

DRUK GREEN POWER CORPORATION LIMITED
CORPORATE OFFICE
THIMPHU BHUTAN

REQUEST FOR
EXPRESSION OF INTEREST
FOR
CARRYING OUT ENVIRONMENTAL AND
SOCIAL IMPACT ASSESSMENT(ESIA) OF
INTEGRATED GONGRI HYDROPOWER
PROJECT AND JERI PUMPED STORAGE
PROJECT

FEBRUARY 2024

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REQUEST FOR EXPRESSION OF INTEREST

1. The Royal Government of Bhutan has entrusted Druk Green Power Corporation Limited (DGPC) to carry out Environmental and Social Impact Assessment (ESIA) of the Integrated Gongri Hydropower Project and Jeri Pumped Storage Project located in the eastern Bhutan. DGPC intends to use its internal fund for the payments under the contract for which this Expression of Interest (EOI) has been issued.
2. DGPC now invites the Expression of Interest from prospective consultancy firms to provide consulting services (hereinafter called “Services”) for “Carrying out Environmental and Social Impact Assessment (ESIA) of Integrated Gongri Hydropower Project and Jeri Pumped Storage Project”.
3. DGPC therefore wishes to hire reputed international consulting firm (hereinafter called the “Consultant”) to provide consulting services for carrying out ESIA. The Consultant shall ensure that the ESIA is bankable and according to international standards and best practices, and in keeping with the Bhutanese Guidelines for Development of Hydropower Projects 2018.
4. Interested Consultants should provide information demonstrating that they have the required qualifications and relevant experience to perform the Services.
5. The EOI must be delivered in a written form to the address below (in person, or by mail or by e-mail) on March 22, 2024 by 3:00 PM (Bhutan Standard Time) and shall be opened on the same day at 3:30PM. For email submission, all documents shall be in PDF format. In case of email submission, the Employer will not be responsible for the confidentiality of the EOI.
6. The EOI Documents comprising of the following documents shall be available for download from DGPC website: www.drukgreen.bt from February 20, 2024 to March 21, 2024:
 - i) Section I – Instruction to Bidders
 - ii) Section II – EOI Evaluation / Shortlisting Criteria
 - iii) Section III – Bidding Forms
 - iv) Section IV – Terms of Reference
7. Clarification, if any, with regard to the EOI shall be obtained from the address mentioned below:

Head, Contracts Management and Procurement Division
Projects Department
Druk Green Power Corporation Limited
Post Box No. 1351, Motithang, Thimphu, Bhutan,
Tel: +975 2 339875
Email: d.wangdi269@drukgreen.bt

Yours sincerely

(Darjay Wangdi)
Head, CMPD



SECTION I - INSTRUCTIONS TO BIDDERS

1. **Scope of Work:** The scope of Work for these projects shall be as specified under Section IV–Terms of Reference (ToR).
2. **Qualification:** Prospective Bidders shall demonstrate that they meet the required qualification and experience criteria and are fully capable of carrying out the consulting services.
3. **Conflict of Interest:** The Bidders shall hold the Employer’s interest paramount, without any consideration for future work, and strictly avoid conflict with other work or its own corporate interests. No firm shall make any unsolicited communication with the Employer. Such attempts to influence the Employer in its decisions on the examination, evaluation, and comparison of the EOIs may result in rejection of the EOI.
4. **Preparation of EOI:** The EOI shall be written in English language and shall be signed by the authorized signatory. The Bidder shall complete all the forms under Section III-Bidding Forms and submit complete set of documents including supporting documents to substantiate the qualification and experience of the Bidder.
5. **Power of Attorney** of the person submitting the EOI on behalf of the Bidder shall be attached. An authorized representative of the Bidder shall sign the original submission letters in the required format of EOI submission and shall initial all pages. The authorization shall be in the form of a written power of attorney attached along with the EOI.
6. In addition to the information sought under this request for EOI, Bidders are required to review the Terms of Reference under Section IV and point out gaps and provide recommendations for improvements.
7. **Modification of EOI:** This request for EOI may be modified or substituted by the Employer before the deadline for submission. The Employer may at its sole discretion, extend the deadline for submission. However, the Employer shall not entertain any request by the Bidders for extension of deadline for submission of EOI. No claims whatsoever will be entertained if submission is not received on due date and time.
8. **Amendments:** At any time prior to the deadline for submission of EOI, the Employer for any reason or on its own initiative may revise the EOI Documents by issuing an amendment, which shall form an integral part of the EOI Documents.
9. **Opening of EOI:** EOI shall be opened on stipulated date and time in the presence of authorized representative, if any.
10. **Shortlisting of Bidders:** Bidders scoring a minimum score of 80 points against the Shortlisting Criteria of the project provided under Section-II shall be qualified and shortlisted for issuance of the Request for Proposal for the Consultancy Services. A Bidder will ultimately be selected for preparation of ESIA in accordance with the Quality and Cost Based Selection (QCBS) method set out in the Procurement Regulations of the Employer.
11. EOI Proposals by a joint venture/consortium shall not be accepted. However, proposal from merged/acquired/subsidiary company shall be allowed using the credential of the holding company subject to providing key experts and backstopping services by the holding company. A proper structure of the company must be provided for evaluation.
12. The Employer reserves the right to verify the credentials/documentary evidences submitted by the Bidders.
13. The bidder shall bear all costs associated with the preparation and submission of the EOI. The Employer in no case shall be responsible or liable for these costs, regardless of the conduct or outcome of the selection process.

14. The Employer reserves the right to accept or reject the EOI partly or fully or cancel the bidding process without assigning any reasons thereof and in such case no Bidder shall have any claim arising out of such action of the Employer.



SECTION II – EOI EVALUATION/SHORTLISTING CRITERIA

Interested consulting firms shall provide information demonstrating that they have the required qualifications and relevant experience to perform the Services. The evaluation and shortlisting shall be based on criteria indicated below:

SN	Qualifying Criteria	Points (%)
A	Relevant Experience in Similar Assignments	
	Corporate Capacity: Environmental and Social Assessment should be core business of the consultant. The consultant should have at least 15 years of experience in same business.	10
B	Experience and familiarity with similar activities: i) Should have successfully completed at least three (3) international contracts of similar nature, scope, size and complexity (in hydropower sector) outside home country and in at least two continents within the last 10 years. ii) Should have successfully completed at least one (1) contract of similar nature and scope in transmission line sector within the last 10 years. iii) Should have carried out successfully terrestrial and aquatic biodiversity assessment, and environmental flow assessment in at least one project.	15
C	The Consultant shall demonstrate having a sound financial situation and capacity by submitting financial audit reports for the last 2 financial years.	10
D	In-house resources of technical staff in the Consultant firm (regular employees of the firm) with minimum 15 years of international experience. Please refer Clause 17.1 of the TOR for list of Key Experts to be included for this consulting services. <i>Note: Consultants should provide a list of in-house technical staff with the name, title, field of expertise, time period with the firm as regular employee, total years of international experience, total years of professional experience, along with the organizational structure. CVs of the experts should be submitted.</i>	60
E	Proven experience/projects involving capacity building and knowledge transfer to client's officials.	5
	Grand Total	100

While describing the assignment(s), the Consultant should furnish the following details:

- *The Consultant should explain in what way the executed assignment was similar in nature to the current assignment.*
- *The Consultant should explain the exact role played by the Consultant in the assignment, especially whether the assignment was carried out in association with other firms as joint venture (JV) or in sub-consultancy.*

SECTION III – BIDDING FORMS

- Form 1: Forwarding letter for Expression of Interest**
- Form 2: Information Sheet**
- Form 3: General and Specific Experience of the Bidder**



Form 1: Format for forwarding letter for Expression of Interest

Date:.....

To

[Insert address of Procuring Agency]

Sub: Expression of Interest for*[Insert title of work]*

Dear Sir/Madam,

This is in response to your letter dated [*.....insert date*.....], inviting Expression of Interest for [*insert description of work*]. We hereby submit our Expression of Interest and have attached necessary information according to the standard forms.

The information furnished by us in this expression of interest is correct to the best of our knowledge. Based on this information, we understand you would be able to evaluate our proposals in order to shortlist for the above-mentioned assignment. We, however, understand that the Employer reserves the right to decide whether or not to shortlist our firm without disclosing the reason whatsoever.

Sincerely yours,

(On behalf of the firm)
Signature:
Name of signatory:
Designation:
Company Seal



Form 2: Information Sheet

2.1 Services Data

Name of the Bidder	
Brief Description of the Assignment	

2.2 (a) Bidder's Information

Name of the Bidder:	Country of Registration:
Name of the owner:	Day, month & Year of Establishment:
Name of Authorized Representative <i>(if applicable)</i> :	Position / Designation:
Contact Person details: Name, Designation, email and phone number	

[Attach valid Trade License / Registration certificate]

2.3 Core Area of Expertise *[Provide a brief Description]*

2.4 Company Profile *[Provide a brief Description]*



2.5 Latest Technology *[where applicable]*

Provide list of latest technology proposed by the firm

2.6 Comments on Scope of Work *[where applicable]*

Provide comments if any on the Scope of Work



Form 3: General and Specific Experience of the Bidder

1. Name of Project:
2. Description of Project:
3. Installed Capacity:
4. Contract Amount:
5. Start & End date (month & Year):
6. Description of services provided:
7. Employer (With complete address, contact details):.....

Notes:

- i) The Bidders shall fill in the details in separate form for each experience/credential claimed.
- ii) For each credential the certificate issued by the Client shall be attached



SECTION IV – TERMS OF REFERENCE

1. Gongri Hydropower Project (HPP)

1.1 Background

The Pre-Feasibility Study of Gongri Hydropower Project was carried out by the erstwhile Department of Hydropower and Power Systems (now renamed as Department of Energy) in February 2022.

The project is located on river Gongri, trans-boundary of Trashigang and Monggar Dzongkhags. The project area and its reservoir spread across seven Gewogs (Chaskar, Dramiste and Narang under Monggar and Udzorong, Kanglung, Samkhar and Yangnyer under Trashigang Dzongkhag). The main project components fall under Chaskar Gewog, under Monggar Dzongkhag. The dam and powerhouse sites are located at N: 3012569.35, E: 340499.52 and N: 3012313.52, E: 340686.92 respectively.

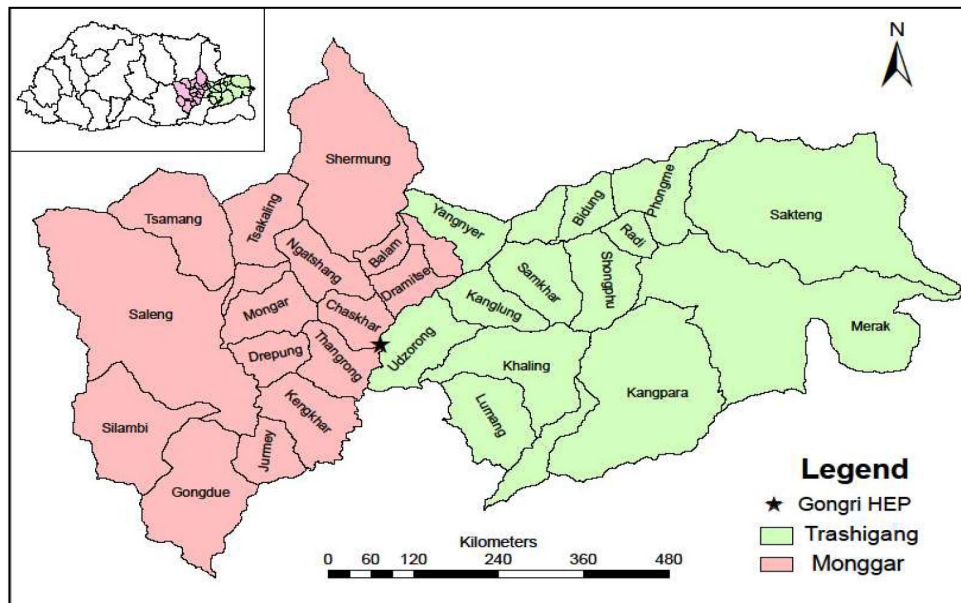


Figure 1: Location of Gongri Hydropower Project

The layout of the project as per the PFS-2022 is as provided below:

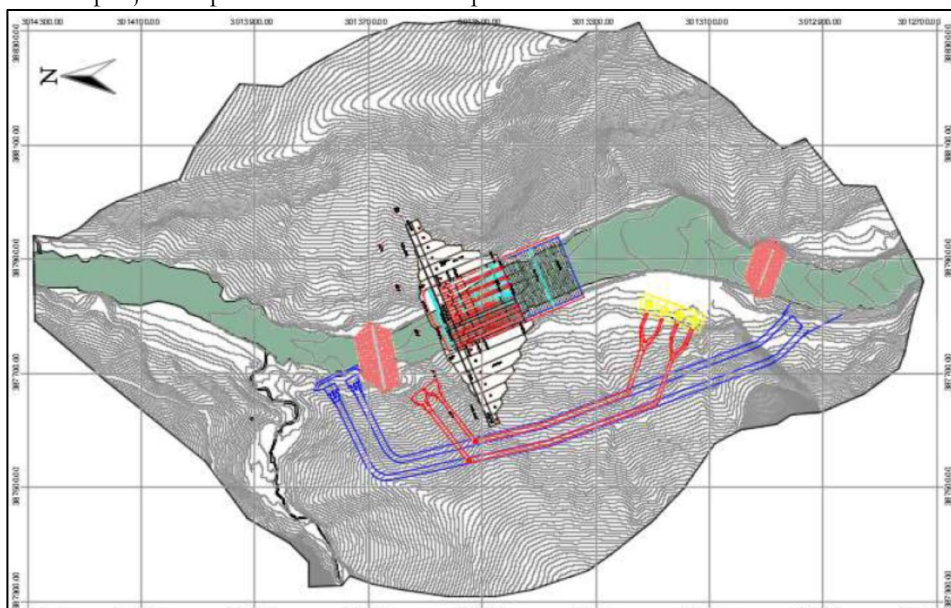


Figure 2: Project Layout

1.2 Key Features

The project envisages an installed capacity of 740 MW with an annual designed energy generation of 2,721.45 MU. The firm power of the project is 129 MW. The designed discharge and net head of the project is 612.52 m³/s and 133 m respectively.

The catchment area at the proposed dam site is 9,666 km². For the hydrological studies, 10-daily discharge series from 1991-92 to 2018-19 (28 years) at the dam site was developed using long-term discharge series at Udzorong primary Gauge & Discharge (G&D) station having catchment area of about 9,175 km². The annual mean flow at dam site is 325 m³/s, corresponding to a runoff volume of about 10,308 MCM. The dam has been designed for safe evacuation of Probable Maximum Flood (PMF) of 15,136 m³/s and Glacial Lake outburst flood of 1,300 m³/s. For the temporary river diversion, the annual monsoon discharge at return period of 1 in 25 years of 2,145 m³/s have been considered.

The project has the following features:

Dam Complex	<ul style="list-style-type: none"> Concrete gravity dam of 177 m height from the deepest foundation level, with seven nos. of gated sluice spillways with breast wall to safely pass the design flood of 15,136 m³/s. Each spillway gate size of 5.0 m (W) x 10 m (H).
Water Conductor System	<ul style="list-style-type: none"> Twin tunnels of 7.5 m diameter circular shaped is designed to convey water to the powerhouse
Powerhouse Complex	<ul style="list-style-type: none"> Semi underground powerhouse - 104 m (L) x 22.0 m (W) x 36 m (H) has been proposed. It will have 4 units of Francis turbine with 185 MW each. GIS Building – GIS building is located upstream of powerhouse to house the transformers and gas insulated switchgear.
Electro-Mechanical Equipment and Power Evacuation	<ul style="list-style-type: none"> The project envisages a semi-underground power house operating at rated head of 133 m and total plant design discharge of 610.52 m³/s. The power house shall house four units of vertical Francis turbines with adequate capacity to provide 185 MW each at generator terminals and 10% continuous over load. The specific speed of turbine comes out to be 168.13 rpm and synchronous speed of the machine is 150 rpm. The power generated would be stepped-up to 400 kV through three single phase generator-transformer each of 13.8/400√3 kV, 76 MVA capacity for each unit with 10% overloading. The power generated from the project shall be evacuated using four circuits arranged in twin moose configuration of ACSR bare conductor wherein one 400kV Double Circuit (D/C) twin moose line is evacuated to Yangbari PS (single tower line) while the other 400 kV D/C twin moose line will be a LILOed to existing transmission line of Kholongchhu hydropower project.
Environment and Social Aspects	<ul style="list-style-type: none"> The initial environmental and social impact assessment was carried out as part of PFS. As per the study, there is no direct displacement of households due to the project design and location. However, around 132.55 acres of private land belonging to 282 households will be inundated under the reservoir. Further, two stupas and holy site at the confluence of Gongri and Sherichhu will also be submerged. The 6 km of Mongar-Trashigang highway will also come under submergence.

2. Jeri Pumped Storage Project (PSP)

2.1 Background

As part of the preparation of the Bhutan Power System Master Plan 2040 (PSMP-2040) by the Department of Energy, MoENR through the support of Japan International Cooperation Agency (JICA), the conceptual planning and design of two potential Pumped Storage Hydropower Projects (PSH) namely Jeri and Basochhu was carried out by JICA Experts in February 2022. As per the PSMP-2040 submitted as technical instruction report 2, the upper dam of Jeri PSH is located on river Jeri which is the left bank tributary of Gongri. The upper dam is located just downstream of Lisa village at location coordinate 27°11'19.42" N

and 91°26'48.02" E. The underground powerhouse is located near Genkhar village at 27°13'0.51" N and 91°24'0.28" E. The lower dam for the Jeri PSH will be the Gongri dam.

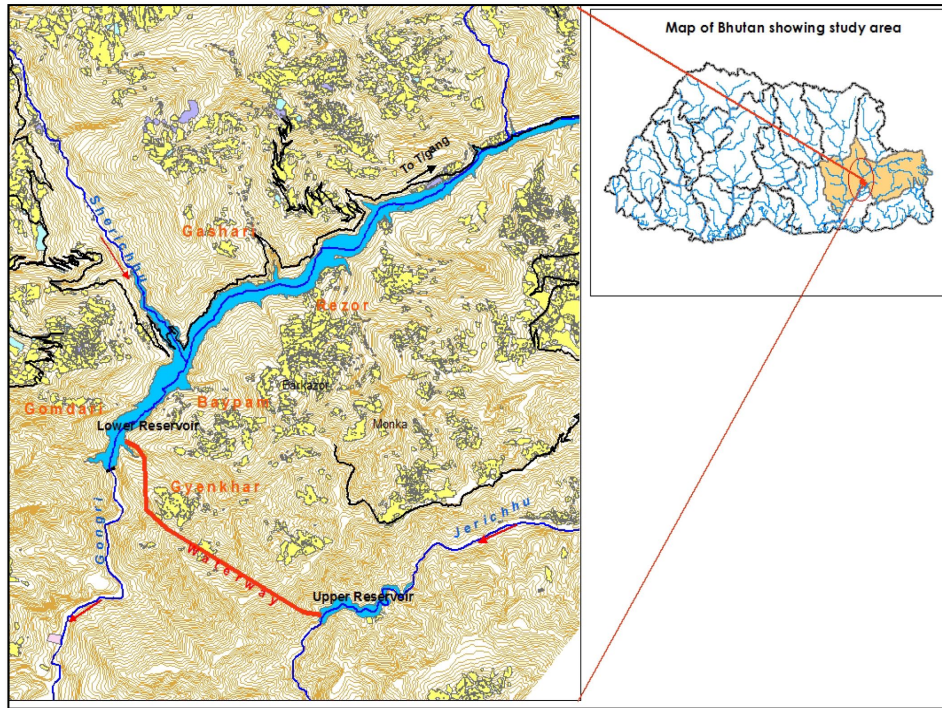


Figure 3: Location of Jeri Pumped Storage Project

The layout of the project is as provided below:

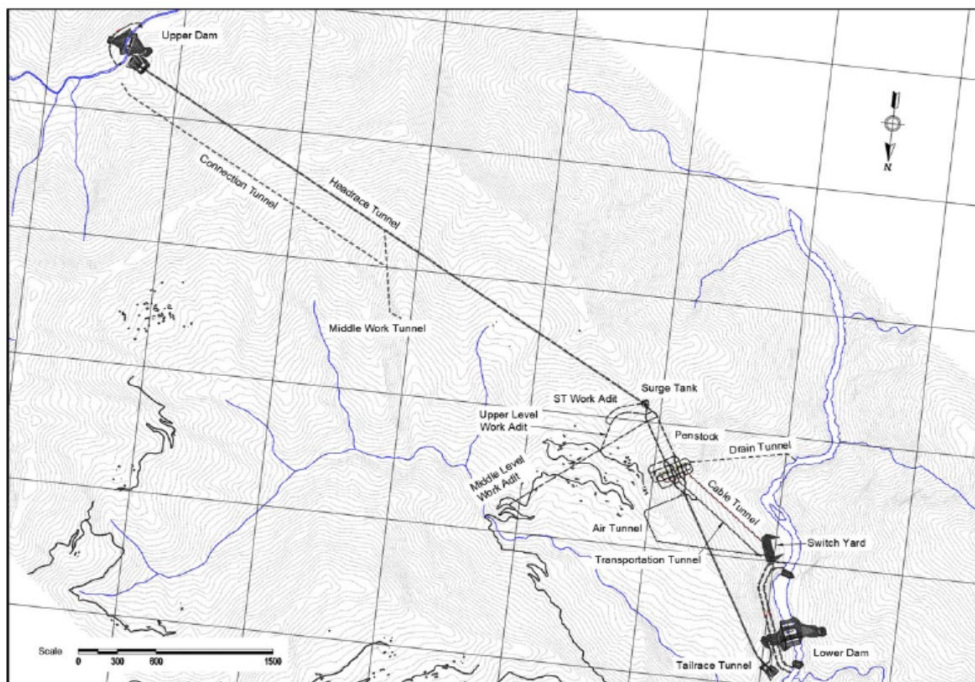


Figure 4: Project Layout

2.2 Key Features

The Jeri PSH envisages an installed capacity of 1,800 MW. The designed discharge and net head of the project is 338 m³/s and 635 m respectively. The catchment area at the proposed upper dam site is 128 km².

The project has the following features:

Dam Complex	<ul style="list-style-type: none"> • Dam – The upper dam is of concrete gravity type with approx. height of 87 m from the deepest foundation level and crest length at top of 225 m.
Water Conductor System	<ul style="list-style-type: none"> • 8.2 m diameter tunnel of length 4,800 m • Penstock of internal diameter 4.7 m of length 1,293
Powerhouse Complex	<ul style="list-style-type: none"> • Underground Powerhouse - 220 m (L) x 34 m (W) x 54 m (H) has been proposed. It will have 4 units of reversible Francis pump-turbine.
Tailrace	<ul style="list-style-type: none"> • Internal diameter of 8.2 m and length 1,714 m
Electro-Mechanical Equipment and Power Evacuation	<ul style="list-style-type: none"> • Jeri PSH envisages underground powerhouse operating at net head of 635 m and total design discharge of 338 m³/s. The power house shall house four units of vertical shaft single stage discharge spiral Francis type pump-turbines with unit output of 450 MW each.
Environment and Social Aspects	<ul style="list-style-type: none"> • The initial environmental and social impact assessment has been carried out. As per the study, it was found that most of the project components fall within the state reserved forest land. However, some private land and 3 chortens which are already vandalized falls under reservoir submergence of Jeri dam. There are 11 households, 4 of which are gungtongs in the area. During the DPR stage, detailed study needs to be carried out to assess the socio-environmental impact of the project. The project is expected to improve local economy, generate employment and improve road connectivity and health facilities.

3. Objective of the Assignment

As a part of the DPR preparation, Environmental & Social Impact Assessment (ESIA) of Integrated Gongri HPP and Jeri PSP will be carried out. The objective of this consultancy service is to conduct environmental and social assessments in line with the applicable requirements of the RGoB and safeguard policies of the international best practices (ADB and the WBG). Specific objective of the ESIA include:

- To carry out site investigations to collect primary data and review all available relevant secondary data to establish a comprehensive environmental and social baseline for the Project Area of Influence (AoI).
- To screen, identify and assess potential positive and adverse environmental and social impacts, including direct, indirect, and induced and environmental and social impacts associated with all project activities, as well as cumulative impacts of the project when taken together with impacts associated with other development projects.
- To develop proposed measures to avoid reduce, mitigate, manage and/or compensate for such impacts, including the institutional arrangements and required capacity building to implement all such measures and monitor their effectiveness, as required before the start of planning, construction and post construction phases separately.
- To identify potential opportunities and design appropriate measures to maximize complementary economic, financial, environmental and social benefits of the project.
- To ensure that all affected people receive assistance to enable them to improve or retain their pre-project living standards and be able to participate and share the benefits of the development.
- To ensure that impacts on vulnerable communities are avoided, minimized, mitigated and/or compensated, and that mechanisms are designed to ensure their meaningful participation during Project planning and implementation, and that they receive culturally appropriate benefits under the project.
- To conduct a public consultation process that ensures that project affected people and other stakeholders are informed about the project and its possible impacts, as well as offered the

opportunity to share their opinions and feedback so as to input into these environmental and social assessment, planning and design studies and their implementation.

- To document all of the above mitigation and development interventions in appropriate forms and formats to be further discussed and agreed upon with DGPC.
- To review and assess the currently available relevant reports, studies and processes; identify the gaps, and undertake additional survey and assessment, if required to address these gaps; and to consolidate the reports into Final Reports to enable project implementation expeditiously.

The Consultant shall carry out this assignment by reviewing available information and conduct detailed assessment through additional literature research, field data collection and analysis, stakeholder consultations, and planning activities that would vary across the different assignment tasks.

4. Study Area

The study area should include the following:

- Catchment Area;
- Submergence Area (Gongri HPP & Jeri PSP);
- Project Area - an area within 5 km (or as may be defined by Bhutanese regulatory agency) from main project components (i.e., reservoir boundary, dam/diversion structure, power house etc.) and, to be extended to its projected area of influence/impact during normal operation or in the event of catastrophic failure.
- Upstream/downstream of the dam sites (to assess impacts of reduced flow). The analyses should include impacts (cumulative and catastrophic) that could affect downstream infrastructure/settlement facilities, command areas downstream of the reservoirs and areas of backwater influence upstream of the proposed reservoir and ancillary structures.

5. Scope of Work

The broad scope of the ESIA under this consultancy is to carry out Environmental & Social Impact Assessment of the proposed project covering economic, social and environmental aspects, identify both the positive and negative impacts, assessment of impacts with its economic evaluation and prepare Environmental Management Plan (EMP) to mitigate the adverse effects, including the socio-economic aspects and Resettlement & Rehabilitation (R&R) Plan (or RP) for project affected people and Environmental Flow (E-flow) Assessment, among others. The Consultant shall refer to all relevant policies, rules, regulations, guidelines and frameworks to address the fulfillments under each of these requirements.

5.1 The Contents of the Report

The following sections outline the report for the ESIA of the Integrated Gongri HPP & Jeri PSP.

5.2 Title page:

The title page should contain the following:

- The name and location of the project.
- Name and address of the proponent.
- Name, qualification and address of the ESIA consulting firm.

5.3 Table of Contents:

- The title and page number of all sections, abbreviations, maps, plans, tables, figures, and annexure of the environmental assessment reports.

5.4 Executive Summary:

A brief description of the proposed project in clear and non-technical language including:

- The objective and need for the project. Explain whether the proposed project has been identified in the Hydropower Master Plan or not, if yes, what rank the project holds in the plan.

- Summary of project area to be acquired for various appurtenant works and the land use pattern within 5 km from the main project components (i.e., dam structure, midpoint of dam and power house) and catchment area.
- Summary of key findings and recommendations of the assessment, including the details of the main environmental impacts, social issues, project footprint of the main project and ancillary/associated facilities, economic benefits, and impacts covering cumulative impacts and proposed mitigation measures.
- A brief description on how the public was consulted stating the issues raised, resolved and pending.
- A brief description on an assessment of alternatives to the project, its main components and ancillary components with respect to the location, technical design and other environmental and social components.
- A brief description on the climate change impact, vulnerability & adaptation assessment.
- Project financial statement including project cost, funding source and the project activity schedule.
- Name of the organization/consulting firm preparing the ESIA report, and qualifications and experience of experts involved in the ESIA/EMP preparation.
- Project benefits: The local, regional and national benefits of the project should be explained.
- A declaration stating that the information disclosed in the ESIA report is correct.

5.5 Maps and Figures

All the maps should be colored and provided in A3 size.

- A map (1:50,000) specifying the location of the project.
- A study area map (1:50,000) of 5 km radius from the project indicating features such as a) total catchment area, b) directly draining catchment area, c) submergence area, & d) project area to be acquired for various appurtenant works area within 5 km from the main project components. The map should also include area of influence including direct impact area, indirect impact area and cumulative impact area.
- A map (1:10,000) showing the land use pattern of the a) directly draining catchment area, b) submergence area, & c) project area to be acquired for various appurtenant works area within 5 km from the main project components (i.e., dam axis, reservoir boundary, power house, HRT, etc.).
- A map (1:10,000) showing locations of human settlements and major constructions including roads and major industries/mines.
- To examine the cascading effect, a clear map (1:50,000) showing the approved/under construction/completed hydropower projects on both upstream (say Punatshangchhu I & II projects) and downstream of the proposed project.
- A drainage map (1:50,000) of the directly draining catchment up to the project site showing the submergence area of both main and regulating dams.
- Soil map (1:50,000) of the study area showing different regions and soil characteristics.
- Geological map (1:250,000) and seismo-tectonic map (1:1,000,000) of the study area of the 5 km radius from the main project component
- A map (1:10,000) specifying the forest cover in the upstream and downstream area, and marking the presence of migratory corridors, occurrence of any endangered/threatened flora and fauna species and/or plants and animals of economic/ecological importance and, zonation of protected areas.
- A map (1:50,000) clearly showing the location of various monitoring stations (for ambient air, water, noise and soil).
- A map (1:25000) specifying the areas vulnerable to floods.
- Demarcation of snow fed and rain fed areas (1:10,000) for a realistic estimate of the water availability.
- A map (1:10,000) showing the number of villages (with population) getting affected due to the project.
- A map/layout showing the project components.

- A map with appropriate scale showing the proposed transmission and distribution line project together with alternative options, the location of towers, sub-stations and existing infrastructure along the length of new route/alignment.
- Map showing the dewatered reach where E-flow assessment was undertaken.
- Map of reach affected by hydro-peaking and flow-regime alteration if reservoir or dam toe type HPP.
- Map showing aquatic habitat characterizing the existing aquatic habitat as pool, riffle/rapid, or run and sediment morphology.

5.6 Policy and Legal Frameworks

- Provide descriptions on the review of existing legislations and policies governing the implementation of the proposed activity and environmental assessment requirements.

5.7 Project Description

- Describe whether the proposed project is as per the approved Power System Master Plan/Development plan of the area. Provide the following essential project related information:

5.7.1 Details of the Project Site and Proponent

- ✓ Location.
- ✓ Gewog.
- ✓ Dzongkhag.
- ✓ Name of proponent.
- ✓ Geographical coordinates for the location of dam, powerhouse, HRT, TRT outlet point and other project components.
- ✓ Present mailing address including telephone number, fax and email (if any).
- ✓ Name and contact address of the environmental focal person.

5.7.2 Catchment area characteristics

- ✓ Name of the river and major tributaries.
- ✓ Overall description of the catchment area.
- ✓ Total catchment area in km² including the catchment area at the intake.
- ✓ Rivers mean annual flow at the project site in Mm³ (MCM).
- ✓ Maximum mean monthly flow at the project site in Mm³ (MCM).
- ✓ Minimum mean monthly flow at the project site in Mm³ (MCM).
- ✓ Probable maximum flood in Mm³ (MCM).
- ✓ Headworks/spillway design flood in Mm³ (MCM).
- ✓ Minimum flow of river in m³/sec.
- ✓ Number of tributaries in the dewatered reach.
- ✓ Minimum dry season flow from side streams/rivers in the de-watered stretch.

5.7.3 Type of project

- ✓ Simple run-off-river.
- ✓ Reservoir run-off-river (e.g., with daily or hourly storage).
- ✓ Seasonal storage.
- ✓ Pumped storage.
- ✓ With or without an inter-basin diversion.
- ✓ Location of the powerhouse in relation to dam.
- ✓ Installed capacity in megawatts.
- ✓ Energy generation.

5.8 Engineering characteristics

5.8.1 For hydropower plant

- ✓ Type and dimension of intake structure (dams).
- ✓ Power house type.
- ✓ Type of turbine(s).
- ✓ Flow through turbine(s).
- ✓ Tunnel length in km.
- ✓ Tunnel diameter in meters.
- ✓ Total length of access roads in km.
- ✓ Surge shaft top and its location, if applicable.
- ✓ Gross head.
- ✓ Provision for E-flow release.
- ✓ Fish migration – upstream and downstream.

5.8.2 Provide brief information on the construction power and power evacuation (Transmission line)

- ✓ Voltage level (in kV).
- ✓ Tapping point.
- ✓ Termination point.
- ✓ Length of line.
- ✓ Right of Way (RoW).
- ✓ Conductor (Number of lines and circuits, composition and diameter, minimum height over ground level for overhead lines, depth and trench and fill specifications for underground lines).
- ✓ Number, type and composition of towers.

5.8.3 Reservoir characteristics

- ✓ Reservoir area in hectares.
- ✓ Reservoir length in km.
- ✓ Reservoir volume in Mm³ (MCM).
- ✓ Reservoir live storage in Mm³ (MCM).
- ✓ Reservoir dead storage in Mm³ (MCM).
- ✓ Dead storage available for sediments above intake in Mm³ (MCM).
- ✓ Storage available for flood retention Mm³ (MCM).
- ✓ Reservoir draw-down height.
- ✓ Full reservoir water level elevation (meters).

5.8.4 Permanent structure for power generation

- Main dam Dam/Diversion structure/weir.
- ✓ Bottom outlet.
- ✓ Secondary dam and dykes (if applicable).
- ✓ Intake.
- ✓ Spillway.
- ✓ De-sander, De-siltation tanks.
- ✓ Tunnel (if applicable).
- ✓ Surge tank (if applicable).
- ✓ Valve house (if applicable).
- ✓ Penstock (if applicable).
- ✓ Powerhouse.
- ✓ Switchyard.
- ✓ Tailrace and headrace tunnel(s).

- ✓ Re-regulation weir/dam (if applicable).
- ✓ Permanent access roads.
- ✓ Offices, residential areas and colonies.
- ✓ Reservoir.
- ✓ Adit (if applicable).

5.8.5 Construction Phase

- ✓ The location and area of contractor's construction facilities (CCF).
- ✓ Temporary access roads.
- ✓ Size, number, location and capacity of the burrow pits and quarry site to be used for construction purposes.
- ✓ Muck disposal/spoil areas (in hectares).
- ✓ The resource requirement (cement, aggregates, steel, etc.) in appropriate units including its source, storage areas, mode of transportation and construction schedule should be presented in the ESIA report.

5.8.6 Operational Phase

- ✓ Reservoir filling.
- ✓ Reservoir operation.
- ✓ Downstream hydrology and water quality below intake point.
- ✓ Downstream hydrology and water quality below tailrace.
- ✓ Downstream hydrology and water quality between intake point and tailrace.

5.9 Alternatives to the project

A description and analysis of all feasible alternatives for all ancillary and associated facilities to the project covering the following:

- The alternative of not undertaking the project (i.e., no-build alternative) in absence of any alternative.
- Description of the project alternatives.
- Analysis of its potential environmental impacts and mitigation measures.
- Principle differences among the feasible alternatives under considerations, particularly regarding potential environmental impacts.
- Reasons for considering the present project over the other alternatives.
- Description of the cleaner technology and environmental management taken into consideration while selecting the equipment and technology.
- Integrated development of hydropower projects with multipurpose use of water for drinking, irrigation, flood control and recreational purposes.
- The alternative analysis should also cover alternatives for project/hydropower facilities' locations, routing/alignment for transmission line, permanent access road to various project components, ancillary facilities, technologies, and construction methods among others.

5.10 Description of Existing Environment of the Project Area (Baseline Data)

The ESIA report must present recent and relevant 4 (four) seasons baseline information pertaining to the geo-physical, biological, socio-economic and cultural situation of the area under study, including any changes anticipated prior to project implementation. Baseline information should be provided within the 5 km radius from the dam structure, midpoint of dam and powerhouse, and the powerhouse. The study area should be defined as the area of influence, including direct impact area, indirect impact area and cumulative impact area.

This section should provide detailed description and analysis of the type of baseline data and information collected, methodology used for data collection and explain how they were used, and the time and frequency of data collection. Based on the data collected, describe the existing baseline environmental and socio-economic conditions in quantitative and qualitative terms including comparison/analysis of the previous

baseline data with the recent data.

Predictive, quantitative models and standards should be used for baseline data collection wherever possible to avoid vague and subjective predictions. Some of the models, but not limited to, are available in the *Environmental Assessment Guideline for Hydropower Projects, 2012*. In addition, the public and relevant stakeholder agencies should be involved during socio-economic data collection.

5.10.1 Land

- ✓ Provide details of land use pattern, land cover (forested, agricultural, degraded, built up, non-built-up areas, etc.) by area, topography, soil characteristics, slope stability in the 5 km study area.

5.10.2 Geological and Geospatial Aspects

Following aspects to be covered:

- ✓ Geography and physiography of the project site.
- ✓ Regional geology.
- ✓ Critical review of the geological features around the project area.
- ✓ Identify the current and potential landslide prone areas in and around the project area. The past records of landslides occurrence in the region should be scrutinized and information such as past events of landslides, area affected, frequency of occurrence per decade, geomorphologic conditions and degree of susceptibility to mass movement should be provided.
- ✓ Justify location & execution of the project in relation to structural components.

5.10.3 Seismo-tectonics

- ✓ Provide site-specific information on earthquake parameters and study on Design Earthquake parameters.
- ✓ Detailed description of seismic character of the study area should be included.
- ✓ Seismicity, tectonics and history of past earthquakes in the area

5.10.4 Hydrology of the basin

In the ESIA report, baseline description of hydrology should be presented. The monthly flow rates and the average annual flow rates of the river should be presented. Following points should be taken into consideration:

- ✓ Hydrology of the basin.
- ✓ Hydro-meteorology, drainage system.
- ✓ Rainfall-runoff data.
- ✓ Hydrology and length of the dewatered area.
- ✓ Source and possibility of a Glacial Lake Outburst Flood (GLOF) must be documented.
- ✓ Flood and its recurrence interval including data related to the frequency of floods, its location and maximum flood levels should be collected and presented in the ESIA report.
- ✓ Catastrophic events like cloudburst and flash floods, if any, should be documented.
- ✓ Water availability for the project and the aquatic fauna. The flow measurements shall be planned and executed in such a way that average, maximum, mean maximum, mean minimum and absolute lean flows should be modeled or measured.
- ✓ Estimated sedimentation rate

5.10.5 Biological resources

Data for the project area to be collected for four seasons with respect to the following:

i. Flora

- Provide information on the floral biodiversity resources (inclusive of but not limited to tree enumeration and survey of forest quality) of the river basin and project area.
- Total forest cover, type of forests, change in forest cover and threats and degradation of forests.
- Vegetation profile and number of species in the project area.
- Predominant flora and introduced exotic flora.
- Species Diversity Index (Shannon-Wiener Index) of the biodiversity and Importance Value Index of the predominant species.
- Documentation of economically important plants, medicinal as well as timber, fuel wood, non-wood timber products, etc.
- Endemic, endangered and threatened species and their geographical distribution as per Forest and Nature Conservation Act 1995 and IUCN red list.
- Location of any protected areas, biological corridors, conservation hotspots and other ecological sensitive areas in the project area.
- The carbon capturing potential of the forest land to be diverted or submerged.
- Conduct a critical habitat screening and assessment on terrestrial ecosystems in line with ADB/WB and relevant government regulations.

ii. Fauna and avifauna

- Inventory of terrestrial and avifauna wildlife
- Present status of wildlife as per Forest and Nature Conservation Act 1995 and IUCN Red list including their habitat condition (separately for aquatic habitat, terrestrial habitat and arboreal habitat).
- Status of Resident/Migratory/Passage migrants
- Species Diversity Index (Shannon-Wiener Index) of the Biodiversity and Importance Value Index (IVI) of the predominant species

iii. Aquatic ecology

The study/sampling should be carried out in following locations at appropriate locations such as in the reservoir, upstream and downstream of the Dams during four seasons (dry, pre-monsoon, monsoon and post-monsoon). The study should comprise the following but not limited to:

- Inventory of existing aquatic fauna like micro-invertebrates, zooplankton, benthos, aquatic mammals, herptiles, phytoplankton and aquatic plant survey.
- Study the fish population and fish diversity in the influence area of the project and assess migratory fish population, if any.
- The above assessment should be done in each habitat type (i.e. pool, riffle/rapid, or run type) both below and above the dam including at least one downstream of tailrace and any major perennial tributaries.
- Identification of spawning habitats in concerned river and its tributaries, and migratory pattern.
- Specifically include biodiversity surveys targeted for any critically endangered, endangered or vulnerable aquatic species as identified by the IUCN or the Bhutan Schedule I, II and III.
- Assess the fluvial geomorphology of the river downstream of the powerhouse to understand the risk of geomorphic impacts from the proposed Project peaking operations (riverbed and bank erosions)

- Conduct a critical habitat screening and assessment on aquatic and riparian ecosystem in line with ADB/WB requirements and relevant government regulations, including no net loss and/or net gain, where applicable/relevant

5.10.6 Physical Resources

i. Protected Area

- Biotic pressure.
- Management plan for protected area (if any) and list of threatened/endangered flora and fauna including their habitat and associations as per FNCA 2023 and IUCN red list.

ii. Water resources

- Collect and examine the water samples from different sampling stations including upstream and downstream of the dams, downstream of the power house and other major components. The sample should also be collected from the any water source (for potable water source for the project) and proposed wastewater discharge points.
- For the proposed potable water sources, a full suite of drinking water standards of Bhutan Drinking Water Quality Standard 2016 should be tested.
- Surface water quality (covering physio-chemical and biological parameters) during the dry, pre-monsoon, monsoon, and post-monsoon periods in line with the Environmental Standards 2020 and nationally stipulated methods.
- For ground water quality testing, pump test should be done to determine the quality of groundwater level and determine the potential impacts to the groundwater
- Study and provide information on current water use in keeping with the principles of the National Integrated Water Resources Management Plan, 2016.

iii. Air and Noise environment

- Baseline information on ambient air quality in the project area in line with the Environmental Standards, 2020.
- Baseline information on noise environment in line with the Environmental Standards, 2020.
- The collection of air quality samples should be collected over a period of 24 hours near the proposed dam and powerhouse sites, quarry sites, muck disposal sites, off-sites access routes as well as the nearby villages during at least the dry and wet seasons.
- For conventional controlled blasting, the charge density, amount of delay and schematic plan etc, needs to be provided.
- The noise monitoring should be conducted at least at the proposed dam and powerhouse work areas, quarry sites, muck disposal sites, construction work camp locations, and off-site access routes as well as the nearby village taking measurements of one-hour LAeq over a 48-hour period.

5.10.7 Socio-Economic Information

- ✓ Land details (agricultural, forest or other land types required for the project).
- ✓ Total land requirement, category of land (Government, Private, Forest, Others) getting affected due to the project.
- ✓ Demographic details of the population in the vicinity.
- ✓ Information on gender and vulnerable groups.
- ✓ Ethnographic profile.
- ✓ Presence of Indigenous peoples
- ✓ Education and literacy
- ✓ Land ownership

- ✓ Economic structure (household income and expenditures, employment and livelihoods).
- ✓ Development profile.
- ✓ Agriculture practices including cropping and horticulture pattern and practices in the study area and their dietary habits and food sources
- ✓ Existing public infrastructure (permanent, semi-permanent, temporary structures) and social services available to the affected population including education, road, health, water and sanitation, communication, network facilities, etc.
- ✓ Use of water: Identify all direct and indirect use of water (drinking, washing/bathing, agricultural and other purposes) in the study stretch through consultation with local communities and relevant agencies.
- ✓ Study on the structural integrity of the existing private and public structures.
- ✓ Information on common diseases in consultation with health establishments.
- ✓ Traffic density in the project area.
- ✓ Community Health and Wellbeing including access to community facilities (e.g., health facilities) and communication (e.g., phone, internet access) and identify key organizations (e.g., non-governmental organizations, civil society groups) active in the area
- ✓ Transport and access
- ✓ Waste Management Facilities (solid and hazardous waste)
- ✓ River and Other Water Source Use (e.g. navigation, fishing, bathing, washing, and drinking).

5.10.8 Cultural Environment

- ✓ Provide inventory of Cultural heritage (both tangible and intangible) that may be affected directly or indirectly by the proposed project including from its ancillary facilities in consultation with the Department of Culture and Local government.
- ✓ Locate important religious structures or sites within the vicinity of project area, if any.
- ✓ Carry out cultural Heritage Impact Assessment

5.10.9 Minimum E-flow assessment

- ✓ The assessment of minimum E-flow should be undertaken in line with the *“Guideline to Determine Minimum Environmental Flow 1Regulations for Dewatered Reaches of Hydropower Projects in Bhutan, 2019”*.
- ✓ Determination of approach and methodology to be applied for E-flow assessment can be undertaken as per the Decision-Making Tree under the E-flow guideline.
- ✓ Site selection for dewatered reach for E-flow assessment, reach affected by hydro-peaking and flow-regime alteration.

5.10.10 Ecosystem Services

Consultant should conduct ecosystem services survey focusing on following points:

- ✓ Focus on provisioning services (food, fuel, timber benefits, and specifically quantifying seasonal fish catch and the number of households depending on these provisioning services) and cultural services (spiritual, recreational and aesthetic benefits).
- ✓ Document the extent of communities’ use of these services, the extent of community reliance services to these, whether there is any seasonality to their use of these services, and evaluate potential alternatives for the use or replacement of these services.

1 **Note:** There will be no dewatered stretch for Gongri HPP as the Powerhouse will be located at the toe of the Dam similar to Kurichbu Hydropower Plant. The environmental flow assessment may be applicable only for Jeri PSP (Consultant to study).

5.11 Social Aspects

Consultant should conduct social baseline survey:

- ✓ Household surveys to generally characterize the socioeconomics and demographics of the AoI (survey of any physically or economically displaced households, whether permanently or temporarily displaced and of other households within the AoI downstream potentially affected by the peaking power operation.)
- ✓ Focus group discussions (FGD) with key groups such as women, fisherfolks, and other river-based livelihoods, farmers, users of ecosystem services (e.g., non-timber forest products), and other vulnerable groups; and
- ✓ Key Informant Interviews (KII) with local officials, health workers, national park managers, and other key informants identified by the Consultant.

5.12 Public Consultation

Public consultation needs to be carried out as per Article 16 of the Environment Assessment (EA) Act 2000, and Section 41 of the Regulation for Environmental Clearance of Projects (RECOP) 2016. The proponent must explain the expected impacts (both positive and negative) of the proposed project to the public and stakeholder agencies, listen to the concerns raised, provide clarifications and maintain record as follows:

- Description of issues raised and resolved during the consultation. List out pending issues and the proponent's views on the pending issues and how it will be addressed by the project.
- Provide evidence of public meeting and participation duly authenticated by the Local Government and Dzongkhag.
- Provide records of public consultation signed by the member(s) of the concerned local authority present during the public consultation.

5.13 Assessment of Environmental Impacts

Assessment of potential environmental impacts should consider both negative and positive impacts of the construction and operation of hydropower and its allied activities and alternatives. The ESIA Report shall assess (in quantitative terms, to the maximum extent practicable) the direct and indirect potential environmental impacts from all aspects of the construction and operation of hydropower including short-term as well as long-term impacts for all the phases of the project (e.g., acquisition, development, operation and decommissioning) and cumulative impacts of the project.

Predictions of impacts should be accompanied by commonly used quantitative and qualitative methods and models available, but not limited to, in the *'Environmental Assessment Guideline for Hydropower Projects, 2012'*.

The ESIA Report should contain a list of both adverse and beneficial impacts anticipated as consequences of the proposed Project activities at different stages of project cycle and the following ancillary activities but not limited to:

- Submerged areas.
- Dewatered area and regime change.
- Permanent colony, labour camps, and offices, stores and other temporary structures.
- Proposed roads.
- Batching and mixing plants.
- Construction material extraction (quarry).
- Stacking Yards, workshop and job facilities.
- Muck disposal sites.
- Pre-construction power.
- All other ancillary facilities.

The impacts to be predicted and quantified, as far as possible in context of their magnitudes, location and duration. Matrices, networks, checklists and questionnaires used in the process of identifying impacts should be appended in the annexes. Any environmental quality standards or socio-economic measures applied in the assessment should be stated.

The impacts should be grouped into following categories.

5.13.1 Land Environment

- ✓ Changes in land use/land cover and drainage pattern.
- ✓ Changes in land quality including effects of waste disposal.
- ✓ Riverbank and their stability.
- ✓ Impact due to submergence and diversion of the river course.
- ✓ Impact of workforce on the local resources.
- ✓ Impact due to induced infrastructure development (if applicable).

5.13.2 Biological Environment

- ✓ Impact on forests, flora, fauna including wildlife, migratory avi-fauna, rare threatened and endangered species, medicinal plants, etc.
- ✓ Pressure on existing natural resources.
- ✓ Changes in aquatic ecosystems.
- ✓ Impact on breeding and nesting grounds of animals and fish, if any.
- ✓ Impact on fish migration and habitat degradation and/or loss due to decreased flow of water.
- ✓ Impact on animal distribution, migration routes (if any), habitat fragmentation and destruction.
 - ✓ Conduct a critical habitat screening and assessment on terrestrial and aquatic/riparian ecosystem in line with ADB/WB requirements and relevant government regulations, including no net loss and/or net gain, where applicable/relevant.

5.13.3 Water Environment

- ✓ Changes and pollution in surface and ground water quality due to construction activities and induced development.
- ✓ Changes in water quantity and quality from water abstraction.
- ✓ Impact due to reduced flow in the dewatered stretch.
- ✓ Changes in the hydraulic regime and downstream flow.
- ✓ Sedimentation of reservoir and sediment as result of project construction
- ✓ Impact on the ground water flow and recharge due to tunneling works and impact on surface water bodies, etc.
- ✓ Impact of pollution load i.e., sewage disposal, sanitation, etc.
- ✓ Impact of muck disposal on water bodies.
- ✓ Hydrology has to be described pre- and post-project for the affected sections of the river. The baseline flows and post-project flows should be presented clearly showing changes in river flow from the effect of the project. This discussion should clearly indicate the flow data and estimation methods applied, and describe the catchment size and land cover; seasonality of river flows; and elevation, grade and accessibility (for river use) of the river sections where flow is reduced.

5.13.4 Air and Noise Environment

- ✓ Changes in ambient and ground level concentrations due to total emissions from point and nonpoint (fugitive) sources.
- ✓ Impact of emission from Diesel Generator (DG) set used for construction power on the environment, if any
- ✓ Changes in ambient levels due to noise generated from equipment, blasting operations and movement of vehicles.

- ✓ Impacts on health of human and wildlife due to changes in air and noise quality.
- ✓ Vibration from heavy truck traffic and use of explosives, including potential for property damage – the effects must be quantified and compared to GIIP standards/guidelines with an explosive’s management plan in the ESMP.

5.13.5 Socio-economic Impacts

- ✓ Impact of land acquisition including a list of all affected families including names of family members, age, educational qualification, source of income, land holdings, house/land to be acquired and house/land left after acquisition, details of any other property in possession and getting affected, animal possession, type of house, etc., number of houses, huts and other infrastructure that will be lost as a result of construction of various project components. Detailed scope is explained under Section 4. 2, Component II: Resettlement Plan below.
- ✓ Impact on local economy including demographic changes.
- ✓ Impact due to immigration of labour population.
- ✓ Impact on human health, hygiene and communicable disease risks.
- ✓ Impact due to increase in traffic.
- ✓ Impact and risks on gender and vulnerable groups.
- ✓ Impact on cultural heritage (both tangible and intangible) such as archaeological, paleontological, historical, religious, pilgrims’ properties, sacred sites, and traditions and customs among others. Any cultural heritage present in the project area and study area should be verified by the Department of Culture, MoHCA and Local Government. Further, views of DoC, MoHCA and relevant agencies must be sought.
- ✓ Physical and economic displacement: to be quantified especially those reliant on the river.
- ✓ Impact on Indigenous Peoples
- ✓ Impact on Gender, including sexual exploitation, abuse, and harassment
- ✓ Impact on Cultural Heritage (including physical cultural resources)

5.13.6 Minimum E-flow Impacts

- ✓ Impacts of different E-flow scenarios on conservation, energy generation, socio-economic and cultural aspects, and hydrological regime as per Section 3.9.9.

5.13.7 Climate Change Impacts

Detailed description of climate change study (using appropriate methodology) should be provided. A hydrological assessment of its watershed and the likely hydrological and allied risks associated under different climate change scenarios should be presented. And the change in project design, and implementation and management plan as per projections and scenarios under changing climate should also be included. The assessment should encompass the following:

- ✓ Impacts of temperature and precipitation due to changing climate.
- ✓ Impacts of climate change in the hydrological regime.
- ✓ Impacts of climate change during the operational life of the project.
- ✓ Vulnerability of a hydropower project to climate change, considering its geographic, regulatory, technical and socio-environmental characteristics.
- ✓ Identification and assessment of climate risks.
- ✓ The risks and opportunities for the hydropower projects.
- ✓ Hydrological and other associated risks.
- ✓ Assessment of likely Greenhouse Gas (GHG) emission (using GHG Reservoir (G-res) Tool) from the project (Reservoirs) and its implication on Carbon Neutral Policy of the country.

5.14 Mitigation Measures and Environmental Management Plan (EMP)

A description and assessment of site specific physical, biological, and management measures designed to limit negative environmental impacts or to enhance positive environmental impacts during development and operation of the project should be provided. The ESIA Report shall specify in detail, the measures to be taken by the proponent to avoid, minimize and mitigate potential adverse environmental impacts. Provide implementation schedule for the mitigation measures. The ESIA Report shall also discuss alternatives to the proposed mitigation measures considered by the proponent, noting the relative benefits and costs of these alternative mitigation measures.

The EMP should discuss the mitigation measures against each impact, the timeline for completion, the responsible departments for implementation, the budget for the EMP, post monitoring provisions and reporting to the concerned regulatory authority. The EMP should essentially include but not be limited to the following:

- Catchment Area Treatment (CAT) Plan within Bhutan: Delineation of micro-watersheds in the river catchment and mapping of critically degraded areas requiring various biological and engineering treatment measures. Identify area for treatment based upon GIS methodology and Silt Yield Index (SYI) method (of AISLUS) coupled with ground survey. The prioritization of watersheds for treatment based upon SYI. Spatial Information in each micro-watershed should be earmarked on maps in the scale of 1:50,000. The CAT plan would be prepared with year-wise physical and financial details.
- Integrated management of the watersheds and catchment areas.
- Compensatory Afforestation Plan in consultation with DoFPS.
- Dam Break Analysis and Disaster Management Plan.
- Biodiversity Conservation & Wildlife Management Plan for conservation and preservation of endemic, rare and endangered species of flora and fauna, if present.
- Species Rescue Plan, if applicable
- Greenbelt Development Plan around the project area and reservoir periphery in consultation with DoFPS.
- Fisheries Conservation and Management Plan in consultation with the Department of Livestock (DoL).
- Air Quality and Noise Management Plan
- Labor Management Plan.
- Alternative fuel supply to workers.
- Soil Conservation.
- Plan for Land Restoration and Landscaping.
- Waste Water Management Plan including installation of Sewerage Treatment Plant.
- Surface and groundwater management plan.
- Reservoir Rim treatment Plan.
- Reservoir sediment management plan.
- Sanitation and Solid Waste Management Plan for domestic waste from colonies and labour camps, etc. taking into account three R's (Reduce, Reuse and Recycle) principle of waste management in line with the Waste Prevention and Management Act 2009 and its Regulation, 2012 (Amendment 2016). Explore the need for establishment and operation of sanitary landfill, if required.
- Public Health Delivery Plan/Human Health Management Plan including the provisions for drinking water facility for local community.
- Energy conservation measures.
- Environmental safeguard during construction (OHS).
- Decommissioning Plan of temporary structures.
- Blasting Operation.
- Crusher and Batching Plant Operation.
- Quarry restoration plan (in line with the approved Final Mine Feasibility Study Report).
- Muck Disposal Plan: The volume of spoil/muck discussed in the ESIA should be the volume of spoil after it has been dumped and compacted at disposal sites, as opposed to the excavation

volume otherwise the volume required in disposal sites will be substantially underestimated. Include the following aspects:

- ✓ Quantification of muck.
 - ✓ Identification of locations and activities wherein muck is generated.
 - ✓ Suitable sites for dumping of muck to be identified in consultation with DGPC and relevant stakeholders. All muck disposal sites should be at a safe distance from the river or any other water body.
 - ✓ Land cover and legal status of each proposed disposal site.
 - ✓ Consider soil bulking factor while estimating the total volume of muck to be disposed of. The percentage increase in volume is taken to be 30% - 40%.
 - ✓ General management measures to be implemented, i.e. topsoil stripping and stockpiling; final landform slopes, construction of suitable retaining structures and drainage; layer-wise compaction of loose muck; plantation of suitable tree species.
 - ✓ Final land use of each filled landform.
- Resettlement and rehabilitation plan including Local Area Development Plan in consultation with the PAPs, Project Authorities and the local government.
 - Cultural heritage (both tangible and intangible) management plan in consultation with Dzongkhag Administration and Department of Culture & Dzongkha Development.
 - Develop mitigation and management plan for different E-flow scenarios on conservation, energy generation, socio-economic and cultural aspects, and hydrological regime.
 - Adaptation and mitigation measures to enhance climate change resilience or climate risk Management Plan.
 - Measures to mitigate cumulative impacts resulting from combined effects of planned and existing projects.

5.15 Environmental Monitoring Programme

This section of the ToR must outline how the monitoring plan of project construction and operation will be elaborated. The Report should clearly specify the nature of the monitoring required, stipulating who should undertake these activities, the cost and any other necessary inputs. The time schedule for monitoring should also be specified. Provide a comprehensive plan covering the environmental and social variables to be monitored, and provide the location and timing of sampling and measurement of the variables. Include baseline, compliance and impact monitoring and indicators to be measured for each of them. Name the institutions responsible for monitoring the different variables and show how the management plan is expected to influence the operation of the project.

In order to ensure implementation of the EMP during project implementation and execution stage, the project management should spell out detailed plan to conduct environmental monitoring as follows but not limited to:

- Mechanism to self-monitoring for compliance with environmental regulations.
- Monitoring of quality of water, air, noise, vibration and occupational health status of project personnel and surrounding habitations and vulnerable population.
- Description of the administrative aspects and planned monitoring program to evaluate the effectiveness of various/specific aspects of technological/mitigation measures.
- Environmental audit of various activities including budgeting and financial management with reference to environmental management.
- Hydro geological monitoring for the entire life of the project.
- Analysis of data, its interpretation and evaluation of any additional studies to be carried out if required.
- Closure/Decommissioning Plan for the project activities along with the fund requirement for implementation of the activities.
- Monitoring of maintenance of minimum E-flow.
- In case of hydropeaking; monitoring of flow fluctuations & upramping/downramping periods in relevant time steps (e.g. 10 minutes).
- Access to tributaries, especially if they are spawning areas, must be monitored (it could be that measures need to be taken after every flood season to restore access).

- Monitoring, evaluation and reporting of climate change impacts and risks.
- Cost and budget outlay for all the plans: Cost for implementing all the EMP including the cost for implementing Environmental Monitoring Programme, aforesaid compensation, mitigation and management measures (Clearly outline a summary of cost estimate for implementing all the EMPs including the cost for implementation of environmental monitoring programme and operation of Environment Management Cell).

5.16 Additional Studies

This section contains a description of other major studies that may be undertaken in support of the preparation of the ESIA. If formal studies on environmental valuation and environmental risk assessment have been undertaken as part of the ESIA, these need to be included.

5.17 Environmental Valuation

Environmental Valuation provides means of assessing the benefits of environmental conservation and its contribution to the national economy. Based on such study, the benefits of the proposed Project and environmental conservation can be compared and decisions could be made accordingly. Therefore, this part of the study should assess the economic value of the conservation and protection of the environment in the proposed Project area and comparison of benefits with the proposed Project should be presented.

5.18 Environmental Risk Assessment

An environmental risk assessment may be a necessary part of the ESIA if there is considerable uncertainty about the likelihood or the magnitude of environmental impacts. The data collected during the basic ESIA studies provides much of the information needed for explicitly dealing with the uncertainties relating to environment impacts. There are two major categories of risk: 1) those to human health, and 2) those to ecosystem integrity. The primary goal of environmental risk assessment is to evaluate risks, their monetary costs, the costs of emergency response and/or avoidance of risk.

Environmental risk assessment studies require a high degree of scientific and mathematical rigor and may be costly if not properly planned.

6. Social Impact Assessment (SIA)

In the earlier ESIA, socio-economic study was carried out during the time of DPR preparation. In the current study, in order to assess the latest potential socio-economic impacts of the project and prepare mitigation measures for adverse social impacts, the following studies shall be carried out as a part of the current consultancy:

- **Component 1:** Conduct a SIA of the proposed Gongri HPP & Jeri PSP; and
- **Component 2:** Prepare a Resettlement Plan (RP) in accordance with internationally accepted standards and guidelines (ADB or World Bank standards/guidelines will be acceptable).

6.1 Component I- Social Impact Assessment

6.1.1 Purpose and Objective

The overall purpose of the SIA is to assess, analyze, monitor and manage the social impacts of the proposed project.

The objective of the SIA is to produce an independent and robust Social Impact Assessment Report that will satisfy best practice and applicable national and international requirements.

The SIA process should be built on the following three elements:

- A detailed assessment of the socio-economic conditions of the people who may be negatively/positively affected;
- A detailed study of the impacts in terms of the extent of land acquisition, crop and tree loss, displacement, livelihoods and employment impacts, aesthetic impacts, cultural impacts (both tangible and non-tangible), community impacts, demographic impacts, development impacts, economic impacts, gender impacts, health impacts, impacts on vulnerable groups and indigenous peoples, infrastructural impacts, institutional impacts, leisure and tourism impacts, political impacts (good governance, human rights,

democratization etc.), poverty impacts, psychological impacts, resource impacts (access and ownership of resources), and impacts on social and human capital;

- A detailed plan to mitigate the identified impacts and an assessment of the costs of such measures. It is essential to generate key indicators based on the SIA in order to facilitate monitoring. Most essential of all is that the impact assessments should be transparent, participatory, and verifiable.

6.1.2 Scope of work

The previous ESIA has identified all affected people and communities that would be affected by the project. However, the current study should re-assess, update and re-identify all the affected people because of the combined scheme and change in project locations. It should define operationally relevant social issues that may affect project design, delivery, and outcomes, and provide mitigation measures for each adverse impact.

- **Tasks:**
 - ✓ Identify stakeholders and people who are directly affected (positively or negatively) and carry out a stakeholders' analysis.
 - ✓ Mobilize and train enumerators. Lead and provide overall guidance and supervision to enumerators in data collection. Ensure data quality control. Check and review the outputs submitted by enumerators to ensure accuracy, completeness and consistency of responses, conduct validation checks of a sample of accomplished questionnaires to ensure data reliability and consistency. Data analysis and reporting.
 - ✓ Provide specific recommendations to avoid/minimize social risks.
 - ✓ Inform, consult, and carry out dialogue with stakeholders on matters regarding project design alternatives, implementation of social mitigation measures, and provide specific recommendations on project areas with high social impacts, including identification of areas, such as presence of significant common property or indigenous communities that may require adjustments in project design or special assistance to mitigate the adverse impacts on them;
 - ✓ Facilitate and coordinate the participation of stakeholders in meaningful consultations and discussions.
 - ✓ Document and analyze the local historical setting of the project area so as to be able to interpret responses to the proposed project, and to assess cumulative impacts.
 - ✓ Collect baseline data (social profiling) to allow evaluation and audit of the impact assessment process and the planned project itself.
 - ✓ Describe the relevant human environment/area of influence and baseline conditions of the people living in the proposed project area.
 - ✓ Provide a rich picture of the local cultural context, and develop an understanding of local community values, particularly how they relate to the planned project.
 - ✓ Conduct a socioeconomic survey of the affected population and provide a socioeconomic profile of the affected population and available infrastructure facilities or services in the project influence area to identify potential positive/negative impacts on poverty reduction and adverse impacts of the project on affected communities.
 - ✓ Identify and describe the activities which are likely to cause impacts (scoping) and identify the full range of probable social impacts that will be addressed.
 - ✓ Predict (or analyze) likely impacts and how different stakeholders are likely to respond.
 - ✓ Assist in the evaluation and selection of site alternatives.
 - ✓ Recommend mitigation measures for each adverse impact induced by the project.
 - ✓ Participate in the valuation process and provide suggestions about compensation (non-financial as well as financial).
 - ✓ Describe potential conflicts between stakeholders and advise on resolution processes.
 - ✓ Determine magnitude of adverse social impacts and identify social safeguard instruments as required based on national laws, policies, and regulations.
 - ✓ Develop coping strategies for dealing with residual or non-mitigatable impacts.
 - ✓ Advise on appropriate institutional and coordination arrangements for all parties.
 - ✓ Develop a mitigation plan.

- ✓ Develop monitoring and evaluation plan/mechanism to assess social development outcomes during the implementation of the project and after its completion.
- **Methods and Tools**
 - ✓ Conduct a detailed socioeconomic survey of the households and villages affected by the project.
 - ✓ For socioeconomic, cultural, and institutional analysis, combine multiple tools and employ a variety of methods for collecting and analyzing data, including both quantitative and qualitative methods (expert and key informant interviews, focus group discussions, beneficiary assessments, rapid and participatory rural appraisal [RRA/PRA], and gender analysis).
 - ✓ Develop interview schedules, field survey questionnaires, and checklist for data collection and discussions.
 - ✓ Screen and prioritize social issues through different techniques, such as mapping and ranking.
 - ✓ For determining the magnitude of impact and analysis of alternatives, indicate all information on structures, utilities and abutting land use that is likely to be affected within the project impact zone.
 - ✓ The selection of SIA methodology should emphasize consultation and participation of project affected persons (PAPs), project implementing and executing agencies at the national, Dzongkhag and Gewog levels. The discussions with relevant government officials and local organizations should be participatory and broad-based, leading to the identification, selection, and agreement on project.
 - ✓ Qualitative analysis should be undertaken in order to comprehend the intricacies of the causal chain and to inform and supplement the quantitative analysis. Methods could include PRA techniques, key informant interviews, most significant change approaches etc. The mix of qualitative and quantitative methods should be designed in order to maximize the usefulness of both types of data in the analysis, and to resolve shortcomings in either type of material.

6.2 Component II- Resettlement Plan

The proposed Gongri HPP & Jeri PSP will require private land to be acquired for construction of project infrastructure such as; access roads, power house, dams, surge shaft, offices and residential colonies, etc. Land acquisition from submergence area is expected to be substantial. Such land acquisition may induce involuntary resettlement, disturb indigenous communities/ethnic minorities, and impact on cultural properties of significance. Therefore, a detailed resettlement plan will have to be prepared.

Cadastral Data required for Resettlement Planning shall be collected by the Consultant.

6.2.1 Purpose and Objective

The overall purpose is to improve the living standards, physical security, and productive capacity and income levels of all the people affected or, at the very least, to restore them to former levels or pre-project levels within a reasonable period of time.

The objective of the study is to prepare a Resettlement Plan in accordance with internationally acceptable standards and guidelines which sets out strategies to mitigate adverse effects induced by the project. The RP, among others, will establish the parameters for the entitlements package for affected people (APs), the institutional framework, mechanisms for consultation and grievance resolution, the time frame, and cost estimates.

6.2.2 Scope of Work

The study will cover all affected persons and formulate strategies in order to assist in determining project impacts on the social, economic, cultural, and livelihood activities of affected persons and communities, and provide mitigation measures in the form of fair compensation for losses suffered by APs.

- **Tasks**
 - ✓ Record any measures taken to reduce land acquisition and resettlement impacts through changes in the design of the project.

- ✓ Mobilize and train enumerators. Lead and provide overall guidance and supervision to enumerators in data collection. Ensure data quality control. Check and review the outputs submitted by enumerators to ensure accuracy, completeness and consistency of responses, conduct validation checks of a sample of accomplished questionnaires to ensure data reliability and consistency. Data analysis and reporting.
 - ✓ Conduct participatory rapid appraisal (PRA) in the project area. Identify key stakeholders and conduct meaningful consultations with them about the project and resettlement effects.
 - ✓ Identify any vulnerable groups who might require special assistance and consult with them.
 - ✓ Conduct a census of all the people potentially affected, to determine the scope and magnitude of likely resettlement effects, and to record likely losses. Suggest a cut-off date for entitlements.
 - ✓ Conduct a socioeconomic survey of a sample of 30 percent of the people affected. Establish a baseline of incomes and expenditures, occupational and livelihood patterns, use of resources, use of common property (water sources, irrigation channels, tsamdros, sokshings, etc.), social organization, leadership patterns, local community organizations, and cultural parameters.
 - ✓ Consult with the agencies (central as well as dzongkhag-level) responsible for land acquisition, land replacement, valuation of assets, and compensation rates.
 - ✓ Review laws, regulations and directives of the RGOB that apply to land acquisition, resettlement, and compensation. In this review consider the method for valuing assets, the timing and method of paying compensation, the legal and administrative procedures applicable, land titling, and registration procedures.
 - ✓ Prepare an entitlement matrix listing all likely effects of permanent as well as temporary land acquisition. Establish criteria for the eligibility of resettlement assistance and benefits of affected households. Prepare standards for compensation and restoration of the social and economic base of the people affected to replace all types of losses.
 - ✓ If APs are displaced and need to be relocated, prepare options for relocation and for income restoration which build upon the existing social, economic and cultural parameters both of the people affected and of any host populations. Provide for relocation costs, lost income, and income support during transition.
 - ✓ Prepare a framework for participation of APs. All APs should be meaningfully consulted when designing entitlements and the implementation of land acquisition and resettlement. Prepare special measures for consultation with any vulnerable groups. Specify mechanisms for the resolution of grievances and an appeals procedure.
 - ✓ Prepare an institutional framework that designates responsibilities to provide compensation, undertake relocation work, take responsibility for income restoration, supervise, manage, and monitor the implementation of land acquisition, land replacement and resettlement activities.
 - ✓ Prepare a monitoring and evaluation plan, identifying the responsibilities, time frame, and key indicators. Specify the time frame for monitoring and reporting.
 - ✓ Prepare a time-bound implementation schedule for land acquisition and resettlement in conjunction with the agreed implementation schedule for project components, showing how APs will be compensated before actual acquisition of the affected land, or before demolition of any affected structures.
 - ✓ Prepare an indicative budget. Prepare indicative land acquisition and resettlement costs. Prepare budgetary allocation and timing. Specify sources of funding and approval process. Prepare an annual budget estimate for resettlement by major category of expenditures.
- **Methods and Tools**
 - ✓ Conduct census, socioeconomic survey, and inventory of assets survey with the help of appropriately designed questionnaires and instruments.
 - ✓ Participate in, and validate, the detailed measurement survey of all private land to be acquired by the project in collaboration with the dzongkhag land records officials to ascertain the precise amount, and type, of private land to be acquired and replaced.

- ✓ Conduct focus group discussions (FGDs) to discuss adjustment in designs.
- ✓ Conduct consultations and discussions with APs, dzongkhag and gewog officials, and the DGPC to finalize the implementation mechanism and to promote informed decision making.
- ✓ Develop database for Project Affected Households to enable monitoring.

6.3 Stakeholder Engagement Plan

The Consultant will prepare a Stakeholder Engagement Plan (SEP), which will describe how the Project will engage with Project Affected Persons (PAPs) and other stakeholders throughout the duration of the project and establish the framework for a tiered grievance mechanism. The objectives of the SEP are:

- ✓ To identify the stakeholders and establish a systematic approach to stakeholder engagement that will help the borrower build and maintain a constructive relationship with each potentially Project affected community in the AoI and other stakeholders with an interest in the project.
- ✓ To provide means for effective and inclusive engagement with Project-affected parties and other interested parties throughout the project life cycle on issues that could potentially affect them. This should include specific efforts to include vulnerable groups and women through separate Focus Group Discussions or other means.
- ✓ To assess the level of stakeholder interest and support for the project.
- ✓ To enable stakeholders' views to be taken into account in the project design and to improve the environmental and social sustainability of the Project.
- ✓ To ensure that appropriate Project information on environmental and social impacts and risks is disclosed to stakeholders in a timely, understandable, meaningful, accessible, and appropriate manner and format, and
- ✓ To provide PAP with accessible and inclusive means to raise issues and grievances, and allow the borrower to respond to and manage such grievances.

This SEP shall identify the key stakeholders, and describe the strategy, frequency, focus, and responsible party for the engagement with each stakeholder or stakeholder group. For the duration of the ESIA process, the responsible party for most engagements will be the Consultant. The SEP should also describe the grievance mechanism and include the grievance mechanism as an appendix, and the relationship of the SEP with the resettlement process.

Deliverables – draft and final SEP, with a proposed grievance mechanism as an appendix.

6.4 Labour Management Procedure

Continuing from and based on the identification of different project workers and risk analysis carried out under the ESIA, the consultant will develop a Labor Management Procedure (LMP) that will set out the way in which project workers will be managed, in accordance with the requirements of national law and international requirements (such as WB's ESS2). Key elements of the LMP should include:

- ✓ Description of the types of project workers to be employed under the project.
- ✓ Description of the anticipated risks, including Occupational Health and Safety, and its analysis.
- ✓ Review of the relevant national laws, regulations and policies related to labor management, including child labor, forced labor, etc.
- ✓ Laying out the policies and principles to be followed under the project, including terms and conditions of employment.
- ✓ A general code of conduct for project workers and gender-based violence management plan to minimize/mitigate such risks.
- ✓ Implementation arrangements, including delineation of responsibilities among PMU, contractors, sub-contractors, as well as management procedures and staffing plan.
- ✓ Contractor management.
- ✓ A grievance redress mechanism, to be established specifically for project workers.

At the same time, the project will also need to come up with actions to manage issues related to the other influx of in-migrants, including workers' family members, and the "camp-followers" who come in for business opportunities. This is probably beyond the contractors' obligation and would need close

involvement of local administrations and the project office in their planning and implementation.

6.5 Gender & Vulnerability Assessment

The Consultant shall develop gender and vulnerability action plan by carrying an analysis on gender and vulnerability in the project area as part of the ESIA, including risks of gender-based-violence, to inform gender action planning and interventions related to vulnerable groups.

One particular risk is related to gender-based-violence (GBV)/Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH) particularly with the estimated influx of population. This risk needs to be assessed and required mitigation measures need to be planned. All the above should be documented in the ESIA. Based on this analysis, the consultant will develop an action plan on gender and for vulnerable population, including specific actions against GBV. This plan could be included in the EMP.

7. Greenhouse Gas Emissions

The management may present emission savings from the generation of renewable energy as this is one of the major project benefits. Accordingly, the volume of CO₂ emissions that will be avoided per annum by the generation of renewable energy from the Project as opposed to the volume of CO₂ that would be emitted by the generation of an equivalent amount of power from the current mix of generation supplying the National Grid should be estimated.

8. Appendices

The following should be included in appendices:

- Maps related to the study.
- Aerial photographs if possible.
- Sample questionnaires, checklists, matrices, charts and photographs.
- Information on the hydrology, meteorology and geology of the project area.
- Information on vegetation, forest and fauna of the project area.
- Location and brief description of sensitive sites.
- Information on water quality, noise intensity and air quality of the project area.
- Audio-visual records of the area if any.
- Information pertaining to agriculture, livestock, soil and use of fertilizers in the area.
- Information on socio-economic and cultural impacts.
- Name and addresses of personnel and the institution(s) involved in the ESIA study.
- List of invited and consulted people in the project affected area, their opinions, records of public involvement (e.g., meeting, workshop, consultation).
- Persons and institutions contacted outside of the project affected area in the process of ESIA study, with their addresses and telephone numbers.

9. References

Should provide a list of references cited in the text of the main report.

10. Outputs and Deliverables

The final expected outcome of the Environmental and Social Impact Assessment Report should include, but is not limited to:

- Incorporation of earlier available studies into the current findings and impact assessments;
- Findings of the Environmental & Social Impact Assessment;
- Findings of analysis and consultations;
- Outline of social safeguard instruments as required;
- Recommendation for adjustments in designs during feasibility and detailed design stage;
- Environment Management Plan (EMP);
- Resettlement Plan (RP), with appropriate action plans and entitlement matrix to provide different types of assistance to all categories of affected people. The plan should include a detailed itemized

budget and other resources required to implement the RP.

The report should be presented in the following formats:

- i. ESIA Report (Part A) for Standalone Gongri HPP. This report shall have separate EMP & RP Reports.
- ii. ESIA Report (Part B) for Integrated Gongri HPP and Jeri PSP.

11. Environmental Clearance of the Project

Environmental Clearance of the Project shall be pursued by DGPC. However, the Consultant shall update and incorporate into the report if there are comments from the stakeholders including Department of Environment & Climate Change (DECC). The Consultant should have adequately consulted DECC and other relevant stakeholders for comments and recommendations before finalizing the report.

12. Conclusions and Recommendations

Based on the findings of the ESIA study, conclusions should be drawn and recommendations should be made regarding project implementation.

13. Checklist for No Objection Certificate

In order to obtain an Environmental Clearance for the project, NOCs must be obtained from all relevant parties. A checklist of agencies from whom NOCs may be required should be presented.

14. Support from DGPC

DGPC will provide the Consultant with support in the form of:

- Providing necessary documentation such as background information, relevant data, engineering design reports, laboratory tests where applicable and other design documents related to the Project.
- Facilitating coordination between the ESIA Consultant and other ongoing consultancies such as technical consultants, including during site visits and meetings.
- Assisting the consultant in arrangements for meetings and field visits including obtaining permission and authorization necessary for the implementation of the consultancy.

15. Responsibilities of the Consultant

The Consultant shall be responsible for and budget costs for all facilities required for this consultancy including travel and accommodation for the duration of the consultancy.

16. Timetable and Deliverables

Total duration of consultancy services is 15 (fifteen) months. The Consultant shall deliver the required reports according to the following timeline, which reflects roughly estimated working time required and will be discussed and finalized during contract negotiations with the selected firm. The documents shall be the property of DGPC.

SN	Report	Timeline (from contract signing)
1	Inception Report	30 days
2	Interim Report (Following data collection & field surveys)	6 months
3	Draft Report	13 months
4	Final Report	15 months
5	Incorporation of comments from stakeholders and RGoB agencies.	Within 2 months from the submission of Final Report.

17.

18. Expertise Required and Qualifications

A consulting firm shall be hired for this assignment. The team composition of the ESIA consultancy is expected by the Client to comprise 7 (seven) key individual experts, and additional areas of expertise, required to fulfil the requirements of this consultancy services.

18.1 Key experts of the ESIA consultancy

The ESIA consultancy will include the following key experts:



- i. **Environment Specialist (Team Leader, International)** shall be in charge of coordinating the ESIA, EMP and RP and other plans integrating the inputs of each specialist, putting together the ESIA, and managing the consultation processes. He/She should have a graduate degree in environmental sciences, environmental or civil engineering, or a related field and at least 15 (fifteen) years' experience, including extensive international experience (outside the country of nationality of the expert), in leading and/or conducting an ESIA.
- ii. **Social Development Specialist (Co-Team Leader, International)** shall be in charge of the social aspects of this consultancy, including consultations for and social impact. He/she will organize, advise and coordinate the social team for their respective assignments and will be responsible for the quality and timely delivery of various required social outputs. The social specialist should have broad operational experiences, including extensive international experience (outside the country of nationality of the expert), in social development aspects such as gender and GBV/SEA/SH, solid knowledge and application experiences applying safeguard policies, particularly involuntary resettlement and indigenous people. This specialist is expected to have experiences in leading teams. A graduate degree in social sciences such as anthropology, sociology, economics, development or other related fields and a minimum of 15 (fifteen) years of relevant professional experiences is required.
- iii. **Environment Specialist (National expert and country focal point)** to work with the environmental specialist (Team leader, international) to design and conduct fieldwork for ESIA and other plans, putting together the ESIA, and conduct the consultation processes. As the national focal point, he/she is also expected to work closely with the Environmental Specialist (Team Leader) and Social Development Specialist (Co-Team Leader) to coordinate environmental and social aspects of the project. He/She should have a graduate degree in environmental sciences, environmental or civil engineering, or a related field and a minimum of 10 (ten) years of experience in conducting an ESIA.
- iv. **Environmental Flow Specialist (International)** – The specialist should have a graduate degree in civil engineering, hydrology/ecohydrology, environmental sciences or a related field and minimum of 10 (ten) years of experience in aquatic ecology, water quality and environmental flow assessments in hydropower projects. He/she should have a deep understanding in environmental decision processes, and utilizing multi-criteria approaches to holistic (environmental and social) decision making in hydropower projects, including ecohydraulic modelling and impact assessment of flow regimes on aquatic ecosystems. He/She should also have deep understanding of and experience in applying international standards on environmental and social standards. He should be able to determine the E-flow based on the Guideline to Determine Minimum Environmental Flow - Regulations for Dewatered Reaches of Hydropower Projects in Bhutan, 2019 using appropriate tool, software and equipment.
- v. **Aquatic and Riparian Biodiversity Specialist (International)**– The Specialist should have a graduate degree in aquatic biology, freshwater ecology, environmental studies or a related field and a minimum of 10 (ten) years' experience in conducting aquatic and riparian ecosystems assessments in hydropower projects. He/She should also have deep understanding of macroinvertebrates and experience in applying international standards.
- vi. **Terrestrial Biodiversity Specialist (International)** – The Specialist should have a graduate degree in terrestrial biology, zoology, ecology, wildlife management or a related field and a minimum of 10 (ten) years' experience in conducting terrestrial biodiversity impact assessments including in hydropower projects. He/She should also have an understanding of and experience in applying international standards on natural and critical habitat assessments (for instance World Bank ESS6 and/or IFC PS6 and those of ADB's).
- vii. **GIS Specialist** – The specialist should have a graduate degree in geography, cartography or a related field such as engineering or environmental science and added specialized coursework in GIS, cartography and surveying with a minimum of 10 (ten) years' experience in designing digital maps using geospatial data and in analyzing spatial and non-spatial information. Alternatively, he/she can have a diploma with specialized course in GIS, cartography or related fields with 15 (fifteen) years of experience.

In addition to the above key experts, the Consultant shall have data analyst, surveyors, technicians, enumerators and data entry assistants to assist the above experts in sampling, identification and to carry out other field/office works. They should have a general knowledge of the project area, fieldwork activities and

be able to communicate in relevant local languages.

19. Attachment of DGPC Officials in this work

DGPC shall be assigning appropriate officials with the Consultants for execution of this work. The Consultant shall integrate the DGPC official (s) and involve in all phases of works.

