Environment & Social Management Plan

Construction of National Emergency Operation Center

Department of Disaster Management
Thimphu

Abbreviation

BoQ: Bill of Quantities
BSR: Bhutan Standard Rates
CBR: California Bearing Ratio
CDB: Construction Development Board
CGI: Corrugated Galvanized iron
DDM: Department of Disaster Management
DEM: Digital Evaluation Model
EOC: Emergency Operation Center
ESMF: Environment & Social Management Framework
ESMP: Environment & Social Management Plan
GPS: Global Positioning System
IT: Information Technology
JICA: Japan International Cooperation Agency
MoHCA: Ministry of Home and Cultural Affairs
MoLHR: Ministry of Labor and Human Resources
NEOC: National Emergency Operation Center
NLC: National Land Commission
PM: Particulate Matter
RCC: Reinforced Concrete Cement
RMC: Ready Mix Concrete
Sq.m: Square Meter
TMT: Thermo Mechanically Treated Rebar
µm: Micro Meter

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1. Introduction

This ESMP is prepared for the construction of a National Emergency Operation Center (NEOC) at Thimphu in Bhutan. This activity is a part of the Bhutan: Hydromet Services and Disaster Resilience Regional Project funded through the World Bank, and implemented by the Department of Disaster Management under the Ministry of Home and Cultural Affairs (MoHCA), Royal Government of Bhutan.

The ESMP is prepared based on the ESMF of the project which was finalized on May 26, 2016. Based on the screening report prepared for the activity, preparation of an ESMP was deemed necessary.
The ESMP is prepared to identify potential social and environmental impacts of the proposed construction and propose mitigation measures to encounter those impacts. It also identifies the causes and receptors of these impacts.

2. Project description

Background: The NEOC is the lynchpin in any national effort to respond to a disaster and is a national priority for Bhutan, also identified as key in the Disaster Management Act 2013. Therefore, the structure will be designed to withstand known hazards and will be capable of 24x7 operations for an extended period, including during major disasters affecting the immediate area.

Location and site details: The proposed site for the NEOC construction is a government land registered under the DDM, in the jurisdiction area of Thimphu Thromde. It is located within the DDM office compound along the Rabten Lam (road name), above the Memorial Chorten. As per the Thimphu Thromde's urban land precinct classification, the proposed area of NEOC construction falls under the UV-2-MD where the allowable built up coverage is 50% of the total land area. The total land area allocated for the NEOC construction is 900sq.m and the allowable built up area is 450sq.m.

Figure 1 Google earth image of the proposed site.

Figure 2 Proposed NEOC construction site

Size of the building: The proposed NEOC building is a four storied Reinforced Cement Concrete (RCC) framed structure with traditional Bhutanese architecture incorporated. The total height of the building will be about 14m from ground level. The expected total built up area of the building is 1800 square meters (450sq.mx4 floors).

Design of the building: The design of the NEOC building will follow the principle of "universal access" to ensure accessibility and user-friendly environment to all users including those with special needs. It will include necessary components such as ramps, adequate railings, proper signage and information boards to enhance accessibility and safety. Separate toilets for men and women will be provided to take care of social concerns.

Main construction activities: The construction work would include excavation works for foundation of the building and site development, casting of the RCC framed structure, building of walls, installation of plumbing, electrical and telecommunication works, and finishing works such as plastering, flooring, ceiling, etc. The existing retaining wall at one end of the proposed construction site will also be reconstructed as it is evaluated to be weak as per the geo-technical study report of the proposed construction site. These works will require scaffolding, concrete mixing and casting, curing of cement works.

Main construction materials and their sources: The main construction materials will include sand, cement, stones, aggregates, bamboo, steel bars, paints, ceramic tiles, plumbing materials, electrical and telecommunication fittings, CGI sheets, wooden planks, etc. The construction work will be managed by a local construction contractor selected through a competitive bidding process once the design is in place. This selected contractor will manage the supply of construction materials based on the specifications provided in the Bill of Quantities (BOQ). As per normal practice, construction materials such as stones, aggregates, sand and wood are supplied from in-country quarries and supplied by local suppliers. Cement is also bought from in-country cement manufacturing units. Steel bars are bought from the joint steel company in Bhutan based on Pasakha. Other construction materials such as paints, tiles, electrical fitting, etc. are available in local hardware stores, imported from neighboring countries, mostly from India. The quantities are not yet determined.

Methodology of construction: The construction work will involve both machines and manual labour. Heavy works such as excavation will require excavators and trucks for dumping earth. Other machineries required at the site will include RMC transits, batching plant, and concrete mixers for RCC works. Hydraulic lifts will be used to transport construction materials to upper floors. Trucks will be used to transport construction materials to the site. Minor casting works and finishing works which include plastering, laying floor planks and tiles and fitting of electrical and telecommunication items will be manually carried out.

Construction management: A local construction contractor will be selected through a competitive process based on the BOQ prepared by the design consultant. This construction contractor will manage the construction which will include supply of construction materials and management of construction workers and execute the construction as per the approved drawings and technical specifications of materials.

Construction workers: The construction contractor will manage the construction workers. If expatriate workers are hired, the approval will be sought from the Ministry of Labor and Human Resources (MoLHR) by the contractor. Approximately, 20 workers which include 3 carpenters, 2 rod benders, 5 masons, 1 concrete machine operator, and 9 concrete workers will be required for the majority of the construction works which include the main building RCC frame and brick walls. At a later stage, about 10 to 15 specialized workers for laying of tiles, painting, fitting electrical and telecommunications works will be hired. Workers may be both expatriate as well as local depending on their skills. In general, it is seen that men are hired as workers at construction sites since it is a physically strenuous job. Therefore, there will not be any issues for campsites.

Campsite for construction workers: The camp site for construction workers will be provided near the construction site. The identified land is owned by the Thimphu Thromde. The approval for the use of this land will be sought from the competent authority and properly documented. Upon approval of the design and drawings of the NEOC by the Thimphu Thromde, water supply for the construction site and the workers will be provided by the Thimphu Thromde and electricity supply will be provided by the Bhutan Power Corporation. The camp will be a temporary sheds constructed near the site.

Timeline of construction work: The expected construction period is eighteen months. In case of a need of time extension, it will be provided based on justification. The construction of the NEOC is expected to commence from January 2020 and will be completed in 18 months from the date of award of the work to the contractor.

Use of the NEOC building: The NEOC should be functioning 24*7 in the event of any disaster. The upper floor will host the office of the Head of the department and other officers of the department. The lower three floors will include rooms for the functioning of the NEOC such as GIS room, conference halls, IT server rooms, etc. based on the requirements. Furthermore, the NEOC will be equipped with a multilayered, resilient disaster communications system for voice and data including a portable generator and cord; all-in-one printer/scanner/fax; portable projector; satellite phone; Wi-Fi hotspot; very-high frequency radio handset; very-high frequency repeater system with antennae; hand-held GPS with camera; rugged/waterproof equipment case to aid in the times of mobile connection failure or power cuts.

3. Baseline data

Topography: Thimphu lies in an altitudinal range of 2,000 to 3,800 meters above the mean sea level. It is a narrow valley with mountains on both sides with the Thimphu river (Wang Chu) flowing at the base of the valley. At the southern end of the city, the Lungten Zampa Bridge connects the east and west banks of the Wang Chu. The proposed site for the NEOC construction lies at 3200 meters above the mean sea level with coordinates at 27.4728° N, 89.6393° E.

Rainfall: The city experiences a southwest monsoon-influenced subtropical highland climate of a warm, temperate climate. The southwest monsoon rainfall occurs during mid-June to September. Thimphu experiences a wet season from May through September and a dry season for the remainder of the year. Lightning and thunder often precedes rainfall in the region. As spring approaches, the landscape is marked by violent winds and relatively dry and clear skies. Rainfall in the valley varies between 500 millimeters and 1,000 millimeters per year, the bulk of which is received during the monsoonal wet season.

Temperature: The average temperature recorded during winter varies between 5–15 °C while in summer the variation is between 15–30 °C. The coldest average (minimum) temperature in January is −2.6 °C and the average highest temperature recorded during August is 25 °C.

Air quality: The National Environment Commission (NEC) studied the air quality of Thimphu by monitoring the PM10 (particulate matter with aerodynamic diameter ≤ 10μm) level and conclude that the PM10 level is increasing year by year for Thimphu. Data from 2011-2012 suggests higher PM10 level during winter, and then gradually declines to the lowest level during summer. Rain helps to suppress the suspended particulate. The study concluded that from the year 2007 to 2012 the level of PM10 content has doubled.

Major land use: Thimphu is the capital of Bhutan and Thimphu Thromde is the main urban settlement in Bhutan with most of the central agencies of the government located here. The proposed site is about one kilometer away from the main town. The site is within the existing DDM office compound. It is about 1km from the National Referral Hospital and about 500m from the well-known Memorial Chorten. Nearby structures include the JICA office below the proposed site and a private primary school across the road. The private school is located about 500 meters away from the construction site. The school operates from 9:00AM to 3:00PM. As there is the road and a barren land between the proposed construction site and the school fence, activities at the construction site is not expected to have any impact on the functioning of the school. There are no other private residential buildings located within the 100 meters of the construction site. The construction would not have any effect on the communities. There is road on both sides of the site with a small stream on the left side. The site is about 10 meters raised from the stream and hence it does not have any adverse effect on the building. There are no past records of flash flooding from this stream. There are no objects like trees, stones having historical importance in the site. The site is free from cultural sites, cremation ground and is free from vegetation. As the site is away from the main town, there isn't much traffic movement, pedestrian movement and is quite both during day and night.

Connection of drinking water, sewer lines: The source of for the drinking water in the DDM compound where the site under discussion is located is from Motithang water source, which is a

treated water source by the Thimphu Thromde. This same water source will be used for the NEOC during and after construction. Its sewer lines are connected to the septic tank constructed near the DDM office.

Waste management: The Thimphu Thromde in collaboration with private parties collects both dry and wet waste on a regular basis from all households and offices. Normally, wet waste is collected twice a week and dry waste is collected once a week. Similarly, the waste from the NEOC will be segregated as required (wet and dry) and disposed off to the waste collectors. If huge quantities of waste are generated from material wrappings, carpentry works, etc., it should be transported to the main solid wasteland in Memelakha, which is about 12km from the construction site. Excavated earth is dumped at a site identified by the Thimphu Thromde, normally where they are doing land filling, upon approval from the Thimphu Thromde.

The geotechnical and geophysical study for the construction of the NEOC was completed and a detailed topography map was prepared. The topographic map was prepared on the scale of 1.250 with 0.5m contour interval, which enabled the preparation of cross section of the site, slope map, hill shade map and DEM of the proposed site. Laboratory tests for dry density, water content, CBR, bulk density, specific gravity, permeability, soil classification and direct shear tests were performed on the proposed site with random samples.

The test results concluded that the proposed site is conducive for the NEOC construction with the following recommendations:

a. Foundation of the structure should be laid not less than 3 m depth, since the firm soil is expected at this depth.
b. Gabion walls may be constructed to protect the erosion in the lower terraces towards the valley side and the structure may be founded on firm soil.
c. Proper retaining walls and breast walls needs to be built for the stability of the road as well as slopes.

Figure 3 Existing retaining walls at the proposed site which will be replaced by a new RCC or gravity wall

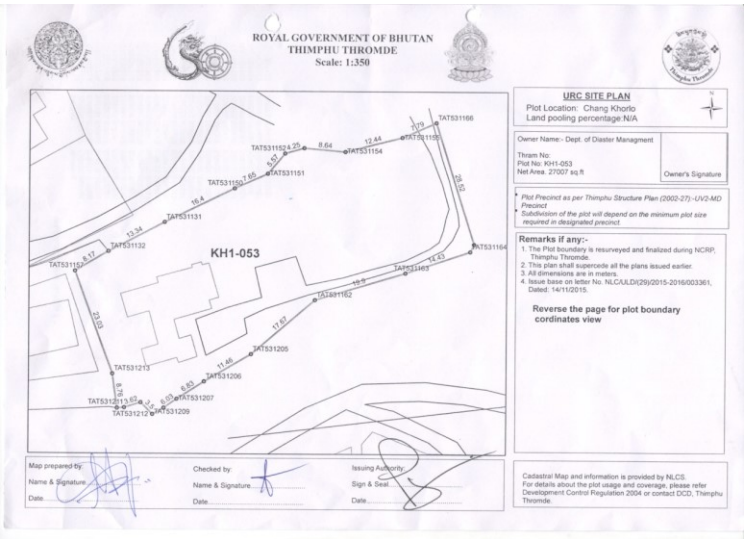


Figure 4 Site Plan with coordinates

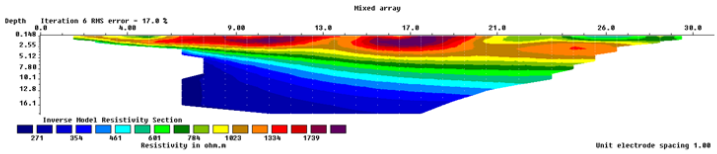


Figure 2=4A: ZZ array electrical resistivity section along profile 2(Res2dinv software)

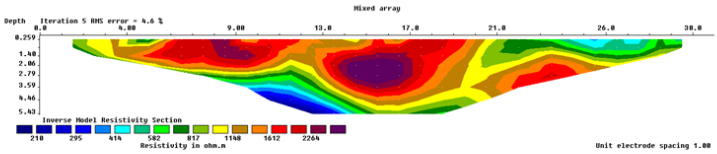
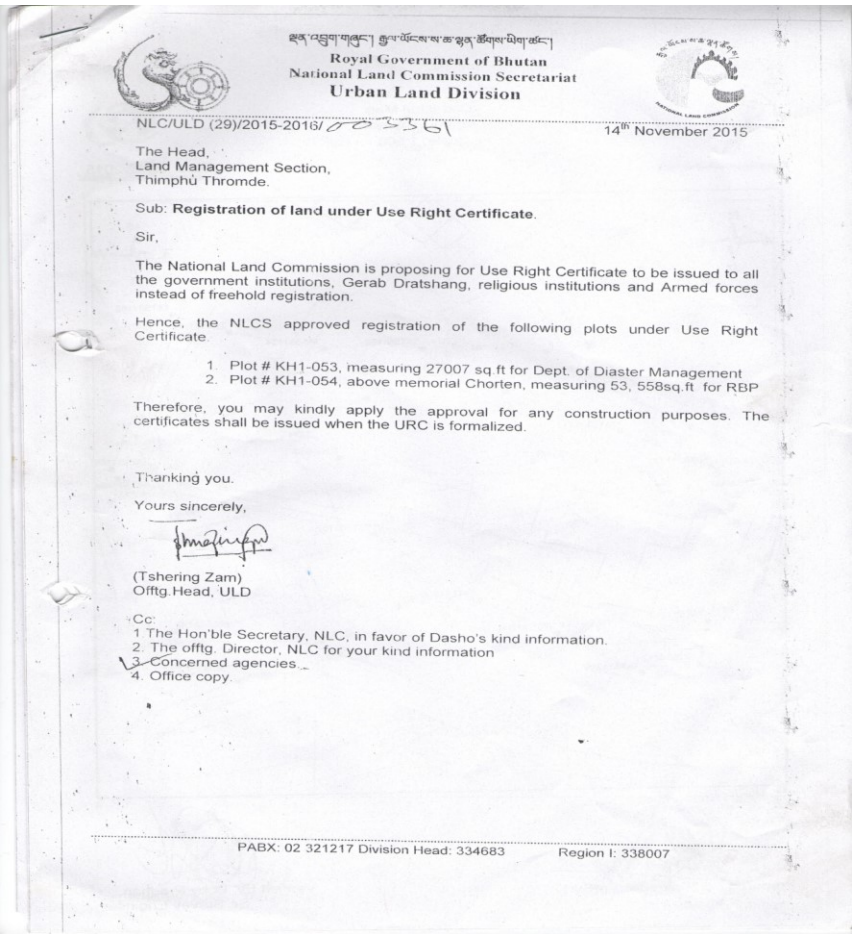


Figure 2-4B: Wenner array electrical resistivity section along profile 2(Res2dinv software)

Figure 5 Soil profile at the proposed site



Royal Government of Bhutan
National Land Commission Secretariat
Urban Land Division

NLC/ULD (29)/2015-2016/ 003361 14th November 2015

The Head,
Land Management Section,
Thimphû Thromde.

Sub: **Registration of land under Use Right Certificate.**

Sir,

The National Land Commission is proposing for Use Right Certificate to be issued to all the government institutions, Gerab Dratshang, religious institutions and Armed forces instead of freehold registration.

Hence, the NLCS approved registration of the following plots under Use Right Certificate.

1. Plot # KH1-053, measuring 27007 sq.ft for Dept. of Diaster Management
2. Plot # KH1-054, above memorial Chorten, measuring 53, 558sq.ft for RBP

Therefore, you may kindly apply the approval for any construction purposes. The certificates shall be issued when the URC is formalized.

Thanking you.

Yours sincerely,

(Tshering Zam)
Offtg.Head, ULD

Cc:
1. The Hon'ble Secretary, NLC, in favor of Dasho's kind information.
2. The offtg. Director, NLC for your kind information
3. Concerned agencies
4. Office copy.

PABX: 02 321217 Division Head: 334683 Region I: 338007

Figure 6 land user right certificate issued by NLC

4 Potential Impacts and mitigation Measures during construction phase

Minor impacts on the environment and surrounding, and social issues are expected during the construction phase. No impacts are expected during the operation phase.

4.1 The potential impacts expected during the construction phase and proposed mitigation measures are as follows:

i. Damage trees at construction site

Causes or source: These trees need to be removed for the construction of NEOC as they are located very near to the area to be built up.

Receptors of Impact: None

Significance of Impact: None

Mitigation Measures: Necessary approvals will be sought from competent authority for cutting down the trees after the approval of the construction drawings.

ii. Increased level of dust

Causes or source: Earth excavation for foundation and site development, and dumping of construction materials at site will be the main causes of increase in level of dust. Mixing of cement, aggregate and sand may also cause some level of dust pollution during major casting works such as the slab casting.

Receptors of Impact: Construction workers and staff of DDM would be the most affected. Some degree of the dust pollution may also impact pedestrians along the road.

Significance of Impact: Although no significant impacts have been reported of such practices, it is felt that such pollution may have some impacts on the health of the construction workers. The dust may also cause discomfort to the DDM staff, as it may dirty their offices more often. It may also cause some level of discomfort for the DDM staff when they are outside.

Mitigation Measures: The following mitigation measures shall be adopted at the construction site to minimize the generation of the dust:

a. Provide misting water sprays sufficient to reduce airborne dusting from the excavation of the foundation
b. Apply additional water dust suppression during dry weather
c. Avoid dust- generating works on high wind days

iii. Increased level of noise

Causes or source: Use of heavy machineries during the construction works such as excavators, mixer machines for concrete mixing, vibrator machines for concrete casting, carpentry machines,

etc. will be the main sources of increase level of noises. In addition, heavy vehicles like trucks used for transporting construction materials will also contribute to the increase in noise level. Construction workers living near the construction site may also cause additional noise in the locality.

Receptors of Impact: The construction workers and DDM staff will be the most affected. Some degree of the noise level may also impact pedestrians along the road. Slight disturbance may also be felt by the JICA office.

Significance of Impact: The increase in the level of noise may affect the DDM staff in focusing on their work. It may also have some impact on the people living in the nearby buildings. A higher degree of disturbance is expected during the starting of the construction when excavators will be deployed and during slab casting days. While excessive noise is not only annoying and distracting, but can lead to hearing loss, sleep disturbance and extreme stress, the level of noise generated during the construction work is not expected to reach this level of disturbance.

Mitigation Measures: The following mitigation measures shall be adopted at the construction site to minimize the level of noise:

a. Noise generating works such as excavation works, major cement casting works, carpentry works, and transportation of construction materials will be carried out during normal day working hours to have minimal noise disturbance in evenings and at night.
b. The workers at the site must always use personal protection equipment i.e. ear plugs to protect from the noise level at the site
c. Those workers who are not operating the noise generating equipment must avoid the areas where the noise level is high.
d. Advise the contractor to use less noise generating equipment wherever possible.
e. Temporary barriers/enclosures (e.g. plywood with sound absorbing materials) should be built around noisy equipment where possible such as the carpentry work area.

iv. <u>Pollution of soil and water sources</u>

Causes or source: Waste from excavated soil, waste generated from packaging of construction materials and domestic and sewerage waste generated by the workers will be the sources of pollution of soil and water sources.

Receptors of Impact: The construction workers and DDM staff will be the most affected. If waste is not properly managed at the construction site and the labor camp, the surrounding will also be dirtied.

Significance of Impact: Improper management of wastes could pose a great risk to the health of workers and the community. It can also deteriorate the pleasant view of the environment. Furthermore, improper disposal of waste such as sharp objects like glass and metal can injure the workers and other people accessing the site. Improper disposal of domestic waste by the workers can also lead to foul smell and may cause health hazards.

Mitigation Measures: The following mitigation measures shall be adopted at the construction site to minimize pollution of soil and water sources and proper management of waste:

a. Develop a proper waste management plan and strictly comply per the conditions set out in the plan
b. Segregate wastes into categories i.e. hazardous, degradable, non-degradable, reusable
c. Keep wastes disposal bins as required for waste segregation at the site

v. Damage to the existing infrastructure:

Causes or source: The current entry road to DDM compound will be closed and developed as a part of the NEOC construction.

Receptors of Impact: DDM staff

Significance of Impact: None. The entry will be made above the proposed construction site which is already in use.

Mitigation Measures: The DDM has already sought approval from the Thimphu Thromde for the reallocation of the access road to the DDM office. It is already in use.

Figure 7 Existing way to the DDM office

Figure 8 Newly constructed access road to the DDM office

vi. Social disturbance

Causes or source: Construction activities and the presence of workers in the project area.

Receptors of Impact: DDM staff and residents in the locality.

Significance of Impact: The construction workers may cause some noise issues during the evenings.

Mitigation Measures: The contractor will be instructed to manage the construction workers and explain the social behaviors to avoid such as making loud noises and playing music at high volumes at odd hours, maintaining proper manners and behaviors at the camp site.

vii. Safety and health risk for construction workers

Causes or source: Usually unsafe practices and constraints due to limited space can lead to accidents and injuries at construction sites, but listed below are some of the most common:

a. Failures in hazard identification
b. Lack of safety training for workers
c. Failure to wear proper safety equipment (such as helmets and safety harnesses)
d. Construction equipment malfunction or failure
e. Improper maintenance of tools and materials
f. Equipment design or manufacturing defects
g. Equipment left on the ground instead of being stored correctly (creates a trip and fall hazard)
h. Poor construction site management
i. Falling debris or dropped objects striking workers below
j. Holes in flooring
k. Improper scaffolding construction

Receptors of Impact: The construction workers and technical personnel at the site.

Significance of Impact: Accidents at constructions sites can result in a range of injuries starting from minor injuries to fatalities. The leading safety hazards on construction sites include falls, being caught between objects, electrocutions, and being struck by objects. These hazards have caused injuries and deaths on construction sites throughout the world. Motor vehicle crashes are another major safety hazard on construction sites. It is important to be cautious while operating motor vehicles or equipment on the site.

Mitigation Measures:

a. Ensuring the workers at site use personal protection equipment i.e. helmets, safety boots, goggles, gloves etc.
b. Site should be free from risk by using proper scaffolding
c. Use of good construction equipment
d. Develop a site management safety plan and follow strictly
e. Create accountability at all levels
f. Make sure the contractors are pre-qualified for safety

g. Make sure the workers are properly trained in appropriate areas

viii. Safety risk for community

Causes or source: Some of the possible risks to the nearby communities and pedestrians are:

a. dust pollution
b. traffic congestion that may lead to vehicle accidents due to increase in volume of heavy vehicle movements
c. Spillover of construction materials on the road side due to limited storage space within the construction site
d. Falling hazards from the building during construction

Receptors of Impact: Pedestrians, vehicle users and the people residing nearby.

Significance of Impact: Discomfort during walking and traffic congestion during peak hours.

Mitigation Measures:

a. Use of proper traffic signs and posting of risky sign boards to prevent accidents
b. Prohibit visits to the construction site for outside people other than the authorized persons.
c. Fence the construction area from the main road

ix. Disturb traffic and/or cause traffic safety risks

Causes or source: Heavy vehicles transporting construction materials such as boulders, TMT rebar, sand, aggregates, cement may cause traffic congestion along the road of the construction site. Limited space to stack construction materials may also cause parking issues for the DDM staff which may lead to parking along the road side.

Receptors of Impact: DDM staff and people driving along that road.

Significance of Impact: The significance may be higher during slab casting times when huge quantities of materials need to be stacked. Improper management of vehicular movements and parking could lead to accidents and fatalities.

Mitigation Measures: Some of the major considerations when planning traffic control on a construction site include:

a. Restricting vehicle and pedestrian movements to set areas wherein risk may be present when required – eg. by providing separate traffic routes for pedestrians and vehicles and securing areas where vehicles are in use with barricades or barriers
b. Ensuring both vehicles and pedestrians or site workers are visible – eg. with clear signage and lighting and by ensuring walkways are not blocked or obscured
c. Ensuring workers and visitors understand traffic rules and procedures – eg. Through the use of signage and a traffic management plan which is clearly communicated to workers.
d. Ensuring adequate timing for unloading of the construction materials such as early in the morning and late in the evening when the traffic movement is minimum.
e. Using of the traffic signals such as hand-held ‘stop’ and ‘slow’ signs could be informative to the drivers plying over the road near the construction site.

f. A team from the contractor should regulate the traffic flow when there is the loading or unloading of the construction materials.
g. Temporary fencing of the construction site.

Figure 9 Road along the construction site

Figure 10 Stream below the construction site

4.2 Potential impacts during operation phase - Once the NEOC building is completed it will host the EOC in the lower floors and the DDM office at the upper floors. No environmental and social issues are expected during the operation of the NEOC.

5 Monitoring

The ESMP will be used as the guidance to minimize any environmental and social issues at the construction site and nearby area resulting from the construction work. The monitoring and implementation of the proposed mitigation measures will be as follows:

- Based on the proposed mitigation measures, the focal person from DDM will monitor that all mitigation measures are put in place in place by the construction contractor. The Design firm which will also have the role to provide technical support to DDM during the supervision of the construction work will support DDM in monitoring the compliance of the proposed mitigation measures.
- Monitoring officers from Thimphu Thromde will conduct site inspection to ensure the earth excavated is properly disposed and the proper site management procedures are adopted.
- The DDM will set a standard, say do a check at the site once a month on the compliance of the proposed mitigation measures.
- Some of the key timings when monitoring will be required would be during the excavation of foundation, stock piling of materials for major slab casting. The Annex 11 of the ESMF shall be used to monitor the environmental issues.

6 ESMP Implementation Arrangements

The responsibility of the implementation of the ESMP falls on the construction contractor. To ensure this is done, the ESMP will be incorporated as a part of the bidding document for the construction work to be part of the contract. The monitoring of compliance of this is the responsibility of the DDM. As and when required, the Thimphu Thromde may oversee the compliance of the environment related issues such as earth dumping. The details of the compliance such as following safety occupational standards will be monitored by the DDM. With the site monitoring support from Thimphu Thromde, the DDM will ensure compliance of the conditions provided in the approvals and update them as and when required.

7. Estimated Budget for ESMP implementation

The DDM will have to bear the fees for dumping of excavated site and getting environmental clearance from the Thimphu Thromde. In addition, DDM will also have to bear subscription charges while seeking approval from NEC and other agencies. For such fees and necessary approvals, the DDM estimates BTN One lakh. Costs for implementation of mitigation measures such as safety equipment for workers will be packaged under the construction cost by the contractor.

8. Consultation, Disclosure of the ESMP

After clearance by the Bank, we will present this document to the relevant stakeholders which include NEC and Thromde, Ministry of Labour & Human Resources for their information. Administrative approval for the construction and Environmental Clearance from Thromde has already been sought by DDM. After the contractor is selected for the construction work, a presentation will be made to the contractor and his lead team members who will be engaged in the day to day work for the construction to guide them on the implementation of the mitigation measures. Presentation of the ESMP will also be done to relevant project officers at DDM for their information and provide necessary supervision at the site as required. The document will be uploaded on DDM's website for public information.