

# Draft Initial Environmental Examination

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October 2011

## BHU: Urban Infrastructure Project–Samdrup Jongkhar Water Supply Subproject

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

## **CURRENCY EQUIVALENTS**

(as of 5 October 2011)

Currency unit	–	ngultrum (Nu)
Nu1.00	=	\$ 0.020239
\$1.00	=	Nu 49.4075

## **ABBREVIATIONS**

ADB	Asian Development Bank
CCC	construction complaints committee
CEMP	contractor's environmental management plan
EIA	environmental impact analysis
EMP	environmental management plan
FGD	focus group discussion
MWHS	Ministry of Works and Human Settlement
NEC	National Environment Commission
PIU	project implementation unit
PMO	project management office
PMU	project management unit
PPTA	project preparation technical assistance
RRP	report and recommendation of the president (ADB)
SES	socioeconomic survey
SJDM	Samdrup Jongkhar District Municipality

## **WEIGHTS AND MEASURES**

db	–	decibels
ha	–	hectare
km	–	kilometer
km <sup>2</sup>	–	square kilometer
l	–	liter
m	–	meter
m <sup>2</sup>	–	square meter
m <sup>3</sup>	–	cubic meter
mld	–	million liters per day
MT	–	metric tons
mtpd	–	metric tons per day

## **NOTE**

In this report, "\$" refers to US dollars.

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## Executive Summary

1. An environmental assessment was made for the proposed water supply project of Samdrup Jongkhar District Municipality (SJDM). It is one of the three subprojects to be funded by the Asian Development Bank (ADB) under the Urban Infrastructure Project of the Ministry of Works and Human Settlement (MWHS). Samdrup Jongkhar is a border town located in the southeastern 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 government laws, including (i) the National Environmental Protection Act of 2007, (ii) the Environmental Assessment Act of 2000, and (iii) Regulation for Environmental Clearance of 2002.
2. The overall institutional setup follows the existing implementation arrangement of an ongoing project, the Urban Infrastructure Development Project (UIDP) supported by ADB, where the MWHS is the executing agency, with a project management unit operating under the MWHS's Department of Urban Development and Engineering Services (DUDES). The participating Samdrup Jongkhar District Municipality (SJDM) is the implementing agency, and will set up a respective project implementation unit (PIU).
3. **Subproject description.** The proposed Samdrup Jongkhar subproject will help improve the living conditions of the urban population in the town and enhance competitiveness by improving its water supply infrastructure. The proposed project will rehabilitate the existing, outdated water supply system, and has the following components: (i) new 16,365-m pipeline; (ii) new disinfection system for the water output of the infiltration gallery and slow sand filter; (iii) new 300 m<sup>3</sup> ground storage reservoir at the lower zone; and (iv) replacement of filter material for the slow sand filter. No land acquisition or involuntary resettlement is required.
4. **Environmental and socioeconomic conditions.** Project implementation will not pose significant problems to the environment, since the existing water supply system has been operating since 1985 and is located in an urban area, and the project will focus on rehabilitation rather than developing a new system. There is no anticipated augmentation of the water supply system under this project. Water sources of the system are not within undisturbed landscapes, but within the municipal boundary, and have therefore been within the realm of human use for several decades. There are no designated protected or sensitive ecological areas within or near the project area.
5. On socioeconomics, Samdrup Jongkar is the gateway to six districts of Eastern Bhutan from India in the east, and has emerged and developed as a strategic town in the eastern zone of Bhutan. It is about 100 km from Guwahati, India, where an international airport is located, and is accessible to that city by road. It is therefore at a strategic location for trading, and is a leading center for the export of oranges, potatoes, and ginger, among other items. It has a potentially strategic role to play in regional connectivity and developing trade links between Bhutan and the immediate region.
6. **Impacts and EMP.** Screening for environmental impacts is done through a review of the parameters associated with projects for urban water supply system against the components of the proposed Samdrup Jongkhar subproject. An important consideration in analyzing the environmental impacts of the proposed subproject is the fact that these are improvements of an

existing system in an urban setting. These are not new incursions into ecologically undisturbed landscapes.

7. During detailed design and preconstruction, potential nuisances and problems to the public during construction shall be addressed by inclusion in the tender documents of specific provisions on 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.

8. Adverse environmental impacts during construction are temporary, not significant, and can easily be mitigated. There will be no massive construction activities that can damage the environment. Water supply pipe-laying is a low-impact construction activity, since trench excavation is shallow, with an average width of 0.45 m. Excavated soil is backfilled to the trench after pipe-laying, and surplus soil hauled to suitable disposal sites. Typical construction issues are manageable with the implementation of a contractor's environmental management plan (CEMP) for the following: (i) erosion and sediment runoff; (ii) nuisance to the public; (iii) noise and dust; (iv) vehicular traffic; (v) construction wastes; (vi) oil and fuel spillages; (vii) construction camps; (viii) occupational health and safety; (ix) public safety and convenience; (x) proper closure of construction sites; and (xi) potential damage to any archaeological and cultural assets.

9. An environmental management plan (EMP) is developed to effectively manage the environmental issues, and will form part of the bidding and contract documents. 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 preconstruction, 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. The EMP shall be the basis for the CEMP.

10. **Consultation and participation.** Project planning and the subsequent IEE preparation for the proposed water supply subproject recognized the need for public consultation and participation as central to effective environmental safeguard. Within the context of "meaningful consultation," Samdrup Jongkhar initiated a process of consultation during project preparation and intends to continue it during the construction phase. Samdrup Jongkhar conducted an initial public consultation and information disclosure on 1 August 2011. Participants included: (i) concerned individuals, (ii) the people's representative or Thuemi, (ii) business owners, (iii) the municipal engineer, and (iv) the executive secretary. Details of the subproject components were presented to the stakeholders, and their views on the proposed subproject 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 conducted last 20 July 2011 in Samdrup Jongkhar. The project team also met and discussed with the mayor and town counselors during the ADB fact-finding mission on 10 August 2011.

11. **Grievance redress mechanism.** Implementation of the proposed Samdrup Jongkhar subproject will be fully compliant to ADB's safeguards requirement on grievance redress

mechanism. Samdrup Jongkhar 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. Samdrup Jongkhar 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) Samdrup Jongkhar'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.** Samdrup Jongkhar is presently suffering from insufficient water production, and compounded by an old distribution network built in the 1980s. The proposed water supply system improvement under UIP will enable Samdrup Jongkhar to increase its water production and enhance its reliability to deliver safe drinking water. The proposed rehabilitation of the slow sand filter will boost its water production capacity, and new pipes will reduce non-revenue water, therefore increasing water supply and overall system efficiency.

13. Analysis of potential environmental impacts revealed no significant adverse impacts to people and environment from the proposed water supply 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 will be done by the supervision consultant's PIU and PMU, and an environmental monitoring report will be submitted on a semiannual basis to ADB. 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 Samdrup Jongkhar Water Supply Subproject. Its environmental classification as category B is deemed appropriate.

14. The 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 contractor's submission of a CEMP. The PMU shall monitor the PIU's compliance to the EMP. In addition, creation of a 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 Samdrup Jongkhar, including training, is recommended for effective EMP implementation. The PIU shall continue the process of public consultation and information disclosure during detailed design and construction.

## **I. INTRODUCTION**

1. The Samdrup Jongkhar Municipality is a local government located in the southeastern region of the Kingdom of Bhutan, and one of the selected towns 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 Samdrup Jongkhar 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 is one of three IEE reports under the UIP. Preparation of the IEE involved field visits to the proposed subproject area; review of available information; and discussions with local government officials, NEC, and other government agencies, and members of the community within the subproject area.

4. The IEE has been carried out in accordance with ADB's Safeguard Policy (2009) and the requirements describe in its Appendix 1 (Safeguard Requirement 1: Environmental Safeguards). 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 is also prepared consistent with 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) the National Environmental Protection Act of 2007, (ii) the Environmental Assessment Act of 2000, and (iii) Regulation for Environmental Clearance of 2002. At the national policy level, environmental protection and conservation is a constitutional mandate, and is required 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 the National Environment Commission (NEC), the government agency mandated to look after all issues related to the environment throughout the country. Their mandate includes the 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 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 clearance for individual projects. Information on the process for obtaining an environmental clearance and timelines for processing are presented in Appendix 1.

10. In cases where a forest has to be cleared, the municipality has to apply for a forestry clearance from the Department of Forestry in compliance with the 2006 Forest and Nature Conservation Rules of Bhutan. Information on the process for obtaining a forestry clearance is presented in Appendix 2.

11. Aside from environmental laws and regulations, the 2004 Penal Code of Bhutan also includes a provision on environmental pollution, wherein Article 409 states 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.

12. 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 (25 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.

### **III. DESCRIPTION OF THE SUBPROJECT**

#### **A. Location**

13. This proposed water supply subproject shall cover the entire Samdrup Jongkhar built-up areas. These are areas covered by the Local Area Plans (LAP) 1 and 2 of Samdrup Jongkhar. Hydraulically, the entire Samdrup Jongkhar is divided into two zones. The LAP 2 area is the upper zone, while LAP 1 is the lower zone. The upper zone is supplied by the existing slow sand filter, while the lower zone is supplied by the existing infiltration gallery.

## **B. Project Components**

14. The proposed water supply subproject has the following components: (i) new 16,365-m pipeline; (ii) new disinfection system for the water output of the infiltration gallery and slow sand filter; (iii) new 300 m<sup>3</sup> ground storage reservoir at the lower zone; and (iv) replacement of filter material for the slow sand filter.

15. The new 16,365-m pipeline shall be made of high-density polyethylene pipes (HDPE) that conform to pressure class 10kg/cm<sup>2</sup> pipelines, and range in size from 63 mm in diameter to 225 mm diameter, including valves and other appurtenances. Some 7,225 m or 44% of the total pipelines are 63 mm in diameter. The disinfection system shall consist of tanks for the chlorine solution (from powders) and electricity-driven dosing pumps for delivering the chlorine solution to the production pipelines, feeding the water transmission pipeline that supplies the distribution networks. Chlorine solution is prepared by mixing the chlorine powders with water. The filter media of the two parallel 9-m<sup>2</sup> slow sand filters shall be replaced. These have not been replaced since construction.

16. Total project cost is estimated at Bhutan Ngultrum (Nu) 31,135,048, based on 2011 prices.

## **C. Construction**

17. The pipelines shall be laid in prepared trenches (with an average width of 0.45 m) that shall be hand excavated to a depth of 1.5 m and provided with 225 sand beddings. Trenches shall be located beside the road and not in sidewalks. The laid pipeline shall be backfilled with selected earth in layers not exceeding 200 mm, watered, rammed, and compacted to the satisfaction of the supervising engineer. All backfill material shall be compacted. All laid pipelines shall be inspected and tested hydraulically after the completion of installation. The supervising engineer shall not accept any section of the pipelines until all requirements of the test have been obtained. Lines that fail to meet the requirements shall be corrected, and the pipeline re-tested until it conforms to the requirements.

18. An estimated 1,425 m<sup>3</sup> of surplus excavated soil will be generated by the pipeline construction. These shall be disposed of more than 2 km away from the built-up areas, in sites approved by the supervising engineer. It will be the contractor's responsibility to identify suitable sites for disposal of the surplus excavated soil.

## **D. Implementation and Operation**

19. The rehabilitated water supply system shall continue to be operated by the Samdrup Jongkhar Municipality. It is not a build-and-operate project. Construction is scheduled to start in the first quarter (Q1) of 2014, and is expected to be completed by Q4 2015.

## **IV. DESCRIPTION OF THE ENVIRONMENT**

20. A description of the existing environmental and socioeconomic conditions of the Samdrup Jongkhar subproject influence area is presented in the following subsections:

## A. Physical Resources

21. Samdrup Jongkar is located within a valley surrounded by steep slopes and teak forests. The Dungsam Chhu River flows through the middle of the town and across the Indo-Bhutan international border into Assam. The topography of the town gradually slopes down towards the Dungsam Chhu and finally towards the Indian border. The lowest elevation in the town is towards the south end (190 mean sea level, or msl), while the highest elevation level is in the northeast of the town, within mountainous forests (310 msl). The town is thus built over an elevation difference of about 120 m. Samdrup Jongkhar has a humid, subtropical climate where the winters are quite comfortable, with a maximum temperature of 25 °C, but the rest of the year is hot and humid. The town experiences rain during summers, with the annual precipitation in the range of 3,000-5,000 mm.

## B. Ecological Resources

22. The proposed subproject is an improvement of an existing water supply system in an urban setting. The facilities are therefore located in built-up areas and agricultural landscapes. An important fact to consider is that sites are not within undisturbed landscapes, since the pumping station of the infiltration gallery and slow sand filter have been operational for several years already, while the water supply distribution networks are in urban areas and roads that have been functional for a very long time. The proposed subproject is therefore not a new incursion into an ecologically untouched area. Hence, over the years the ecological changes due to human activities in these areas have resulted in its present landscapes.

23. **Protected areas.** Information from the Nature Conservation Division of the Department of Forestry indicated that there are no protected areas in and around Samdrup Jongkhar.

## C. Economic Development

24. Samdrup Jongkar is the gateway to six districts of Eastern Bhutan from India in the east. It has emerged and developed as a strategic town in the eastern zone of Bhutan. It is about 100 km from Guwahati, India, where an international airport is located, and is accessible to that city by road. It is therefore at a strategic location for trading, and is a leading center for the export of oranges, potatoes, and ginger, among other items. It has a potentially strategic role to play in regional connectivity and developing trade links between Bhutan and the immediate region.

25. **Land use.** Present land use patterns are residential, commercial, mixed use, institutional, social amenities, industrial, vacant land, and open space. The town is divided into Local Area Plans (LAP) 1 and 2. LAP 1 is located in the southern most part of the town, along the western edge of the Dungsam Chhu. The area is distinctly divided into two parts by the main entry road into Samdrup Jongkhar from Assam, India. Below the main road is a primarily high-density, mixed-use area, with commercial and residential land. Abutting the entry road, on either side are large government parcels that mainly accommodate residential areas of several government institutions and departments like the Royal Bhutan Police, District Forest Officer, General Reserve Engineering Forces, etc.

26. LAP 2 is located in the central part of the town, mostly along the eastern edge of the Dungsam Chhu, continuing down south across the Lower Market area on the other side of the river as a narrow strip of commercial and mixed use area. The area is seen as the main core of the town, with the creation of a town center accommodating residential, industrial, and

commercial development. The development along the main road leading to the north of the town is primarily low density at the rear side, scattered institutional settlements, with industrial and residential land uses. Abutting the internal road, on either sides are large parcels that mainly accommodate vacant land and several government institutions and departments, along with industrial areas.

27. **Existing water supply system.** Samdrup Jongkhar's existing water supply system serves an estimated 6,000 people with 550 metered service connections. It was constructed in 1985. Presently, it has two surface water sources: the Rikkhe Chhu, with a slow sand filter, and the Dungsam Chhu, with an infiltration gallery. The pumping station of the infiltration gallery has a capacity of 1 mld using four pumps, while the slow sand filter has a capacity of 1.75 mld. Capacity of the infiltration gallery has been reduced to 0.5 mld due to clogging. Capacity of the slow sand filter is also reduced, since the filter media has not been replaced since its construction. Consequently, water supply service is intermittent due to limited water production from the two sources. Water quality is also a concern. Bacteriological tests conducted last 9 July 2011 by the Samdrup Jongkhar General Hospital on water samples from the water sources, reservoirs, pumping station, and distribution network showed that all water samples are contaminated with bacteria. This condition does not meet the World Health Organization (WHO) bacteriological standard for drinking water. The Samdrup Jongkhar General Hospital reported that the number of cases of diseases associated with drinking water in 2010 was 753, and this year, has already reached 649 as of July 2011.

28. **Existing sanitation system.** All houses have septic tanks without soak pits. Since the houses are very close to each other, the septic tanks are located quite near to the houses, leading to unhygienic living conditions. For health services, the town is being served by the Samdrup Jongkhar General Hospital. The town has an open storm water drainage system that follows the natural gradient of the site. Samdrup Jongkhar has plans for a decentralized sewerage system according to their structure plan for both LAP 1 and LAP 2. The Government of India (GOI) has made available Nu 15 million for 2011 to fund the sewer lines and waste water treatment plant (WWTP) of LAP 1.

29. **Transportation, communication, and power.** Samdrup Jongkhar can be reached by road from central Bhutan and India. It is a 10-hour drive from Phuentsholing, Bhutan through Assam, India. The town is served by a mobile phone service. Electricity is supplied by hydropower.

#### **D. Socio and Cultural Resources**

30. Samdrup Jongkhar has a total population of 5,952, according to a 2005 census. LAP1 has a density of 114 persons per ha, while LAP2 has 32 persons per ha. The town has an average density of 30 persons per ha. Existing social and civic amenities include a temple, a police station, a cinema hall, the Sunday market, and a public toilet.

### **V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

31. A comprehensive screening for environmental impacts is made through a review of the parameters associated with water supply projects against the components of the proposed Samdrup Jongkhar subproject and the environment where the facilities are located. A screening checklist was developed from various sources, such as ADB's Rapid Environmental Assessment (REA) Checklist, and 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 already have 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 and mitigation measures that should be carried out are detailed in the environmental management plan (EMP) at the end of this section as Table 2.

33. Environmental impacts arising from decommissioning of facilities of the proposed water supply system 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 a growing urban area, 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 are 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, reinforced steel bars used in the structures, structural steel, roofing materials, electrical wires, etc.

**Table 1: Summary of Environmental Impacts Screening for Samdrup Jongkhar's Water Supply Subproject**

<b>Environmental Impacts and Risks</b>	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>PRECONSTRUCTION PHASE</b>		
Encroachment on environmentally sensitive areas	NA	NA
Impacts and risks to biodiversity conservation	NA	NA
Potential damage to historical and cultural assets	Δ -	Δ
Potential competing use of water resource	Δ -	Δ
Potential nuisance and problems to the public	● -	Δ
Loss of assets (IR concerns)	Δ -	Δ
<b>CONSTRUCTION PHASE</b>		
Modification of construction site topography	NA	NA
Removal of Trees	NA	NA
Displacement of Rare or Endangered Species	NA	NA
Soil erosion and sediments of construction sites	● -	Δ
Nuisance/ public inconvenience due to pipe-laying	● -	Δ
Noise from construction equipment	● -	Δ
Local air pollution due to construction activities	● -	Δ
Oil and other hazardous materials release	Δ -	Δ
Vehicular traffic congestion and public access	● -	Δ
Hazards to public due to construction activities	● -	Δ

<b>Environmental Impacts and Risks</b>	<b>Without Mitigation</b>	<b>With Mitigation</b>
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
<b>OPERATION AND MAINTENANCE PHASE</b>		
Health hazard due to delivery of poor water quality	● -	Δ
Increased wastewater due to increased water consumption	● -	Δ
Noise and air pollution of pumping stations	Δ -	Δ
Ground subsidence due to overpumping	na	na
Waste generation of slow sand filter	na	na
Slow sand filter operation risk and safety	na	na
Pumping stations operational risk and safety	● -	Δ
Increased employment opportunities	Δ +	Δ

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

### **A. Design/Pre-Construction Phase Considerations**

34. Samdrup Jongkhar's water supply system components are already existing, and are not located in areas that are environmentally sensitive or have historical and cultural importance. Most areas immediately adjacent to the road where pipelines are to be laid are already occupied by residential, commercial, and other structures. 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. The pumping station is in an open space with grasses and shrubs. There are no known archaeological and cultural assets in this site.

35. **Impacts and risks to biodiversity conservation.** The issue on impacts and risks to biodiversity conservation is not applicable to the Samdrup Jongkhar's subproject, since its components are located in existing urban areas, and not in areas that are environmentally sensitive.

36. **Competing use of water resource.** Samdrup Jongkhar's water supply system has been abstracting water from both Dungsam Chhu and Rikkhe Chhu without any problems, since there is adequate flow for the downstream users of Dungsam Chhu. There is no augmentation proposed under this project. Flow of the Rikkhe Chhu joins the Dungsam Chhu before reaching the existing infiltration gallery.

37. **Nuisance and problems to the public.** Potential nuisances and problems to the public during construction of the Samdrup Jongkhar subproject can best be avoided if proactively addressed during detailed design and preconstruction. 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, (v) public safety and convenience, and (vi) maintaining access to buildings during construction. These issues shall be reflected in the construction contracts.

## B. Construction Phase Environmental Impacts

38. **Site preparation.** Construction activities for improving Samdrup Jongkhar's water supply system will not involve modification of the construction site topography. Water supply pipelines will follow the existing site contour. The new chlorination system and the replacement of filter media will not involve new sites. There will be no removal of trees, since construction activities will be in the same sites as the existing water supply system. There will be no displacement of rare or endangered species, since there are no known rare or endangered species within the existing sites, and construction activities will not involve new sites. These issues are therefore considered not applicable.

39. **Soil erosion and sediment in construction sites.** Soil erosion in construction sites could occur if preventive measures are not instituted. During rainy periods, exposed soil at construction sites can easily be washed away by runoff and carried to the natural drainage system.

40. **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.

41. **Nuisance/public inconvenience due to pipe-laying.** Public inconvenience may arise in pipe-laying works due to prolonged water supply service interruptions. Dumping of construction materials and solid wastes in watercourses will also cause nuisance to the public, aside from affecting water quality and the flow regime.

42. **Mitigation.** The construction contractor shall be required to: (i) install pipes in the shortest time possible to minimize water supply cut-off periods, and/or use nighttime schedules<sup>1</sup>, as well as announce water supply interruptions 2-3 days prior to actual cut-off; (ii) not dump earth, stones, and solid wastes in watercourses to avoid adverse impact on water quality and flow regime; and (iii) provide continued access, through planks, etc., to buildings and businesses.

43. **Construction noise.** Potential sources of noise are the construction equipment, such as trucks and other equipment, which can generate noise of 80 dB from a distance of 30 m. Loud noise sources such as blasting are not expected in the construction activities of the Samdrup Jongkhar subproject, since there would mainly be pipe-laying activities in existing pipeline routes.

44. **Mitigation.** Nuisance from equipment noise can be mitigated with the use of sound suppression devices for the equipment. Noisy equipment shall not be operated during nighttime to early morning (9 p.m.–6 a.m.). According to NEC standards, noise levels in rural areas should not exceed 55 dB during daytime and 45 dB during nighttime. Noise levels in commercial areas should not exceed 65 dB during daytime and 55 dB during nighttime. Workers using noisy

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<sup>1</sup> Contractors will consult public on feasibility of nighttime works in residential areas prior to construction.

equipment shall be provided with earplugs. Contractors will consult public on feasibility of nighttime works in residential areas prior to construction.

45. **Local air pollution due to construction activities.** Dust generation from trenching, 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. During dry periods, the issue is more problematic. Another potential source of air pollution are stockpiles of construction materials such as soil and aggregates. Without any mitigating measures, dust generation could be problematic during dry periods. This issue is important for the proposed pipe-laying activities, since the sites will be excavated for the installation of new pipelines.

46. **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.

47. **Oil and other hazardous material releases.** Equipment and vehicles will be used in the various construction activities. 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 accidental spills from seeping into the ground.

48. **Vehicular traffic congestion and public access.** Construction activities, such as pipe-laying, may cause traffic congestion in heavily traveled roads and narrow streets. It may hinder public access. In the Samdrup Jongkhar subproject, pipe-laying along the roads in commercial areas is expected to cause traffic congestion since many vehicles are using these areas. Installation of secondary pipes crossing the road to the other side may cause the temporary closure of half the road, and will lead to traffic congestion.

49. **Mitigation.** Contractors shall be required to: (i) prepare a traffic plan; (ii) closely coordinate with local authorities for the closure of roads or rerouting of vehicular traffic; and (iii) ensure access in areas with excavations by providing planks and access between mounds, expediting works in front of shops, and providing signs to direct the pedestrians to access areas. 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.

50. **Hazards to the public due to construction activities.** Construction activities, such as pipe-laying along the roads, may result in hazardous driving conditions, since vehicles would still be using the road while construction activities are ongoing. The movement of construction vehicles and presence of excavations would pose some hazards to the driving public. There is also risk of people falling into open trenches, since pipe-laying trenches are normally left uncovered until pipeline testing is completed.

51. **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 trenches.

52. **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 workers' 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 camp to other areas. These conditions will increase public health risk.

53. **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' camp to avoid carrying away any contaminants. The contractor shall be required to use temporary diversion drains, catch drains, and silt-traps at these camps.

54. **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.

55. **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; (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.

56. 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; and (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.

57. **Increase employment opportunities at work sites.** The various construction activities for the Samdrup Jongkhar water supply system will definitely require a number of workers. The impact would be beneficial and positively significant, since employment opportunities in the area will increase.

58. **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.

59. **Improper closure of construction sites.** Construction activities will generate construction solid wastes after completion of work. This may include used surplus soil, wood materials, steel works cuttings, paint and solvent containers, used oil from equipment, unused aggregates, etc. If not removed from the sites after completion of the construction activities, these solid wastes will cause nuisances to the community as well as aesthetic problems, and some will be potential sources of contaminants for surface runoffs. An estimated 1,425 m<sup>3</sup> of surplus excavated soil will be generated by the pipeline construction.

60. **Mitigation.** After completion of work, 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. The required surface restoration must be implemented. All surplus excavated soil shall be disposed of more than 2 km away from the built-up areas, in sites approved by the supervising engineer. It will be the contractor's responsibility to identify suitable sites for disposal of the surplus excavated soil. The recovered old pipes will be sold by auction to interested buyers, according to the municipal engineer.

### C. Operation Phase Environmental Impacts

61. **Future wastewater management.** Presently, wastewater generation is handled by septic tanks, since all buildings are required to have one. In the future, wastewater shall be handled by decentralized sewerage systems. Samdrup Jongkhar has plans for a decentralized sewerage system according to their structure plan for both LAP 1 and LAP 2. The Government of India has made available Nu 15 million for funding the sewer lines and WWTP of LAP 1.

62. **Health hazard due to delivery of poor quality water.** Delivery of poor quality water will increase the health risk to water consumers. Threats to water quality are always present in all components of a water supply system, from the raw water sources up to the service connections. Threats of contamination in water sources may be due to the presence of bacteria, viruses, protozoa, or chemicals. This raises the need to provide a secure barrier to post-treatment contamination as the water is transported to the consumer. Samdrup Jongkhar should therefore manage the environmental risk to its water supply system. Failure to implement the appropriate management measures may result in adverse consequences threatening public health, such as a microbial outbreak.

63. **Mitigation.** Delivery to customers of poor quality water from the pumping station of the infiltration gallery and the reservoir of the slow sand filter can be prevented in a broader scale by implementing a water safety plan as advocated by the World Health Organization (WHO). A water safety plan shall enable Samdrup Jongkhar to: (i) prevent contamination of its water sources; (ii) treat the water to reduce or remove contamination that could be present, to the extent necessary to meet the water quality targets; and (iii) prevent recontamination during storage, distribution, and handling of drinking water. It is an approach that will clearly show the desire of Samdrup Jongkhar to apply best practices in ensuring delivery of potable water to its consumers. Preparation of the water safety plan shall be done by Samdrup Jongkhar with assistance from a consultant familiar with the WHO water safety plan. For the water quality targets, WHO drinking water standards for bacteria count (*E. coli*), which stated that no bacteria shall be detected in any 100 ml sample, shall be used. For the physical properties of water, there are no Bhutanese standards, but the Indian standard are suggested as the interim standards: for pH = 6.5-8.5, turbidity = 5 NTU, and suspended solids = 500 mg/l.

64. For controlling microbial contamination, a hypochlorinator will be installed at the pumping station of the infiltration gallery and the reservoir of the slow sand filter to ensure that water will be chlorinated, and adequate residual disinfection will be maintained. This device uses a feed pump to inject controlled amounts of chlorine solution into the water leaving these points. This is safer than using chlorine gas. The WHO recommends that chlorine residual should be maintained throughout the water supply distribution system. WHO values for chlorine residual are: (i) 0.5 mg/l free chlorine residual after 30 minutes contact time at pH less than 8.0, and (ii) 0.2 mg/l minimum free chlorine residual at the point of delivery. Samdrup Jongkhar shall continue to seek the assistance of the Samdrup Jongkhar Hospital in monitoring the bacteriological quality of its water supply system.

65. **Increased wastewater due to increased water consumption.** Rehabilitation of the water supply system will also increase the water consumption due to water availability.

66. **Mitigation.** The present system of using septic tanks will continue to handle the increase in wastewater generation. In the future, wastewater of LAP 1 area will be handled by a decentralized sewerage system with a WWTP.

67. **Noise and air pollution of pumping station.** Noise of pumping stations is not an issue for this subproject, since there will be no significant sources of mechanical noise within the station. Potential sources of noise, such as pumps and electric motors, are housed inside an existing building that provides noise attenuation. Local air pollution levels will not be affected by equipment use during normal operations, since the pumping station is running on electricity supplied by the local power company. There will be no operational activities that will cause dust generation. Mitigating measures are therefore not necessary for noise and air pollution.

68. **Ground subsidence due to overpumping.** This issue is not applicable for this subproject, since sources of water are the rivers.

69. **Waste generation of slow sand filter.** The existing slow sand filter is a passive system that relies on gravity for water flow. There is no generation of wastes. This issue is therefore not applicable for this subproject.

70. **Slow sand filter operational risk and safety.** The existing slow sand filter will not inherently pose risks to the environment and people. This facility is a passive system that relies on gravity for water flow. There are no hazardous situations for workers. This issue is therefore not applicable for this subproject.

71. **Pumping stations operational risk and safety.** The existing pumping station at the infiltration gallery will not inherently pose risks to the environment and people. This facility is not using flammable materials during normal operations. Conditions of extreme temperature and pressure are not to be expected. Use of diesel-powered generators as stand-by power source is considered safe, since these are equipped with safety devices. A potential source of risk may arise if chlorine gas will be used as disinfectant. Accidents may occur with chlorine gas handling.

72. **Mitigation.** In water facilities, the significant source of hazardous situations is the use of chlorine gas as disinfectant. This is being avoided in the existing pumping stations by using the liquid form of chlorine. This is inherently a safer disinfectant, similar in character to household bleach or swimming pool chlorine.

73. **Increased employment opportunities.** Operation and maintenance of the infiltration gallery, pumping station, slow sand filter, reservoirs, and pipelines, will definitely require a number of workers. The impact would be beneficial, since employment opportunities in the area will increase. However, the expected number of additional workers will be small, since the water supply facilities are not labor intensive. This impact is therefore considered less significant.

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

**Table 2: Environmental Impacts and Risks for Inclusion in EMP of Samdrup Jongkhar Subproject**

Environmental Impacts and Risks	Without Mitigation	With Mitigation
<b>PRECONSTRUCTION PHASE</b>		
Potential damage to historical and cultural assets	Δ -	Δ
Potential nuisance and problems to the public	● -	Δ
Loss of assets (IR concerns)	Δ -	Δ
<b>CONSTRUCTION PHASE</b>		
Soil erosion and sediments of construction sites	● -	Δ
Nuisance/ public inconvenience due to pipe-laying	● -	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
Occupational health and safety at work sites	● -	Δ
Increased employment opportunity at work sites	● +	● +
Improper closure of construction sites	● -	Δ
<b>OPERATION AND MAINTENANCE PHASE</b>		
Health hazard due to delivery of poor quality water	● -	Δ
Increased wastewater due to increased water consumption	● -	Δ
Pumping stations operational risk and safety	● -	Δ

Legend: Δ = insignificant; ● = significant;

+ = positive; - = negative.

## VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

75. During the planning phase, Samdrup Jongkhar has undertaken various activities for information disclosure, public consultation, and public participation for its proposed water supply 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 water supply subproject was disclosed to the public during the conduct of a socioeconomic survey (SES) in July 2011. It was an occasion not only for project disclosure, but also for stakeholder identification and to scope issues and concerns. During the SES, respondent households in Samdrup Jongkhar were informed about the proposed subproject and interviewed for socioeconomic data. A focus group discussion (FGD) was also conducted on 20 July 2011 in Samdrup Jongkhar.

77. **Public consultation.** On 1 August 2011, Samdrup Jongkhar conducted an initial public consultation and formally discussed the proposed water supply subproject with the stakeholders and requested their views. Stakeholders were encouraged to raise their social and environmental issues. Participants included (i) concerned individuals, (ii) people's representative or Thuemi, (iii) business owners, (iv) municipal engineer, and (v) executive secretary. Stakeholders expressed support to the proposed water supply subproject. A summary of the consultation outcomes is presented in Table 3, while the documentation is presented in the appendixes.

78. **Future disclosure and consultations.** A continuing process of public consultation and information disclosure shall be advocated. During detailed design, Samdrup Jongkhar's PIU shall again conduct public consultations and information disclosure. Views of the stakeholders will be considered in the overall design process. Stakeholders' consultations shall be continued throughout the duration of the construction phase. The PIU 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 3: Summary of Consultation Outcomes**

Group Represented	Issues/Concerns Raised	Project's Response
Business	Is the present low water pressure at the service connection point due to small water pipes or insufficient supply of water?	There is insufficient supply. That is why there is an urgent need to improve the water sources and seek more sources.
Business	The galvanized iron house pipes are easily corroded, perhaps due to too much chlorine.	The chlorination system will be improved under the project.
Business	There will be no significant problems during construction if the activities will be planned well, such as not keeping an open trench for too long.	There will be close supervision by the PIU of the contractor's activities so as to prevent such type of situation from occurring.
Business	Will long water interruptions during construction be avoided, since it will cause so much inconvenience to the public?	Careful planning of the contractor's activities, particularly the transferring of the existing service connections to the new distribution pipelines, will be done; there will be notification on the water service interruptions as being done presently.

## VII. GRIEVANCE REDRESS MECHANISM

79. Local grievance redress mechanism (GRM) is important in the implementation of the proposed Samdrup Jongkhar Water Supply Subproject, since any complaints and concerns of the affected people must be addressed promptly, at no cost 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 be handled at various levels, including through the formation of an ad hoc construction complaints committee (CCC) for the expeditious resolution of the complaints.

80. **First level of GRM.** An expeditious resolution to most grievances during construction can easily be handled by the contractors' representatives and PIU officers at the construction site, and whenever necessary, together with the construction supervision consultants. The phone number of the PIU office will be publicly posted at the construction sites for any complaints. 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.** Samdrup Jongkhar 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) Samdrup Jongkhar's PIU head. Creation of the ad hoc CCC and its operation shall be included in appropriate sections of the civil works contract. Expedient resolution of complaints during construction is important, since activities are sometimes continuous and can easily change the landscape 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 Samdrup Jongkhar's 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 level GRMs.** If the complaint cannot be resolved at the CCC, the complainant has the option to first raise the issue to the Mayor of Samdrup Jongkhar (third level GRM), and if the complaint cannot be resolved at the Mayor'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 Samdrup Jongkhar Water Supply 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 the roles during implementation and the required monitoring are also discussed. This section also outlines the requirements and responsibilities during preconstruction, construction, and operation.

### **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 impact was determined in the screening process. Costs for mitigations during the preconstruction, construction, and operation phases are part of the detailed design cost, construction contracts, and Samdrup Jongkhar operation and maintenance costs, respectively.

**Table 4: Environmental Mitigation Plan of Samdrup Jongkhar Subproject**

<b>Project Activity</b>	<b>Potential Environmental Impact</b>	<b>Proposed Mitigation Measure or Enhancement Measure</b>	<b>Location</b>	<b>Mitigation Cost</b>	<b>Responsibility for Implementation/ Supervision</b>
<b>PRECONSTRUCTION PHASE</b>					
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; hand digging of trenches to avoid damaging the existing pipelines	Pipeline trenches, civil works excavations	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	Pipeline routes	Part of detailed design cost	PIU, design consultants/PMU
IR concerns	Loss of assets	Compensation and other assistance for lost assets; consultation and information dissemination to affected people	Pipeline routes	Part of detailed design cost	PIU, design consultants/PMU
<b>CONSTRUCTION PHASE</b>					
Pipe-laying and other civil works	Soil erosion and sediments in construction sites during rainy periods	Total area exposed shall be minimized; use of temporary diversion drains and catch drains at work sites; silt fencing	Pipeline routes; reservoir	Incorporated in construction contract	Contractor/PIU, supervision consultants
Pipe-laying, and other construction works	Nuisance/ inconvenience to the public	Minimizing of water supply cutoff periods and/or use of nighttime schedules, as well as announcement of water supply interruptions 2-3 days prior to actual cutoff; no dumping of earth, stones, and solid wastes in watercourses	Pipeline routes	Incorporated in construction contract	Contractor/PIU, supervision consultants
Pipe-laying and other civil works	Nuisance from noise of construction equipment	Consultation with affected areas; not to operate noisy equipment during nighttime (9 p.m.– 6 a.m.); sound suppression for equipment; ear plugs for workers	Pipeline routes	Incorporated in construction contract	Contractor/PIU, supervision consultants

<b>Project Activity</b>	<b>Potential Environmental Impact</b>	<b>Proposed Mitigation Measure or Enhancement Measure</b>	<b>Location</b>	<b>Mitigation Cost</b>	<b>Responsibility for Implementation/ Supervision</b>
Pipe-laying 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; no smoke belching equipment	Pipeline routes	Incorporated in construction contract	Contractor/PIU, supervision consultants
Pipe-laying and other civil works	Traffic congestion and hindrance to public access	Close coordination with local authorities in road closure and traffic rerouting; contractor's traffic plan; provision of planks, provision of access between mounds, expediting of works in front of shops, and provision of signs to direct the pedestrians to access areas. Consider night works in busy commercial areas.	Pipeline routes	Incorporated in construction contract	Contractor/PIU, supervision consultants
Pipe-laying 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
Pipe-laying 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 trenches in pipe-laying	Pipeline routes	Incorporated in construction contract	Contractor/PIU, supervision consultants
Rehabilitation and closure of construction sites	Improper closure of construction sites	Remove all construction wastes and implement surface restoration; proper disposal of surplus soil in suitable site more than 2 km from built-up areas	Pipeline routes, slow sand filter	Incorporated in construction contract	Contractor/PIU, supervision consultants
Pipe-laying and other civil works	Increase employment opportunities	Contractor required to give preference to local labor; workers' recruitment to be coordinated with local officials	Pipeline routes	No cost	Contractor/PIU, supervision consultants
<b>OPERATION PHASE</b>					
Water production	Health hazard due to delivery of poor water quality	Water disinfection using chlorine; water safety plan implementation	Pipelines, reservoirs and pumping station	Part of operation and maintenance costs	Samdrup Jongkhar Municipality/ MWHS
Delivery of more water	Increased wastewater generation due to increased	Septic tanks; in the future, decentralize sewerage system for LAP 1 area	Distribution networks area	House owners cost; Government of India for	Households; Samdrup Jongkhar Municipality

Project Activity	Potential Environmental Impact	Proposed Mitigation Measure or Enhancement Measure	Location	Mitigation Cost	Responsibility for Implementation/ Supervision
	consumption			decentralized sewerage	
Pumping station operation	Pumping station operational risk and safety	Use liquid chlorine (from solids) instead of chlorine gas	Pumping station	Part of operation and maintenance costs	Samdrup Jongkhar Municipality/ MWS

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.

**86. Tender documents and construction contracts.** EMPs will form part of the bidding and contract documents. Environmentally responsible procurement advocates the inclusion in construction contract documents of provisions addressing the management of environmental impacts and risk during construction. This includes the contractor's submission of a contractor's EMP (CEMP). 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, (vii) public safety and convenience, (viii) occupational health and safety, (ix) proper closure of construction sites, and (x) potential damage to any archaeological and cultural assets.

**87. Contractor's EMP.** During construction, each contractor will be guided by a detailed contractor's EMP (CEMP). This shall be based on the Samdrup Jongkhar subproject's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by Samdrup Jongkhar's PIU and other monitoring parties. Inclusion in construction contract documents of 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 the PIU's construction supervision engineer to focus on specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the CEMP, the PIU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules. The CEMP shall be prepared by all contractors before the start of the construction works and shall be approved by the 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, and air and noise pollution control. It shall also include guidance on the proper design of the construction zone, careful management of stockpiles, vegetation, topsoil, and vehicles and machinery.

**88. Water safety plan.** Samdrup Jongkhar shall manage the environmental risk to its water supply system on a broader scale. As previously pointed out, the role of a water safety plan in addressing the risk cannot be overemphasized. This is an approach advocated by WHO for

ensuring the delivery of safe drinking water to the consumers. The water safety plan shall enable Samdrup Jongkhar to: (i) prevent contamination of its water sources; (ii) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets; and (iii) prevent recontamination during storage, distribution, and handling of drinking water. It is an approach that will clearly show the desire of Samdrup Jongkhar in applying best practices to ensure delivery of potable water to its consumers. Samdrup Jongkhar shall prepare the water safety plan with assistance from external resources such as consultants.

89. **Unanticipated environmental impacts.** Where unanticipated environmental impacts become apparent during project implementation, the PIU 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

90. Table 5 presents the information on: (i) aspects or parameters 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 in the appendixes.

**Table 5: Environmental Monitoring Plan of Samdrup Jongkhar Subproject**

Aspects/ Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implemen- tation Respon- sibility	Compliance Monitoring Respon- sibility	Monitoring Cost
<b>PRECONSTRUCTION PHASE</b>						
Specific provision in tender documents on archeological/ cultural relics	Pipeline trenches, civil works excavations	Verify draft and final documents	Twice—draft and final documents	Design consultants	PMU	Part of project management in detailed design (minimal cost)
Consultation meetings; specific provisions in tender documents on nuisance and problems to public	Pipeline routes	Verify meetings documentation; verify draft and final documents	After completion of meetings; twice—draft and final documents	PIU, design consultants	PMU	Part of project management in detailed design (minimal cost)
<b>CONSTRUCTION PHASE</b>						
Total area to be exposed; runoff flowing into disturbed sites	Pipeline routes	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
Water supply interruptions; materials and solid wastes dumped in watercourses	Pipeline routes	Visual inspection of sites; work schedules verification	Daily	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost

Aspects/ Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implemen- tation Respon- sibility	Compliance Monitoring Respon- sibility	Monitoring Cost
						to PIU
Noise levels in rural areas not to exceed 55 dB during daytime and 45 dB during nighttime; noise levels in commercial areas not to exceed 65 dB during daytime and 55 dB during nighttime	Pipelines routes	Use of sound level meter	Daily	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Dust, cover of stockpiles, smoke belching equipment	Pipeline routes	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	Pipelines routes	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	Pipelines routes	Visual inspection of sites	Daily	Contractor	Construction supervision consultants, PIU	Part of consultant's construction supervision contract; minimal cost to PIU
Construction wastes and surplus soil	Pipeline routes, slow sand filter, pumping station	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	Pipeline routes	Verification of contractor's records	Once a month	Contractor	PIU	No cost
<b>OPERATION PHASE</b>						
<i>E. coli</i> bacteria; water's physical and chemical parameters	Pipelines, reservoirs, and pumping	Water sampling and laboratory test	Monthly for bacteria; annual for physical and	Samdrup Jongkhar Municipality	MWHS	Part of operation cost

Aspects/ Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implemen- tation Respon- sibility	Compliance Monitoring Respon- sibility	Monitoring Cost
	station		chemical			
Septic tanks	Areas with water service connections	Verification of municipal engineer's records	Once a year	Samdrup Jongkhar Municipality	MWHS	Minimal cost
Liquid chlorine use	Pumping stations	Verification of operation records	Once a year	Samdrup Jongkhar Municipality	MWHS	Minimal cost

MWHS=, PIU= project implementation unit, PMU= project management unit.

91. **Water quality tests.** Bacteriological test for water quality shall continue to be done by the Samdrup Jongkhar Hospital. The municipal government shall make arrangements with the hospital for the monthly tests to be done. For physical and chemical tests of water quality, the municipal government shall identify a nearby laboratory where the water samples can be tested once a year, probably in India.

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). A tendering process advocating environmentally responsible procurement is a desired outcome during the preconstruction 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 reduced risk to the public. For the operation phase, Samdrup Jongkhar's water supply system must meet the WHO drinking water standards for bacteria count (*E. coli*), which states that no bacteria shall be detected in any 100 ml sample. For the physical properties of water, there are no Bhutanese standards, but the Indian standards are suggested as the interim standards: for pH = 6.5-8.5, turbidity = 5 NTU, and suspended solids = 500 mg/l.

**Table 6: Project Performance Monitoring of Samdrup Jongkhar Subproject**

Desired Outcomes	Aspects / Parameters to be Monitored	Means of Monitoring	Frequency	Implemen- tation	Compliance Monitoring	Monitoring Cost
<b>PRECONSTRUCTION</b>						
Detailed design is environmentally responsive	EMP requirements incorporated in detailed design	Verify detailed design documents; EMP requirements reflected in tender documents	Two reviews: (i) draft detailed design documents, and (ii) prior to approval of final documents	Design consultants	PMU	Minimal cost
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	Minimal cost
<b>CONSTRUCTION PHASE</b>						
Effective management of environmental	Number of public complaints on	Verification of contractor's records; PIU	Once a month	Contractor	Construction supervision consultants,	Part of consultant's construction

Desired Outcomes	Aspects / Parameters to be Monitored	Means of Monitoring	Frequency	Implementation	Compliance Monitoring	Monitoring Cost
impacts during construction	construction activities	coordination with local officials			PIU	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
<b>OPERATION PHASE</b>						
Water quality meets drinking water standards	Required drinking water quality parameters	Water sampling and laboratory test	Monthly for bacteria; annual for physical and chemical	Samdrup Jongkhar	MWHS	Part of operation cost

EMP= MWHS= PIU= project implementation unit, PMU= project management unit.

### C. Implementation Arrangement

93. This subsection presents the (i) institutional setup, (ii) implementation schedule, (iii) required clearances and permits, and (iv) capability building. Presently, the PMU at DUDES has only three staff members: a project manager, an assistant project manager, and a junior engineer. Hence, meeting the environmental requirements at the project-planning phase, such as the preparation of IEEs, is through external resources such as consultants. At the PIU level, Samdrup Jongkhar still has to form a PIU. The Office of the Municipal Engineer is presently assuming the PIU function.

94. **Project management unit (PMU).** The PMU in DUDES will appoint one staff to oversee the monitoring of environmental safeguards implementation. In general, this staff will oversee contractor's compliance with the environmental management plans, public complaints, PIU environmental monitoring, and reporting to ADB. Specifically, the PMU is responsible for the following activities related to environmental safeguards: (i) confirming that IEEs with EMPs are updated, where necessary, by design monitoring supervision consultants (DSMC) in accordance with ADB's Safeguard Policy Statement (SPS, 2009), based on detailed designs, and submitted to ADB for review and approval prior to contract award; (ii) confirming that EMPs are included in the bidding documents and civil works contracts; (iii) ensuring contractor's EMPs (CEMPs) are prepared by contractors prior to construction and endorsed by PIUs; (iv) establishing a system to monitor environmental safeguards of the project, including monitoring the indicators set out in the monitoring plan of the EMP; (v) facilitating and confirming overall compliance with all government rules and obtaining all required environmental clearances and any other environmental permits prior to contract award; (vi) supervising and providing guidance to the PIUs to properly carry out environmental monitoring and reporting; (vii) reviewing, monitoring, and evaluating the effectiveness with which the CEMPs are implemented, and recommending necessary corrective actions to be taken as necessary; (viii) consolidating quarterly environmental monitoring reports from PIUs and submitting semiannual environmental monitoring reports to ADB; (ix) ensuring timely disclosure of final IEE/EMPs in locations and forms accessible to the public; and (x) addressing, recording, and reporting on any grievances brought about through the grievance redress mechanism in a timely manner, as per the IEEs.

95. **Project implementation unit (PIU).** The PIU in Samdrup Jongkhar will appoint one staff to oversee the monitoring of environmental safeguards implementation. The PIU, with the assistance of DSMC environmental specialist (consultant support), will do the following: (i) ensure the draft IEE/EMP prepared during the feasibility study is updated during detailed design stage, where necessary; (ii) ensure EMPs are included in bidding documents and civil works contracts; (iii) ensure overall compliance with all government rules and obtain all required environmental clearances, as well as any other environmental permits prior to contract award; (iv) oversee implementation of EMP and CEMPs, including environmental monitoring; (v) take corrective actions when necessary to ensure no environmental impacts; (vi) submit quarterly environmental monitoring reports to the PMU; and (vii) address any grievances brought about through the grievance redress mechanism in a timely manner, as per the IEEs.

96. **Implementation schedule.** As presented in the project description, construction of the water supply subproject is scheduled to start in Q1 2014 and to be completed by Q4 2015. Samdrup Jongkhar shall ensure that construction contract provisions related to the EMP shall be included in the tendering stage in 2013.

97. **Clearances and permits.** Samdrup Jongkhar shall apply for an environmental clearance (EC) from NEC for the proposed improvement of the water supply system. Samdrup Jongkhar shall ensure that it has applied for the EC by Q2 2012, since the 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 MWHS, the PMU, and the municipalities with subprojects. Under the UIP implementation arrangement, consulting services will be provided to support the PMU and PIUs. Cost of the capacity building is included in the overall UIP consulting services. For Samdrup Jongkhar, there is a need for staff training on the operation and maintenance of the rehabilitated water supply system. Training is included in the overall capacity building for UIP.

## IX. CONCLUSION AND RECOMMENDATIONS

99. Samdrup Jongkhar is presently suffering from insufficient water production, compounded by an old distribution network. The proposed water supply system improvement under UIP will enable Samdrup Jongkhar to increase its water production and enhance its reliability to deliver safe drinking water. The proposed rehabilitation of the slow sand filter will boost its water production capacity.

100. The environmental screening process has highlighted the environmental issues and concerns of the proposed water supply subproject. An important fact considered in the screening is that the proposed sites are not within undisturbed landscapes, since the pumping station of the infiltration gallery and slow sand filter have been operational for several years already. The proposed subproject is therefore not a new incursion into an ecologically untouched area.

101. Based on the screening for potential environmental impacts and risks of the proposed water supply subproject, there are no significant negative environmental impacts and risks that cannot be mitigated. Hence, the proposed Samdrup Jongkhar Water Supply 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 subproject.

102. Implementation of the proposed water supply subproject is hereby recommended with emphasis on the following: (i) EMP of Samdrup Jongkhar 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 submission 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) MWHS shall ensure that capability building for Samdrup Jongkhar shall be pursued, particularly the training of personnel on operation and maintenance of the water supply system; (vii) monitoring of health and safety requirements shall be given more importance during implementation to reduce risks to the public and to Samdrup Jongkhar's personnel; and (ix) Samdrup Jongkhar's PIU shall continue the process of public consultation and information disclosure during detailed design and construction.

## **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. In this project, application shall be to the NEC Secretariat.

1. 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.
2. Minimum contents of environmental information: The environmental information shall contain a short and concise description of the following elements:
  - (i) the potential adverse effects of the project on the environment, including the direct, indirect, and cumulative effects;
  - (ii) how the project complies with relevant sectoral guidelines or code of best practices, if any, issued by the secretariat or competent authorities;
  - (iii) how the impacts of the project will be avoided, minimized, or reduced; and
  - (iv) the environmental benefits of the project, including how the project will benefit concerned people and use clean and sustainable technologies.
3. 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.
4. 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
5. 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.
6. 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.
7. 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.

8. 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**

<b>Action</b>	<b>Time Limit</b>
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	1–3 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.	1–3 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/competent authority.	Time frame to be negotiated
Decision/response on the environmental clearance based on the findings of the environmental assessment report	1–3 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–1 month

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

**APPENDIX 2: PROCEDURES FOR OBTAINING FORESTRY CLEARANCE FROM THE  
DEPARTMENT OF FORESTS FOR CLEARING FOREST LAND**

1. Land ownership has to be determined, whether it is government land or private land
2. If it is government land, the applicant has to make a written application to the Dzongkhag Land Allotment Committee.
3. Once the application is with the committee, the Chairman then writes to all concerned authorities, including NEC, for their consent.
4. The committee will then work with the National Land Commission for the registration of the said land in the name of the applicant.
5. After registration, the Forestry Department is supposed to clear the area within 60 days.
6. If the Forestry Department fails to clear the area within 60 days, the applicant has the right to cut down the trees after the forest officials have marked the trees for felling.
7. The logs belong to the government, and are to be auctioned.
8. If the land is private land and has to be acquired, then the procedures for resettlement, land substitution, and compensation shall be followed.

### APPENDIX 3: EXISTING WATER SUPPLY SYSTEM



Photo No.1 – Area of existing water supply infiltration gallery in Dungsam Chhu River. On left side of photo is the retaining wall of the pumping station.



Photo No. 2 – Pumping station of the infiltration gallery



Photo No. 3 – Chlorine dosing tank for manual supply of chlorine solution to the pumping station



Photo No. 4 – Typical valve and valve box of the distribution system



Photo No. 5 – Typical street with commercial establishments



Photo No. 6 – Typical road with institutional establishments

## **APPENDIX 4: MINUTES OF THE PUBLIC CONSULTATION/MEETING HELD AT THE MUNICIPAL ENGINEER'S OFFICE, SAMDRUP JONGKHAR, 1 AUGUST 2011**

### **Opening/Presentations:**

1. Samdrup Jongkhar's executive secretary opened the public consultation/meeting at around 10 a.m. by welcoming everybody, and explained that the purpose of the meeting was to present the water supply subprojects and to elicit views from the stakeholders regarding the proposal, particularly issues that they may have raised.
2. The meeting continued with the subproject presentation by the municipal engineer, who described the components of the proposed subproject, including rehabilitation of the water supply distribution network and the infiltration gallery.

### **Comments, Views, Issues, and Concerns raised by Stakeholders**

3. Mr. Karma Wangdi asked whether the low water pressure at the service connection point is due to small water pipes or insufficient supply of water. The municipal engineer responded that there is insufficient supply. That is why there is an urgent need to improve the water sources and seek more sources. The municipality has improved the water transmission pipelines in order to increase the supply, since previously, the gravity supply pipeline was not flowing fully.
4. Mr. Karma further expressed his observation that the galvanized iron house pipes are easily corroded, perhaps due to too much chlorine. The municipal engineer responded that the water supply system is being chlorinated. However, he is promoting the boiling of water for drinking, and advised the people not to rely only on the chlorination that they are doing.
5. Sangey Wangdi believed that there will no significant problems during construction if the activities will be planned well, such as not keeping an open trench for too long. The municipal engineer responded that there will be close supervision by his office of the contractor's activities so as to prevent such type of situation from occurring.
6. Yeshe Chowden asked if long water interruptions during construction will be avoided, since it will cause so much inconvenience to the public. The municipal engineer responded that such situation will be avoided by careful planning of the contractor's activities, particularly the transferring of the existing service connections to the new distribution pipelines. Before executing the transfer, there will be notification on the water service interruptions, as being done presently.
7. Dawa Rinchen expressed his views that indeed there will be inconveniences, since there will construction activities. However, these will be lessened by careful planning of activities, and the people must be patient since the construction activities are for their benefit.
8. Finally, the stakeholders expressed their support to the proposed water supply project and thanked the government's representatives that the Samdrup Jongkhar water supply system will be improved to benefit everyone. The executive secretary welcomed the expression of support and informed everyone that ADB will support more of Samdrup Jongkhar's infrastructure requirements in the future if the municipality is successful in implementing the

proposed subproject. The municipal engineer informed the stakeholders that more support from ADB is required in the future for the implementation of the long-term plan on water sources, since the proposed project is only an interim measure.

9. The executive secretary closed the meeting by thanking everyone for their participation in the public consultation.

10. Meeting closed at 11 a.m.

**APPENDIX 5: LIST OF PARTICIPANTS OF SAMDRUP JONGKHAR PUBLIC  
CONSULTATION  
AND INFORMATION DISCLOSURE (1 AUGUST 2009)**

**Stakeholders/Participants:**

- Ugay Duiji, people's representative, Thuemi
- Sangey Wangdi, proprietor - Marphu Auto
- Samdrup Dorji, proprietor - Pewa Workshop
- Kinzang Wangdi, manager – Barma Chemicals
- Mendarawa, proprietor – Bon Appetite
- Dechen Wangme, proprietor – Dechen School
- Yeshi Choden, proprietor – Yeshi Tyres
- Selden, proprietor – Selden Grocery
- Karma Wangdi, proprietor
- Dawa Rinchen, manager – Gongphel Construction

**Samdrup Jongkhar Municipality**

- Thuji Tshering, executive secretary
- Yeshey Dorji, municipal engineer

**UIP CONSULTANT**

- Ruel Janolino – environment specialist, Poyry

# APPENDIX 6: ATTENDANCE SHEET OF SAMDRUP JONGKHAR PUBLIC CONSULTATION AND INFORMATION DISCLOSURE (1 AUGUST 2011)

ADB TA 7630-BHU: URBAN INFRASTRUCTURE PROJECT LIST OF PUBLIC CONSULTATION PARTICIPANTS PROPOSED WATER SUPPLY SUBPROJECT OF SAMDRUP JONGKHAR				
Consultation Date: 01 AUGUST 2011				
No.	Name	Designation	Organization	Signature
1	Ugye Diji	Tuemi Toe		
2	Gangay Rangeli	Proprietor	Maphu Dawa	
3	Sandrup Dorji	Proprietor	Pema Workshop	
4	Kinzang Wangdi	Manager	Barma Chemical	
5	Mendarawa	Proprietor	Bon Appetite	
6	Dechen Wangme	Prop.	Dechen Pt. School	
7	Yeswi Choden	Prop.	Yeswi Tyres	
8	Selden	Prop.	Selden Grocery	
9	Karma Wangdi	Prop.	Kanung/Lama	
10	Dawa Rinchen	G.M.	Gongphel Const	
11	Thupj. Ishing	E.S.	Municipality	
12	Pelkey Dorji	DY. EE	Municipality	
13	RUEL JANOLINO	CONSULTANT	POYRY	

## APPENDIX 7: PHOTOGRAPHS OF SAMDRUP JONGKHAR PUBLIC CONSULTATION MEETING



Photo No. 7 – Municipal engineer answering some issues raised at public consultation meeting (1 August 2011)



Photo No. 8 – A stakeholder raising a point at public consultation meeting (1 August 2011)



Photo No. 9 – Another stakeholder raising a point at public consultation meeting (1 August 2011)



Photo No.10 – Samdrup Jongkhar's executive secretary and women stakeholders listen to a point raised at public consultation meeting (1 August 2011)

## **APPENDIX 8: SAMPLE CONTENTS FOR ENVIRONMENTAL MONITORING REPORT**

### **A. Summary of EMP Implementation**

1. Overall status of EMP implementation
2. Key issues, corrective actions, and any grievances

### **B. Details of EMP Implementation Status**

1. Permissions/consents (list of relevant permits, clearances, etc. and status of obtaining these)
2. Field visits and consultations (sites visited, dates, persons met)
3. Training (nature of training, number of participants, date, location, etc.)
4. Progress of work (percentage of physical completion)
5. Design/location/preconstruction stage monitoring
6. Construction stage monitoring
7. Operation stage monitoring
8. Occupational health risks and safety plan for workers
9. Redress of grievances (type of grievance, date, persons, etc.)
10. Corrective actions taken

## **APPENDIX**

Consents

Permissions

Monitoring data (water quality, air quality, etc.)

Photographs

Maps