muhammad Kutty, Sub Engineer, Kakkayam	KSEBL