

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

VIRBHADRA BARRAGE
(PIC: GENUAWA003)

ENVIRONMENT AND SOCIAL DUE DILIGENCE REPORT



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Office of Executive Engineer (E&M)
Virbhadra Barrage
UJVN Limited
Rishikesh, Uttarakhand

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ABBREVIATIONS AND ACRONYMS

AIDS	:	Acquired Immunodeficiency Syndrome
CA	:	Conservation Area
CCA	:	Culturable Command Area
COVID	:	Coronavirus Disease
CSS	:	Compact Secondary Substation
CWC	:	Central Water Commission
DRIP	:	Dam Rehabilitation and Improvement Project
DSRP	:	Dam Safety Review Panel
E&S	:	Environment & Social
EAP	:	Emergency Action Plan
ESDD	:	Environmental and Social Due Diligence
ESF	:	Environmental and Social Framework
ESIA	:	Environmental and Social Impact Assessment
ESMF	:	Environment and Social Management Framework
ESMP	:	Environment and Social Management Plan
ESS	:	Environmental and Social Standard
GBV	:	Gender Based Violence
GIS	:	Geographic Information System
GRM	:	Grievance Redressal Mechanism
HIV	:	Human Immunodeficiency Virus
HR	:	Head regulator
IA	:	Implementation Agency
IPF	:	Investment Project Financing
MCM	:	Million Cubic Meters
OHS	:	Occupational Health & Safety
PA	:	Protected Area
PDO	:	Project Development Objective
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
SITC	:	Supply, installation, testing & commissioning
SPF	:	Standard Project Flood
SPMU	:	State Project Management Unit
ST	:	Scheduled Tribes
TRC	:	Tailrace channel
WB	:	World Bank
WQ	:	Water Quality

EXECUTIVE SUMMARY

Virbhadra barrage is located at Virbhadra about 5 km d/s of Rishikesh in Dehradun District of Uttarakhand on the river Ganga. The barrage serves to divert water to the power channel for generation of electricity at Chilla Power House (144 MW). The gross storage of the reservoir is 8.1 MCM.

It has been proposed to undertake rehabilitation measures (structural civil & hydro-mechanical remedial works, electrical works and basic facility enhancement) under the proposed Dam Rehabilitation and Improvement Project (DRIP II) with a view to increase the safety and to strengthen dam safety management.

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

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

As per the ESDD exercise, risk/impacts that have been identified relate to Water Quality, Physical Environment, labour and SEAH/GBV. Environment risks of air, water, noise, land use, soil and resource use for repair & restoration of spillway glacis and downstream protection work from gate Numbers 5 to 15 of barrage, construction of coffer dam / ring bandha and repair & strengthening of boulder excluder tunnel of under sluice gate 1 are considered moderate. Similarly, environment and social risk of labour camp and disposal of debris has also been identified as moderate. Due to location of barrage on boundary of “Rajaji National Park”, impact of rehabilitation work on protected area has also been considered 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.

Since risks and impacts are low to moderate, 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 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\$26.84million);

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 – VIRBHADRA BARRAGE

Virbhadra barrage is located at Virbhadra about 5 km d/s of Rishikesh in Dehradun District of Uttarakhand on the river Ganga. It was constructed between 1973-74 and 1980-81 and the barrage serves to divert water to the power channel for generation of electricity at Chilla Power House (144 MW). The gross storage of the reservoir is 8.1 MCM.

Salient features of the Virbhadra barrageproject are reported below:

Project Name	Virbhadra Barrage
River Basin	Ganga
River/Stream	Ganga
District	Dehradun
Latitude/Longitude	30 ⁰ 04' 27" / 78 ⁰ 17' 18"
Type of Project	Run off the river hydro project
Gross Command Area (GCA)	NA

Cultivable Command Area (CCA)	NA
Hydro Power Installed Capacity	144 MW
Average Annual Energy Generation (MU):	720 MU
Domestic/Municipal/Industrial Water Supply (Annual)	NA
Dam	
Type	Concrete barrage
Total length of the Main dam	312 m
Length of Embankment dam	NA
Length of Masonry/Concrete dam	312 m
Top width of Embankment Dam	NA
Top width of Masonry/Concrete Dam	7.5 m
Elevation of top of Embankment Dam	NA
Elevation of top of Masonry/Concrete Dam	338.50 m
Elevation of top of Upstream Solid Parapet Wall	NA
Height of Embankment Dam above Lowest River Bed Level	NA
Height of Masonry/Concrete Dam above deepest foundation level	22.15 m
Lowest River Bed Elevation	322.50 m
Deepest Foundation Elevation	321.50m
Saddle Dam	NA
Spillway	
Type of Spillway	Broad crested
Length of Spillway	312m
Location of Spillway	Main barrage on right of under sluices
Spillway Crest Level	326.50 m
Number of bays	11
Total Discharging Capacity at MWL	10,560cumec
Spillway Gate	Vertical lift
Spillway gate size	18 m width & 10.15 m height
Type of Hoist for Spillway Gates	Rope drum
Type of Energy Dissipation Arrangement	Dentated sill
Hoist capacity of spillway gates	30 MT
Under Sluice Arrangement	
No of sluices	4
Size of sluice	18 m width & 11.15 m height
Discharging capacity of sluice at FRL	4280 cumec
Crest level	325.50 m
Head regulator	
Location	Left bank
Number	5
Sill level	326.50 m
Size	11 m width & 7.2 m height
Discharging capacity	665 cumec
Reservoir	
Catchment Area at barrage site	21,400 sq km
Maximum Water Level	336.50 m
Full Reservoir Level	336.50m

Minimum Draw Down Level	333.00m
Gross Storage Capacity at FRL	8.10 MCM
Live Storage Capacity	5.11 MCM
Date of Starting the Construction	1973-74
Date of Completion	1980 – 81
Date of first full impoundment	07/11/1980
Original Inflow Design Peak Flood	14,750cumec
Maximum observed flood peak and date	13,600 cumec on 17/06/2013
Revised Inflow Design Peak Flood	23,5330cumec

1.3 PROPOSED INTERVENTIONS/ACTIVITIES AND INTENDED OUTCOMES

The Dam Safety Review Panel (DSRP), constituted by CWC, Government of India for the purpose of inspection of the those projects which are planned to be undertaken for the repair, rehabilitation and modernization work under World Bank funded DRIP-II schemes, made a visit to Virbhadra barrage on 17/11/2019 for inspection purpose and recommended measure to improve the safety and performance of barrage 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 barrage operations, management and maintenance, with accompanying institutional reforms. The project will improve the safety and operational performance of barrage and mitigate risks to ensure safety of downstream population and property. The following rehabilitation proposals as described in the PST PART A have been formulated based on DSRP recommendations and these proposals form the basis for preparation of present ESDD report. All rehabilitation proposals listed under Part B in PST, are not being taken up at the present time and therefore are not considered as part of the ESDD.

Structural Rehabilitation Works

- Works related to chain link fencing along right afflux bund road of barrage
- Weather coat painting & other related works over civil structures with in barrage premises
- Protection & refurbishment work from spillway work from Spillway glacis to end sill of gate no 5 to 15 of barrage
- Works related to repair of damaged railing at barrage bridge & H.R. bridge
- Construction of coffer dam / ring bandha

Structural Measures for ensuring hydrological safety

- Replacement of S. S. plate on track guide of gate groove of barrage gates
- Replacement of sill beams
- Replacement of wheels, bearing of under sluice gates and other bay gates
- Procurement of bearing of spillway gates & head regulator
- SITC of package substation of 500 KVA, 11 KV/415 V CSS
- Providing and fixing of chequered plates at barrage gates, HR gates and gantry crane platform at barrage structure
- Epoxy on under sluice gates, otherway gates at barrage
- Replacement of rubber seal of HR gate, otherway gate, under sluice gate at barrage

- Repair & strengthening of boulder excluder tunnel of under sluice gate 1
- Providing and fixing of new pre-fabricated cabin above hoisting equipment of under sluice gate 1 to 4, other bay gate 5 to 15, head regulator gate 1 to 5

Basic Facilities Improvement

- Construction of new control room building
- Construction of training center/transit camp building N
- Construction of guest house building near police chowki*
- Construction of residential building at hydel colony

Si.No.	Name of Work	location	Land Ownership	Land Requirement
1	Construction of new control room building	Photographs Attached as Figures 1.3 and 1.4	UJVN Ltd.	812.95 Sqm
2	Construction of guest house building near police chowki		UJVN Ltd.	445.00 Sqm
3	Construction of residential building at Hydel Colony.		UJVN Ltd.	1514.00 Sqm
4	Construction of training center/transit camp building at Rishikesh.		UJVN Ltd.	1160.00 Sqm

Instrumentation, SCADA, Surveillance system, etc.

- Design, supply, installation, commissioning and testing of early warning system & public address system
- SITC of solid waste disposal system
- Engineering, design, supply, installation, testing and commissioning of solar power panel for power backup*
- Procurement of 4 vehicles
- Procurement of furniture for office/training center at Chilla

Others

- Consultancy works related to supervision of design for structures and supervision of civil & basic facilities works
- Hydrographic Survey of Virbhadrha Barrage, pashulok, Rishikesh..

** These activities have not been recommended for inclusion under rehabilitation works and hence have not been considered in present ESDD.*

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



Photo – 1 Virbhadra Barrage Pond

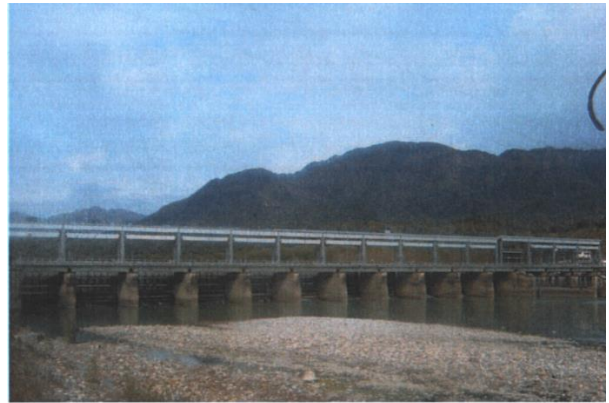


Photo – 2 Barrage View from D/S



Photo – 3 Position of Barrage Gates

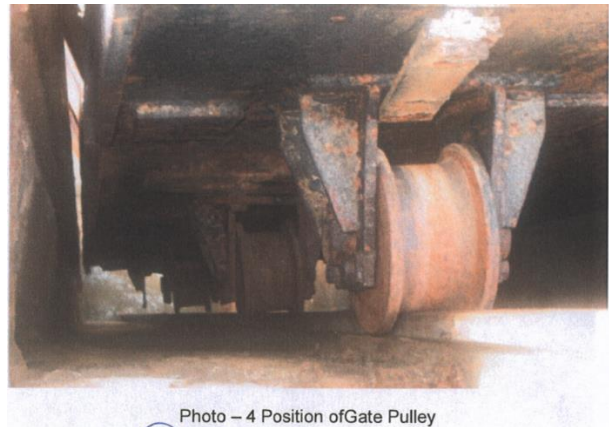


Photo – 4 Position of Gate Pulley



Photo – 5 Damaged SS Plate of Wheel Track of Spilway Gate



Photo – 06 Damaged Rubber Seal of Head Regulator Gate



Photo – 7Rusted Chequered Plate at Highest Platform



Photo – 8Damaged SS Sill Plate

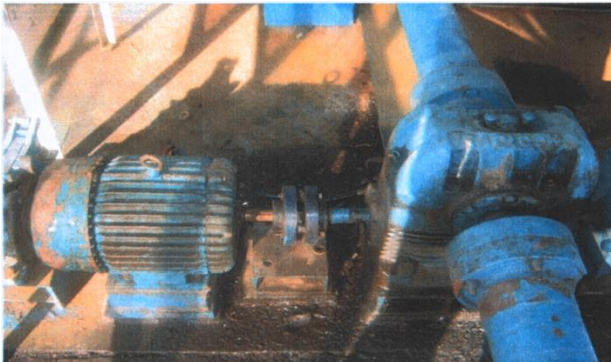


Photo – 9Hoisting Motors

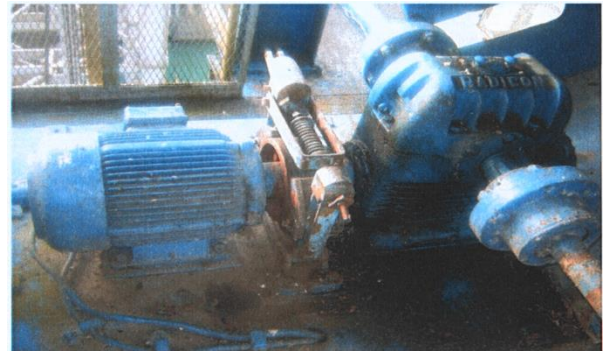


Photo – 10Barrage Gate Motor



Photo – 11Trash Rack

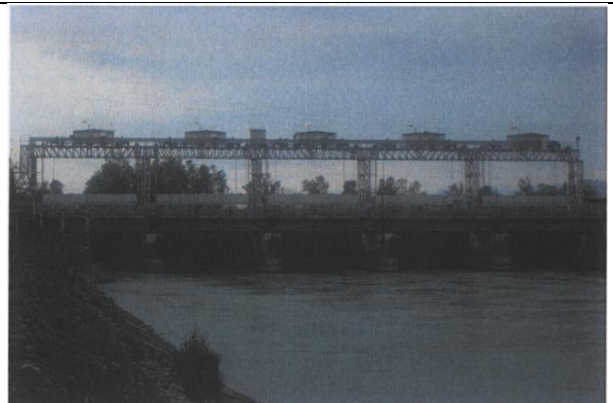


Photo – 12Head Regulator Gates



Photo – 13Distress Condition of Piers



Photo – 14 Distress Condition of Piers

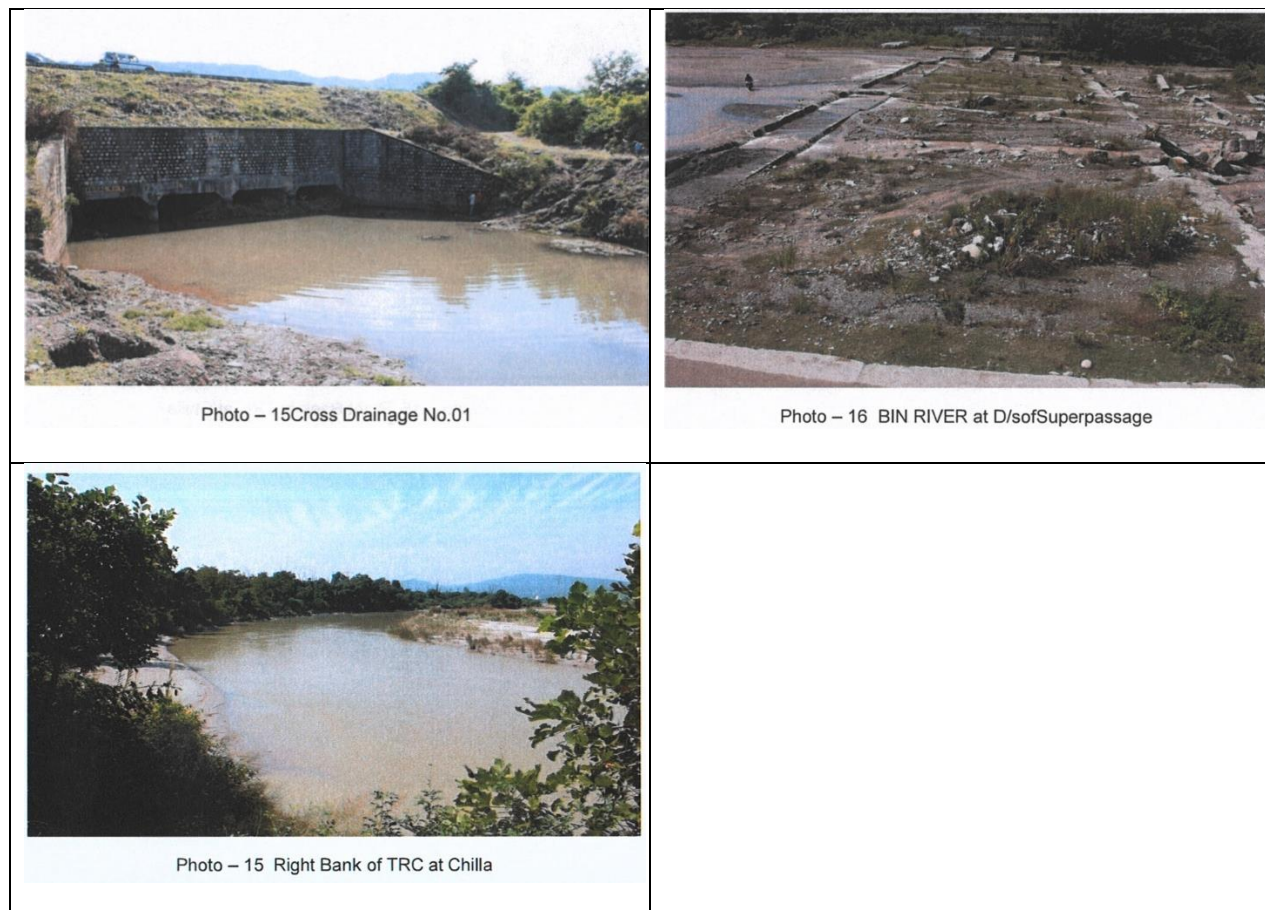


Figure 1.1: Selected Photographs of Improvement/Intervention area

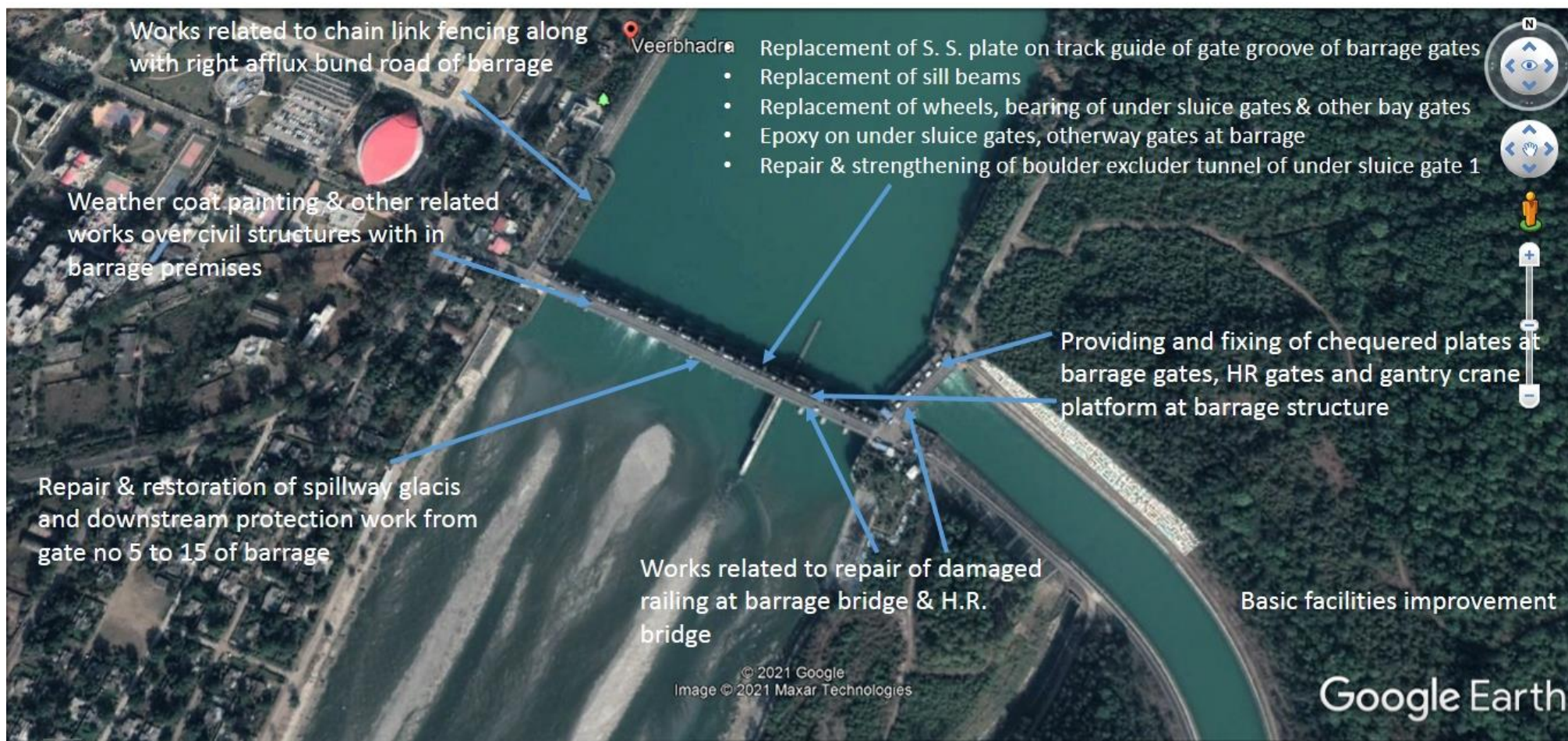


Figure 1.2: Project Area showing major intervention locations

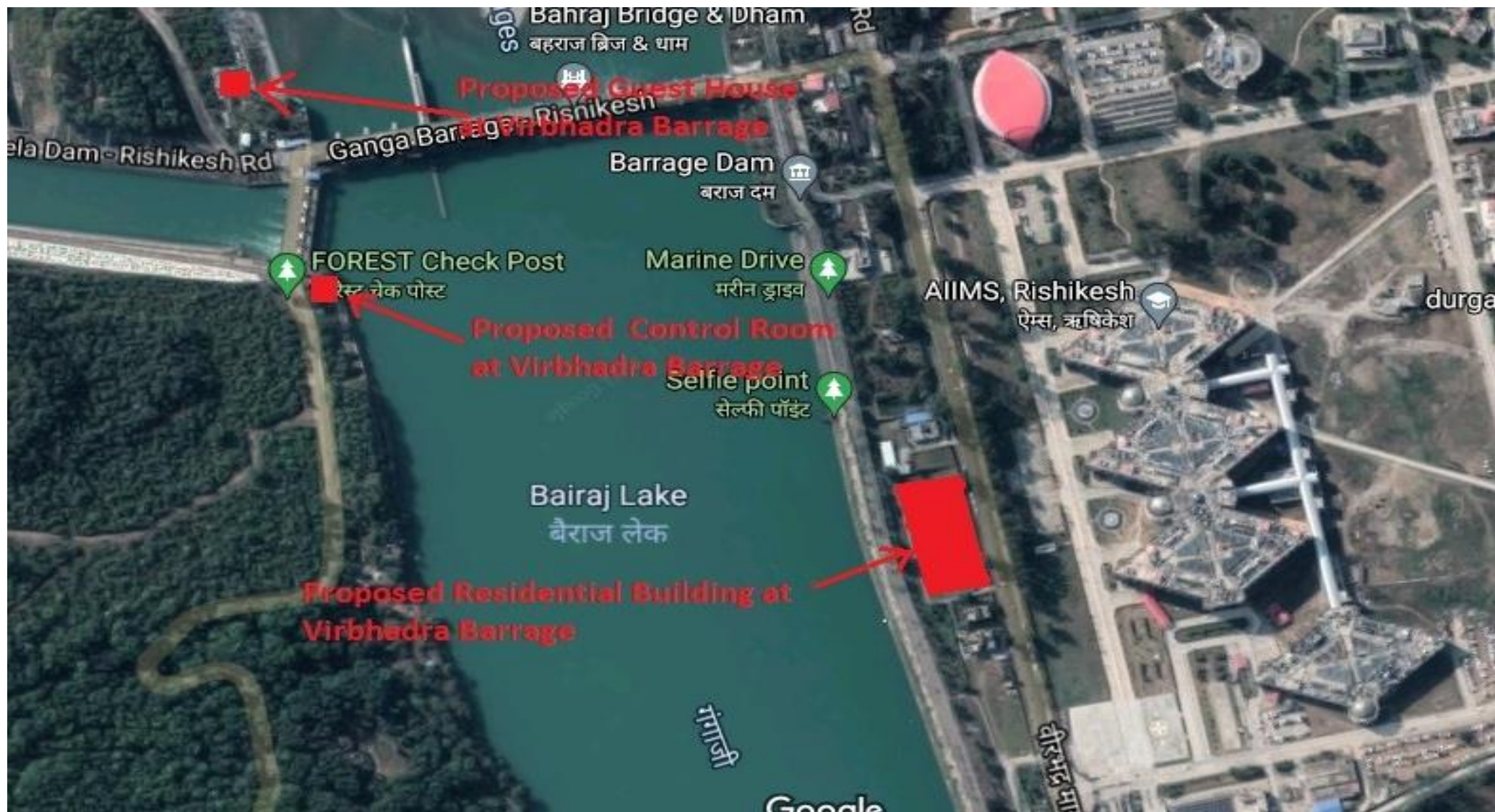


Figure 1.3: Showing Proposed Structure locations at Virbhadra Barrage

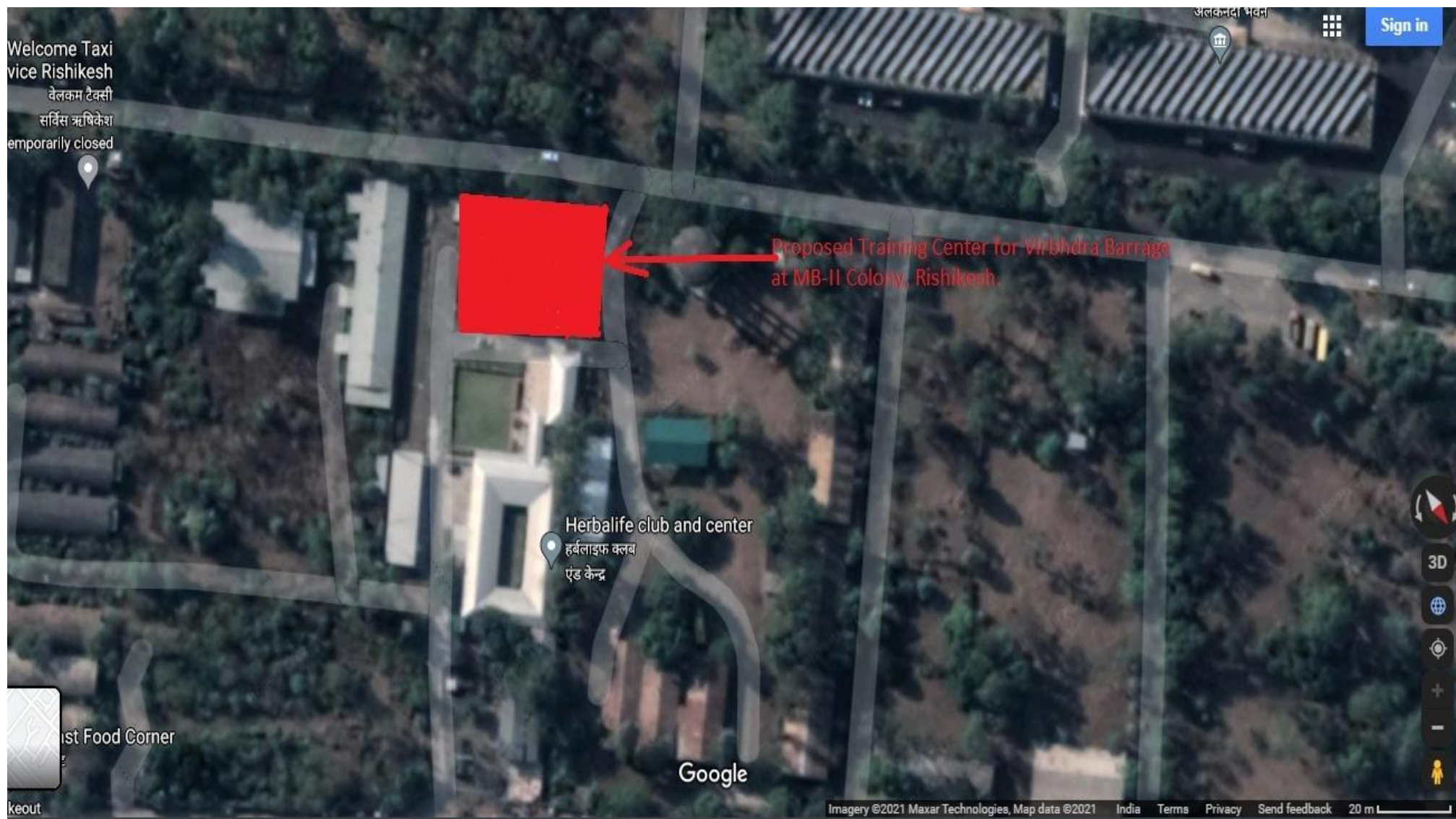


Figure 1.4: Showing Proposed Training Center locations at MB-II Colony, Rishikesh.

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 36months. 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 total Bidders as defined in the Procurement Regulations. Following is the overall implementation and procurement schedule:

a) Overall Phasing of Project Implementation:

Proposed Starting of implementation (MM/DD/YYYY) : 01/01/2021

Proposed Ending of implementation (MM/DD/YYYY) : 31/01/2024

Implementation Duration (months) (MM) : 36months

b) Timeline phasing of implementation:

Sl. No.	Description	From (month/year)	To (month/year)	Status of Procurement Process
1	Civil Work – Main Package	01/01/2021	31/01/2024	Procurement process will be initiated after obtaining approval of the PST from World Bank.
2	Other Packages	01/01/2021	31/01/2024	
3	Procurement – instrumentation, goods, inspection vehicles	01/01/2021 – 31/01/2024		

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:

- To identify, evaluate and manage the environment and social risks and impacts of the sub-project in a manner consistent with the ESSs;
- 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;
- 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 barrage 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.

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

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 Virbhadrha barrage, environment and forest clearances will not be applicable as neither it is a new barrage project nor any forest land required for the rehabilitation work. River Ganga on its left bank forms boundary of the Raja ji National Park. Most project appurtenant like head regulator, power channel, power-house etc are located within Rajaji National Park. Rehabilitation work is proposed on the existing barrage structures only, bordering/inside the protected area, therefore, permission from wildlife department should be taken for any proposed activity falling within national park. Project authorities will intimate the wildlife department/park authorities before start of rehabilitation work and follow their guidelines for rehabilitation work and transportation of man and material on the routes passing through the Rajaji National Park. Other applicable regulatory requirements are discussed in ESMF.

2.2 DESCRIPTION OF INSTITUTIONAL FRAMEWORK

The sub-project will be implemented by Uttarakhand Jal Vidyut Nigam Limited (UJVNL). UJVNL has in-house expertise to address E&S issues. As per the suggestions of CPMU/CWC, if required specific consultancy services of Environmental and Social experts to assist the department in resolving E & S issues shall be outsourced.

A formal GRM system has been established for dealing with external complaint at central level, which is connected to project site level. There is also an internal complaint committee as per Sexual Harassment Act at head office level and the same is used as platform for dam level.

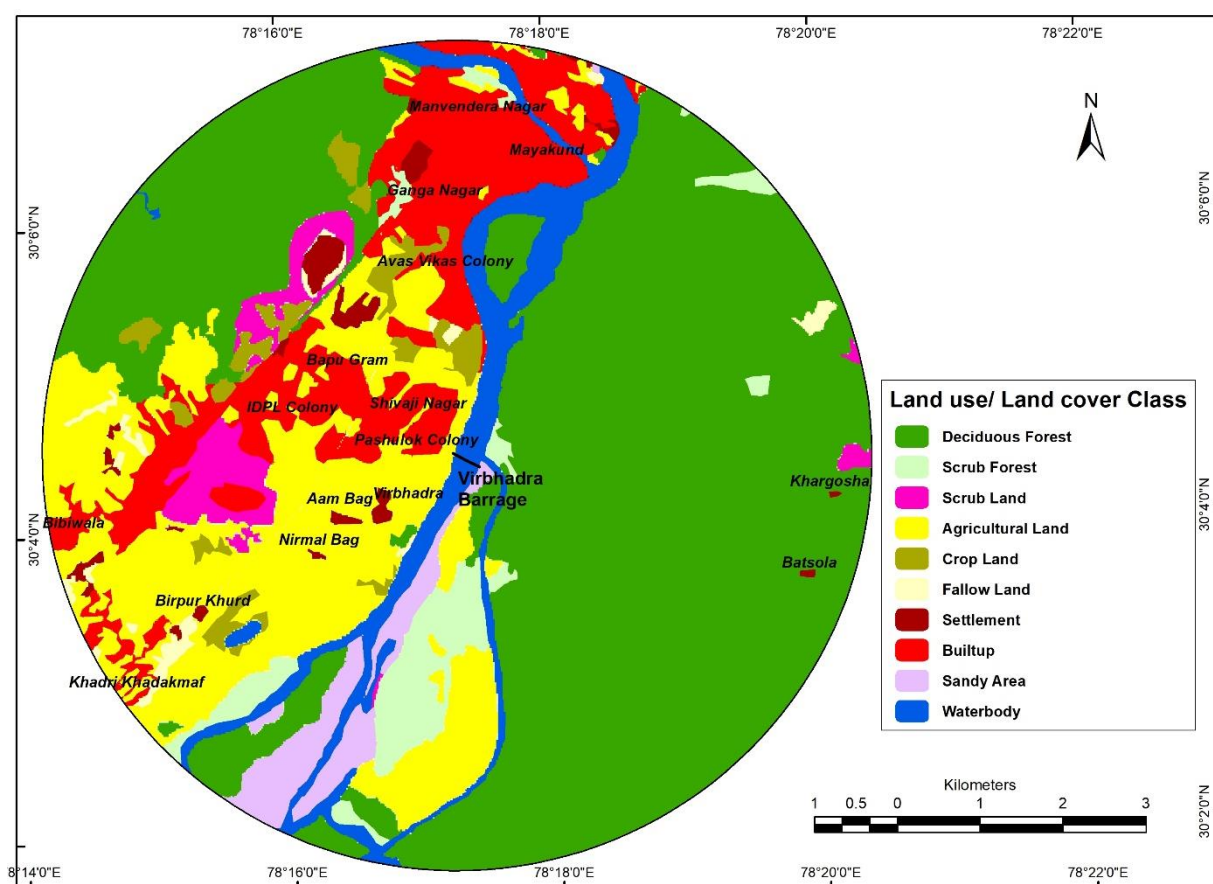
As committed in ESCP, a Grievance Redress Mechanism (GRM) will be established and operated by the contracted agencies to address Project workers workplace concerns before start of work. SPMU will have oversight responsibility on the functioning of the GRM.

Assessment of physical, ecological and socio-economic conditions at barrage 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 barrage is presented at **Figure 3.1**. Present land use is mainly deciduous forest and agriculture followed by scrub land and scrub forest, water bodies (mainly river and reservoir), settlement, fallow and sandy areas. There are 16 habitations or village falling in 5 km of radius of the Virbhadra barrage; they are Pashulok colony, Virbhadra, Shivaji Nagar, IDPL colony, Babu Gram, Aam bag, Nirmal bag, Avas Vikas colony, Ganga Nagar, Mayakund, Manvendera Nagar, Bibiwala, Birpur Khurd, Khadri Khadakmaf, Khargosha and Batsola.



[(Source: Digital data on land use/land cover maps using bhuvan prepared by National Remote Sensing Centre (NRSC) with Uttarakhand Space Application Centre along with further refinement using Google Earth]

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

Natural Hazards

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

The design flood for barrage is 14,750 cumec. The revised hydrological studies have been carried out by CWC in 2017 and they worked out the revised design flood (SPF) as 23,530 cumec. It is proposed that the barrage and its appurtenant including afflux bunds, guide walls etc be checked for revised design flood and accordingly, appropriate measures (structural and non-structural) to be taken up to take care of increased design flood during concurrency of DRIP II.

Project falls in earthquake zone IV, 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

Virbhadra barrage is located on the boundary of Rajaji National Park which was notified as protected area on August 12, 1983 by merging Rajaji Wildlife Sanctuary with Motichur and Chilla wildlife sanctuaries. Rajaji National Park is spread over an area of 819.54 sq. kms and falls in three districts of Uttarakhand i.e. Dehradun, Haridwar and Pauri Garhwal. Rajaji National Park has been declared Rajaji Tiger Reserve vide notification dated 18th April 2015. A total area of 1075.17 sq. km. has been declared as Rajaji Tiger Reserve. The Core Zone comprises the whole of Rajaji National Park is 819.54 sq km. The Buffer Zone has an area of 255.63 sq km which comprises of a reserve forest block (Bijni Beat) under the administrative control of RNP, part of Shyampur Range of Haridwar Forest Division and Laldhang&Kotdwar ranges of Lansdowne Forest Division.

The National Park is rich in the diversity of flora with broadleaved deciduous forests, riverine vegetation, scrubland, grasslands and pine forests as well as of fauna with 23 species of mammals and 315 avifauna species found in the National Park. The river Ganga bifurcates the Park into two distinct parts: the eastern part comprising of Chilla and Gohri range and the western part comprising of Haridwar, Dhaultganga, Beriwar, Chilla, Motichur, Kansaru and Ramgarh ranges. The Park is renowned for its elephants population. The mountain goat, goral, chital, sambar, barking deer, hog deer, nilgai, wild pigs and sloth bears are also noteworthy residents. Tigers and leopards are the prime predators in Rajaji. The leopard cat, jungle cat, civet and yellow-throated marten are other carnivores. Mammals like the jackal and the Bengal fox scavenge in the park. The Himalayan black bear though uncommon, can be sighted in the higher reaches of the park. The rivers which flow through the park harbour species of fish such as trout and mahaseer.

Location of the barrage w.r. t. to National Park is shown in Figure 3.2.

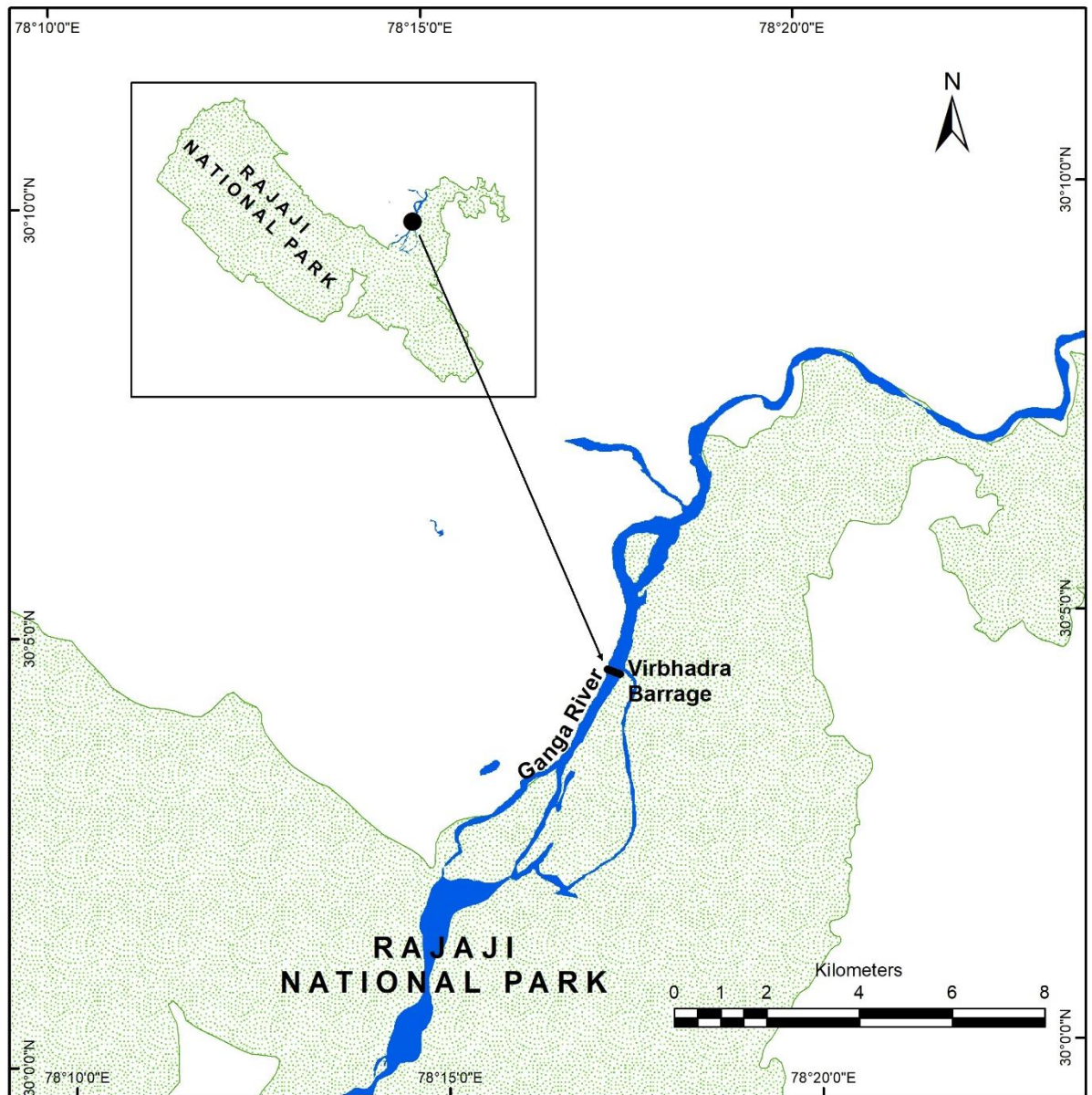


Figure 3.2: Location of Barrage wrt to Rajaji National Park

3.3 SOCIAL ENVIRONMENT

The Virbhadra Barrage project is located on the river Ganga in district Dehradun in the state of Uttarakhand. Uttarakhand state does not have any Schedule V¹ areas.

The district is located in the Shivalik range of Himalayas on the western border of the state. The district consists of six tehsils and six community development blocks for implementation and monitoring of development schemes at rural level. As per census 2011, there are 748 revenue villages, out of which 731 villages are inhabited and 17 villages are un-inhabited.

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**.

There are three sectors of the economy i.e., primary, secondary and tertiary which reflect the direction of growth of any region. In Dehradun district, the tertiary (services) sector contributed the maximum share of 69.38 percent to Gross District Domestic Product (GDDP) which is much higher than that of Uttarakhand's share of 51.9 percent to Gross State Domestic Product (GSDP) in 2013-14. The district's primary (agricultural) sector contributes just about 4.32 percent to GDDP while the secondary sector's contribution is 26.29 percent.

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

Description	Number	Respective %	Description	Number	Respective %
No. of Households	3,47,001	--	Household Size	5	--
Total Population	16,96,694	--	Population (0-6 age)	2,01,652	11.88
Male	8,92,199	52.58	Boys (0-6 age)	1,06,746	52.94
Female	8,04,495	47.42	Girls (0-6 age)	94,906	47.06
Sex Ratio	902		Sex Ratio (0-6)	889	
Population (SC)	2,28,901	13.49	Population (ST)	1,11,663	6.58
Male	1,20,430	52.61	Male	58,264	52.18
Female	1,08,471	47.39	Female	53,399	47.82
Literates	12,59,506	74.23	Literacy Rate (in %)	--	84.25
Male	7,02,216	55.75	Male	--	89.40
Female	5,57,290	44.25	Female	--	78.54
No. of Workers	5,82,768	34.35	Cultivators	77,176	13.24
Male	4,58,834	78.73	Agricultural Labours	38,195	6.55
Female	1,23,934	21.27	Household Industrial Workers	22,992	3.95
No. of Main Workers	4,88,161	83.77	Other Workers	4,44,405	76.26
No. of Marginal Workers	94,607	16.23			
Source: Census of India, 2011 (District Handbook)					

According to Census 2011, total population of the district is 16,96,694, out of which 52.58% are males and 47.42% are females with the sex ratio of 902. The population density is 549 persons per sq. km in the district. There are 11.88% population belongs to 0-6 age group, out of which 52.94% are boys and 47.06% are girls in the same age group with the sex ratio of 889.

The district has literacy rate of 84.25%.The male literacy rate in the district is 89.40% and that of female is 78.54%, thus a gender gap in literacy rate of 10.86% in the district.

In the district, the Scheduled Caste and Scheduled Tribe population is 13.49% and 6.58% respectively to the total population. The ST households will be taken into account during the implementation of Emergency Action Plan.

Work participation rate of the district has observed about 34.35%, out of which 78.73% are male workers and only 21.27% are female workers, thus a significant gender gap in work participation rate of 57.46%.

Among the total work force in the district, 83.77% are Main Workers and 16.23% are Marginal Workers. About 13.24% workers are cultivators and 6.55% are agricultural labourers. About 76.26% of work force is engaged in other than agricultural activities including 3.95% household industrial workers.

3.4 CULTURAL ENVIRONMENT

List of National Monuments in Uttarakhand and list of State Protected monuments in Uttarakhand have been reviewed. There are protected monuments identified by Archaeological Survey of India however none of them are in the vicinity of the project. Barrage is located 5 km d/s from holy town Rishikesh which is on Himalayan foothills beside the Ganges River. Rishikesh is renowned as a centre for studying yoga and meditation, temples and ashrams.

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 barrage area or outside the barrage 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 barrage sub-project. Based on the above findings, the ESDD report recommends Risk category of the barrage 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 barrage area/premises. Due to nature of these activities, likely impacts will be on physical environment in terms of air pollution, noise pollution and waste generation. None of the proposed structural interventions involve acquisition of private land and/or private assets. These activities in no way cause restriction on access to land or use of resources by local communities and there is no economic displacement envisaged due to the sub-project. Activities interfacing with water bodies – river/reservoir will have risk of spillage of chemicals, construction material, and debris leading to water pollution and impacts on fishes.

Pre-construction and construction stage major auxiliary or preparatory intervention are within barrage area. Deployment and haulage of heavy machinery, setting up of workshop, operation of concrete mixture and heavy pumps will be within barrage area. Other activities such as labour camp and debris disposal will also be kept within the barrage area or on right bank because of left bank being the Raja ji National Park boundary. 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. Due to its location vis-à-vis national park, risk of outside labour, transportation of man and material and noisy civil and hydro-mechanical works may have the potential to impact the habitat of fauna.

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 barrage or on right bank, set up construction equipment and machinery near work location at pre-determined/approved sites without impacting national park. Influx of skilled migrant labour, albeit few in numbers, for construction works is likely. The labour will stay within in/proximity the barrage premises; hence risk of SEA/SH is unlikely.

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.

- Protection & Refurbishment Work from Spillway Glacis to end-sill of Gate No. 05 to 15.
- Construction of coffer dam / ring bandha
- Repair & strengthening of boulder excluder tunnel of under sluice gate 1
- Labour Camps
- Major Debris Disposal

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 barrage water body	Land	Tribal	Labour	Cultural heritage	GBV/SEAH
Civil (within barrage Boundary)	M	M	L	M	None	L	M	L	M	None	L
Hydro Mechanical	M	M	L	M	None	L	L	L	M	None	L
Instrumental SCADA, surveillance	L	L	L	L	None	L	L	L	L	None	L
Painting	L	L	L	L	None	L	L	L	M	None	L
Road work	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safety measures (Siren, Lighting)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
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 barrage Area Like training Structure	L	L	L	L	None	L	M	L	M	None	L
Additional activities for Tourism /Solar/Fisheries/ Water recreation enhancement	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Criteria for Risk Evaluation:

Low: Localized, temporary and Negligible

Moderate: temporary, or short term and reversible under control

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

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

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

4.2 STAKEHOLDER CONSULTATION

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

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

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

Environmental Impacts and Risks

1. Environment risks and impacts, as assessed above, for various project activities under this sub-project are categorised as Low and Moderate due to localised nature of proposed activities i.e. activities remain limited to barrage area except for labour camp and muck/debris disposal.
2. Execution of civil and hydro-mechanical work within barrage body will generate localised impacts on physical environment and resource use; pose risk of exposure of workers requiring personal protective equipment (PPE) use.
3. Civil works interfaced with water body especially like repair & restoration of spillway glacis and downstream protection work from gate no 5 to 15 of barrage, repair & strengthening of boulder excluder tunnel of under sluice gate 1 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.
4. Construction waste, muck etc. from various above rehabilitation works and construction of control room, residential, training centre/transit camp buildings etc require careful disposal at pre-identified and approved site to minimise the risk of pollution on this count.
5. Since the project is on boundary of Rajaji National Park, which is home to several faunal species, there is risk of impact on ecology especially fauna due to civil and hydro-mechanical works. Therefore, there is a need to control noise generation from rehabilitation work, plan waste disposal sites outside the national park preferably on right bank and control the waste water discharge from construction sites.
6. Rehabilitation work would require labour to work on various sections of barrage 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 barrage premises and on the barrage structure, there shall be no adverse impacts on land and assets due to any sub-component or sub-activities
2. The barrage is not located in the Schedule V area, though, there is about 6.58% scheduled tribe population in the district and there are scheduled tribe households in vicinity and downstream areas. These households shall not be directly impacted by

project in any manner. These ST households will be taken into account during the implementation of Emergency Action Plan.

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 barrage premises/proximity and hence there would be minimal interface with communities and therefore significantly lower SEAH/GBV risks.
4. Waste generation from labour colony can pollute drinking water sources of community, risk is low and can be mitigated by providing adequate sanitation facilities.
5. No impacts are envisaged on cultural heritage as no such sites are identified in project vicinity.
6. Labour related risk would include:
 - Safety issues while at work like injuries/accidents/ fatalities leading to even death, while at work; Occupational health and safety risks due to exposure of workers to unsafe conditions while working at heights, working using lifts, handling of equipment and machinery, exposure to air and noise pollution etc. will be addressed through OHS guidelines.
 - Short term effects due to exposure to dust and noise levels, while at work
 - Long term effects on life due to exposure to chemical /hazardous wastes
 - Inadequate accommodation facilities at work force camp, including inadequate sanitation and health facilities
 - Sexual harassment at work
 - Absence or inadequate or inaccessible emergency response system for rescue of labour/workforce in situations of natural calamities.
 - Health risks of labour relating to HIV/AIDS and other sexually transmitted diseases
 - Non-payment of wages
 - Discrimination in Employment (e.g. abrupt termination of the employment, working conditions, wages or benefits etc.)
 - Unclear terms and conditions of employment
 - Discrimination and denial of equal opportunity in hiring and promotions/incentives/training opportunities
 - Denial for workers' rights to form workers' organizations, etc.
 - Absence of a grievance mechanism for labour to seek redressal of their grievances/issues

5.1 CONCLUSIONS

5.1.1 Risk Classification

As per the ESDD exercise, risk/impacts that have been identified relate to Water Quality, Physical Environment, labour and SEAH/GBV. The summarised environmental and social risks of identified activities with level of risk is presented in previous chapter. Environment risks of air, water, noise, land use, soil and resource use for repair & restoration of spillway glacis and downstream protection work from gate no 5 to 15 of barrage, construction of coffer dam / ring bandha and repair & strengthening of boulder excluder tunnel of under sluice gate 1 are considered moderate. Similarly, environment and social risk of labour camp and disposal of debris has also been identified as moderate. Due to location of barrage on boundary of “Rajaji National Park”, impact of rehabilitation work on protected area has also been considered 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 barrage is categorized as Moderate. OHS is a substantial risk activity and is being treated separately through OHS plan in accordance with WB ESHS guidelines.

5.1.2 National Legislation and WB ESS Applicability Screening

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

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

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

Relevant ESS	Reasons for Applicability of the standard
ESS2: Labour and Working Conditions	Due to engagement of Direct worker, Contracted workers and Community workers (likely for EAP and other non-structural interventions) for rehabilitation work
ESS3: Resource Efficiency, Pollution Prevention and Management	Civil and hydro-mechanical work including resource consumption; requiring protection of physical environment and conservation of resources
ESS 4: Community Health and Safety	Rehabilitation work, although limited to barrage complex, can increase community exposure to risk and impacts; directly or indirectly.

Relevant ESS	Reasons for Applicability of the standard
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural resources	Project components like left bank head regulator, power channel and power house etc fall within Raja ji National Park. All interventions are planned on barrage and head regulator, therefore to eliminate risks of impacts on protected habitat, 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)
 - Bio-diversity 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	<ul style="list-style-type: none"> • Labour Management 	SPMU/IA	Before mobilization of

WB-ESS Triggered	Mitigation Instrument	Responsibility	Timelines
Working Conditions	Procedure (LMP) including OHS management plan		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 www.damsafety.in website as well as other accessible locations such as the office of Engineer in Charge at barrage 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 barrage 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 barrage 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 treatmentetc.)	A	DI	WQ, F, PA, PE, L, G
5	Structural Improvement/Repair work -Downstream of Dam site (with no interfacing with dam reservoir)	A	DI	WQ, F, PA, PE, 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, F, PA, PE, L, G
8	Hydro-mechanical activities Downstream of Dam site (with no interfacing with dam reservoir)	A	DI	WQ, F, 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, L
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	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			
B	Pre-construction and construction stage major auxiliary or preparatory intervention			
1	Acquisition (diversion of forests land for non-forest purposes) of forest land	NA		

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
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	DI/DE	WQ, PA, PE, L, G
8	Heavy machinery deployment and setting up maintenance workshop	A	DI	PE, L, G
9	Setting up Hot mix plant	NA		
10	Deployment of Concrete mixture and heavy pumps	A	DI	PE, L, G
11	Temporary land acquisition	NA		
12	Need of Tree felling/ vegetation clearance	NA		
13	Disposal of large amount of Debris	A	DI/DE	PE, L
14	Transport of large construction material	A	DE	PA, PE, L
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 coffer dam / ring bandha	WQ, F, PA, PE, L, G	Air and noise pollution, Risk of increase in reservoir water turbidity, Impacts on fish, Impacts on fauna (national park) due to works/noise, Land contamination due to disposal of waste, Labour and GBV risk	M
b	Works related to repair of damaged railing at barrage bridge & H.R. bridge	PE, PA, L	Noise pollution, Impact of avi-fauna due to noise, 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	Works related to chain link fencing along with right afflux bund road of barrage	PE, L	Generation of waste from packaging material, Dug up material generation and disposal due to fencing poles, Labour risk	L
b	Weather coat painting & other related works over civil structures with in barrage premises	PE, L	Land contamination due to paints, Labourrisk	L
c	Protection & Refurbishment Work from Spillway Glacis to end-sill of Gate No. 05 to 15	WQ, F, PA, PE, L, G	Air and noise pollution, Risk of increase in river water turbidity, Impacts on fish, Impacts on fauna (national park) due to works/noise, Land contamination due to disposal of waste, Labour and GBV risk	M
3.	Hydro-Mechanical activities Down - stream of Dam Site (with no interfacing with dam			

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
	reservoir)			
a	Replacement of S. S. plate on track guide of gate groove of barrage gates	PE, L	Noise pollution, Labour risk	L
b	Replacement of sill beams	PE, L	Noise pollution, Labour risk	L
c	Replacement of wheels, bearing of under sluice gates and other bay gates	WQ, PE, L	Water pollution, Noise pollution, Generation of waste material from packaging etc Noise pollution, Labour risk	L
d	Procurement of bearing of spillway gates & head regulator	PE	Generation of waste material from packaging etc	L
e	SITC of package substation of 500 KVA, 11 KV/415 V CSS	PE	Air pollution	L
f	Providing and fixing of chequered plates at barrage gates, HR gates and gantry crane platform at barrage structure	PE, L	Noise pollution, Labour risk	L
g	Epoxy on under sluice gates, otherway gates at barrage	WQ, L	Water pollution, Labour risk	L
h	Replacement of rubber seal of HR gate, otherway gate, under sluice gate at barrage	PE	Generation of waste material from packaging etc	L
i	Repair & strengthening of boulder excluder tunnel of under sluice gate 1	WQ, F, PA, PE, L, G	Air and noise pollution, Risk of increase in river water turbidity, Impacts on fish, Impacts on fauna (national park) due to works/noise, Land contamination due to disposal of waste, Labour and GBV risk	M
j	Providing and fixing of new pre-fabricated cabin above hoisting equipment of under sluice gate 1 to 4, other bay gate 5 to 15, head regulator gate 1 to 5	PE, L	Noise pollution, Generation of waste material from packaging etc, Labour risk	L
4	Basic Facilities Improvement			
a	Construction of new control room building	PE, L, G	Air and noise pollution,	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
			Generation of construction waste/debris, Generation of waste material from packaging etc, Labour and GBV risk	
b	Construction of training center/transit camp building	PE, L, G	Air and noise pollution, Generation of construction waste/debris, Generation of waste material from packaging etc, Labour and GBV risk	L
c	Construction of residential building at hydel colony	PE, L, G	Air and noise pollution, Generation of construction waste/debris, Generation of waste material from packaging etc, Labour and GBV risk	L
5.	Instrumentation, SCADA, Surveillance system, etc.			
a	Design, supply, installation, commissioning and testing of early warning system & public address system	PE, L	Generation of waste material from packaging etc., Labour risk	L
b	SITC of solid waste disposal system	PE, L, G	Air pollution, Generation of waste material from packaging etc., Labour & GBV risk	L
c	Procurement of 4 vehicles	PE	Air pollution	L
d	Procurement of furniture for office/training center at Chilla	PE, L	Generation of waste material from packaging etc, Labour risk	L
B.	Pre-construction and construction stage major auxiliary or preparatory intervention			
1	Setting up Labour Camps (location within barrage premises or outside)	WQ, PE, G	Wastewater generation from domestic activities, waste generation, GBV risk within labour and involving community.	M
2	Heavy machinery deployment and setting up maintenance workshop	PE	Heavy machinery will be deployed for repair and	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
			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	
3	Deployment of concrete mixture and heavy pumps	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	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.