

Initial Environmental Examination

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BHU: Urban Infrastructure Project - Phuentsholing and Road and Bridge Subproject

Prepared by the Royal Government of Bhutan for the Asian Development Bank.

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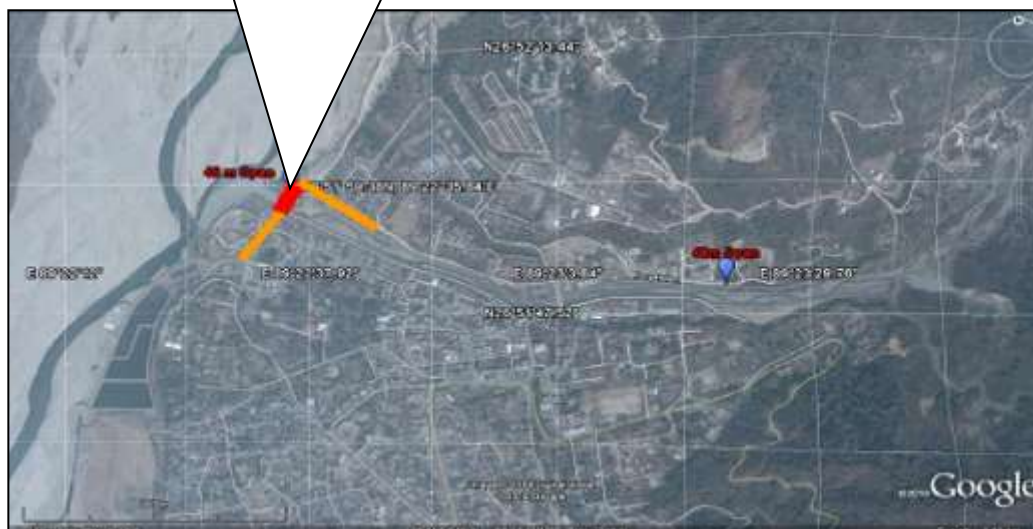
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Initial Environmental Examination

Initial Environmental Examination
Project Number: 44240-01
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August 2014

Phuentsholing Bridge and Approach Roads

Bhutan: Urban Infrastructure Project



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CURRENCY EQUIVALENTS

(As of August 2011)

Currency Unit	Bhutan Ngultrum (Nu)
\$1.00	= Nu44.0

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
CCC	Construction Complaints Committee
CEMP	Contractor's Environmental Management Plan
DES	Department of Engineering Services
DHS	Department of Human Settlement
DMSC	Design Monitoring and Supervision Consultants
DoFPS	Department of Forests and Park Services
EIA	Environmental Impact Analysis
EMP	Environmental Management Plan
ES	Executive Secretary
GRM	Grievance Redress Mechanism
IEE	Initial Environmental Examination
Msl	Meters above sea level
NEC	National Environment Commission
PDM	Phuentsholing District Municipality
PIU	Project Implementation Unit
PMO	Project Management Office
PMU	Project Management Unit
PMC	Project Management Consultants
PPTA	Project Preparation Technical Assistance
RRP	Report and Recommendation of the President (ADB)
PAM	Project Administration Manual
PT	Phuentsholing Thromde (Municipality)
Thrompon	Mayor

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EXECUTIVE SUMMARY

1. An environmental assessment was made for the proposed new bridge and approach roads of Phuentsholing District Municipality (PDM). It is one of the 3 subprojects to be funded by the Asian Development Bank (ADB) under the Urban Infrastructure Project of the Ministry of Works and Human Settlement (MoWHS). Phuentsholing is located in the southern part of the Kingdom of Bhutan on the border of India. Relative to the significance of impacts and risks, this subproject is deemed Environmental Category B based on ADB's environmental categorization and the type of assessment warranted only the preparation of an Initial Environmental Examination (IEE) report. This IEE was carried out under ADB's TA 7630-BHU and in accordance with ADB's *Safeguards Policy (2009)* and updated in October 2013.

2. The assessment was also carried out within the policy, legal, and administrative frameworks relevant to the environmental assessment of wastewater projects in the Kingdom of Bhutan. These include the following laws and regulations: (i) *National Environmental Protection Act of 2007*, (ii) *Environmental Assessment Act of 2000*, and (iii) *Regulation for Environmental Clearance of 2002*. The overall institutional setup follows the existing implementation arrangement of an ongoing project, the Urban Infrastructure Development Project (UIDP) supported by ADB, where the Ministry of Works and Human Settlement (MoWHS) is the executing agency with a project management unit (PIU) operating under MoWHS' Department of Engineering Services (DES)¹. The participating local governments are the Implementing Agencies (IAs) with their respective project management unit.

3. *Subproject Description*. The proposed Phuentsholing subproject will help improve the living conditions of the urban population by decongesting the core area and allowing an alternative route. The proposed subproject components include the following: (i) concrete bridge with of 46 m length, (ii) 136 m length of approach road in the southern side of the bridge (left bank), (iii) 70 m length of approach road in the northern side of the bridge (right bank), and (iv) improvement of 208 m of existing unpaved road in the northern side of the proposed bridge connecting the 70-m approach road. The roads shall be of 18 m width with 4-lanes and paved with bitumen.

4. *Environmental and Socioeconomic Conditions*. Project implementation will not pose significant problems to the environment since the proposed subproject is located in an urban setting. An important fact to consider is that the sites are not within undisturbed landscapes. These are urban landscapes with residential, institutional, and commercial areas. The roads have been functional for a very long time already, while the Om Chhu has river training works. Phuentsholing is the second largest city in Bhutan with a total population of 20,537². By virtue of its location on the Indo-Bhutan border, it has developed rapidly from a small settlement to being the largest commercial center of the country. As one of the main commercial gateways to Bhutan, it occupies a unique place in the national economy and contributes much towards the growth of industrialization

5. *Impacts and EMP*. Screening for environmental impacts is made through a review of the parameters associated with projects for roads and bridges against the components of the proposed Phuentsholing subproject. The screening has considered the fact that actual land uses of these areas have been residential, commercial, and institutional. The

¹ The erstwhile DUDES is reorganized into two departments viz Department of Engineering Services (DES) and Department of Human Settlement (DHS) in 2011.

² Source: Phuentsholing Municipality website <http://www.pcc.bt/>

proposed associated roads will be in existing roads. The proposed subproject is therefore not a new incursion to an ecologically untouched area.

6. During detailed design and pre-construction phase, potential nuisances and problems to the public during construction shall be addressed by inclusion in the tender documents of specific provisions addressing these issues. Although there are no issues related to historical and cultural assets, a precautionary measure shall be taken by inclusion of provisions in tender and construction contract documents requiring the contractor to immediately stop excavation activities and promptly inform the authorities if archaeological and cultural assets are discovered.

7. The potential impact to the river due to the occurrence of vortex-induced turbulent flows at the bridge pier may also affect fish habitats. Without a mitigating measure, this impact could become permanent. This issue shall be addressed during the design phase by the inclusion of scour countermeasures to prevent the occurrence of vortex-induced turbulent flows such as placement of precast concrete armor units around the base of the pier. Pollution of the river during bridge construction by excavated materials and construction wastes can be significant though temporary.

8. Adverse environmental impacts during construction are temporary, less than significant, and can easily be mitigated. There will be no major earthworks since the roads will follow existing contours. However significant excavation for erecting the abutments is foreseen. Piling driving activities in the center of the Om Chhu will be limited to only one pier. No blasting activity is foreseen at the moment. Should a need arise during construction, a controlled blasting technique (using 'silent blasting' technique e.g. Use of Acconex) shall be adopted. Typical construction issues are manageable with the implementation of a Contractor's Environmental Management Plan (CEMP) for: (i) erosion and sediment runoff, (ii) pile driving aquatic impact, (iii) nuisance to the public, (iv) noise and dust, (v) vehicular traffic, (vi) construction wastes, (vii) oil and fuel spillages, (viii) construction camps, (ix) occupational health and safety, and (x) public safety and convenience.

9. An Environmental Management Plan is developed to effectively manage the environmental issues. The plan includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional set-up discusses the requirements and responsibilities during pre-construction, construction, and operation phases. The plan includes tabulated information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures and monitoring.

10. *Consultation and Participation.* Project planning and the subsequent IEE preparation for the proposed bridge and roads subproject recognized the need for public consultation and participation as central to effective environmental safeguard. Within the context of "meaningful consultation," Phuentsholing initiated a process of consultation during project preparation and intends to continue it during the construction phase. Phuentsholing conducted an initial public consultations and information disclosure on 29 July 2011. Participants included: (i) elected people's representatives from various areas of Phuentsholing, (ii) Phuentsholing Executive Secretary, (iii) staff, and (iv) PPTA Consultant. Details of the subproject components were presented to the stakeholders and their views on the proposed bridge and roads were requested. Stakeholders expressed support to the proposed subproject. Project disclosure activities were also done during the conduct of a socioeconomic survey in July 2011. A focus group discussion (FGD) was also conducted last 24 July 2011 in Phuentsholing with stakeholders and key informants.

11. *Grievance Redress Mechanism.* Implementation of the proposed Phuentsholing subproject will be fully compliant to ADB's safeguards requirement on grievance redress mechanism. Phuentsholing shall disclose the proposed mechanism in public consultations during detailed design and in meetings during the construction phase. Complaints about environmental performance of projects during the construction phase can best be handled by an ad-hoc Construction Complaints Committee (CCC) for the expeditious resolution of the complaints. Phuentsholing shall form the ad-hoc CCC to be chaired by its PIU head. Members shall include the following: (i) contractor's representative at the site such as Construction Manager or Construction Superintendent, (ii) the elected people's representative of the area, the "Thuemi", and (iii) Phuentsholing's PIU head. Creation of the ad-hoc CCC and its operation shall be included in appropriate sections of the civil works contract.

12. *Conclusion and Recommendation.* The northern area of Phuentsholing is presently connected to the core area by an old bridge that cannot be closed even for minor repairs due to the lack of an alternate route. Local officials raised the urgent need of having another bridge and should the old bridge collapse, the northern area will be isolated. The proposed bridge and associated roads under UIP will provide a reliable alternate route and will increase confidence on accessibility between the core area and the northern area. The bridge will greatly help the development of the town since the industrial activities are located in the northern area. With the bridge, the interaction between the core area and the northern area will be facilitated. Pedestrian safety is also considered in the bridge design with the provision of a 1.7-meter pedestrian footpath on both sides. The bridge will help decongest the core area since people at the other side of the river who need to go shopping can easily reach the core area by foot instead of bringing their cars through the existing bridge. In the future, it will also help decongest the core area since it will become part of a proposed by-pass route. Trucks coming from India and passing through Phuentsholing shall be asked to use this route and by-pass the core area.

13. Analysis of potential environmental impacts revealed no significant adverse impacts to people and environment from the proposed bridge and roads subproject. The IEE concludes that adverse environmental impacts arising from the location, design, construction, operation, and maintenance of the proposed subproject can be mitigated to less significant levels and the corresponding mitigation measures are doable. Monitoring can easily be done. The project can be implemented in an environmentally acceptable manner. An expanded environmental impact assessment is therefore not warranted, and this IEE shall be finalized as the final environmental assessment document of the Phuentsholing subproject. Its environmental classification as Category B is deemed appropriate.

14. Project Management Unit (PMU) and PIU shall ensure that EMP requirements for the construction phase will be reflected in the tender documents and civil works contracts and implemented including the contractors submission of a Contractor's Environmental Management Plan (CEMP). PMU shall monitor PIU's compliance to the EMP. In addition, creation of Construction Complaints Committee (CCC) and its operation, as part of the grievance redress mechanism, shall be included in appropriate sections of the subproject's civil works contracts. Institutional strengthening of Phuentsholing, including training, is recommended for effective EMP implementation. PIU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

I. INTRODUCTION

1. The Phuentsholing District Municipality (PDM) is a local government located in the Kingdom of Bhutan and one of the selected subprojects under the Urban Infrastructure Project (TA 7630 -BHU) funded by the Asian Development Bank (ADB). The objective of the TA study is to assist the government of Bhutan to prepare a project for sustainable urban development in its two largest cities and two large towns. It is intended to improve the livability and competitiveness in urban areas through the provision of better facilities such as roads, water supply and sanitation infrastructure.

2. Preparation of this Initial Environmental Examination (IEE) is part of the activities under TA 7630-BHU. It provides ADB with an assessment of the environmental concerns to be considered regarding the subproject location, design, construction, and maintenance. This report is also intended to assist the Phuentsholing Municipality in the preparation of the required environmental document to meet the National Environment Commission (NEC) requirements for an application of the necessary Environmental Clearance (EC) before the start of the construction activities.

3. This IEE prepared earlier by Poyry IDP Consult, Inc. (Philippines) in association with Progressive Research and Consultancy Services, (PRCS) (Bhutan) has been updated and finalized in August 2014 under the DMSC Project of ADB – 2816. Preparation of the IEE involved field visits to the proposed subproject area; review of available information, discussions with local government officials, NEC, and other government agencies, and members of the community within the subproject area. The assistance of the Phuentsholing Municipality and staff in arranging the site visits, meetings, and providing support during the conduct of the study is gratefully acknowledged. The report was finalized after reviewing the earlier IEE report (August 11, DRAFT v. 2), field visits for data update and discussions with PIU and PDM. Field assessment and data update were carried out within the 18 m road corridor/Right of Way (RoW), 9 m either side from the centerline fixed by PIU for the project.

4. The IEE has been carried out in accordance with *ADB's Safeguard Policy (2009)* and the requirements describe in its Appendix 1 (Safeguards Requirement 1 - Environment). The IEE follows the outline prescribed in the Annex to Appendix 1 excluding the section on analysis of alternatives (not necessary for an IEE). It also considers the laws of Bhutan and its requirements for environmental clearance as embodied by its *Environmental Assessment Act of 2000*.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

5. The policy, legal, and administrative frameworks relevant to the environmental assessment of infrastructure projects in Bhutan have been established by the following laws and regulations: (i) *National Environmental Protection Act of 2007*, (ii) *Environmental Assessment Act of 2000*, and (iii) *Regulation for Environmental Clearance of 2002*. At the policy level, environmental protection and conservation is a state policy in Bhutan under its constitution. The government is mandated to (i) protect, conserve, and improve the pristine environment, (ii) safeguard biodiversity, and (iii) prevent pollution and ecological degradation.

6. The *National Environmental Protection Act of 2007* is the overall law on environmental protection and specifies the powers, functions, and operational framework of NEC, an agency of the government mandated to look after all issues related to environment in Bhutan. One feature of this law is maintenance of environmental quality through the enforcement of environmental standards and promotion of best environmental management practices to address pollution and environmental hazards.

7. The *Environmental Assessment Act of 2000* was enacted to establish procedures for the assessment of the potential effects of strategic plans, policies, programs and projects on the environment and for the determination of policies and measures to reduce potential adverse effects and to promote environmental benefits. Under this law, no development consent can be issued without first seeking an Environmental Clearance - the decision under Chapter III of the same act, issued in writing by the Secretariat or the Competent Authority, to let a project proceed, which includes terms to ensure that the project shall be managed in an environmentally sound and sustainable way.

8. Development consent refers to the approval issued or renewed by a Competent Authority in the form of a license, lease, or permit for land use or construction. A Competent Authority is an agency of the government that has the power to issue development consent for a project. However, when an applicant is also a Competent Authority, NEC shall be the Competent Authority with jurisdiction to issue an environmental clearance. This law emphasizes the importance of public consultation and requires the applicant to consult all concerned people and organizations prior to submission of the application or the environmental assessment documents to the Competent Authority.

9. Following the *Environmental Assessment Act of 2000*, the *Regulation for Environmental Clearance of 2002* was adopted. The Regulation defines responsibilities and procedures for the implementation of the *Environmental Assessment Act of 2000* concerning the issuance and enforcement of environmental clearances for individual projects. Information on the process for obtaining an Environmental Clearance and the timeline for processing is presented in the appendices.

10. Aside from environmental laws and regulations, the 2004 Penal Code of Bhutan also has a provision on environmental pollution wherein its Article 409 provides that a defendant shall be guilty of the offense of environmental pollution if such defendant knowingly or recklessly pollutes or contaminates the environment including air, water, and land and makes it noxious to public health and safety.

11. International conventions are also part of the environmental framework since Bhutan is a party to some international conventions, treaties and agreements on the principles and actions necessary for sustainable development and environmental protection. It has ratified the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change (25th of August 1995). These international conventions explicitly reference the application of environmental assessment to address the effects of human activities. The Convention on Biological Diversity, in particular, promotes the use of appropriate procedures requiring environmental impact assessment of proposed projects that are likely to have significant adverse effects on biological diversity

12. The overall institutional setup follows the existing implementation arrangement of an ongoing project, the Urban Infrastructure Development Project (UIDP) supported by ADB, where the Ministry of Works and Human Settlement (MoWHS) is the executing agency with a project management unit (PMU) operating under MoWHS' Department of Engineering Services (DES). The participating local governments are the implementing agencies with their respective PIU.

III. DESCRIPTION OF THE SUBPROJECT

A. Location

13. The proposed project is located in downstream area of the Om Chhu in Phuentsholing Municipality (Figure 1). This site is very near the junction of the Om Chhu and Amo Chhu, a very large river. During non-summer months this section of the Om Chhu has very little flow. Presently, grasses and shrubs dominate the site's riverbank, while the riverbed near the riverbanks can easily be seen due to a very low flow (APPENDIX -_Photographs Nos.1 and 2). According to PIU, there are no available studies of the Om Chhu regarding biodiversity situation. The bridge pier will be located at the center of this river section.

Figure 1: Location Map of Proposed Bridge and Approach Roads



B. Components and Cost Estimate

14. The proposed subproject components include the following: (i) a 46 m long PC I Girder Bridge of 19 m width over Om Chhu river, (ii) 136 m length of approach road in the southern side of the bridge (left bank), (iii) 70 m length of approach road in the northern side of the bridge (right bank), and (iv) improvement of some 208 m of existing unpaved road in the northern side of the proposed bridge connecting the 70 m approach road. The roads shall be of 18 m width with 4-lanes and paved with bitumen. This bridge and roads are part of a proposed bypass/link road. It is located in the western part of Phuentsholing as shown in Figure 1.

15. The proposed bridge is designed to primary urban road standard in terms of width and lanes (18 m width with 4-lanes). It shall be provided with footpaths and drains on both sides and a divider in the middle. It is a pre-stressed I-girder reinforced cement concrete bridge with pile foundations. Its overall design span is 46 m with an intermediate pier that divides the span into two equal spans of 23 m length each. The associated approach roads are also designed to primary urban road standard. These roads will be on embankments ranging from 1 m to 2 m heights with retaining structures.

16. *3D Model of Proposed Bridge*. A 3D model of the proposed bridge is presented in Figure 2 for a better visualization of the proposed structure. The pier of the proposed bridge shall have a width of 1.4 m, which is only 3% of the river's total width.

Figure 2: 3D Model of Proposed Bridge



C. Construction

18. Construction of approach roads will require: (i) clearing of the existing road and marking of alignments, (ii) stockpiling of materials for road construction such as sand, gravel, soil and bitumen, (iii) preparing the road bed for pavement construction, (iv) laying of pavement, (v) cleaning and site closure of construction sites and (vi) dismantling and removal of existing houses and part of city electricity office, electric lamp posts, overhead power lines, boundary walls, fences and drains (on the left bank) and relocation of RBP Outpost, demolition of embankment, STP complex, residential quarter and fencing (on the right bank). Bridge construction will require: (i) clearing the abutments areas and marking of alignments, (ii) stockpiling of construction materials, (iii) pile driving for bridge supports at the bridge center and abutment areas, (iv) concreting, (v) placement of pre-cast components such as beams, and (vi) cleaning and site closure of construction sites. During construction of bridge and approach roads temporary closure of the existing footpath and diversion of the road users are essential to prevent accidents to road users from construction activities and also to allow undisturbed work progress.

19. Piles installation for the pier shall use a crane-supported pneumatic pile driver to sink the piles into the riverbed. This device uses air pressure to raise and drop a heavy hammer onto a pile. The hammering mechanism will move on vertical steel tracks called leads to be attached to the crane. The leads, which shall be longer in length than the piles, will be lifted vertically into position by the crane over the area where the pile shall be driven. The bottom of the leads has an anchor that sinks into the riverbed, holding it in place. To raise a pile into the leads, the crane operator shall first lower the hammering mechanism close to the riverbed where a worker would attach flat nylon straps to the hammer to secure the pile. As the hammer is raised back up, the pile shall be lifted with it until it was fully upright in the leads. The hammering mechanism once started (the machine's repeated actions of raising and dropping of the hammer on the top of the pile) drives the pile into the riverbed. The crane can easily be positioned in the riverbank to do the work since the pier distance from the riverbank is only 23 meters.

D. Implementation and Operation

20. The proposed bridge and roads shall be operated and maintained by the Phuentsholing Thromde. Responsibility for roads and bridges within the Thromde now rest on the local government and in cooperation with the Department of Roads (DoR). Construction is scheduled to start on the fourth quarter of 2014 and expected to be completed by end of 2016.

IV. DESCRIPTION OF THE ENVIRONMENT

21. A brief description of the existing environmental and socioeconomic conditions of the Phuentsholing subproject influence area is presented in the following subsections:

A. Physical Resources

22. Phuentsholing is strategically located on the border with India and has an entrance/exit gate with the Indian city of Jaigaon. It occupies the river terraces of the Om Chhu and is confined by steeply rising foothills to the north and east, and by the Amo Chhu to the west. It is relatively flat town by Bhutanese standards. Topography around the core of the town is generally undulating, but there is considerable and expanding development on the sleeper periphery. Elevations range from 190 msl to 320 msl approximately. Areas to the north of the city consist of steep slopes, with many of the slopes already denuded for housing development thus leaving little room for further expansion. Land within the Phuentsholing Thromde boundaries is 320 ha, but only 180 ha is suitable for development and is already fully developed. Because of land constraints, development has already grown beyond the existing city boundaries to the elevated areas like Kabreytar, Damdara and Kharbandi to the north and Pasakha to the east.

23. The urban area is divided by the Om Chhu. This river rises in Bhutan and discharges to the Amo Chhu, one of the major rivers in Bhutan, originating from China. Flow discharges can reach as high as 1000 m³/s and flooding can occur. Phuentsholing experiences warm sub-tropical climatic conditions, with temperatures ranging between 10 to near 40°C during the summer. The local climate is wet, and the highest rainfall of the country is reported to occur in the southern foothills including Phuentsholing town where it has been known to reach a total maximum of 4,400 mm.

24. Geologically, Bhutan is divided into two broad geological zones, the Lesser Himalayan belt along the southern and southeastern border and the Tethyan belt in remaining parts. The Lesser Himalayan formation includes a wide range of sedimentary and low grade metamorphic rocks including argillites and metargillites, sandstones, quartzites, limestone, dolomite and gypsum. The Tethyan formation mainly includes stronger gneisses that accounts for more than 70 per cent of the country's bedrock and schists and marble, affording a relatively high degree of stability, compared to other locations in the Himalayas. Chhukha district falls in the Lesser Himalayan belt with tectonically active sedimentary and meta-sedimentary rocks, gneiss, schist, quartzite and limestone. The "main central thrust" area falls close to Phuentsholing. Hence, it is underlain mostly with schistose rocks. The majority of the soil in and around the town is of weaker phyllites. This makes the soil texture very fine and hence the slopes very unstable.

B. Ecological Resources

25. The sites of the proposed bridge and approach roads are within the urban area. Devoid of forested areas in the urban area, the road corridors and immediate environs are unlikely habitats for large wild animals, rare or endangered species. Farm and domesticated animals are therefore the large faunal species such as cows, goats, house

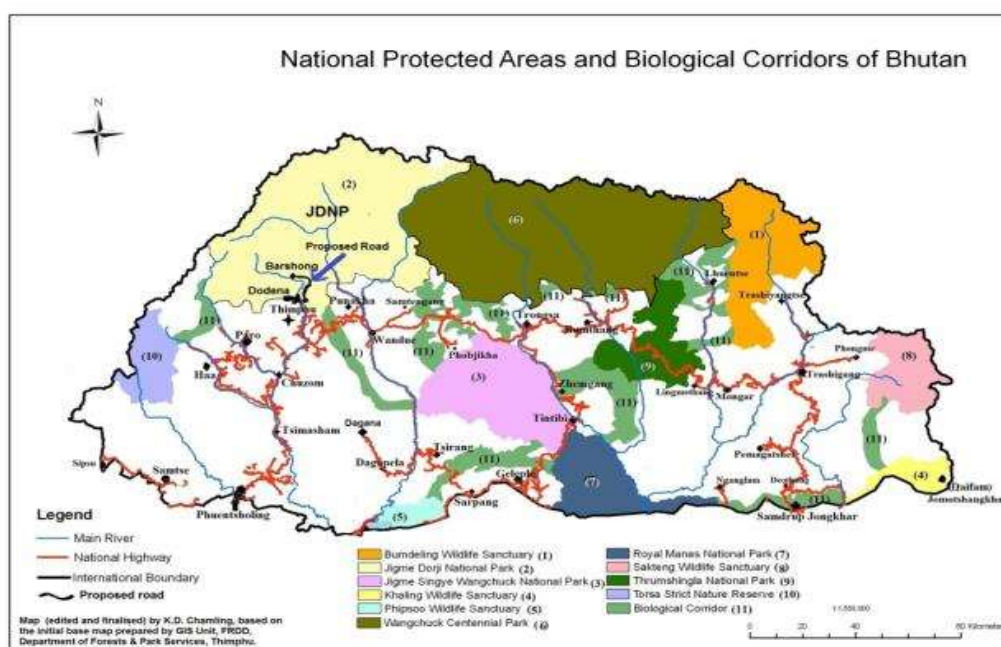
cats, and dogs. Avi faunal species found are crows, pigeons, doves, sparrows, bulbuls, robin blue, tailor birds etc. Subtropical ornamental plants have been planted within the city including mature trees in recreational ground.

26. According to the PIU, there are no available studies of the Om Chhu regarding: (i) biodiversity situation, (ii) monthly average flow, and (iii) river flow velocity. However, the PIU has noted that there are few fish species in the river during summer and some prawns and crabs in winter. The river is monsoon fed with very little to no running water in the dry or winter months. The volume of water in the river is directly proportionate to the precipitation in the catchment of this river.

27. An important fact to consider is that the sites are not within undisturbed landscapes. These are located in urban landscapes with residential and commercial areas and roads that have been functional for a very long time already. Hence, over the years the ecological changes due to human activities in these areas resulted to the present residential and commercial landscapes. Houses, school buildings, and other community structures are good indicators that indeed this area has long been transformed into its present landscape.

28. *Protected Area.* Bhutan has ten protected areas, five of which are designated as national parks, four are wildlife sanctuaries, and one is a strict nature reserve. Information from the Nature Conservation Division (NCD) of the Department of Forests & Park Services (DoFPS) indicated that there are no protected areas in and around Phuentsholing.

Map of protected areas in Bhutan



C. Economic Development

29. By virtue of its location on the Indo-Bhutan border, Phuentsholing has developed rapidly from a small settlement to being the largest commercial center of the country. As the main commercial gateway to Bhutan, with an industrial estate (in Pasakha) and mega projects like Chhukha and Tala Hydro Power projects in its immediate hinterland, Phuentsholing occupies a unique place in the national economy. The function of the city is manifold, acting simultaneously as the commercial center, industrial center, institutional center, and administrative center. Phuentsholing contributes much towards the growth of industrialization of the nation. This is evident from the type and number of industries located in the city and its hinterland, investment and employment generation. Industries like Bhutan Polythene Company, Drangchu Beverages, Bhutan Board Product Ltd. and few other small and medium size industries are operating from the existing industrial area of the city. Chhukha Dzongkhag, including Phuentsholing town, was recorded to have a total of 1,406 industrial establishments in 2003, most of them being contract based. In addition Phuentsholing has a number of wood processing and agro based industries.

D. Socio and Cultural Resources

30. Phuentsholing is the second largest city in Bhutan with a total population of 20,537. The unprecedented growth of the city during 1986-1991 converted the surrounding forests and available agricultural land into residential, commercial and other uses to accommodate the increasing population. The population is projected to reach 67,000 by the year 2027.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

31. A comprehensive screening for environmental impacts is made through a review of the parameters associated with roads and bridge projects against the components of the proposed Phuentsholing subproject and the environment where the facilities will be located. A screening checklist was developed from various sources such as ADB's "Rapid Environmental Assessment (REA) Checklist, and World Bank (WB) Environmental Source Book. Some items of the checklist may not be applicable to this particular subproject. However, they are included in the discussions to indicate that their applicability was reviewed in the environmental impact screening process. This will help identify which topics do not require further attention.

32. The assessment is made on the following phases of the subproject: (i) Pre-construction, (ii) Construction, and (iii) Operation and Maintenance. Results of the environmental impacts screening are summarized in Table 1, while the discussions of each issue are presented in the succeeding sections. In Table 1, impact types and magnitudes are indicated for both impacts without the mitigating measures and the resulting situations when mitigating measures will be implemented. The screening table uses the symbols "+" for positive impacts and "-" for negative impacts. Symbols for impact magnitudes are "Δ" for insignificant and "●" for significant. The symbol for an insignificant negative impact is "Δ -", while a significant negative impact is "● -". The second column of the table indicates the type and magnitudes of the impacts without any mitigating measures being applied. Some impacts have already insignificant magnitudes even without mitigations and mitigating measures are therefore no longer required. The last column of the table indicates the expected impact magnitude after applying the mitigating measures. Hence, a significant negative impact (● -) will become insignificant (Δ) after applying the mitigating measures. A summary of the environmental impacts that should be carried to the

section for Environmental Management Plan (EMP) is presented at the end of this section as Table 2.

33. Environmental impacts arising from decommissioning of facilities were also reviewed but are no longer further discussed due to the following: (i) decommissioning of facilities is a remote possibility since these will serve growing urban areas and such facilities are critical for sustaining those areas, (ii) residual waste cleanup is not a major concern since the facilities are not industrial manufacturing plants with potential problems for toxic and hazardous wastes, and (iii) solid wastes from decommissioning is also not a major concern since the structures are mostly made of reinforced concrete and the solid wastes are mostly recyclable materials such as broken concrete materials, reinforcing steel bars used in the structures, structural steel, etc.

Table 1: Summary of Environmental Impacts Screening

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Encroachment to environmentally sensitive areas	na	na
Impacts and risks to biodiversity conservation	● –	Δ
Potential damage to historical areas and cultural areas	Δ –	Δ
Potential nuisance and problems to the public	● –	Δ
CONSTRUCTION PHASE		
Modification of construction site topography	Δ –	Δ
Removal of Trees/fruit trees	● –	Δ
Displacement of Rare or Endangered Species	na	na
Demolition/relocation of existing structures (fencing, footpath, LT electric poles, semi-permanent huts/quarters)	● –	Δ
Demolition and relocation of Sewer pump and electricity supply switch gear unit	● –	Δ
Soil erosion and sediments of construction sites	● –	Δ
Bridge construction/Pile driving aquatic impact	● –	Δ
Noise from construction equipment	● –	Δ
Local air pollution due to construction activities	● –	Δ
Oil and other hazardous materials releases	Δ –	Δ
Vehicular traffic congestion and public access	● –	Δ
Hazards to public due to construction activities	● –	Δ
Pollution and health risk due to workers camp	● –	Δ
Occupational Health and Safety at Work Sites	● –	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● –	Δ
OPERATION AND MAINTENANCE PHASE		
Hydrodynamic and ecological effects to the river	● –	Δ
Waterlogging and soil erosion due to clogged and inadequate drainage facilities	● –	Δ
Increased risk of accidents	● –	Δ
Increased risk of water pollution	● –	Δ

Environmental Impacts and Risks	Without Mitigation	With Mitigation
Increased noise levels due to increase vehicular traffic	● -	Δ
Increased air pollution due to increase vehicular traffic	Δ -	Δ
Improved accessibility	● +	● +

Legend: n.a. = not applicable; Δ = insignificant; ● = significant; + = positive; - = negative

(● -) significant negative impact; insignificant negative impact is (Δ-)

A. Design/Pre-Construction Phase Considerations

34. *Encroachments.* The proposed bridge and associated roads will not be new incursions to an ecologically untouched area. The sites actual land uses have been residential, commercial, and institutional. The sites for the approach roads have been used as roads, while the riverbanks are essentially open spaces with secondary growth of grasses and shrubs. There are no known archaeological and cultural assets in these sites that may be affected by the proposed bridge and roads. Nevertheless, precautions will be taken to avoid potential damage to any archaeological and cultural assets by inclusion of provisions in tender and construction documents requiring the contractors to immediately stop excavation activities and promptly inform the authorities if archaeological and cultural assets are discovered.

35. *Design Measures.* During the design phase, the consultants shall review the bridge design with the aim of reducing impacts to river hydrodynamics and fish habitats by evaluating the following: (i) use of scour countermeasures in preventing the generation of vortex-induced turbulent flows at the bridge pier and (ii) pier location. For the roads, the consultants shall ensure that the drainage system shall be designed with appropriate water carrying capacities thorough a detailed study of the road catchment hydrology. These requirements for design measures shall be included in the TOR of the design consultants.

36. *Impacts and risks to biodiversity conservation.* The potential impacts and risks to biodiversity conservation is the occurrence of vortex-induced turbulent flows at the bridge pier. Without any mitigation, the pier will experience scouring at its base and the vortex-induced turbulent flows may also affect fish habitats. Design of the bridge pier shall therefore include scour countermeasures to prevent the occurrence of vortex-induced turbulent flows such as placement of precast concrete armor units around the base of the pier. The construction of bridge abutments requires earthwork exaction. Adequate measures need to be in place to ensure that river pollution is avoided or minimized with preventive and mitigation measures.

37. *Nuisance and Problems to the Public.* Potential nuisances and problems to the public during construction of the proposed bridge and roads can best be avoided if proactively addressed during detailed design and pre-construction phase. Consultation and information dissemination to potentially affected people shall be done during detailed design. Tender documents shall include provisions addressing potential nuisances and problems to the public during construction. These include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (v) public safety and convenience. These shall also be reflected in the construction contracts.

38. *Damages to existing structures:* Field assessment (recorded within the 18 m road corridor) has shown that the project will affect buildings, huts, road side drains, trees and fruit bearing trees, street lights, Low Tension overhead electricity lines, fences, footpaths and sewer treatment pumping structures and man-hole covers. On the right bank a Community Police Outpost with a lamp post will be affected and needs to be relocated. (Refer Table 2 below). The costs for demolition, restoration or relocation of affected structures need to be properly assessed and included in the design and reflected in the contract package.

Table 2: Lists of affected structures (within 18 m road corridor)

Sl. No.	Structures	Quantity	Location	Remarks
A : Left bank of Om chhu				
1.	Street light	1 no.	Take-Off point (Ch. 0.000)	Needs relocation.
2	Lined drains (covered)	18 m.	-----“-----	Replace with a box culvert.
3	Brick wall with 5-strand angle fencing	18 m		Demolition. (City Elec. Office compound.)
4	Semi-permanent hut	1 unit	Inside the city electricity office (old) compound.	Demolition. (The hut has been vacated and reusable materials, such as CGI sheets, windows, doors and wooden timbers have been salvaged.)
5	Water storage tank	1 no		Demolition.
6	Lamp post	1 no		Demolition
7	City electricity Office	1 unit		Demolition (currently vacated)
8	Brick wall with 5-strand angle fencing	18 m		Demolition. (City Elec. Office compound.)
9	LT overhead lines with posts	1 no	Outside city elec. Office compound	Relocation or raising.
10	Storm water drain	18 m		Needs replacing with Hume pipe drain during approach road construction.
11	Trees_ flowering/fruiting	11 Nos.		Needs felling.
12	Street light	1 no		Relocation.
13.	Footpath (including angled fence and paved road)	18 m		Restoration
B.: Right bank of Om chhu				
14	Community Police Outpost with lamp post	1		Relocation on specified site by RBP.
15	Footpath on embankment	5 m		End portion near Police outpost.
16	STP pumps	1 unit	Inside	Entire system to be

			compound	relocated.
17	Power supply electric box	1 unit	Inside compound	Entire system to be relocated
18	Permanent house	1 unit	Inside compound	Driver's residence. (Vacated and reusable materials salvaged already.)
19	Trees/fruiting trees	11 nos	Inside compound	Needs felling
20	Sign board	1 no.	Outside compound	Relocation
21	Drains	74.2 m	Besides YDF	Demolition
22	Cross-drain	7.5 m	Near Police Outpost	Needs demolition.
23	Sewer line manholes	2 nos	Along the road	Needs protection.
24	Street lights	2 nos	Along the road	Relocation

B. Construction Phase Environmental Impacts

39. *Site Preparation.* Construction of the proposed bridge and roads will not involve modification of the construction site topography. The road will follow as much as possible the existing site contour. This issue is therefore considered not significant. Removal of trees (fruiting and flowering mainly inside the compounds) will not be an issue since the sites for the approach roads have been used as roads, while the riverbanks are essentially open spaces with growth of grasses and shrubs. However, prior permission needs to be obtained from relevant office for felling and removal. The issue on displacement of rare or endangered species is not applicable to this subproject since there are no known rare or endangered species within the proposed sites.

40. *Soil Erosion and Sediment of Construction Sites.* During rainy periods, exposed soil at the construction site can easily be washed away by runoff and carried to the natural drainage system. Hence, soil erosion of the construction sites could occur if preventive measures are not instituted. Construction of approach roads will damage existing drains at three locations. Adequate remedial measures need to be provided to prevent flooding of roads.

41. Mitigation. Control of the surface runoff is necessary in preventing erosion. The contractor shall be required to use structural erosion prevention and sediment control practices which will divert the storm water flows away from the exposed areas, prevent sediments from moving offsite, and reduce the erosive forces of runoff waters. These may include the following: (i) interceptor dikes, (ii) pipe slope drains, (iii) straw bale barriers, (iv) sediment traps, and (v) temporary sediment basins. Whenever possible, total exposed area shall be minimized. Part of the drains affected by the project need temporary to permanent redesign to address the drainage system both during construction and operation phases.

42. *Pile Driving Aquatic Impact.* Pile driving may generate sound pressure underwater due to the high-energy capacity hammer driving the piles. The generated underwater sound pressure may be harmful to fish and other aquatic animals. This situation may occur in the pile driving for the pier foundation of the proposed bridge. It is not applicable to the abutment foundation since its location is not in the water, but in land.

43. Mitigation. Underwater sound pressure generation can be reduced by: (i) use of a soft-start pile driving where the hammer is not used at full strength at the start of a pile driving session, and (ii) installing a sleeve casing lined with polyurethane around the pile with some clearance and within the entire water depth during pile driving. Whenever possible, the contractor may schedule the pile driving activities during non-summer months where the river flow is very small.

44. *Construction Noise*. Potential sources of noise are the construction equipment, such as trucks and other equipment, which can generate noise of 80 dB(A) from a distance of 30 meters. Loud noise sources such as blasting are not expected in the construction activities of the Phuentsholing subproject.

45. Mitigation. Nuisance from equipment noise can be mitigated with the use of sound suppression devices for the equipment. In areas near any house or noise-sensitive sites, noisy equipment shall not be operated during nighttime to early morning (22:00H – 06:00H). According to NEC standards, noise levels in residential areas should not exceed 55 dB(A) during daytime and 45 dBA during nighttime. Noise levels in commercial areas should not exceed 65 dB(A) during daytime and 55 dBA during nighttime. Workers using noisy equipment shall be provided with ear plugs.

46. *Local Air Pollution Due to Construction Activities*. Dust generation from earthworks and soil preparation activities during dry periods will be an air pollution problem. Intermittent episodes of air pollution from smoke belching equipment may also occur. This issue is considered significant during dry periods. Another potential source of air pollution are large stockpiles of construction materials such as soil and aggregates. Without any mitigating measures, dust generation could be significant during dry periods.

47. Mitigation. The contractor should be required to perform regular water spraying of the sites during dusty periods in order to reduce the generation of dusts. He will also be required to use equipment that are properly maintained and are not smoke belchers. Covers for stockpiles that will be left idle for a long time shall be required. Covers will prevent dust generation due to wind action.

48. *Oil and other hazardous materials releases*. Heavy equipment and vehicles will be used in the various construction activities for the Phuentsholing subproject. Aside from fuel, oil, and grease, the activities may also involve the use of paints and solvents. Although there is potential for accidental releases of these materials, the issue is not considered significant since expected quantities will be relatively small. However, as part of good construction practice, the contractors will be required to implement an awareness program for all workers regarding the prevention and management of spills and proper disposal of used containers. Fuel and oil shall be stored in a designated secured area provided with an impermeable liner to prevent the accidental spills from seeping into the ground.

49. *Vehicular Traffic Congestion and Public Access*. Road construction activities may cause traffic congestion in narrow streets. It may hinder public access. This issue is considered significant since the existing roads to be upgraded are connected to narrow roads. Near the approach roads of the bridge have commercial activities. During construction, vehicles movement to and from these commercial establishments will be hampered by the movement of equipment and hauling of materials.

50. Mitigation. Contractors shall be required to: (i) prepare a traffic plan and (ii) closely coordinate with local authorities for the closure of roads or rerouting of vehicular traffic. Timing of construction activities in any sites should consider the schedules of local activities with heavy presence of people such as festivities, processions, parades, etc.

51. *Hazards to public due to construction activities*. Road construction activities may result to hazardous driving conditions since vehicles would still be using the road while construction activities are ongoing. The movement of construction vehicles and excavations would pose some hazards to the driving public.

52. Mitigation. The contractor shall be required to implement a road safety plan incorporated in his construction schedule. Safety measures shall be implemented including: (i) warning signs to alert people of hazards around the construction sites, (ii) barricades, and (iii) night lamps for open excavations.

53. *Pollution and Health Risk due to Workers Camp*. The contractor is expected to erect temporary workers' camps during construction of the subproject. Improperly managed silt runoff and sanitary wastes from these camps may reach nearby areas. Poor sanitation and lack of proper solid waste management at the worker's camp will provide the conditions for vermin and other disease vectors to easily multiply and infect the workers. This may lead to the transmission of diseases from the workers camp to other areas. These conditions will increase public health risk.

54. Mitigation. The construction contractor shall be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing into the workers camps to avoid carrying away any contaminants. The contractor shall be required to use temporary diversion drains, catch drains, and silt-traps at these camps.

55. *Occupational Health and Safety at Work Sites*. Hazards exist in all construction sites in many different forms such as sharp edges, falling objects, flying sparks, chemicals, noise and various potentially dangerous situations. Good practice in occupational health and safety requires that employers protect their employees from workplace hazards that can cause injury. Transmission of HIV/AIDS, use of controlled substances, excessive abuse of alcohol leading to fights and quarrels in camps cannot be ruled out.

56. Mitigation. Contractors shall be required to address the issue on occupational health and safety at the construction sites by: (i) implementing a health and safety plan (including emergency medical evacuation plan), (ii) ensuring that an equipped first aid station is available at all times, (iii) providing the workers with potable water and adequate sanitation facilities, (iv) providing the workers with clean eating areas, and (v) providing the workers with personal protective equipment (PPE) to minimize exposure to a variety of hazards. Above all the workers should be screened and free from communicable diseases.

57. However, establishing and maintaining a safe and healthful work environment requires responsibilities from both the contractors and their workers. In general, contractors are responsible for: (i) performing a "hazard assessment" of the workplace to identify and control physical and health hazards, (ii) identifying and providing appropriate PPE for employees, (iii) training employees in the use and care of the PPE, (iv) maintaining PPE, including replacing worn or damaged PPE, (v) periodically reviewing, updating and evaluating the effectiveness of the PPE

program. Workers should: (i) properly wear PPE (ii) attend training sessions on PPE, (iii) care for, clean and maintain PPE, and (iv) inform a supervisor of the need to repair or replace a PPE.

58. *Improper Closure of Construction Sites.* Construction activities will generate construction solid wastes after completion of work. This may include used wood materials, steel works cuttings, paint and solvents containers, used oil from equipment, unused aggregates, etc. If not remove from the sites after completion of the construction activities, these solid wastes will cause aesthetic problems and some will be potential sources of contaminants for surface runoffs.

59. Mitigation. After completion of work activities, the contractor shall be required to remove the construction wastes from the sites before finally leaving. The entire site must be free of any construction solid wastes. Implement the required surface restoration.

60. *Increase Employment Opportunities at Work Sites.* Various construction activities for road construction and bridge erection will definitely require a number of workers. The impact would be beneficial and significant since employment opportunities in the area will increase.

61. Enhancement. Whenever possible, the contractor shall be encouraged to use the available local labor for these construction activities. The recruitment of workers shall be coordinated with the local officials.

C. Operation Phase Environmental Impacts

62. *Hydrodynamic and Ecological Effect on the Om Chhu (river).* Presence of the proposed bridge will have effects on the hydrodynamic and ecology of the river at that location. As seen on the 3D model shown in Figure 2, the proposed bridge will have an intermediate pier that divides the span into two equal spans of 23 m length. In general, the flow constriction effect of the bridge is not significant since it will only have one pier with a width of only 1.4 m or only 3% of the river's total width. The potential hydrodynamic effect is the occurrence of vortex-induced turbulent flows at the bridge pier. Without any mitigation, the pier will experience scouring at its base. The vortex-induced turbulent flows may also affect fish habitats. It is therefore necessary to prevent the occurrence of vortex-induced turbulent flows.

63. Mitigation. To reduce the chance of generating vortex induced turbulent flows at the bridge pier, placement of precast concrete armor units around the base of the pier will be included in the design. These scour countermeasures will help prevent the occurrence of scour holes in pier foundation due to vortex-induced turbulent flows. Due to the weight and design of the pre-cast armor units, turbulent flows will not be able to develop into large holes at the riverbed and will fail to generate vortex-induced flows. This measure is one of the approaches for scour countermeasures recommended by the *Handbook of Scour Countermeasures Designs* (2005). During the design phase, the design consultants shall ensure that the scour countermeasure shall be included in the tender documents.

64. *Waterlogging and Soil Erosion due to clogged and inadequate drainage facilities.* During the operation phase, drainage facilities of the approach roads to the proposed bridge will accumulate some sediments and debris. This will surely reduce their water conveying capacity and could lead to waterlogging and soil erosion. Eventually, it will cause the deterioration of the drainage facilities and further erosion of the

surrounding environment. The situation will be aggravated if the drainage facilities have inadequate design capacities.

65. Mitigation. Road drainage facilities, such as culverts and drains, shall be maintained regularly to maintain their design capacities. Removal of the accumulated sediments and debris must be done regularly. Discharge points to streams must be inspected regularly to ensure they are stable and not deteriorating due to scour. It is therefore necessary for PDM to implement a road drainage maintenance program. Detailed study of the road catchment hydrology during the design phase shall ensure that the road drainage system has appropriate water carrying capacities.

66. *Increased Risk of Road Accidents*. Risks of accidents, associated with increased vehicular traffic, are normally influenced by the road features and its surroundings. In addition, pedestrians and non-motorized vehicles are at greater risk since they use the road together with the motorized traffic. Improving the road will normally increase the vehicular traffic and the travel speed of the vehicles. It is therefore expected that the risks of accidents will slightly increase.

67. Mitigation. Decreasing the risks of accidents associated with increase vehicular traffic would require a strong information and education campaign at the local level on the risks of accidents. The following measures may also help decrease the risks: (a) improvement of crossing sites such as providing the appropriate signs and markings, (b) speed-limiting measures such as provision of speed limit signs and active police enforcement of speed limits at densely-populated areas, and (c) provision of adequate road shoulders. Implementation of the mitigating measures will reduce the expected impact to an insignificant level.

68. *Increased risk of water pollution*. Phuentsholing intends to divert some of the road traffic from the existing bridge to this proposed new bridge. It is therefore expected that the risk of water pollution from oil, grease, fuel spills, and other materials from vehicles using the proposed bridge and roads will increase. Oil tankers and chemical tankers, in particular, are expected to use this route.

69. Mitigation. PDM, together with the people's representative, shall prepare a spills response plan specific to this new bridge and roads. It should contain, at least, procedures on (i) how to stop the flow of spill, (ii) contain the spill to prevent from spreading including the storage of absorbent material for spills, and (iii) cleanup of the spilled materials. A list shall be prepared of who are transporting hazardous materials and the quantities being transported along these routes. This will help estimate the magnitude of potential problems and design an effective spills response plan

70. *Increase noise levels due to increase vehicular traffic*. This proposed bridge at the Om Chhu will be used as an alternate route from the city core area to the northern area of Phuentsholing. PDM intends to divert the traffic to this route. This will surely increase the noise levels along the proposed roads.

71. Mitigation. A noise mitigation will be necessary for sensitive sites. Wherever possible and appropriate, restriction of heavy vehicle movement from 11 p.m. till 4.30 a.m. should be enforced to reduce the noise level at night.

72. *Increase air pollution due to increase vehicular traffic*. Increase air pollution due to increase vehicular traffic at the bridge and approach roads will be insignificant since the site is a place where air dispersion can easily dilute the emissions from

vehicles. Bridge location is very near a large open space, the junction of Om Chhu with Amo Chhu, where wind can easily develop and provide air dispersion.

73. *Improved Accessibility.* Constructing an alternate bridge with the associated approach roads at the Om Chhu has significant positive impacts to the served communities. This route will become an all-weather transport link between the two sides of the river.

74. After screening, Table 2 lists the environmental impacts and risks that requires mitigation and shall be carried to the EMP Section.

Table 3: Environmental Impacts and Risks for Inclusion in EMP

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Impacts and risks to biodiversity conservation	● -	Δ
Potential damage to historical areas and cultural areas	Δ -	Δ
Potential nuisance and problems to the public	● -	Δ
CONSTRUCTION PHASE		
Soil erosion and sediments of construction sites	● -	Δ
Pile driving aquatic impact	● -	Δ
Noise from construction equipment	● -	Δ
Local air pollution due to construction activities	● -	Δ
Vehicular traffic congestion and public access	● -	Δ
Hazards to public due to construction activities	● -	Δ
Pollution and health risk due to workers camp	● -	Δ
Increase employment opportunity in work sites	● +	● +
Occupational Health and Safety at Work Sites	● -	Δ
Improper closure of construction sites	● -	Δ
OPERATION AND MAINTENANCE PHASE		
Hydrodynamic and ecological effects to the river	● -	Δ
Waterlogging and soil erosion due to clogged and inadequate drainage facilities	● -	Δ
Increased risk of accidents		
Increased risk of water pollution	● -	Δ
Increased noise levels due to increase vehicular traffic	● -	Δ

Legend: n.a. = not applicable; Δ = insignificant; ● = significant;
+ = positive; - = negative

VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

75. During the planning phase, PDM has undertaken various activities concerning information disclosure, public consultation, and public participation for its proposed bridge and roads subproject under UIP. The intent was to achieve a meaningful stakeholders' consultation and ensure subproject success.

76. In the course of conducting the PPTA study, information regarding the proposed bridge and roads subproject was disclosed to the public during the conduct of a socio-economic survey (SES) in July 2011. It was an occasion not only for

information disclosure but also for stakeholder identification and to scope issues and concerns. During the SES, respondent households in Phuentsholing were informed about the proposed subproject and interviewed for socioeconomic data. A focus group discussion (FGD) was also conducted last 24 July 2011 in Phuentsholing.

77. Public Consultation. Last 29 July 2011, PDM conducted an initial public consultation and formally discussed the proposed bridge and roads subproject with the stakeholders and requested their views. Stakeholders were encouraged to raise their social and environmental issues. Participants included: (i) elected people's representatives from various areas of Phuentsholing, (ii) PDM Executive Secretary, (iii) PDM staff, and (iv) PPTA Consultant. Stakeholders expressed support to the proposed PDM subproject. Summary of the consultation outcomes is presented in Table 3, while the documentation is presented at the annexes.

78. Future Disclosure and Consultations. A continuing process of public consultation and information disclosure shall be advocated. During the tendering process, PDM shall again conduct public consultations and information disclosure. Stakeholders' consultations shall be continued throughout the duration of the construction phase. PDM shall keep records of environmental and social complaints, received during consultations, field visits, informal discussions, and/or formal letters, together with the subsequent follow-up and resolutions of issues.

Table 4: Summary of Consultation Outcomes

Group Represented	Issues/ Concerns Raised	Project's Response
Stakeholders at the left bank area of the proposed bridge	Increased risk to students of Phuentsholing Higher Secondary School	A traffic management program will be implemented; bridge will be provided with 1.7 meters pedestrian path on both sides; a separate pedestrian bridge will be implemented by an ongoing project
Stakeholders at the left bank area of the proposed bridge	There will be more impact to left bank areas when the future development in the north will be using the proposed bridge to reach the core area of Phuentsholing	More studies will be conducted in the future regarding the future development in the north; wider roads will be implemented in the future to support the increase vehicle traffic coming from these areas
Stakeholders at the right bank area of the proposed bridge	The people's representative expressed her support to the proposed bridge since it will allow her constituents to access the other side of the river.	The project will give a lot of benefits not only to some areas, but to all Phuentsholing since it will decongest the core area; people of the left bank can reach the core area easily by foot instead of bringing their cars through the existing bridge
Stakeholders of other areas	What will happen if the old existing bridge will collapse	Northern areas of Phuentsholing will be isolated since the existing bridge is the only access point. This is the reason that there is an

		urgency to construct the proposed bridge
Stakeholders of various areas	All the people's representatives expressed their support to the proposed bridge and approach roads	PDM Executive Secretary welcome the expression of support and reiterated the importance of proposed bridge not only to decongest the core area but also to provide an alternate access to the northern areas in case the existing bridge will be destroyed

VII. GRIEVANCE REDRESS MECHANISM

79. Local grievance redress mechanism (GRM) is important in the implementation of the proposed Phuentsholing bridge and roads subproject since any complaints and concerns of the affected people must be address promptly at no costs to the complainant and without retribution. This mechanism shall be disclosed in public consultations during detailed design and in meetings during the construction phase. Complaints about the environmental performance of the subproject during the construction phase can best be handled by various levels including the formation of an ad-hoc Construction Complaints Committee (CCC) for the expeditious resolution of the complaints.

80. *First Level GRM.* An expeditious resolution to most grievances during construction can easily be handled by the contractors' representatives at the construction site and whenever necessary together with the construction supervision consultants. At this first level, the grievance should be resolved within 2 days maximum. If the complaint is not resolved at this level, the complainant may elevate his grievances to the second level GRM which is the ad-hoc CCC.

81. *Second Level GRM.* Phuentsholing shall form the ad-hoc CCC to be chaired by its PIU head. Members shall include the following: (i) contractor's highest official at the site such as Construction Manager or Construction Superintendent, (ii) the elected people's representative of the area, the "Thuemi", and (iii) Phuentsholing's PIU head. Creation of the ad-hoc CCC and its operation shall be included in appropriate sections of the civil works contract. Expeditious resolution of complaints during construction is important since activities are sometimes continuous and can easily change the landscapes within a week. For the quick filing of complaints, the CCC shall prepare a form to be used for the filing of grievances/complaints. The use of form will also facilitate the filing of complaints by illiterate persons through the assistance of another person.

82. The steps to be followed in filing complaints and the procedures for redress are the following: (i) complainant shall provide the background and file the complaint verbally or in writing to CCC. The CCC secretary shall assist the complainant in filling-up the complaint form; (ii) within 2 working days, the PIU head, contractor's representative, and complainant shall discuss if the complaint can be resolved without calling for a CCC meeting; (iii) if the complaint cannot be resolved by the PIU head and contractor's representative, a CCC meeting shall be called with the complainant to resolve the complaint within 5 working days.

83. *Third and Fourth Levels GRMs.* If the complaint cannot be resolved at the CCC, the complainant has the option to first raise the issue to Thrompon (3rd level GRM)

and (v) if the complaint cannot be resolved at the Thompson's level, the complainant shall seek recourse with the courts.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

84. This section addresses the need for mitigation and management measures for the Phuentsholing subproject. Information includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional set-up is presented in the implementation arrangement and discusses the roles during implementation and the required monitoring. It also outlines the requirements and responsibilities during pre-construction, construction, and operation phases.

A. Environmental Mitigation

85. **Table 4** presents the information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures. Details of mitigating measures are already discussed in Section V where the need for mitigation of each impacts was determined in the screening process. Costs for mitigations during the pre-construction, construction, and operation phases are part of the detailed design cost, construction contracts, Phuentsholing operation and maintenance costs, respectively.

Table 5: Environmental Mitigation Plan

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
PRE-CONSTRUCTION PHASE					
Excavation requirements	Potential damage to archaeological and cultural assets	Tender documents shall include a provision that will require construction activities to be stopped immediately upon discovery of any archaeological and cultural relics and authorities will be informed promptly	roads	Part of detailed design cost	Design Consultants / PMU and PIU
Design of bridge pier	Scouring of pier base due to vortex-induced turbulent flows	Bridge pier design shall include scour countermeasures to prevent the occurrence of vortex-induced turbulent flows such as placement of precast concrete armor units around the base of the pier	Bridge pier	Part of detailed design cost	Design Consultants / PMU and PIU
Social and community concerns	Potential nuisance and problems to the public	Consultation with the affected communities regarding the expected impacts and proposed mitigation measures of the project; Tender documents shall include provisions addressing the potential nuisances and problems to the public during construction phase	roads	Part of detailed design cost	PIU, Design Consultants / PMU
CONSTRUCTION PHASE					
Road construction and other civil works	Soil erosion and sediments of construction sites during rainy periods	Total area exposed shall be minimized; use of temporary diversion drains and catch drains at work sites.	Roads, bridge abutments	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Pile driving for bridge	Underwater sound pressure	Use of soft-start pile driving; installing a sleeve casing	Bridge pier	Incorporated in construction	Contractor / PIU, Supervision

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
	generation harmful to fish and aquatic animals	lined with polyurethane around the pile with some clearance and within the entire water depth during pile driving; whenever possible, schedule the pile driving activities during non-summer months where the river flow is very small		contract	Consultants
Road construction and other civil works	Nuisance from noise of construction equipment	Consultation with affected areas; not to operate noisy equipment during nighttime (22:00 – 06:00); sound suppression for equipment; ear plugs for workers	Roads, bridge abutments	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Road construction and other civil works	Air pollution due to construction activities	Water spraying for dust control; construction materials with potential for significant dust generation shall be covered; not smoke belchers equipment	Roads, bridge abutments	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Road construction and other civil works	Traffic congestion and hindrance to access	Close coordination with local authorities in road closure and traffic rerouting; contractor's traffic plan	Roads	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Road construction and other civil works	Pollution and health risks due to workers camp	Proper camp sanitation; installation of sanitary facilities; solid waste management; surface runoffs control	Workers camp	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Road construction and other civil works	Hazard to public due to construction activities	Implement road safety plan and safety measures including warning signs to alert people of hazards around the construction sites, barricades, and night lamps for open excavations	Roads, bridge abutments	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Road construction and other civil works	Occupational health and safety at work sites	Implement health and safety plan; equipped first aid station available at all times, potable water and adequate sanitation facilities provided to workers; providing workers with clean eating areas; providing the workers with personal protective equipment	Roads, bridge, and abutments	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Rehabilitation and closure of construction sites	Improper closure of construction sites	Removal of all construction wastes and implement surface restoration	Roads, bridge abutments, pier	Incorporated in construction contract	Contractor / PIU, Supervision Consultants
Road construction and other civil works	Increase employment opportunities	Contractor required to give preference to local labor; workers recruitment to be coordinated with local officials	Roads and bridge	No cost	Contractor / PIU, Supervision Consultants
OPERATION PHASE					
Interaction of the bridge pier with river flows	Scouring of pier base due to vortex-induced turbulent flows	Placement of precast concrete armor units at the pier base	Bridge pier	Part of construction cost	Contractor / PIU, Supervision Consultants (installation during construction)
Public use of bridge and roads	Waterlogging and soil erosion due to clogged and inadequate drainage facilities	Regular maintenance of culverts and drains to maintain their design capacities; regular removal of accumulated sediments and debris in the drainage	Road drainage	Part of operation & maintenance costs	PDM

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility Implementation/ Supervision
		system; regular inspection of discharge points to streams to ensure they are stable and not deteriorating due to scour; ensuring appropriate water carrying capacities of the road drainage system through detailed study of the road catchment hydrology during the design phase			
Public use of bridge and roads	Increase risk of accidents	strong information and education campaign at the local level on the risks of accidents; improvement of crossing sites such as providing the appropriate signs and markings; speed-limiting measures such as provision of speed limit signs and active police enforcement of speed limits at densely-populated areas; provision of adequate road shoulders	Bridge and roads	Part of operation & maintenance costs	PDM
Public use of bridge and roads	Increase risk of water pollution	Implementation of spills response plan specific that include procedures on (i) how to stop the flow of spill, (ii) contain the spill to prevent from spreading including the storage of absorbent material for spills, and (iii) cleanup of the spilled materials.	Bridge and roads	Part of operation & maintenance costs	PDM
Public use of bridge and roads	Increase noise levels due to increase vehicular traffic	Installation of noise barrier	youth center at the right bank of the river	Part of construction cost	Contractor / PIU, Supervision Consultants (installation during construction)

86. Although details of the required mitigating measures are already discussed in the screening for impacts, the following items are discussed further to highlight their importance: (i) tender documents and construction contracts, (ii) contractor's environmental management plan, and (iii) unanticipated environmental impacts.

87. *Tender Documents and Construction Contracts.* Environmentally responsible procurement advocates the inclusion in construction contract documents the provisions addressing the management of environmental impacts and risk during construction. This includes the contractor's submittal of a CEMP and site management plan. Tender documents and construction contracts shall therefore include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience.

88. *Contractor's EMP.* During construction, each contractor will be guided by its detailed Contractor's EMP (CEMP). This shall be based on the subproject's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by PIU, and other

monitoring parties. Inclusion in construction contract documents the provisions requiring the contractor to submit a CEMP is important since the contractor will be legally required to allocate a budget for mitigation measures implementation. The CEMP will allow PIU construction supervision engineer to focus on what are specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the CEMP, PIU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules.

89. The CEMP shall be prepared by all contractors before the start of the construction works and shall be approved by PIU. This requirement shall be included in the construction contracts. It shall provide details on specific items related to the environmental aspects during construction. It shall include specifications on requirements for dust control, erosion and sediment control, avoidance of casual standing water, management of solid wastes, workers' camp sanitation, pollution from oil, grease, fuel spills, and other materials due to the operation of construction machineries, safety and traffic management, avoidance of inconveniences to the public, air and noise pollution control. It shall also include guidance on the proper design of the construction zone, careful management of stockpiles, vegetation, topsoil, vehicles, and machinery.

90. *Unanticipated Environmental Impacts.* Where unanticipated environmental impacts become apparent during project implementation, PDM shall prepare a supplementary environmental assessment and EMP to assess the potential impacts and outline mitigation measures and resources to address those impacts.

B. Environmental Monitoring

91. **Table 6** presents the information on: (i) aspects or parameter to be monitored, (ii) location where monitoring is applicable, (iii) means of monitoring, (iv) frequency of monitoring, (v) responsibility of compliance monitoring, and (vi) cost of monitoring. The PMU shall prepare quarterly environmental monitoring reports to be submitted to ADB detailing the status of mitigating measures implementation. A sample template for the environmental monitoring report is presented at the appendices.

Table 6: Environmental Monitoring Plan

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Specific provision in tender documents on archeological/cultural relics	Bridge abutment areas	Verify draft and final documents	Twice – draft and final documents	Design consultants	PMU	Part of project management in detailed design (minimal cost)
Design contract includes provision of scour countermeasure of bridge pier	Bridge pier	Verify draft and final documents	Twice – draft and final documents	PIU	PMU	Part of project management in detailed design (minimal cost)
Consultation meetings; Specific provisions in tender documents on nuisance &	roads	Verify meetings documentation; Verify draft and final documents	After completion of meetings; Twice – draft and final	PIU, Design consultants	PMU	Part of project management in detailed design (minimal cost)

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
problems to public			documents			
CONSTRUCTION PHASE						
Total area to be exposed; runoff flowing into disturbed sites	Roads, abutment areas	Visual inspection of sites; plans verification	Daily during rainy periods	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
soft-start pile driving; sleeve casing lined with polyurethane around the pile during pile driving	Bridge pier	Visual inspection of pile driving activity	Daily	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
noise levels not to exceed 55 dB(A) during daytime and 45 dBA during nighttime in residential areas; for commercial areas should not exceed 65 dB(A) during daytime and 55 dBA during nighttime	Bridge and roads	Use of sound levels meter	Daily	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Dust, cover of stockpiles, smoke belching	roads	Visual inspection of sites	Daily	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Road closure and traffic rerouting	roads	traffic plans verification	weekly	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Sanitary toilets, garbage bins, runoff controls	Workers camps	Visual inspection of camps	Once before start of construction and once monthly	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Road safety plan; sign, barricades and night lamps	roads	Visual inspection of sites	Daily	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
health and safety plan;	Roads, bridge	Check copy of health	daily	Contractor	Construction supervision	Part of consultant's

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
first aid station, potable water and adequate sanitation facilities; clean eating areas; personal protective equipment	abutment's area	and safety plan; visual inspection of sites			consultants, PIU	construction supervision contract; minimal cost to PIU
Construction wastes	Roads, bridge abutment's area	Visual inspection of sites	Once before final stage of demobilization	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Number of local labor employed	Construction sites	Verification of contractor's records	Once a month	Contractor	PIU	No cost
OPERATION PHASE						
Occurrence of vortex-induced turbulent flows at bridge pier	Bridge pier	Visual inspection	Once a month during rainy season	PDM	people's representatives (Thuemi)	Part of PDM's operation cost
Clogged culvert and drains	roads	Ocular inspection of facilities	5 times per year	PDM	people's representatives (Thuemi)	Part of PDM's operation cost
Vehicular accidents involving pedestrians	Bridge and roads	Verification of community and police records	Twice per year	PDM	people's representatives (Thuemi)	Minimal cost to PDM
Fuel and other materials spills	Bridge and roads	Verification of community and police records	Once a month	PDM	people's representatives (Thuemi)	Minimal cost to PDM
Noise levels	Youth center	Use of noise meter	Twice per year	PDM	people's representatives (Thuemi)	Part of PDM's operation cost

92. Project Performance Monitoring. Project performance monitoring presents the desired outcomes as measurable events by providing parameters or aspects that can be monitored and verified (Table 6). Tendering process advocating environmentally responsible procurement is a desired outcome during the pre-construction phase. This can easily be verified by checking if EMP requirements are incorporated in construction contracts. Construction phase desired outcomes include effective management of environmental impacts and reduce risk to public. Desired outcomes of the operation phase are the road drainage system performing well and very few vehicular accidents.

Table 7: Project Performance Monitoring

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Frequency	Implementation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION						
Detailed design is environmentally responsive	EMP requirements incorporated in detailed design	Verify detailed design documents;	Two reviews: (i) draft detailed design	PIU, Design consultants	PMU	Mini-mal cost

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Frequency	Implementation	Compliance Monitoring	Monitoring Cost
		EMP requirements reflected in tender documents	documents and (ii) prior to approval of final documents			
Tendering process advocates environmentally responsible procurement	EMP requirements incorporated in construction contracts	Verify construction contract documents;	Prior to finalization of construction contract documents	PIU	PMU	Mini-mal cost
CONSTRUCTION PHASE						
Effective management of environmental impacts during construction	Number of public complaints on construction activities	Verification of contractor's records; PIU coordination with people's representatives (Thuemi)	Once a month	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Reduce risk to public during construction	Number of accidents involving construction activities	Verification of contractor's records; PIU coordination with local officials	Once a month	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
OPERATION PHASE						
No scouring of bridge pier	Presence of scour holes at pier river bed	Visual inspection during low flows	Once a year	PDM	people's representatives (Thuemi)	Minimal cost
Road drainage system performed well	Clogged and overflowing drainage system	Verification of operation records and community records	Once a year	PDM	people's representatives (Thuemi)	Minimal cost
Very few vehicular accidents due to effective traffic management	Number of vehicular accidents	Verification of operation records and community records	Once a year	PDM	people's representatives (Thuemi)	Minimal cost
Few accidental spills of fuel and other materials	Number of spills	Verification of operation records and community records	Once a year	PDM	people's representatives (Thuemi)	Minimal cost
No complaints on noise levels	Complaints on noise levels	Verification of operation records and community records	Once a year	PDM	people's representatives (Thuemi)	Minimal cost

C. Implementation Arrangement

93. This subsection presents the: (i) institutional set-up, (ii) implementation schedule, (iii) required clearance, and (iv) capability building

94. *Institutional Setup.* MoWHS is the executing agency, while PDM is the implementing agency. DES of MoWHS shall establish a PMU located at its premises and headed by a project manager. The PMU, supported by a team of project management consultants (PMC), will be the key organization for ensuring the overall execution and implementation of the project. The PMU will be responsible for planning, monitoring, and reporting on the project, as well as for cost and quality control. It will (i) serve as the secretariat for the project steering committee (PSC);

(ii) undertake project management, administration, and interagency coordination at the executive level; (iii) supervise and guide the PIUs; (iv) maintain project accounts; (v) oversee procurement procedures to ensure compliance with the government's and ADB's policies and procedures; (vi) liaise with ADB for quarterly project progress updates and other reporting and communication matters; and (vii) prepare the project completion report to the Government and ADB. A PMU staff shall be designated as the Environment Officer for UIP. The PMU Environment Officer and the design consultants shall ensure that the EMP and design considerations for environmental aspects are included in the design and tender documents. During construction, PMUs Environment Officer shall coordinate with the PIU on environmental monitoring aspects.

95. The existing PIU for Phuentsholing will remain in place for this subproject and shall be responsible during construction and operation phases. During construction, PDM shall form the ad-hoc Construction Complaints Committee to be chaired by its PIU head. The role of the CCC during the construction phase is highlighted since it is an important aspect of the grievance redress mechanism in promptly addressing the public's complaints about environmental performance of the subproject during execution of the construction activities. Overall construction supervision shall be the responsibility of the PIU. These include contract management, interpretation of contract provisions, time management, quality control, monitoring of construction problems and delays.

96. *Implementation Schedule.* As presented in the project description, construction of the Phuentsholing subproject is scheduled to start on the last quarter of 2013 and to be completed on the third quarter of 2015. PDM shall ensure that construction contract provisions related to the EMP shall be included in the tendering stage in 2013.

97. *Clearances and Permits.* Under present environmental regulations in Bhutan, PDM shall apply for an Environmental Clearance (EC) from the NEC for the proposed bridge and associated roads. PDM shall ensure that it has applied for EC by the first quarter of 2012 since maximum time for EC processing is one year.

98. *Capability Building.* UIP implementation will be supported by consulting services that include: (i) project management advisory services, including detailed engineering designs, preparation of contract documents, and support to construction supervision and quality control; and (ii) institutional development and capacity building for MoWHS, the PMU, and the municipalities with subprojects. Cost of the capacity building is included in the overall UIP consulting services. For Phuentsholing, there is a need for staff training on road and bridge and maintenance since its engineering division is now responsible for all roads and bridges inside the city.

IX. CONCLUSION AND RECOMMENDATIONS

99. The northern area of Phuentsholing is presently connected to the core area by an old bridge that cannot be closed even for minor repairs due to the lack of an alternate route. Local officials raised the urgent need of having another bridge and in the event the old bridge collapses, the northern area will be isolated. The proposed bridge and associated roads under UIP will provide a reliable alternate route and will increase confidence on accessibility between the core area and the northern area. The bridge will greatly help the development of the town since the industrial activities are located in the northern area. With the bridge, the interaction between the core area and the northern area will be facilitated. Pedestrian safety is also considered in the bridge design with the provision of a 1.7-meter pedestrian footpath on both sides. The

bridge will help decongest the core area since people at the other side of the river who need to go shopping can easily reach the core area by foot instead of bringing their cars through the existing bridge. In the future, it will also help decongest the core area since it will become part of a proposed by-pass route. Trucks coming from India and just passing thru Phuentsholing shall be asked to use this route and by-pass the core area.

100. The environmental screening process has highlighted the environmental issues and concerns of the proposed bridge and associated roads subproject. The screening has considered the fact that actual land uses of these areas have been residential, commercial, and institutional. The proposed associated roads will be in existing roads. The proposed subproject is therefore not a new incursion to an ecologically untouched area.

101. Based on the screening for potential environmental impacts and risks of the proposed bridge and roads subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. Hence, the proposed subproject can easily be implemented in an environmentally acceptable manner. There is no need for further environmental assessment study. A full EIA is not warranted and the subproject's environmental classification as Category B is deemed appropriate. The IEE shall therefore be finalized as the final environmental assessment document of the proposed Phuentsholing subproject.

102. Implementation of the proposed Phuentsholing subproject is hereby recommended with emphasis on the following: (i) EMP of the bridge and road subproject shall be included in the design process; (ii) Contracts of design consultants shall have provisions requiring the consultants to consider EMP recommendations in the design process; (iii) Tendering process shall advocate environmentally responsible procurement by ensuring the inclusion of EMP provisions in the bidding and construction contract documents; (iv) Contractor's submittal of a CEMP shall be included in the construction contract; (v) Contract provisions on creation and operation of the CCC shall be included in construction contracts; (vi) Monitoring of health and safety requirements shall be given more importance during implementation to reduce risks to the public; and (vii) PIU shall continue the process of public consultation and information disclosure during detailed design and construction phases.

APPENDICES

- Appendix 1 Application of Environmental Clearance under the Regulations for Environmental Clearance of Projects (2002)
- Appendix 2 Site of Proposed Bridge and Approach roads
- Appendix 3 Minutes of the Public Consultation/Meeting held at the Conference Hall of Phuentsholing District Municipality, 29 July 2011
- Appendix 4 List of Participants in Phuentsholing Public Consultation and Information Disclosure [29 July 2011]
- Appendix 5 Attendance Sheet - Sheet of Phuentsholing Public Consultation and Information Disclosure [29 July 2011]
- Appendix 6 Photographs of Public Consultation Meeting
- Appendix 7 Environmental Monitoring Report Template
- Appendix 8 Minutes of the meeting held on the 20th September 2013 with Thromde Officials
- Appendix 9 Site photographs along the 18 m road corridor (September – October 2013 and August 2014)
- Appendix 10 Detailed Environmental Management Plan of Bridge & Approach Roads

Appendix 1

Application of Environmental Clearance under the Regulations for Environmental Clearance of Projects (2002)

The following procedures shall apply to the screening of all environmental information by the Secretariat or Competent Authority.

Environmental information: During the planning and design of a project, and prior to any irrevocable commitment of resources or funds, the applicant shall submit complete environmental information to either the Secretariat or Competent Authority.

28.1 Minimum Contents of Environmental information: The environmental information shall contain a short and concise description of the following elements:

- a) The potential adverse effects of the project on the environment including the direct, indirect and cumulative effects;
- b) How the project complies with relevant sectoral guidelines or code of best practices, if any, issued by the Secretariat or Competent Authorities;
- c) How the impacts of the project will be avoided, minimized or reduced; and
- d) The environmental benefits of the project, including how the project will benefit concerned people and use clean and sustainable technologies.

Modification of Proposal/Application: If an applicant intends to make a material change to a project including an increase in production capacity or the manner of implementing the project after submission of an environmental application, the application shall be treated as a new application.

Determination of Adequacy of the Environmental information: When the Secretariat or Competent Authority receives an application/proposal for the issuance of environmental clearance, it shall communicate its decision to the applicant in writing within the time limit specified in Annex 1. When the Competent Authority determines that an application is duly completed, it shall accept the application and either proceed with review, if it is a listed project, or forward it to the Secretariat for environmental clearance if it is a non-listed project, or falls under Section 17 of this regulation

Public Notice of Proposal: After receipt of notice that the application is adequate, the applicant must comply with the minimum requirements for public consultation set forth in Sections 31 of this regulation concerning the environmental application only in case of significant projects.

Screening Decision: The Secretariat or Competent Authority shall screen the application for environmental clearance as per sectoral guidelines and within time limit as per Annex 1. The Secretariat or Competent Authority may issue an environmental clearance for the project on the basis of the environmental application only if the project meets the requirements set forth in Section 25 of this regulation. The environment application may contain terms and conditions consistent with Section 30 of this regulation, otherwise the Secretariat or Competent Authority may ask the applicant to carry out environmental assessment or issue a blanket denial to the project.

If the Secretariat or Competent Authority requires an environmental assessment or denies the project, a notice of the decision shall be promptly sent to the applicant.

When a decision on the environmental clearance has been taken, the Secretariat or the Competent Authority shall make a public announcement of the decision and make the information available to the public under Article 28 of the EA Act, 2000.

Applicable Time Limits of Processing For Environmental Clearance

Action	Time Limit
Response by Secretariat/ Competent Authority on the receipt of application. This is simply an acknowledgement of the receipt of the application.	Within 15 days
Review by the Secretariat/Competent Authorities to assess the adequacy of the application as per government rules and guidelines	1 to 3 months
Competent Authority forwards application to Secretariat for non-listed projects and listed projects if it falls under Section 17 of this regulation	Within 15 days
Screening of a project will be undertaken to determine the level of environmental assessment required.	1 to 3 months
If screening determines that an Environmental Assessment is required, the level and time frame for the assessment will be determined through negotiations between relevant parties and approved by the Secretariat/ the Competent Authority.	Time frame to be negotiated
Decision/Response on the environmental clearance based on the findings of the Environmental Assessment report.	1 to 3 months
Public notification on decision by the Secretariat/Competent Authority.	Within 15 days
Appeal on the decision.	Within 30 days from the date of publication of public notification
On approval of the clearance, a legal undertaking with the proponent of new projects to comply with the EA Act, 2000	10 days to 1month

Note: Applicable time limits are subject to submission of correct and complete information based on applicable government regulations and guidelines.

Appendix 2**SITE OF PROPOSED BRIDGE & APPROACH ROADS**

Photo No.1 – Location of the proposed bridge at Om Chhu (river).
Location view of proposed right abutment as seen from the left bank.



Photo No.2 – Location view of proposed left abutment as seen from
the right bank.



Photo No.3 – Location of proposed approach to the bridge at the left bank.



Photo No.4 – Proposed 200-meter road connecting the approach road to the proposed bridge at the left bank.

Appendix 3

Minutes of the Public Consultation/Meeting held at the Conference Hall of Phuentsholing District Municipality, 29 July 2011

Opening/ Presentations:

Phuentsholing District Municipality (PDM) Executive Secretary opened the public consultation/meeting at around 9:35 AM by welcoming everybody and explained that the purpose of the meeting is to present the proposed bridge and associated roads subprojects and to elicit views from the stakeholders regarding the proposal, particularly issues that they may raise.

The meeting continued with the subproject presentation by PDM's Chief Urban Planner who emphasized the urgency of having this proposed bridge since the only existing bridge crossing the Om Chhu (river) and connecting the northern and core area of the city is already old and if the bridge will become unpassable for some reasons, the north area will be isolated. He further added that this old bridge cannot be closed even for minor repairs due to the lack of an alternate route.

Comments, Views, Issues and Concerns raised by Stakeholders

Karma Chen, people's representative ("Thuemi") of Om Chhu's left bank area raised the potential increase in risk to students of the Phuentsholing Higher Secondary School. The Executive Secretary responded by saying that a traffic management program will be implemented during the operation of the bridge. He further explained that a separate pedestrian footbridge will be implemented by an ongoing project and the tendering process is ongoing. The Chief Urban Planner added that the proposed bridge subproject shall be provided with a 1.7-meter pedestrian footpath on both sides.

Mr. Chen further raised the possibility of more impact to the left bank areas in the future when development in the north will push through and more people from such area will be using the proposed bridge to reach the core area of Phuentsholing. The Executive Secretary responded by saying that more studies will be conducted in the future regarding the proposed development in the north and wider roads will be implemented in the future to support the increase vehicular traffic coming from these areas.

Shasmila Limbu, people's representative ("Thuemi") of Om Chhu's right bank area expressed her full support to the proposed bridge since it will enable her people to access quickly the other side of the river. The Executive Secretary welcomed the expression of support and further explained that the bridge will give a lot of benefits not only to some areas, but to all Phuentsholing since it will decongest the core area and people of the left bank can reach the core area easily by foot instead of bringing their cars through the existing bridge. Thus, helping decongest the core area.

Ganesh Rai, another people's representative ("Thuemi"), asked what will happen if the old existing bridge will collapse. The Executive Secretary responded that the northern areas of Phuentsholing will be isolated since the existing bridge is the only access point. This is the reason that there is an urgency to construct the proposed bridge.

Finally, all the people's representatives expressed their support to the proposed bridge and associated roads. The Executive Secretary welcomed the expression of

support and reiterated the importance of the proposed bridge not only to decongest the core area but also to provide an alternate access to the northern areas in case the existing bridge will be destroyed.

The Executive Secretary closed the meeting by thanking everyone for their participation in the public consultation.

Meeting Closed at 10:26 A.M.

Appendix 4**List of Participants in Phuentsholing Public Consultation and Information Disclosure [29 July 2011]*****Stakeholders/Participants:***

Karma Chen, people's representative ("Thuemi")
Ganesh Rai, people's representative ("Thuemi")
Shasmila Limbu, people's representative ("Thuemi")
Nar Bdr Rai, people's representative ("Thuemi")

Phuentsholing District Municipality

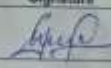

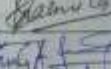
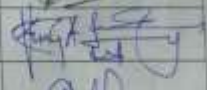


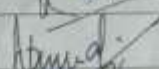
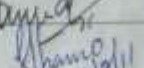
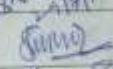






Kinzang Norby, Executive Secretary
D.C. Dhimal, Chief Engineer
Tshering Phuntsho, Chief Urban Planner
Sangay Wangmo, PIU representative
Kinga Loday, Survey Engineer
Jigme Phuntsho, Engineer
C. B. Chuetin, Survey Officer
Shara Lhamo, Administration Staff
Mon Bdr Cummul, Junior Engineer
Deopal Thapa, Junior Engineer

Consultant

Ruel Janolino – Environment Specialist, Poyry

Appendix 5

Attendance Sheet of Phuentsholing Public Consultation and Information Disclosure [29 July 2011]

ADB TA 7830-BHU: URBAN INFRASTRUCTURE PROJECT LIST OF PUBLIC CONSULTATION PARTICIPANTS PROPOSED BRIDGE/ROAD SUBPROJECT OF PHUENTSHOLING				
Consultation Date: 29 July 2011				
No.	Name	Designation	Organization	Signature
1.	Ganesh Rai	Thuram	P.C.C.	
2.	Nan Bole Rai	-H-	P.C.C.	
3.	Shamila Limbu	"	P.C.C.	
4.	Durga Lakhey	Survey Engineer	"	
5.	Jane Phuntso	Engineer	P.C.C.	
6.	C. B. Chhetri	Survey Officer	"	
7.	D. C. Dhimal	C.E.	"	
8.	Shara Khama	Asst. HR/Adm	P.C.C.	
9.	Man Bole Limbu	Junior Engineer	P.C.C.	
10.	Karma Chen	Thuri -	P.C.C.	
11.	RUEL JAVORINO	CONSULTANT	POURM	
12.	Kinjang Norbu	E.S.	P.C.C.	
13.	Deopal Thapa	J.E.	P.C.C.	
14.	Tshering Phuntso	Chief Urban Planner	Phuentsholing Thangka	
15.	Sengay Wangmo	Offg. PM	"	

Appendix 6**PHOTOGRAPHS OF PUBLIC CONSULTATION MEETING**

Photo No.5 – Chief Town Planner presenting the project at the public consultation meeting [29 July11]



Photo No.6 – Peoples' representatives listened to the project presentation at the public consultation meeting [29 July 2011]



Photo No.7 – A people's representative raising some points at the public consultation meeting [29 July 2011]



Photo No.8 – Phuentsholing Executive Secretary answering the issues raised at the public consultation meeting [29 July 2011]

Appendix 7**Environmental Monitoring Report Template****TABLE OF CONTENTS**

Executive Summary
(includes highlights of environmental monitoring)

INTRODUCTION

General introduction, brief project description, and brief description of the environment

CONSTRUCTION PROGRESS

Construction progress to give a picture of where the construction activities during the reporting period; this will relate to the discussions of the next sections

IMPLEMENTATION OF MITIGATING MEASURES

Discussions on the progress of mitigating measures implementation for the reporting period

COMPLIANCE MONITORING

Discussions on: (i) resources use for environmental monitoring, (ii) contractors performance in complying with the EMP, (iii) records of issued non-compliance notices to the contractor, and (iii) problems encountered and solutions

GRIEVANCE REDRESS

Activities of the ad-hoc Construction Complaints Committee (CCC), records of environmental and social complaints, resolutions of issues

FOLLOW-UP ACTIONS

Items that need to be resolved

Appendix 8

Minutes of the meeting held on the 20th September 2013 with Thromde Officials

(to attach the minutes)

Appendix 9

Site photographs along the 18 m road corridor. (September – October 2013 and August 2014)



Photo 1: Low tension overhead lines.



Photo 2: Take-off point (Ch:0.000)



Photo 3: Drain near Take-off point



Photo 4: Confluence of 2 drains at Take-off point.



Photo 5: Brick wall (Electricity Office compound) near Take-off point.



Photo 6: 2nd Brick wall (City Elec. Office compound)



Photo 7: City Elec. Office with lamp post.



Photo 8: Residential quarter with Water tank (Elec. Office compound)



Photo 9: Old city electricity office building (currently vacated)



Photo 10: Community Police Outpost with lamp post.



Photo 11: STP complex that will be dismantled and relocated.



Photo 12: Field visit and Centre Line pegging near Police Outpost.



Photo 13: Field assessment within 18 m road corridor.

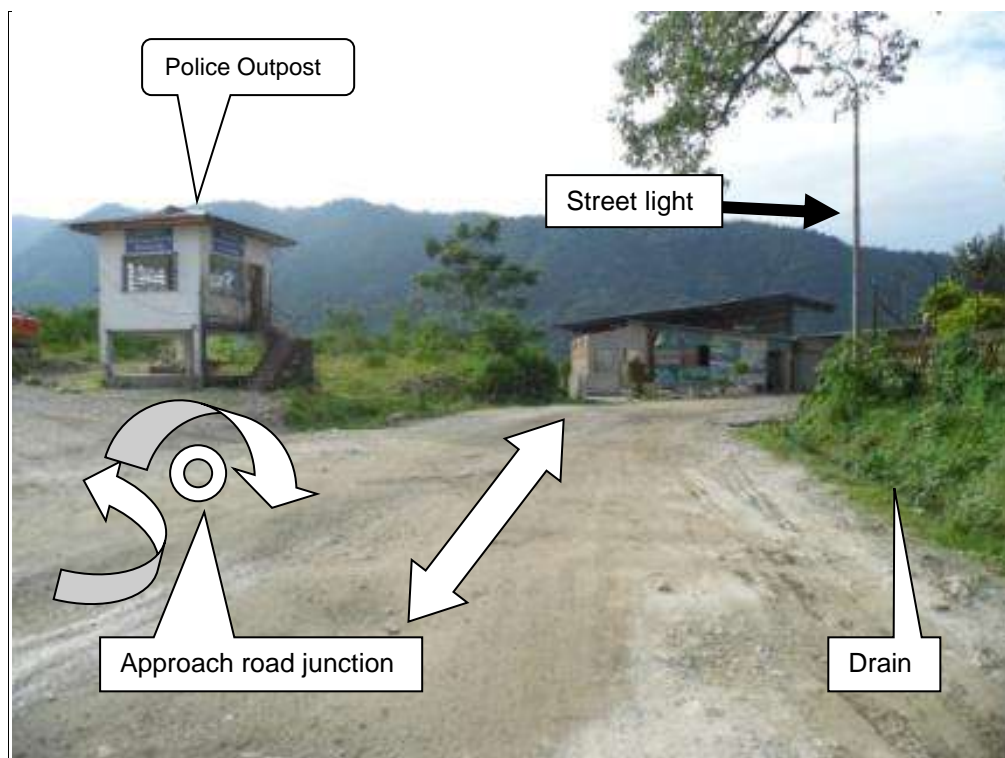


Photo 14: Police Outpost (Right Bank), approach road junction & drain



Photo 15: Drain in front of YDF hall.



Photo 16: Manhole cover of the underground Sewer line.



Photo 17: Existing part of the paved footpath on the left bank.



Photo 18: Reusable materials salvaged from residential quarter. (STP complex).



Photo 19: Reusable materials salvaged from residential quarter. (City Electricity Office compound).

Detailed Environmental Management Plan of Bridge & Approach Roads

Activities/Issues	Potential Negative Impacts	Mitigation Measures	Location	Monitoring Indicators	Monitoring Methods	Responsible Implementing Agency	Responsible Monitoring Agency	Schedule/Frequency
A. Pre-construction Stage								
Implementation of IEE recommendation in project, planning and design	Physical, biological, social and cultural adverse impact	Incorporation of IEE recommendations in project planning and design	Road Corridor	Incorporation of IEE recommendation into project design	Review of final design document, technical specification, bid document	PIU/DMSC	PMU	Following the completion of detail design
Inclusion of Mitigation Measures in Project Cost, Bid Documents, and contract	Physical, biological, social and cultural adverse impact	Incorporation of IEE recommendation in Bid Documents and Contract	Road Corridors	Incorporation of IEE recommendation in Bid Documents and Contract	Review of Bid Documents and Contract	PIU/DMSC	PMU	Following the completion of Bid Document preparation.
Construction Logistics	Adverse impacts on local environment, delay in construction, etc.	Arrangement of logistics in time including adequate manpower, equipment/machineries and materials storage,	Construction Camps, sites	Status of logistics in terms of equipment, materials, storage facilities, precautions, labor camps, manpower etc.	Field Observation	PIU	PM/DMSC	Prior to beginning of constructions
B. Construction Stage								
Site Clearance/removal of vegetation	<ul style="list-style-type: none"> Loss of 22 nos. of trees (flowering and fruit bearing) Loss of micro level ecosystem Soil erosion Scarring of Landscape 	<ul style="list-style-type: none"> Compensatory plantation within road corridors to restore lost habitat Removal vegetation within 18 m road corridor only Bio-engineering _ turfing 	Along the road embankments	Number of trees removed, area of compensatory re-plantation, bio-engineering application locations	Review of document, Field visit, interaction with site engineer, project officials	PIU/DMSC	PM/PMU	Every month during construction
Construction, operation and restoration of camps/camp sites	<ul style="list-style-type: none"> Deforestation and poaching by laborers. Improper waste disposal and loss of aesthetic beauty Health problems within camps and nearby settlements due to lack of hygiene Damage to construction camps and injury to workers due to unsafe location and lack of safe facilities Disturbance to nearby settlements Leaving dirty site behind after shifting camps from one site to other. 	<ul style="list-style-type: none"> Briefing laborers/ construction workers on local culture and rules and regulations of kingdom on illegal activities such as felling of trees, fishing and hunting. Camps to be placed in secure location and be able to protect inhabitants from rain, excessive sunshine and other extreme condition Providing cooking gas or kerosene to discourage use of scarce firewood Waste disposal facilities such as dustbins and garbage to be provided Health screening for laborers Firefighting equipment to be provided Supply of clean drinking water to camps and site offices Adequate Pit latrines to be constructed at the 	Labor camps to be constructed at suitable locations as permitted by the project	Status of Camp site, availability of drinking water, cooking gas or kerosene, waste disposal bin & garbage, pit latrine, firefighting equipment, illegal hunting and felling of timber	Field observation of campsite, interaction with workers, and other stakeholders	PIU/DMSC	PM/PMU	Every month during project period

Activities/Issues	Potential Negative Impacts	Mitigation Measures	Location	Monitoring Indicators	Monitoring Methods	Responsible Implementing Agency	Responsible Monitoring Agency	Schedule/Frequency
		campsites <ul style="list-style-type: none"> • Camp areas to be cleaned and bare surface to be re-vegetated to restore aesthetic value 						
Tree felling	<ul style="list-style-type: none"> • Damage to existing vegetation and structures. • Accidental injuries to workers or pedestrians. • Debris (lops & tops) at site 	<ul style="list-style-type: none"> • Obtain prior permission for felling. • Take adequate precautions while felling trees to avoid accidents and damages to other trees/structures. • Proper removal and disposal 	Along Road Corridor	<ul style="list-style-type: none"> • Clean sites and devoid of debris. • No damages to nearby structures. • No accidents or injuries. 	Review of documents/records, site visits	PIU	PM/PMU/EU	During the Site Clearance
Spoil Disposal	<ul style="list-style-type: none"> • Damage to land, • Damage to properties • disruption of natural drainage, • damages of existing vegetation, • water and air pollution • disposal sites look barren and ugly. 	<ul style="list-style-type: none"> • Use spoils for reclaiming the degraded land in consultation with PIU • No disposal shall allowed in the areas of fragile slopes, floodways, farmland, forest areas, natural drainage path, religious and cultural sites, canal and other infrastructures • Dispose spoils in the designated sites • Disposal Site shall be rehabilitated with bioengineering works. 	Spoil should be dumped in designated sites only.	<ul style="list-style-type: none"> • Planning for Spoil deposition, • Current Spoil disposal practices 	Review of planning and practice of spoil disposal, site visit and interaction with contractors, site engineers and other stakeholders	PIU	PM/PMU/NEC	Every 15 days by PIU and once every 2-3 months by NEC
Earthwork and Excavation	<ul style="list-style-type: none"> • Loss of nutrient rich top soil • Soil Erosion and slope failure, • Disruption of the natural flow of streams, rivers etc. of the project area due to excavation or construction • Air and Noise Pollution, • disruption of water bodies • Damage to properties • 	<ul style="list-style-type: none"> • Top soil shall be scraped and stored for future reuse for bioengineering application • Excavation to be carried out during dry season • Excavation to done with excavators and spoils to be carried to safe locations to designated site. • Apply appropriate Bioengineering technique. 	• Along the road corridor	<ul style="list-style-type: none"> • Use of dump trucks • Employing of trained excavator operators. 	Site Visit, Review of design and contract documents, interaction with stakeholders	PIU	PM	Every month during construction
Slope Instability and Erosion	<ul style="list-style-type: none"> • Increased surface run-offs . • Clogging of drains. • Siltation of Om chhu river. • Damage to aquatic lives. 	• Adoption of appropriate bioengineering .	• Along the road corridor.	No of slope failures, Arrangement for Slope Stabilization, design and implementation of bio-engineering,	Site Visit, Review of design and contract documents interaction with stakeholders	PIU	PM	Every month during construction
Road Surfacing/gravelling	Air and noise pollution	<ul style="list-style-type: none"> • Sprinkle water particularly nearby 	Along the road	General observation or Complain of local residents,	Observation	PIU	PM/DMSC	Every month

Activities/Issues	Potential Negative Impacts	Mitigation Measures	Location	Monitoring Indicators	Monitoring Methods	Responsible Implementing Agency	Responsible Monitoring Agency	Schedule/Frequency
work		settlements to control dust pollution, • maintain equipment and vehicles • works to be carried out during day hours only.						
Air and Noise Pollution	• Problem to public health, workers.	• Sprinkle water. • Provide ear-plugs to the workers.	Along the road corridors	Air and noise level measurement	Observation	PIU	PM/EU	Every three months
Adoption of Occupational Health and Safety Measures	Accidents, loss of life, etc.	Provide PPE to the workers at site.	Construction site	Adoption level of OHS, No of accidents occurred	Observation and interaction	PIU	PM/DMSC	Every three months
C. Operation Stage								
Road Accident	Loss of life and properties	Adoption of Road safety measures, road signals to be erected	Along the road	Frequency of accidents,	Review of records and observation	PDM	PDM/RBP/RSTA	Every six months
Maintenance of Road	Inconvenience to road users, accumulation of differed maintenance	Adoption of regular maintenance practices	Along the road	Maintenance budgets, progress of maintenance works	Review of reports, documents, observation	PDM	PDM	Every six months

Note: The schedule/frequency of NEC's site visits to be left at the discretion of NEC.

DE - Design Engineer
 DMSC - Design Monitoring & Supervision Consultants
 ES - Environmental Specialist
 EU - Environmental Unit of Phuentsholing Municipality
 NEC - National Environment Commission
 PDM - Phuentsholing District Municipality
 PIU - Project Implementation Unit
 PM - Project Manager
 RBP - Traffic Police (Royal Bhutan Police)
 RSTA - Road Surface Transport Authority
 SE - Site Engineer,