

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

**PAMBA DAM
(PIC: KL29HH0022)**

ENVIRONMENT AND SOCIAL DUE DILIGENCE REPORT



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KOTTAYAM**

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ABBREVIATIONS AND ACRONYMS

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

EXECUTIVE SUMMARY

Pamba dam is located in Pathanamthitta District of Kerala State. It is constructed across Pamba River. Water from Pamba reservoir is diverted to Kakki reservoir through an interconnecting tunnel to augment the power generation at Sabarigiri Hydro Electric Project (340 MW). Water stored in Pamba reservoir is routed through Kakki reservoir and diverted to a Power Station located at Moozhiyar through a tunnel – penstock system. The tail water from the power station is released to a small reservoir created in Moozhiyar stream, at Moozhiyar which in turn utilized for the power, irrigation and water supply projects in the downstream reaches.

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. Major rehabilitation works include: Construction of Catwalk Bridge to access the trunnions of Radial Gates of spillway, Construction of culvert in access road to control shaft, Pressure washing downstream of Pamba dam, Overhauling and repair of Gear box of hoisting mechanism of radial gates no. 2 & 4, Painting on metal parts of the hoisting mechanism of spillway and works for protecting hoists from rain, Overhauling and painting of emergency gate of lower-level outlet and repairs to the electrical operating system of hollow jet valve, Overhauling and painting of IC tunnel intake gate and hoisting mechanism and repairs to the electrical operating systems of IC Tunnel Gate, Providing Fencing to the control shaft & Painting Control shaft and Hoist, Pressure washing downstream of dam etc.

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 05th June 2023. The meeting was attended by local people living in the nearby area, permanent staff of KSEBL working at dam site 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, general ecology, labour and SEAH/GBV. Environment risks of air, water, noise, land use, soil and resource use for construction of box culvert in the access road to control shaft is considered moderate. Due to dams' location within ESZ and proximity to protected area, activities such as construction of catwalk bridge to access the trunnions of radial gates of Pamba spillway is 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.

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

Pamba dam is located in Pathanamthitta District of Kerala State. It is constructed across Pamba River. Water from Pamba reservoir is diverted to Kakki reservoir through an interconnecting tunnel to augment the power generation at Sabarigiri Hydro Electric Project (340 MW). Water stored in Pamba reservoir is routed through Kakki reservoir and diverted to a Power Station located at Moozhiyar through a tunnel – penstock system. The tail water from the power station is released to a small reservoir created in Moozhiyar stream, at Moozhiyar which in turn utilized for the power, irrigation and water supply projects in the downstream reaches.

Catchment area of the project is 73.7 Km² as estimated by CWC in the flood report of Pamba dam prepared during October 2020. There is no project in the upstream of the catchment. The downstream project is Perumthenaruvi diversion weir owned and operated by KSEBL.

Pamba is a masonry gravity dam. The length and height of the dam are 281 m & 52 m respectively. Top width is 3.66 m. Top level of dam is 987.86 m. Foundation gallery is provided

in the dam. A spillway of length 54 m is provided in the dam with crest level at 981.46m. A lower-level outlet with diameter 1.8m is provided with sill level at 958.29m.

Salient features of dams are reported below:

Project Name	Pamba dam of Sabarigiri HEP
River Basin	Pamba Basin
River/Stream	Pamba AR
District	PATHANAMTHITTA
Latitude/Longitude	09° 23' 26" / 77° 09' 36"
Type of Project	Hydro Power Project
Gross Command Area (GCA)	NA
Cultivable Command Area (CCA)	NA
Hydro Power Installed Capacity	340 MW
Average Annual Energy Generation (MU):	1338 MU
Domestic/Municipal/Industrial Water Supply (Annual)	NA
Dam	
Type	Masonry Dam
Total length of the Main dam	281 m
Length of Embankment dam	NA
Length of Masonry/Concrete dam	281 m
Top width of Embankment Dam	NA
Top width of Masonry/Concrete Dam	6.1 m
Elevation of top of Embankment Dam	NA
Elevation of top of Masonry/Concrete Dam	987.86 m
Elevation of top of Upstream Solid Parapet Wall	988.76 m
Height of Embankment Dam above Lowest River Bed Level	52 m
Height of Masonry/Concrete Dam above deepest foundation level	57 m
Lowest River Bed Elevation	935.74 m
Deepest Foundation Elevation	930.86 m
Saddle Dam	NA
Main Spillway	NA
Auxiliary Spillway	NA
Sluice arrangement	NA
Outlet works	
Location	Block No 9
Number	1
Sill level	958.29 m
Size	1.80 m dia
Size of Emergency Gate: Width	1.50 m width & 2.90 m height
Discharging Capacity	35 cumec
Main Spillway	
Type of Spillway	Ogee
Location of Spillway	Right flank
Length of spillway	54 m

Spillway Crest Level	981.46 m
Total Discharging Capacity at MWL	912 cumec
Size of spillway gates	7.01 m width & 4.87 m height
Type of Energy Dissipation Arrangement	NA
Auxiliary spillway	NA
Sluice Arrangement	NA
Outlet works	NA
Reservoir	
Catchment Area at dam site	74 sq km
Full Reservoir Level	986.33 m
Minimum Draw Down Level	963.17 m
Gross Storage Capacity at FRL	31.15 MCM
Live Storage Capacity	39.22 MCM
Reservoir Spread Area at FRL	2.01 sq km
Date of Starting the Construction	1962
Date of Completion	1966
Date of first impoundment	1966
Original Inflow Design Peak Flood	912 cumec
Revised Inflow Design Peak Flood	969 cumec

1.3 PROPOSED INTERVENTIONS/ACTIVITIES AND INTENDED OUTCOMES

Dam Safety Review Panel (DSRP) was constituted by KSEBL for inspection of their dams as per order dated 22nd Oct 2019 for the purpose of inspection of the projects those are planned to be undertaken for the repair, rehabilitation and modernization work under World Bank aided DRIP-II schemes. Due to COVID, panel could not complete inspection of all projects so a new panel was constituted vide order dated 2nd July 2020 to inspect remaining projects. Panel made a visit to Pamba dam on 09/10/2020 for inspection purpose 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 rehabilitation proposals mentioned below as described in the PST have been formulated based on DSRP recommendations and these proposals form the basis for preparation of present ESDD report.

Rehabilitation of Dam & Appurtenance Structures

Structural Rehabilitation Works

- Overhauling and repair of Gear box of hoisting mechanism of radial gates no. 2 & 4
- Painting on metal parts of the hoisting mechanism of spillway and works for protecting hoists from rain
- Overhauling and painting of emergency gate of lower-level outlet and repairs to the electrical operating system of hollow jet valve
- Construction of Catwalk Bridge to access the trunnions of radial gates of Pamba Dam

- Overhauling and painting of IC tunnel intake gate and hoisting mechanism and repairs to the electrical operating systems of IC Tunnel Gate
- Providing protective roofing to the hoist structure of IC Tunnel Intake structure.
- Providing ladder to access the top of hoist structure of control shaft

Non-Structural Measures

- Preparation of Tier II EAP of Dam

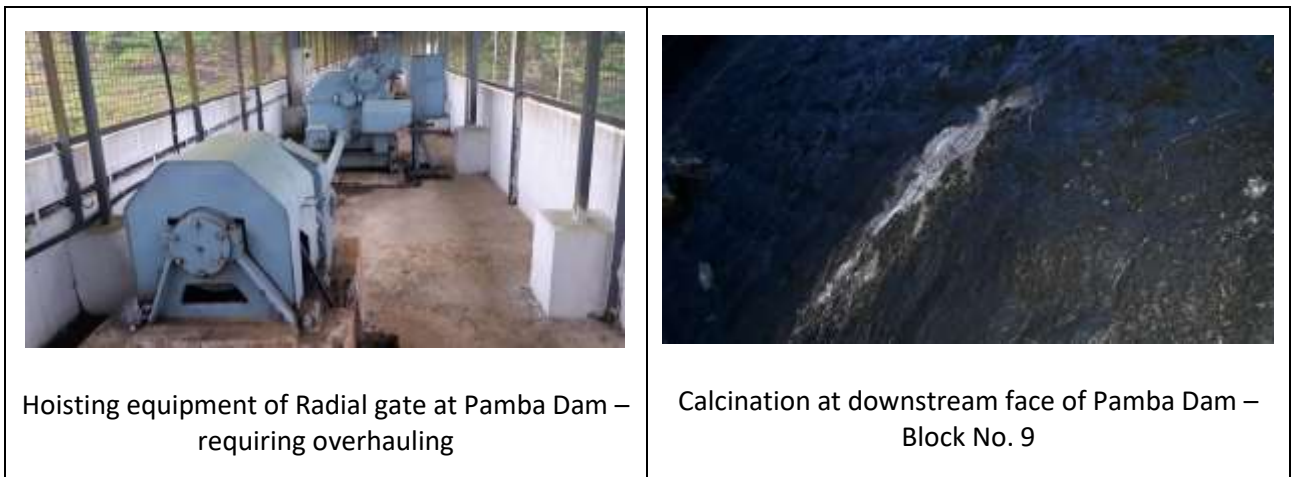
Basic Facilities Enhancement

- Providing Fencing to the control shaft & Painting Control shaft and hoist
- Construction of box culvert in the access road to control shaft

Others

- Pressure washing downstream of Pamba dam
- Replacing collapsible door in the gallery
- Procurement of 15 KVA DG Set
- Conducting water loss test in Block 9 & 10A of Pamba Dam to ascertain the permeability properties
- Hydrographic Survey
- Estimation of Site-Specific Seismic Parameters and Evaluation of Structural Safety of the Dam
- Developing Project Specific Unit Hydrograph for Inflow Forecasting
- Labelling Foundation drains, Vertical drains, Block joints and other salient features in Pamba Dam
- Preparation of As-built drawings
- Testing of materials and other studies

Figures 1.1 and 1.2 provide photographs of key infrastructure proposed for rehabilitation works and also major intervention’s locations.





Motor for operating hollow jet valve – Pamba Dam
– faulty electrical connections



Damaged wooden bridge on the way to IC tunnel
control shaft



Control shaft of IC Tunnel

Figure 1.1: Selected Photographs of Improvement/Intervention area

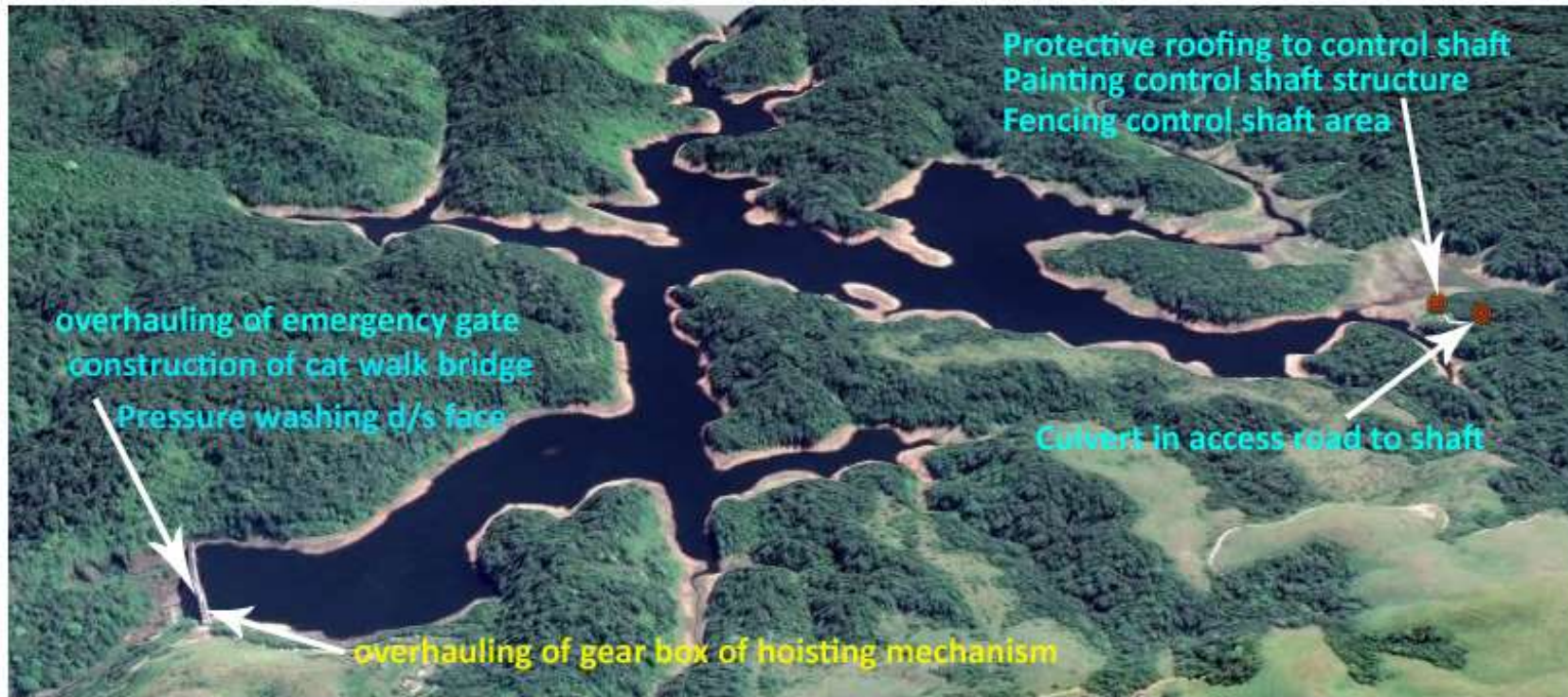


Figure 1.2: Project Area showing major intervention locations

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 36 months. Project Authority will hire contractor(s) based on national open competitive procurement using a Request for Bids (RFB) as specified in the World Bank’s -Procurement Regulations for IPF Borrowers, July 2016, Revised August 2018 Procurement Regulations), and is open to all Bidders as defined in the Procurement Regulations. Following is the overall implementation and procurement schedule:

Overall Phasing of Project Implementation:

Proposed Starting of implementation (MM/DD/YYYY) :07/01/2022
 Proposed Ending of implementation (MM/DD/YYYY) :12/31/2024
 Implementation Duration (months) (MM) : 30 months

S No	Description	From (month/year)	To (month/year)
1	Civil Work – Main Package	07/2022	05/2024
2	Other Packages	11/2022	04/2024
3	Procurement of Goods	01/2023	06/2023
4	Consultancy Contracts	05/2024	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.

The limited direct workers including Engineers/staff working at dam (full time or contracted) and community stakeholders including local people from vicinity villages have been consulted using two sets of questionnaires, one for each category of stakeholders – direct workers and community stakeholders. The Stakeholder consultation was conducted on 05.06.2023. It was attended by the local people living in the nearby area, contract workers, KSEBL staff at dam site etc. About 21 persons were participated in the consultation meeting, with 3 female and 18 male participants.

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 cultivable 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 dams, regulatory clearances will not be applicable as neither it is a new dam project nor any forest land required for the rehabilitation work. Though dams fall outside Periyar Tiger Reserve however, the dam is within Eco-sensitive Zone (ESZ) of Periyar Tiger Reserve. Rehabilitation works are proposed on the existing dams' 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 Eco-sensitive zone of Periyar Tiger Reserve. 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. 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 to improve 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. The Chief Engineer at SPMU and Executive Engineer at field level look after the E&S activities. In addition to the above, KSEBL has hired an E&S expert to assist in E&S activities of DRIP Phase II. 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.

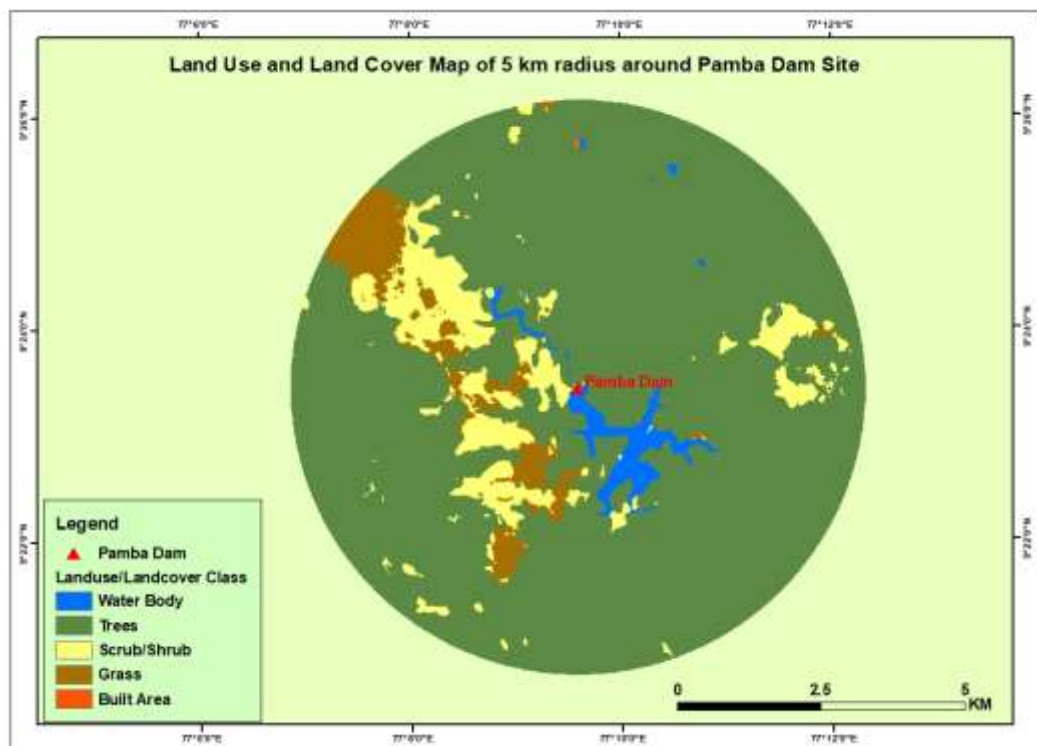
The Grievance Redress Mechanism (GRM) has been established at the site to address the grievances if any from the communities. The Executive Engineer Dam Safety Division, Seethathode is the contact point at site for addressing the grievances if any and the Executive Engineer, DRIP, R&DSO, Pallom is the contact point at SPMU. A complaint register is also being maintained at Division office and at SPMU. 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 project surrounding area's land use and environmental sensitivity was analyzed using GIS techniques. Land use/ land cover map within 5 km radius of dams is presented at Figure 3.1. Present land use is mainly evergreen/semi-evergreen forest and forest plantation followed by grazing land, barren rocky and water bodies/wetland (mainly reservoir and river). There is no habitation or village falling in 5 km of radius of the Pamba dam.



[Source: ESRI 2020 Land cover - Digital data on land use/land cover maps with 10 m resolution derived from ESA Sentinel-2 imagery with further refinement using Arc GIS]

Figure 3.1: Land Use and Land Cover Map of 5 km radius around dam sites

Natural Hazards

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

The gross storage capacity of project is 39 MCM (more than 60 MCM) and height of Pamba dam is 52 (More than 30 m) and as such it comes under the large dam category and therefore shall be designed for Probable maximum Flood (PMF) as per Indian Standard IS: 11223-1985 criteria for fixing spillway capacity. The estimated Flood worked out by CWC is 969 cumec against the original design flood of 912 cumec.

FRL of the reservoir 986.33 m. After 2018 flood, it is decided to release water from the reservoir when the water level reaches 984.50m. Flood routing studies have been carried out considering impinging the PMF at 984.50m m. The outflow and the maximum water level for revised design flood is 781 cumec and 985.87 m respectively. The MWL for revised design flood is lower by 0.46 m than original FRL. Free board available is 1.99 m.

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 Pamba dam have been reviewed to assess the applicability of ESS6. Though the dams fall outside Periyar Tiger Reserve however, the dam is within Eco-sensitive Zone (ESZ) of Periyar Tiger Reserve. **(Figure 3.2):**

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

The proposed rehabilitation activities under the sub-project are very much localized at the existing dam site only. No rehabilitation work is proposed beyond the dam/intake structure boundary, which can directly or indirectly impact the tiger reserve; There will not be any hindrance to the movement of wild animals due to the proposed rehabilitation works. Impacts like transportation of construction materials, manpower and Equipment through Eco-sensitive Zone or Protected area will be mitigated by adoption of standard ESMP and Biodiversity Conservation Plan in line with ESS6 of the World Bank ESS.



Figure 3.2 gives location of the dams with respect to Periyar Tiger Reserve and its ESZ.

Figure 3.2: Protected area vis-à-vis dam

3.3 SOCIAL ENVIRONMENT

The project is located in District Pathanamthitta in Kerala state. Kerala state does not have any Schedule V¹ areas.

The tribal groups namely Mala Pandaram, Mala Arayar, Mala Vedan, Ulladan are located within the district.

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

Description	Number	Respective %	Description	Number	Respective %
No. of Households	3,22,684	--	Household Size	4	--
Total Population	11,97,412	--	Population (0-6 age)	96,837	8.09
Male	5,61,716	52.58	Boys (0-6 age)	49,002	50.6
Female	6,35,696	47.42	Girls (0-6 age)	47,836	49.4

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.

Sex Ratio	1132		Sex Ratio (0-6)	976	
Population (SC)	1,64,465	13.74	Population (ST)	8,108	0.68
Male	78,942	14.05	Male	3,947	0.70
Female	85,523	13.45	Female	4,161	0.65
Literates	1,062,553	--	Literacy Rate (in %)	--	96.55
Male	4,99,181	--	Male	--	97.36
Female	5,63,372	--	Female	--	95.83
No. of Workers	3,92,794	32.80	Cultivators	41,414	10.54
Male	2,81,854	50.18	Agricultural Labours	55,455	14.12
Female	1,10,940	17.45	Household Industrial Workers	11,074	2.82
No. of Main Workers	2,93,257	24.49	Other Workers	2,84,851	72.52
No. of Marginal Workers	99,537	8.31			
<i>Source: Census of India, 2011 (District Handbook of Pathanamthitta District)</i>					

According to Census 2011, population of district is 11,97,412 out of which 46.9% are males and 53.1% are females with the sex ratio of 1132. There are 8.09% population belongs to 0-6 age group, out of which 50.6% are boys and 49.4% are girls in the same age group with the sex ratio of 976.

Pathanamthitta district has literacy rate of 96.55%. The male literacy rate in the area is 97.36% and that of female is 95.83%, thus a very little gender gap in literacy rate of 1.47% in the district.

There is 13.74% population belonging to the Scheduled Caste community in Pathanamthitta district. However, a very negligible 0.68% population belongs to the Scheduled Tribe (ST) community in the area.

Work participation rate of the Pathanamthitta district has been observed about 32.80%, out of which 50.18% are male workers and 17.45% are female workers, thus a huge gender gap in work participation rate of 32.73%.

Among the total work force in the district, 24.49% are Main Workers and 8.31% are Marginal Workers. About 10.54% workers are cultivators and 14.12% are agricultural labourers. A substantial 75.34% of work force is engaged in other than agricultural activities including 2.82% household industrial workers.

3.4 CULTURAL ENVIRONMENT

List of National Monuments in Kerala 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 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.

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 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 like Overhauling and repair of Gear box of hoisting mechanism of radial gates no. 2 & 4, Painting on metal parts of the hoisting

mechanism of spillway and works for protecting hoists from rain etc. will be done with proper measures to prevent the risk of water pollution and impact on fishes.

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 the dam area. Other activities such as labour camp and debris disposal will be kept near to dam area with minimal adverse impacts. 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.

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.

- Construction of Catwalk Bridge to access the trunnions of Radial Gates of spillway
- Construction of culvert in access road to control shaft
- 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 4.1: Summary of Identified Risks/Impacts in Form SF-3

Project Activity	Environment Risks						Social Risks				
	Air, water, noise, land use, Soil, Resource use	Pollution downstream and upstream	General Ecology	Protected Area (Wild Life Sanctuaries, National Park and other natural habitat even if not protected)	Other RET species (flora and fauna) outside protected areas	Fish and Aquatic life within dam water body	Land	Tribal	Labour	Cultural heritage	GBV/SEAH
Construction of Catwalk Bridge to access the trunnions of Radial Gates	M	M	NA	M	L	NA	NA	LNA	L	NA	L
Pressure Washing the downstream face	L	L	NA	NA	NA	NA	NA	NA	L	NA	L
Overhauling of Emergency Gate	M	M	NA	NA	NA	F	NA	NA	M	NA	L
Overhauling and painting of IC tunnel intake gate and hoisting mechanism	M	M	NA	NA	NA	F	NA	NA	M	NA	L
Construction of Culvert in access road to control shaft	M	M	M	M	L	NA	NA	NA	L	NA	L
Providing Fencing to the control shaft & Painting Control shaft	L	L	NA	NA	NA	NA	NA	NA	L	NA	L
Providing protective roofing to the hoist structure of IC Tunnel Intake structure	L	L	NA	NA	NA	NA	NA	NA	L	NA	L
Procurement of 15 KVA DG Set	L	L	NA	NA	NA	NA	NA	NA	NA	NA	NA
Setting up Labour Camps (location within dam premises or outside)	M	M	M	M	NA	NA	NA	NA	NA	NA	L
Heavy machinery deployment and	L	L	L	L	NA	NA	NA	NA	NA	NA	NA

setting up maintenance workshop											
Deployment of concrete mixture and heavy pumps	M	M	NA	L	NA	NA	NA	NA	NA	NA	NA
Disposal of large amount of Debris	M	M	NA	NA	NA	NA	NA	NA	NA	NA	NA
Transport of large construction material	L	L	NA	L	NA	NA	NA	NA	L	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

Preliminary 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 including the proposed activities under the Project and that since the proposed rehabilitation activities lie within the dam premises the possibility of local community's interference during the implementation of rehabilitative measures is minimal.
- 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 implementation of 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 05.06.2023. It was attended by permanent staff of KSEBL working at dam, local people living in the nearby area 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

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 and working in Cardamom plantations is the main source of livelihood of people in the nearby area. They are planting crops like Coconut, Cardamom, Plantain, 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 project activities as unskilled workers.
4. 5 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 1967. 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 etc.

Interactions made with Engineers and local communities is tabulated below;

A. Interaction with Dam Engineers/Staff

Questions	Responses provided / Observations
<p>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.</p>	<p>Proposed rehabilitation activities lie within dam premises. There is no possibility of local community's interference during the implementation of rehabilitative measures.</p> <p>Emergency action plans are prepared disseminated and published in the website of CWC.</p>
<p>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.</p>	<p>There are no unsettled issues regarding displacement or resettlement.</p>
<p>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.</p>	<p>There is neither encroachment nor squatters living within dam premises.</p>
<p>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?</p>	<p>The project field officials would be dealing the issues of environment and social activities. These officials will be supported by the Environment Expert hired for the Project.</p>
<p>5. Who will be in charge of E&S related activities at dam site and at SPMU level?</p>	<p>Sri. Ginesh Kumar, Assistant Executive Engineer posted at dam site shall be in charge for E&S at dam site. At SPMU level, Sri. Jayakumar CR, Assistant Executive Engineer is the in charge officer.</p>
<p>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)?</p>	<p>Communities contact dam officers in person as the concerned officers reside near the dam premises.</p>
<p>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?</p>	<p>Written communication with district revenue authorities is made and with mobile messages. Siren is used to alert at dam site.</p>

8. How do you ensure that downstream community is fully aware of the above existing mechanism?	As the construction of dam done in 1967, 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. The Grievance Redress Mechanism (GRM) has been established at the site to address the grievances if any from the communities. The Executive Engineer, Dam Safety Division, Seethathodu is the contact point at site for addressing the grievances if any and the Executive Engineer, DRIP, R&DSO, Pallom is the contact point at SPMU.
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 tourists visits annually, annual revenue generated, whether any portion of this generated revenue is diverted to regular O&M of this dam.	No; there are no hydel tourism activities.
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?	One village in the immediate downstream reaches.
2. Are they dependent on dam in any way for their livelihood?	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?	Yes. No pending issues
4. Is there any R&R affected person known to you who is currently working with the dam	No

authorities? If so, in what capacity (employee/direct worker/contractor)	
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 wherein downstream communities getting regular update during flood season for any uncontrolled release of water?	Siren of high amplitude, mike announcement is available and 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?	Dam authorities can be contacted 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?	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 Sabarigiri Hydro Electric Project for generating electricity. This reservoir also helps to ensure drinking and irrigation water requirements.
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. Yes, Consultation meeting was held. No mock drill conducted. Yes. Address of the stakeholders are provided in Annexure III.
14. Are you a regular follower of official website of dam authorities as a general public, in case	Follow tender notices invited for maintenance of the dam.

you are a contractor, do you follow various tenders notices being invited for various maintenance of this dam?	
15. Any suggestion to improve overall system by dam authorities in any way, please give in brief?	Dam authorities shall conduct awareness program to the stakeholders for taking preventive measures to minimise the adverse impact of floods.

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 construction of culvert in access road to control shaft (intake structure)etc.
3. Construction work at night time, transportation through ESZ or protected area, may impact flora and fauna in the 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 dams' body will generate localised impacts on physical environment and resource use; pose risk of exposure of workers requiring personal protective equipment (PPE) use.
6. Hydro mechanical works interfaced with water body especially like overhauling of emergency gate of lower-level outlet 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 from construction of culvert to access road to control shaft, maintenance of control shaft structure, painting of emergency gate of lower level outlet and IC tunnel intake gate to minimise the risk of pollution on this count.
8. The wash water generated after pressure washing the downstream of the dam will be properly disposed off without causing any adverse on water bodies.
9. 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 very small (0.68%) scheduled tribe population in the district and there are no tribal settlements in the vicinity and downstream of the dam.
3. There are about 33 households in the vicinity. But they are not directly impacted by project in any manner.
4. Influx of migrant labour (from outside the district and also from outside Kerala depending on the work contractor) 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.
5. Waste generation from labour colony can pollute drinking water sources of community, risk is low and can be mitigated by providing adequate sanitation facilities.
6. No impacts are envisaged on cultural heritage as no such sites are identified in project vicinity.
7. 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, 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 construction of culvert in access road to control shaft is considered moderate. Due to dam location within ESZ and proximity to protected area, activities such as construction of catwalk bridge to access the trunnions of radial gates, maintenance of control shaft structure 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 these sub-project dams 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 5.2: WB ESF Standards applicable to the sub-project

Relevant ESS	Reasons for Applicability of the standard
ESS1: GBV/SEAH risk mitigation framework	The works may lead to interface of migrant labour with communities

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	Though dams fall outside Periyar Tiger Reserve however, both the dams are within Eco-sensitive Zone (ESZ) of Periyar Tiger Reserve. 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 5.3: List of Mitigation Plans with responsibility and timelines

WB-ESS Triggered	Mitigation Instrument	Responsibility	Timelines
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	<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
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 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. However, an Environmental and social expert is hired by the KSEBL for assisting in E&S compliances for the activities. 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 these 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.)	NA		
5	Structural Improvement/Repair work -Downstream of Dam site (with no interfacing with dam reservoir)	A	DI	WQ, 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, E, L, G
8	Hydro-mechanical activities Downstream of Dam site (with no interfacing with dam reservoir)	A	DI	WQ, PA, PE, E, L, G
9	Instrumentation, General lighting and SCADA systems	A	DI	PE, L, G
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		
12	Painting of dam u/s or d/s or both faces	A	DI	WQ, PE, L
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			
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	Construction of Catwalk Bridge to access the trunnions of Radial Gates	PA, PE, L, G	Air and noise pollution, Impact on flora and fauna due to proximity of protected area, Land pollution due to disposal of waste, Labour and GBV risk	PA – M PE – M L – M G – L
b	Pressure Washing the downstream face	WQ, L, G	River water pollution, Labour risk and GBV risk.	WQ – L L – L G – L
3	Hydro-Mechanical activities up - stream of Dam Site (with interfacing with dam reservoir)			
a	Overhauling of Emergency Gate	WQ, F, PE, L, G	Air and noise pollution, Risk of increase in reservoir water turbidity, Impacts on fish, Land pollution due to disposal of waste, Labour and GBV risk	WQ – M F – M PE – M L – M G – L
b	Overhauling and painting of IC tunnel intake gate and hoisting mechanism	WQ, F, PE, L, G	Air and noise pollution, Risk of increase in reservoir water turbidity, Impacts on fish, Land pollution due to disposal of waste like empty paint containers, Labour and GBV risk	WQ – M F – M PE – M L – M G – L
4.	Instrumentation, General lighting and SCADA systems			
5.	Basic Facilities Improvement			
a	Construction of Culvert in access road to control shaft	PE, PA, E, L, G	Air and noise pollution, Impact on ecology, flora	PE – M PA – 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
			and fauna due to proximity to protected area, Land pollution due to disposal of waste/debris, Labour and GBV risk.	E – M L – L G – L
b	Providing Fencing to the control shaft & Painting Control shaft	PE, L, G	Air and noise pollution, Land pollution due to disposal of waste/debris, Labour and GBV risk.	PE – L L – L G – L
c	Providing protective roofing to the hoist structure of IC Tunnel Intake structure	PE, L, G	Air and noise pollution, Land pollution due to disposal of waste/debris, Labour and GBV risk.	PE – L L – L G – L
d	Procurement of 15 KVA DG Set	PE	Air pollution	PE – 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.	WQ – M PA – M E – M PE – M G – L
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	PA – L PE – L E – 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	PA – L PE – 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
			dewatering - risk due to machine handling, waste generation, wastewater and air emissions from operations, hazardous waste generation from oil waste	
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	PE – 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	PA – L PE – L L – 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
Pamba Dam, on 05th June 2023**

S. No.	Name and Place of Participants
1	Sri. Siva G., KFDC Colony, KochuPamba
2	Smt. Suma Vijayakumar, KFDC Colony, KochuPamba
3	Sri. Manoj, KFDC Colony, KochuPamba
4	Sri. Manoharan G., KFDC Colony, KochuPamba
5	Sri. Vishnu Vijayakumar, KFDC Colony, KochuPamba
6	Sri. Prabhu Nambiraj, KFDC Colony, KochuPamba
7	Sri. Manikandan, KFDC Colony, KochuPamba
8	Sri. Rajesh Mariyappan, KFDC Colony, KochuPamba
9	Sri. Raghu Nambiraj, KFDC Colony, KochuPamba
10	Sri. Paramashivam, KFDC Colony, KochuPamba
11	Smt. Emily Paramashivam, KFDC Colony, KochuPamba
12	Sri. Rangayya, KFDC Colony, KochuPamba
13	Sri. Ramar, KFDC Colony, KochuPamba
14	Sri. Shivalingam, KFDC Colony, KochuPamba
15	Sri. Yesu, KFDC Colony, KochuPamba
16	Smt. Pazhaniyammal, KFDC Colony, KochuPamba
17	Sri. Ramachandran, KFDC Colony, KochuPamba
18	Sri. Narayanan, KFDC Colony, KochuPamba
19	Sri. Vijayakumar, KFDC Colony, KochuPamba
20	Sri. Aji T., Assistant Engineer, KSEBL
21	Sri. K. V. Sajikumar, Sub Engineer, KSEBL