

# NEPAL ELECTRICITY AUTHORITY

## ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN OF GRID TIED SOLAR POWER PROJECT, BLOCK NO. 3, NUWAKOT (3.5MW)



**Prepared and Submitted by:**

**Environment and Social Studies Department**

Kharipati, Bhaktapur

Phone No.: 01-6611580, Fax: 01-6611590

Email: [neaessd@wlink.com.np](mailto:neaessd@wlink.com.np)

**March, 2018**



A handwritten signature in black ink, appearing to be 'R. Bhandari', is written over the logo.

## ABBREVIATIONS AND ACRONYMS

BS	:	Bikram Sambat (Nepali Era)
CSR	:	Corporate Social Responsibility
DADO	:	District Agriculture Development Office
DCC	:	District Coordination Committee
DFO	:	District Forest Office
DoED	:	Department of Electricity Development
ESMF	:	Environment and Social Management Framework
ESMP	:	Environment and Social Management Plan
EPR	:	Environment Protection Rules, 1997
ESSD	:	Environment and Social Studies Department
GoN	:	Government of Nepal
GSEEP	:	Grid Tied and Solar Energy Efficiency Project
GRC	:	Grievance Redress Cell
GRM	:	Grievance Redress Mechanism
HHs	:	Households
IEE	:	Initial Environmental Examination
MoEn	:	Ministry of Energy
MoEST	:	Ministry of Environment, Science and Technology
NEA	:	Nepal Electricity Authority
PAS	:	Project Affected Settlement
PH	:	Power house
PV	:	Photovoltaic
PMO	:	Project Management Office
WB	:	World Bank

### Units

ha	:	Hectare
km	:	Kilometer
kV	:	Kilo Volt
m <sup>2</sup>	:	Square meter
MW	:	Megawatt

# Table of Contents

<b>ABBREVIATIONS AND ACRONYMS .....</b>	<b>1</b>
<b>1 INTRODUCTION.....</b>	<b>3</b>
1.1 Background .....	3
1.2 Project Description .....	3
1.3 Construction Planning .....	6
1.3.1 Preliminary Works .....	6
1.3.2 Land .....	6
1.3.3 Requirement of Workforce .....	6
1.3.4 Materials.....	6
1.3.5 Construction Method .....	7
1.4 Objectives, rationale and Methodologies for Preparing ESMP .....	7
<b>2 EXISTING ENVIRONMENTAL AND SOCIAL SETTINGS .....</b>	<b>2-1</b>
2.1 Physical Environment.....	2-1
2.1.1 Topography .....	2-1
2.1.2 Landuse .....	2-1
2.1.3 Air Quality.....	2-1
2.1.4 Noise Quality.....	2-1
2.1.5 Water sources and Drainage Patterns .....	2-1
2.1.6 Soil Erosion and Land Stability .....	2-2
2.2 Biological Environment.....	2-2
2.2.1 Vegetation and Forest Resources .....	2-2
2.2.2 Ethno botany/ Plant Resources Use Pattern .....	2-2
2.2.3 Wildlife (Mammals and Birds) .....	2-2
2.2.4 Rare and Protected Species of Flora and Fauna .....	2-3
2.3 Socio-economic and Cultural Environment.....	2-3
<b>3 ASSESSMENT OF IMPACTS AND MITIGATION MEASURES .....</b>	<b>3-1</b>
3.1 Land Use and Land Take.....	3-1
3.2 Air Quality.....	3-1
3.3 Noise Quality.....	3-1
3.4 Waste Management.....	3-2
3.5 Light reflection .....	3-2
3.6 Impact on Standing Trees and vegetation .....	3-3
3.7 Impacts on safety .....	3-4
3.8 Health and Safety.....	3-4
3.9 Loss of Structure .....	3-5
3.10 Labor influx and Labor camp .....	3-5
3.11 Corporate Social Responsibility .....	3-6
3.12 Environment Mitigation Plan .....	3-6
<b>4 MONITORING AND REPORTING MECHANISM .....</b>	<b>4-1</b>
4.1.1 Environmental Monitoring Plan .....	4-1
4.1.2 Environment Mitigation and Monitoring Cost .....	4-4
4.2 Grievance Redress Mechanism (GRM) .....	4-4
4.3 Implementation of Mitigation/Enhancement Measures and Monitoring Activity .....	4-5

# 1 INTRODUCTION

## 1.1 Background

Nepal with the installed capacity of 900MW power generation connected to the national grid vis a vis a much higher level of peak demand which stood at 1559.7MW in 2016/17 suffers from serious power shortage every year (source: Annual Report, NEA). In response to the constantly growing power shortage, the Government has emphasized on the development of other potential resources particularly of Renewable Energies such as biomass, biogas, solar and wind along with hydropower for the production of electricity and meet the growing energy demand of the country in short term as well as long-term basis. To solve the present energy crisis, and enhance the energy network system of the country, Government of Nepal (GoN) has allocated budget under the title of "Renewable Energy and Capacity Expansion Project" under the soft loan of the World Bank (WB) and co-financing of the GoN in the fiscal year 2071/72. So, Nepal Electricity Authority (NEA), government owned institution has initiated the exploration of sites for the solar power development under project **Grid Tied Solar Power Project (GTSP)**. According to survey license obtained from Department of Electricity (DoED), project is entitled as **Grid Tied Solar Power Project, Block No 3, Nuwakot.** It will be under **Grid solar and energy Efficiency Project (GSEEP)**. This is one of the major projects to produce electricity through solar energy (renewable energy) and thus strengthen and meet growing electricity demand of Nepal. The project produces clean and pollution free energy and thus is environment friendly.

## 1.2 Project Description

The project site Block No 3; Workshop area and Area behind Trishuli Powerhouse (PH), is selected for installation of PV solar farmhouse with a capacity of 3.5MW. The project site is located at Trishuli Colony area of Bidur Municipality-8 of Nuwakot district. The name of the settlement around the project area is Hattigauda settlement. A total of 5.31ha land will be required for the project, which is already owned by NEA for the construction of Trishuli Hydro power project in FY 2022/23 (1965 AD). The project site has sub-tropical climate, influenced by monsoon rains (June-September) and has summer months from March to May. The site has easy access to road. Some buildings (workshop sheds and storage buildings) are present in the proposed area (workshop area). The buildings are old and are not in use for a long time thus in a state to demolish. There are trees in the proposed project site – the trees are planted by the NEA. The major tree species found in the project area are Sisau (*Dalbergia sisoo*) and Aanp (*Magnifera indica*). The project will have to take permission from District forest office (DFO), Nuwakot to cut these trees for site clearance and this will be done after the approval of Initial Environment Examination (IEE) report from the Ministry of Energy (MoEn) through Department of Electricity Development (DoED). There is no any monuments of historical nature or that of religious importance within the site.

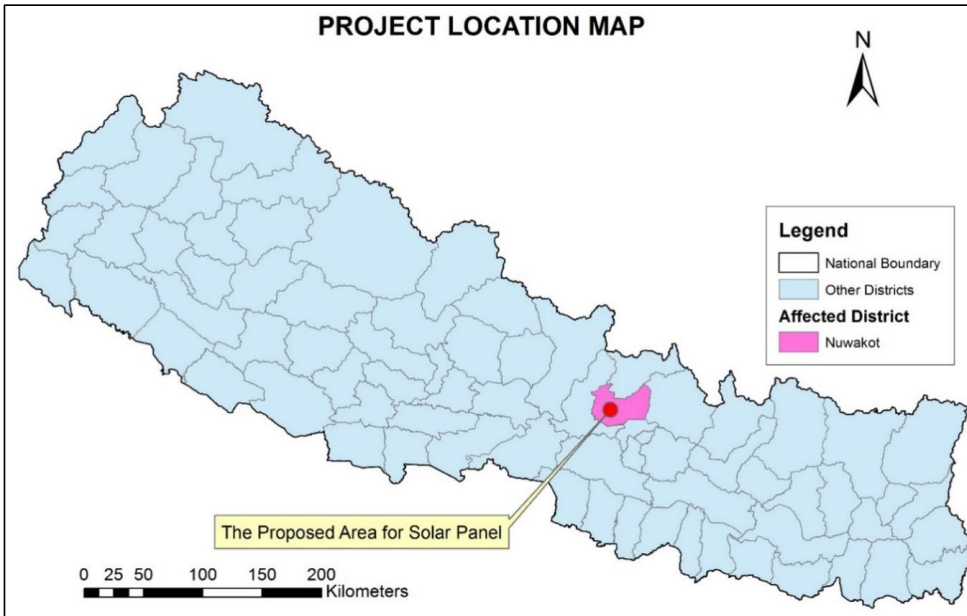


Figure 1-1: Project Location Map

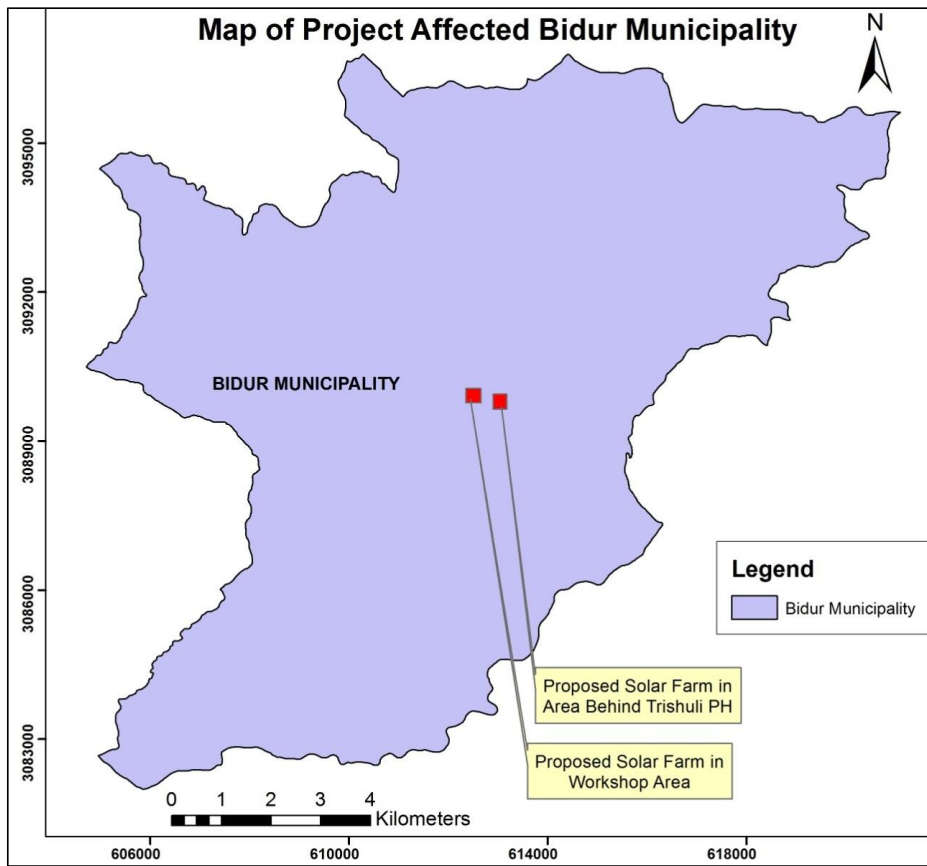


Figure 1-2: Project Affected Bidur Municipality showing the Project Site



Figure 1-3: Google image of Project Site



### 1.3 Construction Planning

The implementation of the proposed project comprises installation, erection, testing and commissioning works of solar panels. The estimated years of project completion is one years starting from March, 2018.

#### 1.3.1 Preliminary Works

Preliminary works for the proposed project consist of contract award, the detail design study and mobilization of the contractors. The detail design study will carry out the spotting of solar panels, preparation of longitudinal profiles, geological field test and laboratory testing, etc.

#### 1.3.2 Land

The project will permanently require approximately 5.31ha of land for solar panels erection and other physical facilities. For the erection of solar panels, approximately 4.78ha land will be needed and the remaining 0.53ha land will be used for other physical facilities such as construction of control buildings, guard quarter and so on. Since the area is under the ownership of NEA, there is no need to acquire private land from the people. In the same way, there is enough land owned by NEA around the area for other purposes.

#### 1.3.3 Requirement of Workforce

During the stages of the construction period of the project, altogether approximately 100 people will be employed including 75 unskilled, 15 semi-skilled and 10 skilled human resources. Most of the unskilled manpower will be hired locally as per available skill and experiences. The workforce will be used for a maximum of 8 months during construction period.

#### 1.3.4 Materials

The main materials required for construction works related with the solar farm project will be as follows;

- Solar modules; Polycrystalline (pc-Si)
- Inverters (String/Central)
- Power supply
- Mounting Structures
- Aggregate
- Cement
- Sand
- Water

The requirement of the project materials are presented in the following table.

**Table 1-1: Requirement of the Project Materials to the Project**

S.N.	Description	Number	Model
1	Solar modules; Polycrystalline (pc-Si)	65,235	RSM60-6-270p
2	Inverters (String/Central)	10	SG125/SG2500
3	Mounting Structures	2718	Steel Structure

Source: GSEEP

The power supply needed for construction activities will be tapped from the existing 11kV TL which is outside the boundary of project site. Aggregate, cement and sand is needed in very minimal amount for the construction of controlled building, guard room and toilet. The

required amount of cement will be acquired from local manufacturers. Likewise, sand will be purchased from local market. Coarse aggregates will be produced at site from excavated materials or purchased from the nearby market. The excavated foundation material can be used as a backfill required for the foundation of mounting structure. The water required to clean solar panels is approximately 7000-20000lt. per MW plans. On the basis of this, total water requirement for this project is 24,000-70,000lt. The panels is planned to clean once a week. The project will arrange these quantity of water by deep boring in the area.

### 1.3.5 Construction Method

Simple land labeling works to be done, not so major land excavation and cutting filling will be done for this project. There is no use of concrete batching plant for this project. Backhoe Loaders, Ramming Machine and Excavator are used during construction. There is no blasting only drilling for piling works will be done.

## 1.4 Objectives, rationale and Methodologies for Preparing ESMP

### Objectives

The objective of the Environment and Social Management Plan (ESMP) is to identify the potentially significant social and environmental issues and risks of the proposed project and to suggest appropriate mitigation measures to mitigate and/or minimize the adverse impacts so that the project is implemented in an environmentally sound manner. The other general objectives of the study are to:

- Identify, predict and describe/ assess potential environmental and social impacts from the installation of the Solar farm;
- Define the roles and responsibilities of all parties involved in project environmental and social management (including monitoring mechanism which should be consistent with the provisions in the project's ESMF);
- Identify and describe measures for impact avoidance, minimization, and mitigation and their costs;
- Define environment and social management mechanisms to ensure the implementation of mitigation measures and monitoring programs; and establish a supervision, monitoring and reporting as well as grievance handling mechanism.
- Consult with potentially affected people, community and stakeholders and help to identify/ understand people's concerns and suggestions and address them, if relevant.

### Rationale

Based on the recommendation identified from screening report, the ESMP is prepared to address the impacts on the particular aspects and describe different measures to mitigate those impacts.

### Methodology

This ESMP report is prepared in accordance with the screening report of the project, field study, consultation with local people/stakeholders and officials. Various methodologies are used to prepare the ESMP; they are:

- Field Investigation
  - ❖ Identification of settlements nearby project area.
  - ❖ Meetings/Consultations/Public Participation



- ❖ Verification of secondary data/ information and collection of data/ information from the field.

The project team visited the site in 2074/09/12 to 2074/09/17. During site visit, two consultation meetings were conducted at project sites (Hattigauda settlement and Bhairum Secondary School). Altogether, 25 local people were participated in the meeting, with 17 males and 8 females. The detail of the meeting is given in Annex I. The team also visited to district level line offices such as Ward No 9, Bidur Municipality, Bidur Municipality office, District Coordination Committee (DCC), District Forest Office (DFO) and District Agriculture Development Office (DADO).

## 2 EXISTING ENVIRONMENTAL AND SOCIAL SETTINGS

The proposed project areas are located at Hattigauda settlement of Bidur Municipality-8 of Nuwakot district. For the study of existing environmental and social settings, the study area is defined as the area for the erection of the solar panels and other physical facilities. The settlement area, forests or other vegetation and places having built up infrastructures or facilities that falls within the boundary of project site is also under the study area.

### 2.1 Physical Environment

The topography, land use, air quality, noise condition, water source, drainage pattern and soil erosion and land stability that shall be influenced due to the construction of this project has been discussed in each topic ahead.

#### 2.1.1 Topography

The proposed sites of Block No.3 are located in the mid-hills of Nepal. The site consists of two sub-blocks i.e. workshop area at elevation of 600m and area behind Trishuli PH at elevation range of 543 to 555m. The terrain of workshop area is flat and area behind Trishuli PH is mild slope facing south.

#### 2.1.2 Landuse

A total of 5.31ha land will be covered by the solar farm which is under the ownership of NEA. The workshop area mainly consists of trees, bush, barren land and some buildings. Similarly, area behind Trishuli PH consists of bush, trees and buildings.

#### 2.1.3 Air Quality

The proposed solar site is located near hospital, school, settlement areas and road, so the main source of air pollution is due to vehicular movement along the road. The transportation density and frequency of the vehicles along the road is low. Therefore, the overall status of air quality at the solar site can be considered to be good and within the range of acceptable limits.

#### 2.1.4 Noise Quality

The proposed solar site is located near hospital, school, settlement areas and road, so the main source of noise pollution is due to market area, school area, hospital area and vehicular movement along the road. The noise level near the settlement is found to be 64dB which is within the range determined by Ministry of Environment, Science and Technology (MoEST) in National Standard of Sound Quality, 2069.

#### 2.1.5 Water sources and Drainage Patterns

The main river which drains the project area is Trishuli River which is about 450m south from workshop area and 80m south from area behind Trishuli PH. There are no any rivulets near the project site but canal of Trishuli PH lie about 50m north from area behind Trishuli PH. The project site is located in hilly area so the chances of water logging is minimal.

### 2.1.6 Soil Erosion and Land Stability

During field visit, there was no any evident of landslide within the boundary of project site. Both sub-block areas are stable.

## 2.2 Biological Environment

Vegetation and forest resources, ethno botany, mammals and birds and rare and protected species of flora and fauna found in the project area are studied in biological environment.

### 2.2.1 Vegetation and Forest Resources

Among the two sites under block 3 of the project, area behind TrishuliPH is devoid of any infrastructure or other flora (trees/vegetation). There is no natural forest found in the project areas as observed during site visit. The area is occupied by invasive shrubs and grasses.

In the workshop area, major tree species are Sisau (*Dalbergia sissoo*), Aanp (*Mangifera indica*), Khirro (*Sapium insigne*), Kadam (*Anthocephalus chinensis*) which are commonly used by locals in the project area. These plant resources are utilized for various purposes like fodder, animal bedding, as fruits and nuts etc. About 120 trees (with DBH >10cm) are found in the workshop area. The details of the potential loss of such trees is presented in the Table 2.2.

Common shrubs found in and around the project area (Workshop area) are Banmara (*Eupatorium sp.*), Titepati (*Artemisia vulgaris*), Aiselu (*Rubus paniculatus*), Argeli (*Daphne sureil*) etc. Similarly common herbs occurring in the project area are Dubo (*Cynodon dactylon*).

### 2.2.2 Ethno botany/ Plant Resources Use Pattern

There is not much significant major timber yielding plant around the project area. Common plant resources use pattern in Workshop area is presented as below:

Table 2-1: List of Common plant resources found in Project area

S.N.	Common name	Scientific name	Usage
1	Sisau	<i>Dalbergia sissoo</i>	Animal bedding, Fiber and fiber yielding, Fodder, Medicinal plants, Seeds, Vegetables
2	Aanp	<i>Mangifera indica</i>	Fruits and nuts
3	Khirro	<i>Sapium insigne</i>	Animal bedding, Exudates, Fodder, Fruit and nuts
4	Kadam	<i>Anthocephalus chinensis</i>	Fodder, fruits and nuts

Source: Field Visit, 2017

### 2.2.3 Wildlife (Mammals and Birds)

Common mammals spotted in the project area (Workshop area) are Jackal (*Canis aureus*), Ban biralo (*Felis chaus*), Bat (*Pteropus giganteus*), Mal sapro (*Martin flavigula*) etc. Common bird species are Crow (*Corvus domesticus*), Cuckoo (*Plantative cuckoo*), Kalij (*Lephura leucomelanos*), Dhukur (*Streptopelia chinensis*), Koili (*Surniculus lugubris*), Suga (*Psittacula*

*cynocephala*), Jureli (*Pycnonotus cafer*), Bakulla (*Bubulcus ibis*), Lampuchhre (*Cissa erythrorhyncha*). Reptiles include snake, lizard etc.

#### 2.2.4 Rare and Protected Species of Flora and Fauna

One species Champ (*Michelia champaca*) is banned for commercial felling, transportation and export as per the Forest Rules, 2051 by government of Nepal is found in the project area.

None of the protected species of fauna (birds and mammals) are reported in the project site. The proposed area is not located within national park, wildlife sanctuary, buffer zone or conservation area. The area is not major suitable habitat for birds and mammals. So, habitat fragmentation is not caused due to implementation of the project.

### 2.3 Socio-economic and Cultural Environment

In the Workshop area, there are altogether 10 abandoned buildings in the proposed site (workshop area). Among them, four are workshop sheds, and six are storage structures. All of these buildings are quite old, lack repair and maintenance, and not in use for a long time. Besides, these are also affected by the earthquake of April-May 2015. There are also old and tear out heavy equipment (9 nos.) within the workshop premises. These, for example, include loader, tipper, truck, jeep, bull dozer and crane etc. The NEA management has proposed to remove/ demolish all these buildings and structures for the installation of solar panel equipment.

Hattigauda, Bidur Municipality-9 is the nearest settlement from the project site (workshop area) which is behind the workshop area. The road of width 8m separates the settlement from the workshop area. There are approximately 60 HHs in the settlement with heterogeneous caste group. The major caste groups of the settlement are Newar, Tamang, Brahmin and Chhetri. Among the total HHs, 26 HHs are indigenous caste group (Newar, Tamang). Hindu is the major religion followed by Buddhism in the settlement. These HHs are not directly affected by the project activities, as they do not lose their properties and earning sources. The project, rather, may create new opportunities of employment for these people to involve in project activities based on their skills. There is also a secondary school named Bhairum Secondary school besides the workshop area with 800 students and 30 teachers. The road of width 8m separates the settlement from the workshop area. District hospital of Nuwakot is also besides the boundary wall of workshop area. After the earthquake of 2015, this hospital has shifted to the current place which is also the land of NEA. None of these social infrastructures will be affected by the project works.

The economic character of Hattigauda settlement is based on business, farming and wage labor. Since the project area is the market area, there is the facility of all basic requirements such as electricity, drinking water, road access etc. The road that goes through the settlement is Hattigauda-Samdi road which is a pitch road. The road is used by local people around the area for transportation. There are no cultural and historical sites within and nearby the project site.

### 3 ASSESSMENT OF IMPACTS AND MITIGATION MEASURES

#### 3.1 Land Use and Land Take

The land use changes due to the erection of the solar panels in the permanent land. A total of 5.31ha land will be covered by the solar farm. However, the land is under the ownership of NEA, thus no individuals will directly be affected by the project activities and no mitigation measure is required.

#### 3.2 Air Quality

##### Impacts:

##### a. Construction Phase

The construction activities consist of site clearance (clearance of trees and buildings) of workshop area and cut-fill work for the levelling and grading of the land in area behind Trishuli PH. These activities will generate dust in the surrounding area of District hospital/GoN, Bhairumsecondary school and settlement near the project site. Apart from these activities, movement of transporting vehicles carrying the construction materials along the existing road will generate fugitive as well as combustion emissions and will cause temporary impact on air quality and thus may cause problem on health of construction workers, student of Bhairum school and people of the settlement. Gas emissions and particulate matter from project vehicles and equipment will also decrease air quality.

##### b. Operation Phase

No impact on air quality is envisaged during the operation phase.

##### Mitigation measures:

##### a. Construction Phase

- Water will be sprayed through tanker along the road near school and Hattigauda settlement once a day to reduce the dust problem during construction period, particularly when construction materials are being transported to the project sites.
- Maintenance of all vehicles and construction machinery will be done.
- Appropriate protective equipment against air (e.g. respirators) will be provided for the workers.

##### b. Operation Phase

No mitigation measures are required in this phase as there is no impact on air quality at this phase.

#### 3.3 Noise Quality

##### Impacts:

##### a. Construction Phase

During the construction phase, noise will be generated by the construction vehicles (backhoe, loader, rammer machine and excavator). The impacts will be felt in hospital, school and Hattigauda settlement. Noise sensitive receptors such as hospital, school are within 20m from the project site.

##### b. Operation

Noise generated during the operation phase will generally result from vehicular traffic which is expected to be negligible.

**Mitigation measures:**

**a. Construction Phase**

- Maintenance of all vehicles and construction machinery will be done.
- Earmuffs or plugs to the workers will be provided as per the requirement.
- The construction work will be limited to daytime as far as possible.

**b. Operation**

No mitigation required during this phase.

### 3.4 Waste Management

**Impacts**

**a. Construction Phase**

The improper disposal of solid waste like cement bags, iron bar and other leftover construction materials and wastes from workers might cause sanitary problem to the hospital, school, and settlement and also to workers involved. There will be no use of batteries for the proposed solar project so the impact due to battery wastes is eliminated.

**b. Operation Phase**

The personnel who work during operation period will generate domestic solid waste. There will be no other waste types generated during operation period.

**Mitigation Measures**

**a. Construction Phase**

- Domestic type solid wastes are biodegradable which will be managed by burying in pit.
- Recyclable wastes (such as glass, paper, plastic, etc.) will be collected separately to be sent for recycling. Separate waste containers (drums, bins, skips or bags) will be provided for different types of waste.
- No waste will be disposed along public road or in the surrounding area of school, hospital and settlement areas.
- Construction workers will be instructed for proper storage and handling procedures of construction waste and other solid wastes.

The contractor will be responsible for the establishment of the waste management system during construction period.

**b. Operation Phase**

The domestic wastes will primarily consist of organic food wastes because these are easily biodegradable and non-hazardous. It will be managed by burying in pits and subsequently covering with soil.

### 3.5 Light reflection

**a. Construction Phase**

There is no impact of light reflection during construction phase.

**b. Operation Phase**

The panel of solar PV are designed to maximize absorption and minimize reflection to increase electricity production efficiency. To limit reflection, solar PV panels are constructed of dark, light-absorbing materials and covered with an anti-reflective coating. The light reflecting percentage of solar PV is as little as 2% of the incoming sunlight. Thus, there will not reflection of light from solar panels. From the study of various assessments relating to solar panels installation as well as the site visit of solar installation areas of Nepal (Training center, Nepal electricity Authority and Chovar site), it is concluded that the glare and reflectance levels from a given PV system are decisively lower than the glare and reflectance generated by the standard glass and other common reflective surfaces in the environments. (Source: *PV Systems: Low levels of Glare and Reflectance vs. Surrounding Environment*).

### Mitigation Measures

No mitigation measure is required during construction and operation phase.

## 3.6 Impact on Standing Trees and vegetation

### a. Construction Phase

Standing trees and vegetation will be lost during the construction of the project. Site clearance comprises of removal/clearance of the generated shrubs and herbs species in the area. Details of the loss of trees is given in the following table.

**Table 3-1: Total loss in terms of plant species**

S.N.	List of tree loss	Scientific name	DBH (cm)	Height (m)	Total
1	Sisau	<i>Dalbergia sissoo</i>	35	11	7
2	Sisau	<i>Dalbergia sissoo</i>	45	12	1
3	Sisau	<i>Dalbergia sissoo</i>	20	15	3
4	Sisau	<i>Dalbergia sissoo</i>	20	10	1
5	Sisau	<i>Dalbergia sissoo</i>	20	12	1
6	Sisau	<i>Dalbergia sissoo</i>	30	7	3
7	Sisau	<i>Dalbergia sissoo</i>	40	10	2
8	Sisau	<i>Dalbergia sissoo</i>	50	10	2
9	Sisau	<i>Dalbergia sissoo</i>	60	11	4
10	Sisau	<i>Dalbergia sissoo</i>	40	10	3
11	Sisau	<i>Dalbergia sissoo</i>	30	10	9
12	Sisau	<i>Dalbergia sissoo</i>	35	11	12
13	Sisau	<i>Dalbergia sissoo</i>	30	12	9
14	Sisau	<i>Dalbergia sissoo</i>	45	18	12
15	Sisau	<i>Dalbergia sissoo</i>	36	12	31
16	Aanp	<i>Mangifera indica</i>	40	10	1
17	Aanp	<i>Mangifera indica</i>	70	15	1
18	Aanp	<i>Mangifera indica</i>	80	18	1
19	Aanp	<i>Mangifera indica</i>	100	17	1
20	Aanp	<i>Mangifera indica</i>	140	15	1
21	Aanp	<i>Mangifera indica</i>	100	13	1
22	Aanp	<i>Mangifera indica</i>	90	12	1
23	Aanp	<i>Mangifera indica</i>	100	12	1
24	Aanp	<i>Mangifera indica</i>	110	13	3
25	Khirro	<i>Sapium insigne</i>			1
26	Kadam	<i>Anthocephalus</i>			1

		chinensis				
					<b>Total</b>	113

Source: Field Visit, 2017

#### b. Operation Phase

Since the operation of the project will permanently occupy land, the ground vegetation cover would be lost due to project activity.

#### Mitigation Measures

Since the removal of trees and other vegetation is within the premises of NEA owned land, the procedures specified in the section 4 of the "Standard for removing government trees, 2071" will be followed. In accordance with the 'Standard for removing Government Trees, 2071', the concerned agency should cut and the trees in its own cost and sell the forest products in accordance with the prevailing laws and acts and deposit the income for royalty. For the purpose of this standard, Examination Committee will be comprised of 7 members with District Forest Officer as a Coordinator. With the request for removing such trees, the committee will monitor the area and the trees to be cut. The cost for such monitoring will be the responsibility of related office/project. Since the land is owned by NEA, compensatory plantation is not required for the project as per the Standard.

### 3.7 Impacts on safety

#### Impacts

##### a. Construction Phase

During the project construction phase, the traffic flow will also arise from the transportation of solar panels and other construction materials. Since, Bhairum Secondary school and district hospital are besides workshop area, there may be the chances of road accidents. Similarly, the project site is also along the road (Hattigauda-Samdi road) and main access for the people of nearby settlements, there may be the chances of road accidents and also the issues of pedestrian safety.

##### b. Operation Phase

No impacts on settlement during this phase is found.

#### Mitigation measures

##### a. Construction Phase

The impacts and possible traffic accidents will be prevented or minimized through different measures.

- Consultation meeting with school management and local community members regarding the awareness towards the safety issues by the project once prior to construction and twice during construction period,
- Placing traffic signs and limiting the maximum speed of vehicles.

##### b. Operation Phase

No mitigation measure is required at this phase.

### 3.8 Health and Safety

#### Impacts

##### a. Construction Phase



There is no impact on the health of the people of nearby settlement due to project activities. However, there is minimal risk of electric shock and occupational injuries to the construction workers during wiring/fitting process. Thus the project should take into consideration for health and safety of the workers.

#### **b. Operation Phase**

There will be no prominent impact on this phase.

#### **Mitigation Measures**

##### **a. Construction Phase**

- An on-site medical facility and first-aid will be provided for the construction phase to cater for primary health care needs of personnel.
- Personal protective equipment (helmets, gloves and steel-toed shoes with rubber soles) for workers will be provided, to minimize health and safety risks.

##### **b. Operation Phase**

No mitigation measure is required at this phase.

### **3.9 Loss of Structure**

#### **Impacts**

##### **a. Construction Phase**

There are 10 damaged structures (4 workshop sheds and 6 storage buildings) and 9 old and tear out heavy equipment of NEA within the proposed site (workshop area) which need to be removed/demolished before the erection of solar panels. The buildings are abandoned and NEA will demolish all these damaged buildings before the construction work of the project will start.

##### **b. Operation Phase**

There is no impact on structure during this phase.

#### **Mitigation Measures**

No mitigation measure is required as the damaged structures are NEA's own property and NEA will manage it properly. The reusable materials such as iron, tin of the buildings and old heavy equipment will be sold through bidding and the income of it will be deposited as royalty whereas other debris come from the buildings will be used in the same place for levelling and grading of the land of the project area.

### **3.10 Labor influx and Labor camp**

#### **Impact:**

##### **a. Construction Phase**

The project should make camp for construction labors. The labor camp will be established within NEA's premises (outside the project area), however the location is not still finalized. There will be the issue of health and sanitation of labors within the camp. Thus, the project should take into consideration for the construction of toilets for male and female workers separately and biodegradable wastes produced by workers should be buried in pits. In the same way, influx of outside labor may affect the social and cultural life style of the local people. Since, total number of construction workers is very few (25 nos.) and their fast mobility, these impacts are expected to low in magnitude.

**b. Operation Phase**

There is no impact during this phase as all labor force will returned back and labor camp will be demolished.

**3.11 Corporate Social Responsibility**

Corporate social responsibility (CSR) is also a part of development of a project. The project has to do some support to the community near the project area for its development. Therefore, as a part of CSR, project will provide financial support to the school (Bhairum Secondary School) which is besides the project area (workshop area) for infrastructure development. For this approximately NRs. 1,000,000 has been estimated.

**3.12 Environment Mitigation Plan**

The identified impacts due to project activities and the mitigation measures are explained in the given table.

**Environmental Impact and Mitigation Matrix**

S.N	Issues	Impacts	Mitigation Measures	Location	Timing of Action	Estimated Mitigation Cost (NRs)	Institutional Responsibility	
							Implementation	Supervision
<b>A.</b>	<b>Construction Phase</b>							
1	Land use and Land take	A total of 5.31ha land will be covered by the solar farm which is under the ownership of NEA.	No mitigation measure is required.	-	Not required	Not required	Not required	Not required
2	Air Quality	<p>The construction activities consists of site clearance (clearance of trees, bush and building structures of workshop area and cut-fill work for the levelling and grading of the land in area behind Trishuli PH. These activities will generate dust in the surrounding area of the school, hospital, settlement.</p> <p>Movement of construction vehicles will increase turbidity in air and also gas emissions and particulate matter from these vehicles will also</p>	<p>Water will be sprayed along the existing road near school, settlement area once a day.</p> <p>Maintenance of all vehicles and construction machinery will be done.</p> <p>Appropriate protective equipment against air (e.g. respirators) will be provided for the workers.</p>	Construction site.	Construction phase.	Project Cost	Contractor	ESSD/NEA

		decrease air quality.						
3	Noise Quality	Noise will be generated by the construction vehicles (grader, excavator, and dumper)	Maintenance of all vehicles and construction machinery will be done.  Earmuffs or plugs to the workers will be provided as per the requirement.  The construction work will be limited to daytime as far as possible.	Construction site.	Construction phase.	Project Cost	Contractor	ESSD/NEA
3	Waste managements	The improper disposal of solid wastes like cement bags, iron bar and other leftover construction materials and wastes from workers might cause sanitary problem in school, hospital, settlement areas and also to workers involved.	Domestic type solid wastes will be managed by burying in pit.  Recyclable wastes (such as glass, paper, plastic, etc.) will be collected separately to be sent for recycling. Separate waste containers (drums, bins, skips or bags) will be provided for different types of waste.  No waste will be disposed along public road, near school, settlement and hospital areas.  Construction workers will be instructed for proper storage and handling procedures of construction wastes and other solid wastes.	Construction sites and camp site.	Construction phase.	Project Cost	Contractor	GSEEP/ESSD

4	Impact on Standing trees and other vegetation.	Altogether 113 standing trees and vegetation will be lost for site clearance during the construction of the project.	NEA itself will cut the trees in its own cost and sell the forest products and deposit the income as royalty according to "Standard for removing government trees, 2071".	workshop area	Construction phase.	NEA Cost	NEA	District Fore Office
5	Impact on safety	Increase of traffic flow leads to the chances of road accidents and other pedestrian issues in nearby school, settlement and hospital.	Consultation meeting with local community members regarding the awareness towards the safety issues by the project ;  Placing traffic signs and limiting the maximum speed of vehicles.	In area surrounding the construction site.	Once prior to construction and twice during construction period.	Project Cost	GSEEP/ ESDD	NEA/ESDD
6	Health and Safety	There is minimal risk of electric shock and occupational injuries to the construction workers during wiring/fitting process.	An on-site medical facility will be designed to cater for primary health care needs of workers;  Personal protective equipment (Hard hats, gloves and steel-toed shoes with rubber soles) for workers will be provided;	Construction site and surround settlement.	Construction phase.	Included in Project Cost	Contractor	NEA/ESDD
7	Loss of structure	10 damaged structures (4 workshop sheds and 6 storage buildings) and 9 old and tear out heavy equipment of NEA will be demolished/ removed.	No mitigation measure is required as the damaged structures are NEA's own property. The reusable materials such as iron, tin of the buildings and old heavy equipment will be sold through bidding and the income of it will be	Project area	Construction phase	NEA Cost	NEA	NEA/ESDD

**Comment [DP1]:** Are there any protected species. Issues and mitigation measures?

**Comment [P2]:** No there are no any protected species in the subproject area.



			deposited as royalty whereas other debris come from the buildings will be used for levelling and grading of the land of the project area.						
--	--	--	--	--	--	--	--	--	--



## 4 MONITORING AND REPORTING MECHANISM

Monitoring is an essential aspect of environmental and social management plan. An Effective monitoring of the whole project cycle, will assist for the implementation of monitoring plan and coordination of work of the project with concerned stakeholders as well as identify the unexpected problems/outcomes that might come in physical, biological and socio-economical sector and facilitate the correction of those. Land use pattern, settlement, health and safety, infrastructure, implementation of the mitigation measures are the few areas of monitoring.

NEA is responsible for regular monitoring and reporting of the implementation of the project. Ministry of Energy (MoEn), Department of Electricity Development (DoED) and local bodies will also be involved during the monitoring.

The environmental monitoring will be carried out at all the project impact areas in a regular or intermittent schedule.

The experts from ESSD will visit project site at periodic interval for the environmental monitoring of the project and prepare the monitoring report. The project manager office (PMO) will be responsible for the distribution of report to the concerned agencies. The detail of monitoring parameters, schedule, method and agencies to be consulted during construction and operation phases for physical, biological and socio-economic and cultural environment is presented in table given below.

### 4.1.1 Environmental Monitoring Plan

A monitoring program, required for the project to evaluate the application and effectiveness of mitigation measures, is formulated in three phases.

#### a. Preconstruction Monitoring

Since the construction work of the project will start immediately, preconstruction monitoring is not required for the proposed project.

#### b. Construction Monitoring

Impact and compliance monitoring will be conducted during this phase of project development.

#### Impact Monitoring

Impact monitoring will be carried out to assess actual level of impact due to project construction. The impact monitoring includes:

- monitoring of the impacts of the project on physical, biological and socioeconomic & cultural environment of the area;
- monitoring of the accuracy of the predicted impacts;
- identify the emerging impacts due to project activities or natural process and develop remedial action; and
- monitoring of the effectiveness of mitigation measures.

#### Compliance Monitoring

The compliance monitoring will be conducted to monitor the compliance of the proposed mitigation measures and monitoring activities. The compliance monitoring will mainly focus on;

- compliance of the tender clause;
- compliance of the mitigation measures;
- timely and adequately implementation of Environmental Management Plan; and
- overall environmental and social performance of the project.



Table: Monitoring Plan

S.N.	Parameter	Indicators	Method	Location	Schedule
<b>A</b>	<b>Construction Monitoring</b>				
<b>Impact Monitoring</b>					
1	Air Quality	Dust around the project area	Observation	Construction site, Hattigauda-Samdi road along Hattigauda settlement	Weekly during construction
2	Noise Quality	Construction vehicles	Standard of MoEST	Construction area	Weekly during construction
3	Waste Management	Unpleasant odour and visual impact	Observation	Labor camp/ construction sites	Weekly during construction
4.	Health and Safety issues	On site medical facilities to the workers; No. of accidents, personal protective equipment to the workers	Inspection of the construction place; Records of accidents	Project area	Continuous during construction period
5.	Employment	No. of local people employed by project	Records kept by management	Project area	Continuous during construction period and annually during operation
6.	Infrastructure development	Infrastructure development in the school	Observation, consultation with school management	Project area	Construction period
<b>Compliance Monitoring</b>					
1	Allocation of adequate budget for implementation of environmental mitigation measures and monitoring works	Yes/No	Review, inquiry and consultation	Kathmandu Office	Preconstruction phase



### 4.1.2 Environment Mitigation and Monitoring Cost

#### Environment Mitigation Cost

No separate mitigation cost is required for the proposed project as no individual property will be acquired by the project. The total CSR cost for the project is estimated to be NRs 1,000,000 Which is only 0.13% of the total project cost.

#### Environment Monitoring Cost

The monitoring costs have been estimated in Table 4-1. The total cost for the monitoring activities (for construction phase) has been estimated as NRs. 2,723,150/-.

**Table 4-1: Monitoring Cost of the Proposed GTSP Block No. 1**

S.N.	Item	No. of Persons	Man-month			Rate/Month (NRs.)	Amount (NRs.)
			Office (100%)	Field (150%)	Total		
<b>Construction Phase</b>							
1	<b>Manpower</b>						
	Sr. Environment Expert	1	1	-	1	41,000	41,000
	Coordinator	1	4.5	1.5	6	35000	236,250
	Civil Engineer	1	2.5	1.5	4	35000	166,250
	Environmentalist	1	2.5	1.5	4	35000	166,250
	Socio-economist	1	2.5	1.5	4	35000	166,250
	Electrical Engineer	1	2	-	2	35000	70,000
	Liaison Officer	1	1	-	1	30,550	30,550
	Support Staff	2	6		12	30,500	366,000
	Cost of line agencies monitoring					LS	10,000
	<b>Sub Total</b>	<b>9</b>	<b>34</b>				<b>1,243,150</b>
<b>Out of Pocket Expenses</b>							
2	TA/DA					LS	500,000
	Vehicle hire/ Maintenance					LS	500,000
	Report Production					LS	100,000
	Computer and Printer					LS	120,000
	Community Consultation					LS	100,000
	Miscellaneous					LS	150,000
	<b>Sub-Total</b>						<b>1,470,000</b>
<b>Total of Construction Phase Monitoring</b>							<b>2,723,150</b>

### 4.2 Grievance Redress Mechanism (GRM)

Grievance redress mechanism will be established to allow project affected families/households (PAFs/HHs), community or other stakeholder to make appeal on any disagreeable issues and practices arising from project works. GRM provides an effective approach for filing complaints and resolution of issues effectively and timely. Considering this, a Grievance Redress Cell (GRC) will be established at project site. A GRC for the proposed project has already been established at project level on 2072/05/11 as specified in the Environment and Social Management Framework (ESMF). The GRC consists of the following members:

Project Coordinator  
Project Manager, GTSP

Coordinator  
Member Secretary

Officer from Bidur Municipality                      Member  
Secretary, the then Charghare VDC                Member

The field level GRC will be formed after the commencement of work in the site. Till then the project level GRC will look after the grievances, if any. The GRC maintains registration books and files to record the complaints filed by the people and communities. The GRC seeks to resolve the issues quickly in order to expedite the project works without resorting to expensive and time-consuming legal actions. The budget for setting up the grievance cell has been provided by the PMO itself.

### **4.3 Implementation of Mitigation/Enhancement Measures and Monitoring Activity**

The proponent has prime responsible for implementing the proposed mitigation/enhancement measures and the monitoring activities. Proponent has an obligation to carry out all these activities along with cost.



**Annex I**  
**Project Related Photographs and**  
**Minutes of Consultation Meeting**

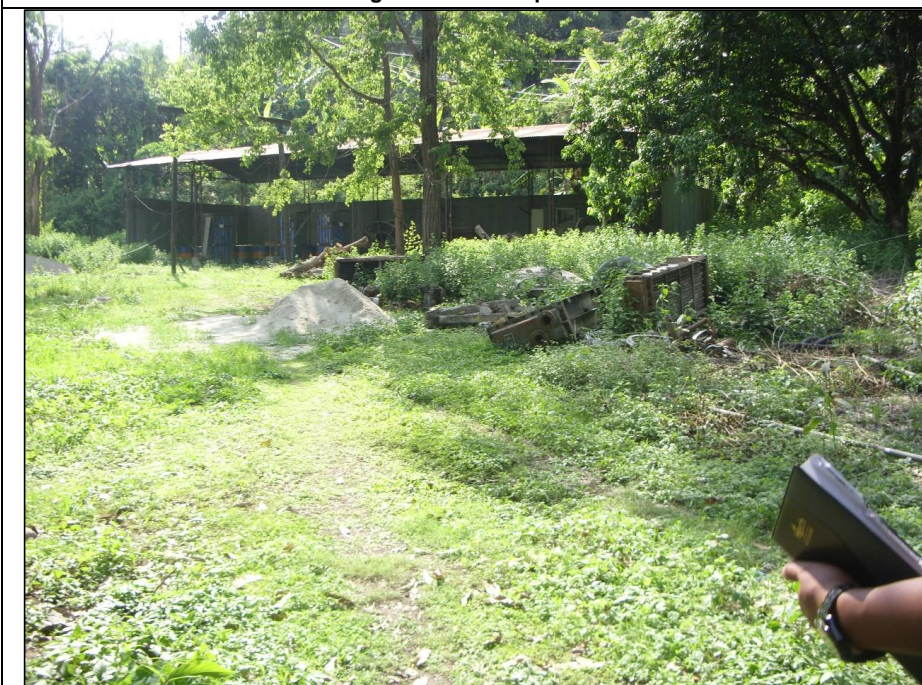
---



*[Handwritten signature]*

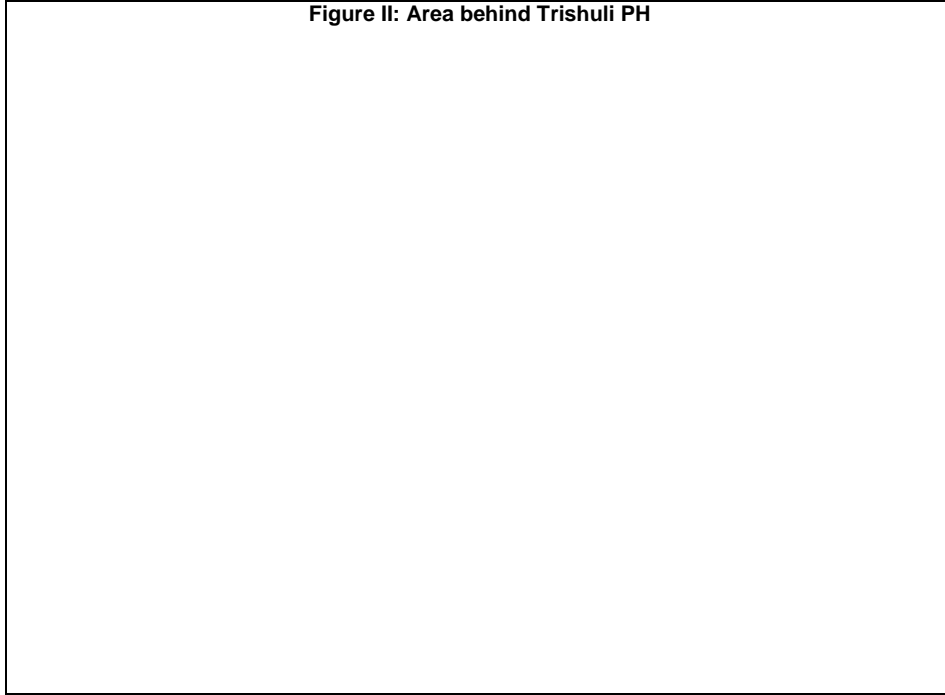


Figure I: Workshop Area



*Handwritten signature*

Figure II: Area behind Trishuli PH



*Handwritten signature*



नेपाल विद्युत प्राधिकरण  
वातावरण तथा सामाजिक अध्ययन विभाग

नेपाल विद्युत प्राधिकरणद्वारा प्रस्तावित ग्रिड सोलार तथा इनर्जि इन्फ्रस्ट्रक्चर आयोजना अन्तर्गत ग्रिडमा आवद्ध सौर्य विद्युत आयोजना कार्यान्वयन गर्दा आयोजना प्रभावित क्षेत्रमा पर्ने सबै वातावरणीय प्रभावहरूका बारेमा ने.वि.प्रा., वातावरण तथा सामाजिक अध्ययन विभाग, भक्तपुरबाट प्रारम्भिक वातावरणीय परिक्षण (IEE) प्रतिवेदन तयार गर्ने सिलसिलामा खटिआएका वातावरणीय अध्ययन टोली तथा स्थानियवासी, सरोकारवालाहरू विच निम्न मिति, समय र स्थानमा छलफल गरी निम्नलिखित रायसुझाव संकलन गरियो ।

स्थान : जिल्ला : सुदूरपश्चिम नगरपालिका : त्रिपुर (साविकको गा.वि.स. त्रिपुर)  
वडा नं./ठारै : १ हात्तिगाँडा मिति : २०७३.१२.१३ समय : १०:००  
अरुण मा. वि. उपस्थिती

क्र.सं.	नाम थर	पद/पेशा	ठेगाना/संस्था	सम्पर्क नं	हस्ताक्षर
१.	कृष्ण किशोर खतिवडा	सि.प्र.अ.	वि.न.फ.स.	९८४९२४८३१०	
२.	नयन थापा	बि.प्रा.	वि.न.फ.स.	९८४९४६३३६	
३.	माधव डुंगेल	"	"	९८४९०९३०५	
४.	शिवराम श्रेष्ठ	"	"	९८४९३३०३९	
५.	सुभाष डुंगेल	"	"	९८६०३१३२६५	
६.	जोमा के.सी	"	"	९८४०३८९०९०	
७.	सरिता अर्याल	"	"	९८१८२३७५६	
८.	सुजिता रिजाल	"	"	९८६१०५४१६८	
९.	रमण पौडेल	गोर्खा	ने.वि.प्रा.		
१०.	कञ्चन पौडेल	"	"		
११.					
१२.					
१३.					
१४.					

रायसुझाव :

विक्रम पौडेल वा नरेश्वर शर्मा जस्ता व्यक्ति समुदायमा प्रभाव  
केन्द्रित गर्ने सक्ने अध्ययन हुन जरुरी देखिन्छ।  
निम्नलिखित वाट नोजिकेमा इन्टरनेट र उक्त इन्टरनेट पार्क सार्ने  
कार्य गर्नुपर्नेछ।





नेपाल विद्युत प्राधिकरण  
वातावरण तथा सामाजिक अध्ययन विभाग

नेपाल विद्युत प्राधिकरणद्वारा प्रस्तावित ग्रिड सोलार तथा इर्नर्जि इफिसियन्स आयोजना अन्तर्गत ग्रिडमा आवद्ध सौर्य विद्युत आयोजना कार्यान्वयन गर्दा आयोजना प्रभावित क्षेत्रमा पर्न सक्ने वातावरणीय प्रभावहरूका बारेमा ने.वि.प्रा., वातावरण तथा सामाजिक अध्ययन विभाग, भक्तपुरबाट प्रारम्भिक वातावरणीय परिक्षण (IEE) प्रतिवेदन तयार गर्ने सिलसिलामा खटिआएका वातावरणीय अध्ययन टोली तथा स्थानियबासी, सरोकारवालाहरु विच निम्न मिति, समय र स्थानमा छलफल गरी निम्नलिखित रायसुझाव संकलन गरियो।

स्थान : जिल्ला : नुवाकोट नगरपालिका : विदुर (साविकको गा.वि.स.....)  
वडा नं./ठाउँ : ८.१.६.१.१.१.१ मिति : २०.७.१८.२०२० समय : .....

उपस्थिति

क्र.सं.	नाम थर	पद/पेशा	ठेगाना/संस्था	सम्पर्क नं	हस्ताक्षर
१.	संगीता नेपाली	विद्यार्थी	वि.न.पा.८	९८५११७६३८	
२.	बालमुकुन्द डोगल	-	वि.न.पा.८	९८५८५३३३	
३.	दुर्गा डोगल	-	वि.न.पा.८	-	-
४.	उमेश श्याम	शिक्षक	विदुर-८	९८५८५३३९	
५.	प्रकाश शिवकोट	बालकापी	विदुर-५	९८५०२४३६	
६.	केशव सापकाटा	"	विदुर-८	९८५११५५५	
७.	रमेश कुंसी	"	"	९७६९२०९५३	
८.	सिता पौडेल	"	विदुर ८	९८५८५३३३०	
९.	मान कटुवाल	राजकिशोर	" १३१८	९८५९२०५३३	
१०.	प्रदीपसहा आर्य	व्यवसाय	" ८	९८५१८६७०९	
११.	नगरज बोगटी	भाषाप्रति	" ८	९८५१०२१०८	
१२.	मोहन तामा	"	" "	९८१००३४	
१३.					
१४.					

- रायसुझाव :
- १) आफ्ना व्यवसाय वहुनै जलसम्पन्न सप्रथम आवेग
  - २) सामुदायिक खुला जग्गा पनि हारले विपत्तमा
  - ३) क्षेत्र इलाका विकासका असर न्यूनीकरण को
  - ४) जनमानस बल्लो जातिके उपयुक्त सरकारी







नेपाल विद्युत प्राधिकरण  
वातावरण तथा सामाजिक अध्ययन विभाग

नेपाल विद्युत प्राधिकरणद्वारा प्रस्तावित ग्रिड सोलार तथा इर्नर्जि इफिसियन्स आयोजना अन्तर्गत ग्रिडमा आवद्ध सौर्य विद्युत आयोजना कार्यान्वयन गर्दा आयोजना प्रभावित क्षेत्रमा पर्ने सबन्धे वातावरणीय प्रभावहरूका बारेमा ने.वि.प्रा., वातावरण तथा सामाजिक अध्ययन विभाग, भक्तपुरबाट प्रारम्भिक वातावरणीय परिक्षण (IEE) प्रतिवेदन तयार गर्ने सिलसिलामा खटिआएका वातावरणीय अध्ययन टोली तथा स्थानियवासी, सरोकारवालाहरू विच निम्न मिति, समय र स्थानमा छलफल गरी निम्नलिखित रायसुभाव संकलन गरियो ।

स्थान : जिल्ला : बुवाकोट नगरपालिका : विट्ट (साविकको गा.वि.स. ....)  
वडा नं./ठाउँ : १२९/हात्तीगैँडा मिति : २०७४/०९/१६ समय : .....

उपस्थिती

क्र.सं.	नाम थर	पद/पेशा	ठेगाना/संस्था	सम्पर्क नं	हस्ताक्षर
१.	द्विरादन रिमाल		हात्तीगैँडा	९७९२९४९९	
२.	कृष्णकुमार शर्मा		१)	९८४९४९९९	
३.	दिनेश शर्मा		"	९८४९४९९९	
४.	कृष्ण प्रकाश शर्मा		विट्ट-९	९८४९४९९९	
५.	जितेंद्र शर्मा		१०	९८४९४९९९	
६.	प्रतम पौडेल	नोकरी	ने.वि.प्रा		
७.	नगेन्द्र शर्मा	"	"		
८.					
९.					
१०.					
११.					
१२.					
१३.					
१४.					

रायसुभाव :

.....  
.....  
.....

Issues/Demands received from Consultation meetings (translated in English):

1. The project should study the electromagnetic effect of solar panels and its impact to the school.



2. There should be the open place in the middle of the market area for locals. Thus, locals have the objection for not starting the project in the workshop area.



*Handwritten signature*