Bhutan For Life

Environmental and Social Management Plan for Department of Energy (2023)

For installation of 30kW Solar PV Plant in Shangsa under JDNP

Contents

1. Introduction

a) Project Background

Lunana Gewog lies in the extreme northwest of the country with a total area of 1,716.26sq.km and is located at an altitude of 3,400m above sea level (m.a.s.l). The gewog consists of five (5) chiwogs and thirteen (13) villages with the population of 810 as per Population and Census Record 2015 with 185 households besides the institutional establishment such as school, administration, BHU and RNR sector.

It experiences climate conditions ranging from temperate to alpine with extremely cold winters, and short summers. During winter, Lunana communities experience heavy snowfall which keeps them snow bound as the mountain passes become inaccessible to the neighboring gewogs and dzongkhags. Due to severe climate conditions with long winters, it does not allow the diversification of agriculture production. However, dry land cropping like wheat, buckwheat, and horticulture production (potato, radish, turnip, etc.) is carried out on a small scale. People of this Gewog entirely depend on cordyceps (*yartsagunbup*) and livestock productions, which are bartered with neighboring gewogs and dzongkhags. The other essential services such as telecommunication facilities & its coverage is 68.72% and 100% electrification through solar home lighting.

Figure 1: Showing overall Lunana community

Bhutan has tremendous natural energy resources, including hydropower, solar, wind, vast forest cover, mineral resources. Most of the electricity supply in the country is met from the hydropower resources except few remotest locations supplied by off-grid solar PV plants. Bhutan has achieved almost 99.9% electrification. Rural communities such as villages in Lunana Gewog, Gasa District still do not have access to the grid due to being one of the remotest and does not have access to motor roads except for *Ramina* village.

The Department initially explored the options of electricity grid extension to Lunana Gewog, which was found technically challenging and cost intensive for construction of around 97 km transmission lines (TL) from the nearest tapping point due to Right-of-Way (RoW) constraint as the line is passing through the private registered land and protected area (JDNP). The construction of TL entails huge requirements of the RoW corridor, which will have detrimental impact on the flora, fauna and the landscape of the park.

Shangsa village is one of the remotest villages under Lunana Gewog which is located at an elevation ranging from 3,400 masl. The nearest road point is *Tonshina* under Laya Gewog and it takes almost 8-9days walking distance. This village consists of ten (10) households with health and education facilities located at *Lhedi* village with a walking distance of 30 minutes. This village still lacks access to clean and reliable electricity, and people are highly dependent on fuelwood for energy sources especially for cooking and heating. The high dependency and firewood extraction on the existing limited forests and non-forests for their subsistence livelihood leads to forest degradation. Furthermore, emissions from the biomass smoke are harmful to human health especially for older adults, women and children since they are the ones who mostly stay at home. As per the findings of the DPR-Mini Hydropower Plant with installed capacity of 500kW conducted in 2019, each household consumes about 2.9 tons of firewood annually which translates to 502 tons in total considering households across these villages.

In order to minimize the issues related to land acquisitions, social and environmental impacts, a 30kW solar PV plant is found to be a feasible and viable option to provide clean and reliable electricity supply to the community. During the construction phase, the locals will be engaged in the construction of the project and after the construction the community will be trained in basic operation and maintenance of a solar PV system.

c) Scope of ESMP

The scope of this study is to predict, assess, evaluate and manage the environmental and social impacts that are likely to be caused by the solar PV Plant that is going to be commissioned in *Shangsa* village, Lunana Gewog, Gasa. The study will also develop specific mitigation actions which might arise due to construction of solar PV plant in line with applicable national policies, guidelines, legislation and regulations to minimize impacts.

During the execution of the project activities, the public consultations with community, relevant stakeholders, impacts and benefits of the project will be informed and their concerns will be fully addressed and also assess risk associated with project activities to community, environment and social.

d) Purpose of ESMP

The purpose of the ESMP is to ensure and safeguard the community during the preparation and construction of project activities. The adverse social and environmental impacts will be identified and implemented in line with the relevant policies, guidelines, regulation frameworks of the Royal Government of Bhutan (RGoB).

The other purpose of the ESMP is to establish occupational health and safety standards on construction safety applicable to the employees at the construction site as per the Contract Agreement.

During the implementation of the project activities, the Contractor will provide training on operation and maintenance procedures at site to DoE project team and at least one (1) person from each household.

e) Applicable law, policies, and regulation

The existing relevant acts, policies, guidelines and regulation frameworks shall be governing during the implementation of the project activities to assess the environmental assessment impacts as follows:

Acts and policy of Bhutan

i. Land Act 2007
ii. Electricity Act 2001
iii. Environment Assessment Act 2000
iv. Water Act 2011
v. Forest and Nature Conservation Act 1995
vi. Waste Prevention and Management Act 2009
vii. Local Government Act 2009
viii. Biodiversity Act 2003
ix. Labour and Employment Act 2007
x. The Local Government Act 2009 and Amendment Act 2014
xi. Alternative Renewable Energy Policy 2013

Relevant Rules and Regulations

i. Regulation on the Environmental Clearance of Projects 2001
ii. Forest and nature Conservation (Amendment) Rules and regulations, 2020
iii. Rules on Biological Corridors 2016
iv. Land Rules and Regulations
v. Rules and Regulations on Occupational Health and Safety (OHS) 2006
vi. Safety Regulation 2008

2. Environmental and Socio-Economic Conditions:

a) Geological and topographical conditions

i. Geological Setting

Bhutan Himalaya, like other parts, has also been divided into four parts based on geomorphology, geology and grade of metamorphism. Each domain is separated from the other by a prominent thrust of regional dimension. These from south to north are:

· Sub Himalaya
· Lesser Himalaya
· Higher Himalaya
· Tethys Himalaya

The project area falls under the Greater Himalaya Sequence based on the geological map of Bhutan by *Sean Long, Nadine McQuarrie, Tobgay Tobgay, Djordje Grujic, and Lincoln Hollister (2011.* The Greater Himalayan Sequence is further The tectonostratigraphic superposition of the Greater Himalayan Sequence is shown below in **Table 1**:

***Table 1**: Tectonostratigraphic superposition of the Greater Himalayan Sequence*

Structurally Higher Greater Himalayan Sequence.	**Leucogranite (Miocene)**	Massive to foliated, syn-Himalayan leucogranite plutons. Leucogranite intrudes the structurally higher and structurally lower Greater Himalayan sections, as well as Tethyan Himalayan rocks near the STDl in the Lingshi region (Gansser, 1983).
	Undifferentiated (age uncertain)	Upper amphibolite-, granulite- (*Gansser, 1983; Swapp and Hollister, 1991; Davidson et al., 1997; Warren et al. 2011)*, and locally eclogite-facies *(Chakungal et al., 2010)* migmatitic orthogneiss and metasedimentary rocks, including schist, paragneiss, quartzite, and marble. At least 13 km thick (*Long et al., 2011B).*
	Metasedimentary rocks (age uncertain) –	Migmatitic schist and paragneiss, and lesser quartzite and marble, locally divided out, based primarily on the mapping of *Gansser (1983).*

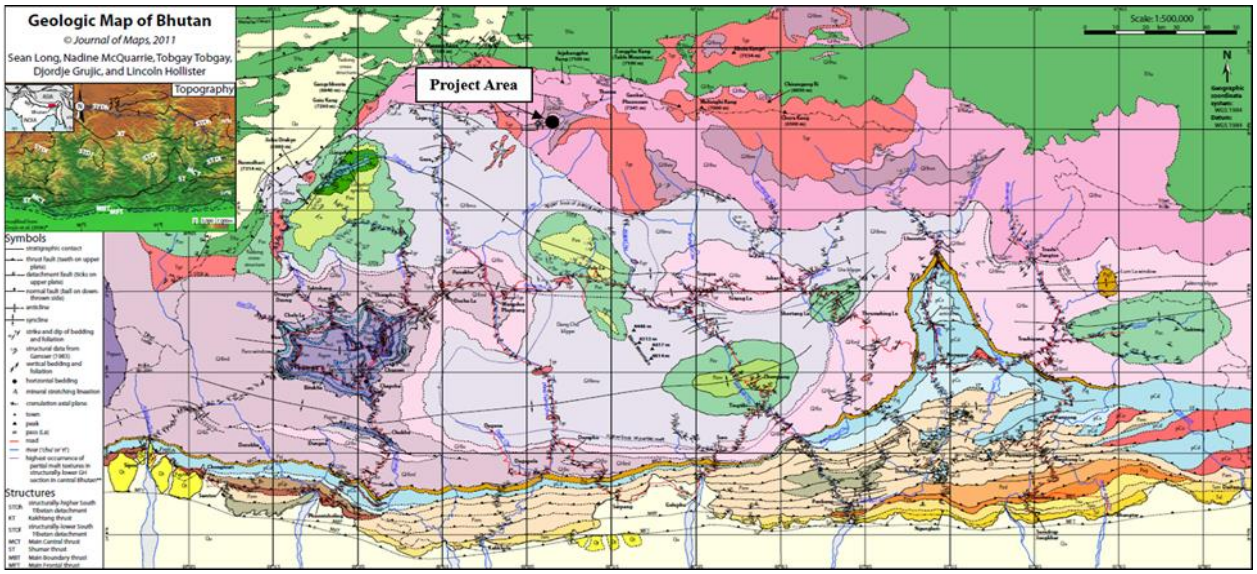

Figure 2: Regional geological map showing project location

The High Himalayan chain lies in the northernmost part and is disposed in the form of an arc from east to west. Himalayan peaks as high as El. 7,500 m are present in this chain. In higher reaches many large size glaciers and glacial lakes are also present and have been recorded from studies of satellite imageries, which sometimes pose dangers of floods by over spilling as has been reported in Sunkoshchhu and Bumthangchhu. The largest lake like Lunana lake has increased in size by 70% between 1984 and 1989 and stores an estimated 70.10 million m3 /s of water.

From the seismo-tectonic map of GSI, as the area falls near to the northern international border (Bhutan and China), no seismic activities have been reported in the project area, yet from the Global

Seismic Hazard Assessment Programme the area is observed to be falling between moderate to high hazard zone.

b) Topographical

Shangsa village under Lunana Gewog falls under the protected area, Jigme Dorji National Park (JDNP). Currently, *Shangsa* village is powered with solar power which caters to basic requirements such as lightning and charging mobile devices. This village has ten (10) households not connected to grid supply and road. The community has to depend on nearby villages for health and education facilities. The geographical location of the *Shangsa* village in Lunana Gewog in Fig. 3 and Number of households is shown below in Fig. 4.

Figure 3: Shangsa Village at Lunana Gewog

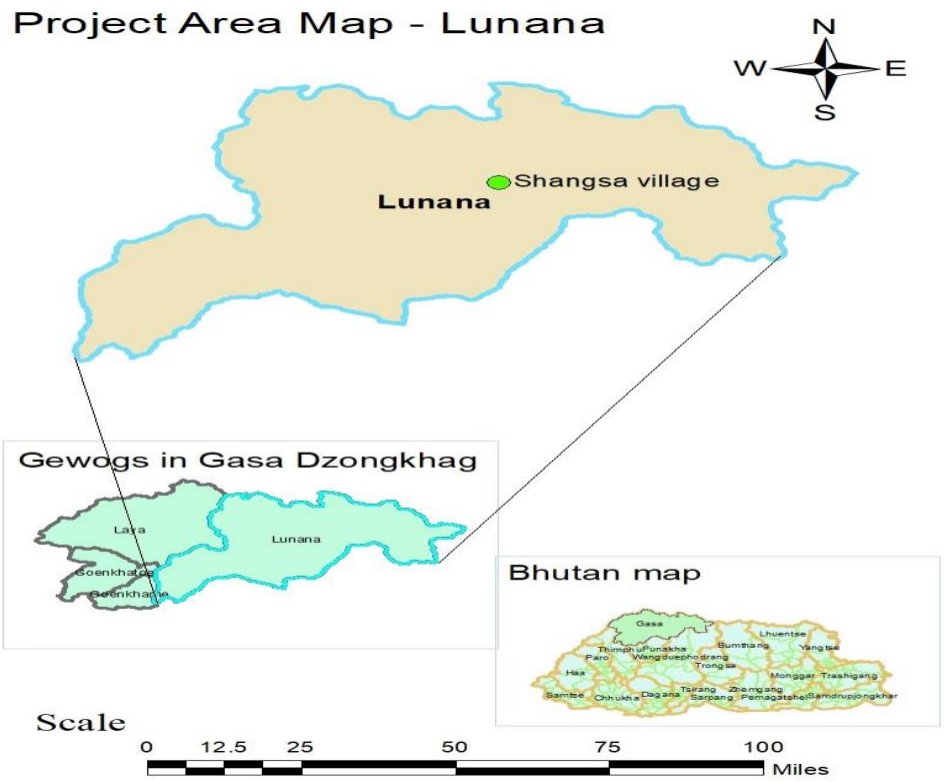

Figure 4: Showing number of households

Table 2: Geographical Coordinate and Altitude

Sl. No.	Parameters	Value
1	Beneficiary of the System/Location	*Shangsa* village, Lunana Gewog, Gasa Dzongkhag
2	Geographical Coordinate (google map)	Latitude: 28°01' 22" Longitude:90°04'40"
3	Altitude	>3,400 masl

c) Climate Conditions

It experiences climate conditions ranging from temperate to alpine with extremely cold winters, and short pleasant summers. During winter, Lunana communities experience heavy snowfall which keeps them snow bound as the mountain passes become inaccessible to the neighboring gewogs and dzongkhags. The ambient temperature of ±20°C, average annual rainfall is 62mm with relative humidity is 55-99% and average snow incidence and period is 240mm (October to April).

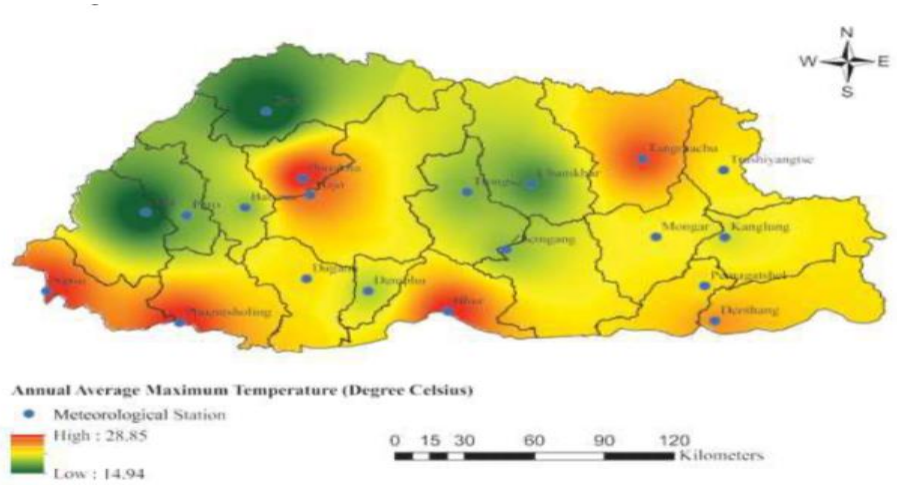

Figure 5: Spatial Distribution of annual average maximum temperature. (Source: NCHM)

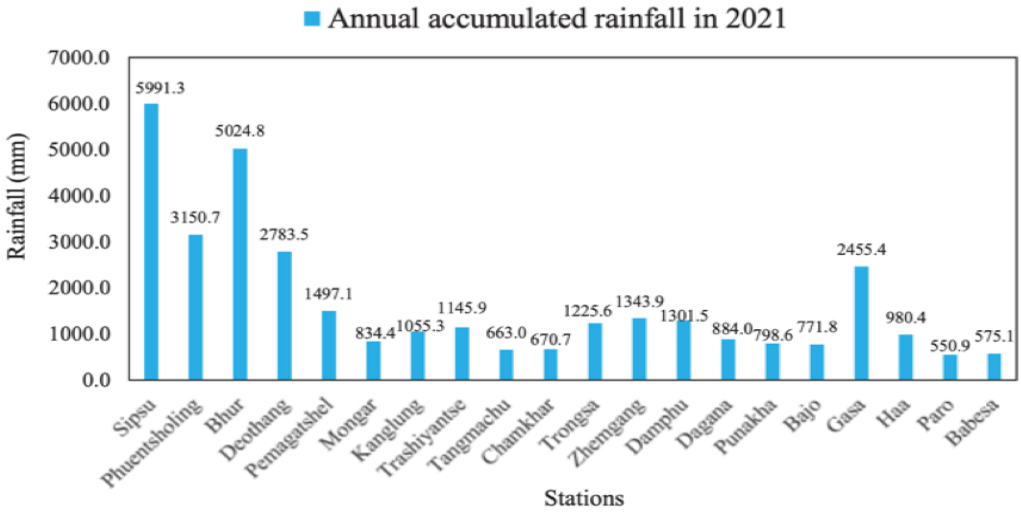

Figure 6:Annual Accumulated rainfall in 2021 (Source: NCHM)

Fig. 5, it shows that the Gasa stations have recorded lower annual average maximum temperature and minimum temperature in 2021.

The annual average rainfall (area average) was 1,685.20mm in 2021. The country as a whole received near normal to slightly below normal rainfall against the long-term average. The highest 24-hour rainfall was recorded at Sipsu with 283.8mm. Gasa experienced the highest number of rainy days with 233 days (rainy days is defined as rainfall greater than or equal to 1 mm) with annual accumulated rainfall is 2,455.4mm in 2021.

d) Hydrological conditions

The *Paluzamchhu*, sub tributary of *Phochhu,* located on the right side of the *Shangsa* village. The proposed project is located in sub-basins and smaller watersheds where the network of hydro-meteorological stations is not available. The location of the project is in an ungauged sub-basin making it difficult to carry out the hydro-meteorological studies.

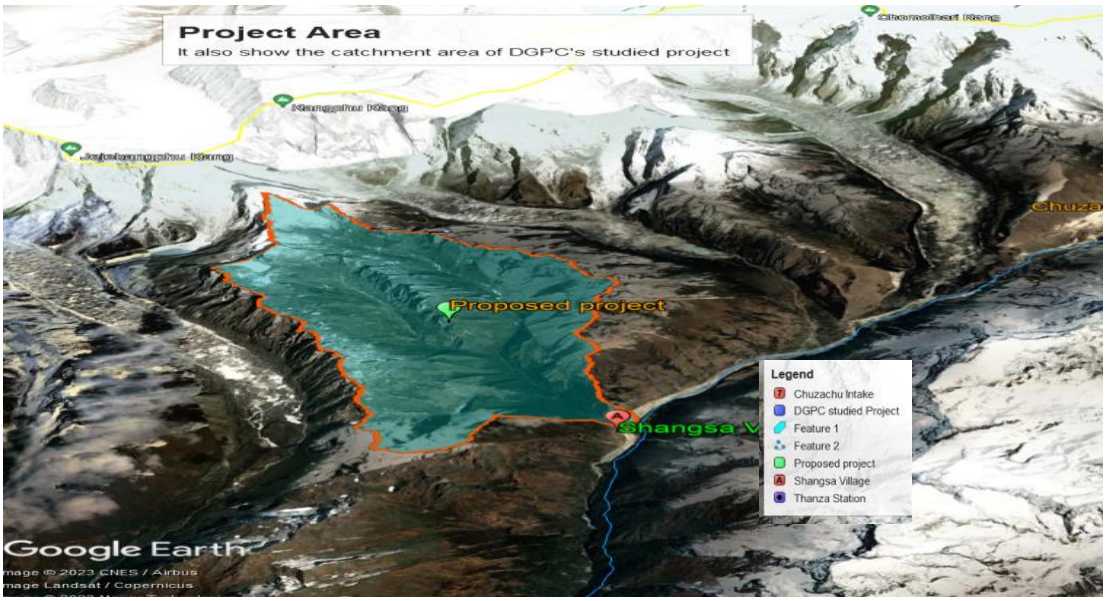

Figure 7: Image showing project area and Chuzachhu catchment

The monthly average flow for 9 years (2014 – 2022) at the *Paluzamchhu* intake (at *Shangsa* village) is derived based on the inflow data from *Samdingkha* station to see the consistency of inflow.

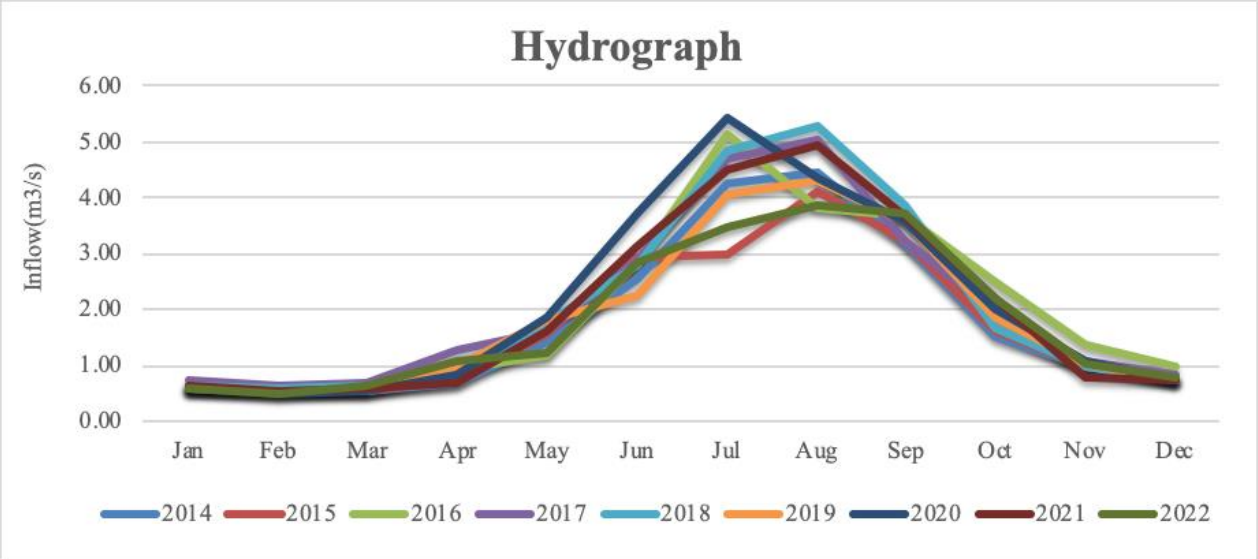

Figure 8: Hydrograph showing average flow at Shangsa

Since the inflow is consistent, considering data from 2014 to 2022, the average monthly inflow is derived by catchment area correlation and is further corrected by reducing 9% for each month.

e) Flora and Fauna

The project area is under Gasa Dzongkhag which has about 19.6% (Forest area 60,853.0 ha) with 7 number of community Forest of 556.08ha[1]. The project area lies within an altitude of about 3400masl, the vegetation cover is typically dominated with shrubs and alpine scrubs, thus the diversity of the flora and fauna in the project area is very less. However, the park has 1,434[2] species of vascular plants belonging to 144 families and 563 genera (9 genera and 13 species of gymnosperms and 554 genera and 1,421 spices of angiosperm. Between 2,000 to 3,500m, temperate cool broadleaved forests are seen such as oaks, some species of rhododendrons, etc. Some of the plants with medicinal and economic importance within locality areas such as *Pangpoey, Khengkar, Gaypaay , balu, Tsulu, phama Latsi* (all are used as *Sangzey*-incense).

[1] Statistical Yearbook of Bhutan 2022

[2] Bhutan For Life: Environmental and Social Management Plan for Jigme Dorji National Park January 2023- June 2024

Figure 9: Some of medicinal and economic plants (Source: DPR Lunana Mini hydropower Project, DGPC)

This Gewog passing through Jigme Dorji National Park (JDNP), which is the habitat for different species of birds and animals like takin, musk deer, blue sheep, snow leopard, red pandas, raven Himalayan black bear, tiger, etc., makes the grid extension a challenge for the future.

Figure 10: Species of animal (Yak)

During the implementation of the project activities, the list of flora and fauna in the JDNP will be verified in consultation with the Park Staff and local community during the field visits to *Shangsa* village.

f) Socio-economic conditions

Shnagsa village consists of ten (10) households with six (6) households clustered and four (4) households scattered within the village. The village is located at a walking distance of almost 30 minutes away from the nearest school and health facility located at *Lhedi* village which is located at an elevation of about 3,730 masl. Currently, the community is highly dependent on firewood for energy sources especially for cooking and heating, while solar home lighting systems are used for basic lighting and mobile charging purposes.

This project is expected to provide a green, safe and reliable energy source that will decrease the dependency on firewood and improve the health and livelihood of the community.

The electrification of the area will have major positive impacts on the area such as, reduction in deforestation, promotion of eco-tourism in the community that would generate additional income and employment. The community can also set up small scale industries and businesses. All of these will boost the community's socio-economic development while also easing the workload on women and children and help invest their time and energy in other productive activities. The improved quality of life in these communities will help the communities retain their ancestral land and make productive use of energy to support the economic development in Lunana. The community will have a reliable source of energy for cooking, heating and lighting. It will also reduce migration of the people and thus improve border security.

Once the community is electrified through solar PV plant, DoE will encourage the community to procure and make use of energy efficiency appliances such as infrared cookers, *Yoe gi thab* (electric

stove), infrared space heaters, etc. Furthermore, no additional costs to community for procurement of new utensils for cooking as the infrared/*Yoe gi thab* cookers are more versatile than induction cooker. For heating, low power consumption and energy efficient heaters can play a crucial role in reducing wood fuel consumptions. All these appliances are available in the local market and the local community can afford it and the procurement of such appliances are not covered under the current scope of the project.

Figure 11: Source of energy for cooking and heating

3. Planned Activities in Year-2023

Shangsa village is one of the remotest villages under Lunana Gewog. The nearest road point is *Tongshina* under Laya Gewog and it takes almost 8-9 days walking distance. The Department of energy shall carry out the activities in the Shangsa village is as follows:

i. Site Survey and investigation, designing of the system
ii. Public consultation meeting for project clearances
iii. Preparation of tender documents and evaluation
iv. Award of work to the contractor
v. Monitoring and evaluation
vi. Testing, installation and commissioning
vii. Public consultation meetings with community including training for operation and maintenance of the systems
viii. Handing over the system to the community

Activity 3.1: Construction of 30kW solar PV plants

Budget: Nu. 9.6 million (approved in FY 2023-24) and required additional budget to complete the project.

Location: Shangsa Village, Lunana Gewog, Gasa

Activity Description

As part of this activity, 30kW solar PV plant will be installed in Shangsa Village under Lunana Gewog which falls under JDNP. During the field assessment and feasibility study conducted in April 2023, there are ten (10) households who would be benefitted by the project. The design and cost estimate for the proposed 30 kW solar PV plant is estimated at Nu. 16.23million. However, actual cost for procurement and installation of a 30kW solar PV plant will be known only after completion of bid evaluation. Due to high and rugged mountainous terrain exceeding El. 3,400 masl, transportation of materials will be expensive therefore, the mode of transportation has to be animals (horses and yaks) or helicopter services.

During the construction phase, there may be around 10 workers stationed at a temporary camp (tents)/rented house. In order to ensure hygiene within the workers, the contractor will be mandated to build proper toilet facilities for the workers which shall be located at least 30 meters away from the water course. The contractor has to explore and connect to new water sources for drinking to avoid stress to the existing water users in the village or seek consent of the villager to connect drinking water for around 10 workers.

Any issues arising due to project activities will be discussed with the Park Staff of JDNP, Local Government and community and resolved according to the existing protocols and system. During the execution of the project activities, the locally available materials will be used like stones/aggregates, timber, sand and other materials required for solar PV system and other materials like solar panels, batteries, inverters etc. shall be procured.

This project is expected to provide a green, safe and reliable energy source that will decrease the dependency on firewood and improve the health and livelihood of the community. The electrification of the area will have major positive impacts on the area such as, reduction of deforestation, promotion of eco-tourism in the community that would generate additional income and employment.

The community can also set up small scale industries and businesses. All of these will boost the community's socio-economic development while also easing the workload on women and children and help invest their time and energy in other essential activities. The improved quality of life in these communities will help the communities retain their ancestral land and make productive use of energy to support the economic development in Lunana. The community will have a reliable source of energy for cooking, heating and lighting. It will also reduce migration of the people and thus improve border security.

Figure 12: Solar PV plant at Lunana Extended Classroom (Yak in Classroom)

Activity 3.1.2.: Carry out internal Wiring for 10 households

Budget: Nu. 2.20million is proposed for this activity (new Activity)
Activity Description:

As part of this activity, internal wiring of the 10 households connected with solar PV plants (after completion of the activity 3.1) will be carried out. The budget for carrying out internal wiring has not been included in the earlier proposal (activity 3.1 above approved by BFL. The cost estimate for the internal wiring for 10 HHs was prepared in line with the Bhutan Schedule of Rates (BSR), which is Nu.2.20 million apart from the estimated cost of solar components at Nu 16.23 million, which is yet to be considered/approved by BFL. The budget for this activity will be incorporated in next AWBP for BFL which is in year 6.

After the installation of solar PV plant, the existing 10 workers will carry out the internal house wiring for the existing 10 households. This will enable the community to make use of the solar energy for cooking, lighting and heating.

Activity 3.2.: Assessment of potential Environmental Impact Assessment (EIA and ESMP) including Environmental Social Safeguard (ESS)

Budget: Nu. 1.20million is proposed for this activity (New Activity)

Activity Description:

The *Shangsa* village has 10 households with a population of 31 (male: 16 and Female: 15). The social and environmental impact assessment study is mandatory for any project and activity that may have adverse impact on the Environment. Thus, the Environmental Act of Bhutan defines the public consultation as mandatory to brief on the positives and negative impacts associated with the project implementation.

During the public consultation, different stakeholders such as local Leader (*Gup & Tshogpa*), park staff, DoE project team, and one member from each household will be engaged. The communication will be done in Local language (Dzongkha). The DoE Project team will interact with the various stakeholders and present project layout including the benefits of the project besides negative impacts. Some of the benefits are the improvements in health, livelihood and better quality of life, including less time spent fetching fuelwood and carrying heavy loads for women. The DoE will inform the stakeholder engagement plan and support required to implement the project activity within the specified completion date. The stakeholders' opinions and doubts will be clarified and documented accordingly. The list of people consulted along with signature/thumb impressions will be recorded.

In order to carry out this activity, the ESMP budget needs to be prepared since this budget is not reflected in the BFL's approved budget. Therefore, the Department proposed Nu. 1.20 million to meet the expenditures during the public consultations (2 times). The Initial public consultation shall be held in August 2023 by DoE in consultation with Lunana Gewog and Gasa Dzongkhag Administration. During the consultation, we will explain the benefits and impacts of the project besides the community ownership. The final public consultation will be at the end of the project period (May/June 2024) to assess the impact of the project.

There is no budget provision to conduct public consultation in the approved activity. Hence, DoE proposed an additional budget of Nu.1.20million to carry out 2 times public consultations at *Shangsa* village, Lunana Gewog.

The draft work schedule for the activity is attached in **Annex-I**.

4. Potential Social and Environmental Impacts

Some of the expected Social and Environmental Impacts expected from the activities are as follows:

a) Waste generated from construction phase

There will be waste generated from excavation of earth during the construction phase. However, the soil will not be contaminated from any fertilizers, pesticides or other chemical substances, as the digging does not use any of these items. Hence, there is no risk to the community and no major digging of earth.

b) Waste generated from labour camps at site.

Minimum solid waste is likely to be generated from labour camps/offices/residences at site with an estimate of 10 employees residing in the project site during the construction phase. Such waste will be segregated into biodegradable and non-biodegradable wastes. Biodegradable waste will be disposed of in pits that will be dug in the dump yard and covered with soil. Non-degradable waste will be disposed of at designated sites and waste water can be disposed of with a proper soak pit.

c) e-waste after useful life of battery and panels

After the useful life of the battery and panels, it turns out to be an e-waste for the system. Such waste issues can be addressed through proper waste management systems and safety disposal. Also with the advancement of the technologies, some of the battery and solar panels components can be recycled. Solar energy technologies have positive environmental impacts when compared to conventional energy, for instance, no emissions because it does not use chemicals.

d) Land Acquisition

Since solar electrification would require land for the installation of solar panels and distribution poles, DoE intends to visit the project site in August 2023 to conduct feasibility studies and public consultations.

There will be two kinds of land acquisition during the implementation of project, permanent and temporary requirements:

Permanent land requirement is for construction of solar PV plant and construction of distribution poles, which will fall either on private or state-owned land. The loss of land is mainly from the solar PV plant and pole footing of the distribution line.

Temporary land requirement for project site office, worker campsite and storage of materials and small equipment. The land taken for these purposes shall be handed over and impacts are transient in nature.

e) Occupational, Health and Safety

The occupational, health and safety aspects will be clearly specified in the bidding documents, where the selected contractor's responsibility is to provide PPE, first-aid facilities and emergency planning and response at the work site to coordinate with the project team.

For safety aspects, the solar PV plants will be completely fenced and cover the electrical joints safely in line with standards in place by the Electricity Regulatory Authority.

The DoE Project team will ensure all workers follow occupational, health and safety norms such as use of protective equipment and gears during working hours.

f) Noise and Air Pollutions During Construction

The construction and installation of solar PV plant does not involve use of heavy equipment and will not have any adverse impacts on the noise level in the vicinity. No vehicular movement as there is no access to *Shangsa* village. The noise pollution could be from the helicopter during the transportation materials to the site.

Figure 13: Transportation of materials by helicopter

The air quality will not be polluted since there is no major excavation of earth and dust from the construction activities of the project components.

g) Conflict between temporary workers and local community

Sexual harassment and domestic violence may arise between the local community and temporary workers during the construction phase. However, DoE will take proactive measures to prevent such conflicts from happening. In case any such issues do arise, they will be promptly addressed and handled according to the applicable legal procedures and if it is within the scope of existing BLF Grievance Redressal Mechanism (GRM), BFL GRM procedures will also be used. To ensure that the workers and communities are aware of the existing BFL GRM an awareness on the procedures and benefits of BFL GRM will be provided to them before the start of work. The Contractors will also be made aware on the occupational health and safety of the workers and GRM procedures,

5. Environmental and Social Impacts and Mitigation Measures

Potential impact	Impact scale	Proposed mitigation measures	Responsible party	Cost*
Activity: Installation of 30kW Solar PV Plant at Shangsa Village				
Waste: generation of waste as a result of construction and labour camps.	Short Term (Minor)	*Pre-Installation:* requirements for appropriate waste management will be included in the bidding documents, as a precondition for the contractor's selection *During construction and installation:* ● Identification of the different waste types at the project site (papers, plastics, food, etc.); ● Ensure that camps are located away from existing stream, river, or water sources, and that no discharge from camps is made into nearby water bodies; ● Dumping of waste on private land, or in other non-designated places shall be prohibited; ● Dumping waste shall be prohibited on fragile slopes, forests, religious or other culturally sensitive areas or areas where livelihood is derived; ● DoE Project Team will be stationed at the site to monitor the physical progress of the works as well as the safety and waste management in line with ToR of the contract.	DoE & Contractor	*To be part of Contract Agreement and cost shall be met from the activity cost*

		• No risk to the community and no major digging of earth during the construction phase.		
e-waste after useful life of battery and panels	Short term (Minor)	• Such e-waste issues can be addressed through proper waste management systems and safety disposal. Also with the advancement of the technologies, some of the battery components can be even recycled.	DoE, Local Community and local Government	
Noise disturbance and air quality: Possible noise disturbance as a result of outdoor equipment usage and installation works	Short term (Minor)	• Does not use any heavy equipment and machines, thus, no noise pollution to the local community. • The installation works will not be permitted during the nights, the operations on site shall be restricted to the hours 6am—7pm; • The air quality will not be polluted since there is no major excavation of earth and dust from the construction activities.	Contractor	*To be part of Contract Agreement and cost shall be met from the activity cost*
Water quality: contamination of local water sources may occur due to waste water and sewage from construction camps	Short term (Minor)	*Pre-Installation:* requirements for appropriate measures to prevent water contamination will be included in the bidding documents, as a precondition for the contractor's selection *During Construction and Installation:* • An environment-friendly toilet (e.g., pit toilet) and washing facilities shall be made available, built with locally available materials; • Throwing waste in water sources shall be prohibited; • Possible hazardous waste if any will be collected separately for the final and appropriate disposal;	DoE & Contractor	*To be part of Contract Agreement and cost shall be met from the activity cost*

		After installation ● Pit toilets will be dismantled and pits shall be covered properly ● All waste shall be removed from the project site		
Social impacts				
Disturbance of traditional ways of life: as a result of site selection and/or installation activities	Long term (Minor)	● Public consultations shall be held with the affected communities and local government before and during construction and installation to mitigate any adverse impacts on the community ● Avoid sites that are in close proximity to monasteries or other sacred sites ● Redesign installation plans as needed to avoid obstruction (e.g., to avoid view disturbance of a monastery)	DoE & Contractor	*To be part of Contract Agreement and cost shall be met from the activity cost*
Access to and usage of water sources during the construction phase	Short term (Minor)	Prepare a water management plan in consultation with the local community to ensure that community's access to water sources is not disturbed, and usage of water sources is fairly allocated between local communities and construction workers (e.g., by specifying water usage times for workers).	DoE & Contractor	*To be part of Contract Agreement and cost shall be met from the activity cost*
Workers' health and safety	Short term (Minor)	● Comply with the workers' health and safety guidelines ● Ensure regular health screening for the workers pre and during transportation and installation activities	DoE &	*To be part of Contract Agreement and cost*

		● First-aid boxes shall be made available at the work site for workers. First-aides' names shall be prominently displayed. ● The contractor shall display the emergency telephone/mobile numbers of key contact person, police, ambulance, etc. in case of emergency. ● Ensure that no underage workers, or children are engaged ● Ensure decent work conditions, including an appropriate salary, working hours, accommodation and food for workers ● Implement a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns	Contractor	*shall be met from the activity cost*
Local community's health and safety	Short term (Minor)	● Ensure the safety of all project-related equipment ● Minimize the use of hazardous materials, and ensure that community members are not exposed to them. In case that the use of such materials is necessary, provide sufficient notice to local community members and inform them on safety and protection measures. ● Avoid dumping any waste or otherwise contaminating community sources of water supply and water quality. ● Provide information to local communities on construction and installation activities and plans	DoE & Contractor	*To be part of Contract Agreement and cost shall be met from the activity cost*

Conflict between temporary workers and local communities	Short term (Minor)	● Workers shall be made aware of local culture and traditions, as well as the legal consequences of harassment and intimidation, especially with regards to sexual harassment and gender-based violence. ● Local communities shall be made aware of the engagement of temporary workers in project sites. ● Strict monitoring shall be carried out to ensure conflicts are minimized ● Local workers shall be encouraged to participate	DoE & Contractor	*To be part of Contract Agreement and cost shall be met from the activity cost*
Land Acquisition	Short term (Minor)	● Permanent land is required for installation of solar PV plant and pole footing of the distribution line. If it is unavoidable, private land will be acquired and compensation shall be provided as per existing Land Act.	DoE & Contractor	Not embedded in the activity. A separate budget is required for permanent land compensation. Which will be worked out later.

** Please specify the implementation costs of the requested mitigation measures and the source of funding (embedded into the activity or from BFL's separate ESS funds)*

6. ESMP Implementation Arrangements

The implementation of project activities will be carried out by the Department of Energy (DoE). The Project Manager, DoE and ESS Focal, BFL shall be responsible for compliance with all procedures outlined in this ESMP, as well as compliance with any requirements to obtain clearances, permits, approvals, or consent documents from relevant authorities and stakeholders.

This ESMP should be part of the contract where the Contractor is obligated to perform all proposed preventive or mitigation environmental and social measures in this plan and to keep the evidence of any documents related to applying these measures.

The Project Manager, DoE/ ESS Focal, BFL shall monitor the implementation of proposed measures by the Contractor and Contractor's subcontractors with visual checking, reviewing the records of evidence that the measures have been applied and ask the Contractor to apply the measures as soon as possible. Non-compliances should be recorded and the Report on any non-compliances should be reported to the ESS consultants immediately, and the ESS consultants will report it to the PCU (M&E Officer). Each non-compliance should be closed with appropriate measure/s and the evidence should be kept.

Disbursement of project funds to the DoE will be contingent upon their full compliance with the safeguard's requirements.

7. ESMP Monitoring Arrangements

The Project Manager, DoE/BFL focal person in DoE with assistance from officials from JDNP will closely monitor the implementation of all planned activities and the required mitigation measures, and ensure that they fully comply with this ESMP and with the terms and conditions included in the environment clearances issued by RGoB's national authorities.

DoE BLF focal and project manager is also fully responsible for the compliance of all external contractors and service providers working in the project site with the safeguard's requirements outlined in the ESMP.

The monitoring of activities under this ESMP will be carried out in the following manner:

SN	Activities	Monitoring team	Timeline		Location	Means of Verification
			Start	Complete		
1	Installation of 30kW Solar PV plant at	Field focal	July 2023	June 2024	Shangsa Village	Implementation Report (Quarterly Report and Annual

	Shangsa Community					Completion Report)
2	Public Consultation	ESS officer	July/ August 2023	April/May 2024	Shangsa Village	

Monitoring by implementing entities:

- o Field visits at least twice - during the intervention and within four months after the intervention July 2023 – June, 2024.
- o Reports by the implementing entities submitted to ESS focal within a week after each field visit

- Monitoring by ESS focal:
  - o Field visits by ESS officer - at least once during the intervention, together with the implementing party
  - o Reports by ESS focal to the PCU (M&E officer) - within one week after the field visit

- Bi-annual Reports by PCU (M&E officer) to Secretariat
  - o Annual Progress Report - January, 2024
  - o Semi-Annual Progress Report – 30 July 2023

8. Capacity Needs and Budget

Activities under this ESMP will be implemented by the DoE and work shall be executed by the contractor for supply, installation, testing and commissioning of the solar PV plants. The Contractor's manpower requirement will be an expert and technician for carrying out solar designing and installation of the solar PV system. The competency and expertise of the human resource shall be mentioned in the bidding document and will be strictly monitored.

The budget for each activity is as follows:

1. Procurement of materials : Nu. 16.23 million (approve budget Nu. 9.6m)
2. Transportation of materials : Nu. 3.50 million
3. House wiring (10HHs) : Nu. 2.20 million (not included – new activity)
4. Project Administration Cost : Nu. 1.00 million (not Included- new activity)
5. Public Consultation :Nu. 1.20 million (not included – new activity)

Total (Nu.) :Nu. 24.13 million

The draft work plan and budget utilization plan for the activity is attached in **Annexure-I** for reference. The above estimated budget proposal is for activities to be carried out from July 2023 to June 2024 and DoE has not considered the ESS mitigation budget, which will be proposed later once the DoE works out the actual land requirement for installation of solar PV plant and distribution lines.

9. Consultation and Disclosure Mechanisms

Community consultation will be carried out in/August 2023 and April/May 2024 respectively to inform the local community regarding the project activities, funding source, energy production and climate protection goals, improve public health, solicit their opinions, ownership for sustainability, employment during construction phase particularly transportation of materials. During the consultation, the local stakeholders will be informed about the project, their feedback will be sought and if there is any changes that need to be done after the consultation, it will be communicated to BFL PCU.

The Department will seek no objection letter from the local community for the installation of a solar PV system at *Shangsa Village*, which will be shared with PCU Office and PA management office along with attendees (gender and age) of public consultation in *Shangsa* village.
Detailed minutes of the meeting for the consultation with the gender disaggregated data (male/female) of the participant list along with the pictures will be attached to this ESMP.

10. Stakeholder Engagement Plan

The local community that resides in the vicinity of the planned activity will be engaged throughout the implementation of these activities. They will be engaged in following manner:

- Transportation of materials to the site (Contractor/DoE)
- Installation and testing of solar PV plant (DoE project team and Contractor)
- User training on operation and maintenance of essential solar plant components, etc. (DoE project team, Contractor and one member from each household)
- Local leaders (Lunana Gup and Shangsa Village Tshogpa) and JDNP staff at Lunana Gewog, contractor, DoE officials during public consultations
- Local leaders (Lunana Gup and Shangsa Village Tshogpa and JDNP staff shall be involved for statutory clearances
- Contractor shall carryout the procurement of Solar PV components.

Annexure. – I: Project Implementation and Budget Utilization Plan

Sl. No.	Particular/Activity	Q2 (FY 2022-23)			Q3 (FY 2023-24)			Q4 (FY 2023-24)			Q1 (FY 2023-24)			Q2 (FY 2024-25)		
		Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
1	Mobilization/supplementary budget	Budget approved on 6 April 2023														
2	Request for Budget release from MoF		Nu. 0.10m													
3	Preliminary Assessment of Project site															
4	Consultation with public and relevant stakeholders for the activity ESMP															
5	Engineering design and preparation of Bidding document for tendering															
6	Process Administrative approval to invite tender															
7	Award of Work to the Contractor and Release of 10% advance released															
8	Site Handing-Taking over to the Contractor															
9	Procurement of materials by the Contractor															

10	Transportation of solar PV material to site															
11	Physical inspection and validation with the specification and data sheet provided by the manufacturers at site.															
12	Installation, testing and commissioning of solar PV panels, Inverters, battery bank, etc.															
13	Carry out electrical internal wirings and supervision of the works															
14	Training of local community people on operation and maintenance of solar PV plants and its associated equipment															
15	Compliance monitoring and evaluation															
16	Commissioning & handing taking of the system to the community/DoE															
17	Release of final payment															

Work Completed

Planned activities

unfavorable climate condition