

# Initial Environmental Examination

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BHU: Secondary Towns Urban Development  
Project—Samdrup Jongkhar Sewerage and  
Sanitation Subproject



## CURRENCY EQUIVALENTS

As of 8 May 2018

Currency unit	–	ngultrum (Nu)
Nu1.00	=	US \$0.015
\$1.00	=	Nu67.147

## ABBREVIATIONS

ADB	Asian Development Bank
BDWQS	Bhutan Drinking Water Quality Standards
DHMS	Department of Hydro-Metreological Services
EIA	environmental impact assessment
EMP	environmental management plan
FNCA	Forest and Nature Conservation Act
GRF	Government Reserved Forest
GRM	grievance redress mechanism
HDPE	high density polyethylene
IEE	initial environmental examination
LAP	local area plan
MOWHS	Ministry of Works and Human Settlements
MPN	most probable number
msl	mean sea level
OHS	occupational health and safety
NECS	National Environmental Commission Secretariat
NEPA	National Environment Protection Act
NLCS	National Land Commission Secretariat
O&M	operation and maintenance
PIU	project implementation unit
PMU	project management unit
PPE	personal protective equipment
PPTA	project preparation technical assistance
REA	rapid environmental assessment
RGoB	Royal Government of Bhutan
SPS	safeguard policy statement
TA	technical assistance
ToR	terms of reference
UNFCCC	United Nations Framework Convention on Climate Change
WTP	water treatment plant
WWTP	wastewater treatment plant

## WEIGHTS AND MEASURES

ac	–	acre
ha	–	hectare
HP	–	horsepower
km	–	kilometer
lpcd	–	liters per capita per day
lps	–	liter per second
m	–	meter
m <sup>2</sup>	–	square meter

m <sup>3</sup>	–	cubic meter
mg/L	–	milligrams per liter
mm	–	millimeter
MPN	–	most probable number
NTU		Nephelometric Turbidity Unit
TCU	–	True Color Units
ug/Ncm	–	microgram per normal cubic meter

#### **NOTE**

In this report, "\$" refers to United States dollars.

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## EXECUTIVE SUMMARY

1. An environmental assessment was made for the proposed sewerage and sanitation subproject for Samdrup Jongkhar thromde<sup>1</sup> under the Secondary Towns Urban Development Project (STUDP). This environmental assessment was accomplished through Asian Development Bank (ADB) technical assistance (TA) 8551-BHU.<sup>2</sup>
2. An initial environmental examination (IEE) was carried out for the Samdrup Jongkhar sewerage and sanitation subproject. In accordance with ADB Safeguard Policy Statement (SPS), 2009, an initial screening was conducted using ADB's rapid environmental assessment (REA) checklist for sewerage and sanitation. Results of the screening and assessment reveal that the subproject is unlikely to cause significant adverse environmental impact. Thus, the subproject is categorized as category B for environment as per ADB SPS, 2009.
3. This draft IEE report was prepared in accordance with ADB SPS 2009 requirements for environment category B projects. The assessment was also carried out within the policy, legal, and administrative frameworks relevant to sewerage and sanitation projects in Bhutan.
4. **Subproject scope and description.** This IEE covers the Samdrup Jongkhar sewerage and sanitation subproject, which comprises the construction of: (i) 4.5 kilometers (km) of sewer network with manholes etc. to connect 250 households to the existing wastewater treatment plant (WWTP); and (ii) access roads, fencing, drainage and operator's quarters, etc.
5. **Environmental and socioeconomic conditions.** Project implementation will not pose significant problems to the environment since the proposed routes of the sewerlines are along the roads parallel to the existing pipelines and within existing right of way. Most areas immediately adjacent to the road where sewerlines are to be laid are already occupied by residential and other structures, while areas beyond the road corridors are basically agricultural land. The sites are not within undisturbed landscapes or protected areas, but areas already inhabited by local people whose activities over the years resulted to their present residential, institutional, commercial, and agricultural land uses.
6. **Environmental impacts and environmental management plan.** Screening for environmental impacts is made through a review of the parameters associated with sewerage projects for sewerage projects against the components of the proposed subproject. An important consideration in analyzing the environmental impacts of the proposed subproject is the fact that these are improvements and expansion of existing sewerage systems in an already altered environment. The issue on impacts and risks to biodiversity conservation is not applicable to the subproject since the components will not be located in areas that are environmentally sensitive or that have precious ecology.
7. This IEE is based on final detailed design. During pre-construction phase, potential nuisances and problems to the public during construction shall be addressed by inclusion in the tender documents of specific provisions addressing these issues. Although there are no issues related to historical and cultural assets, a precautionary measure shall be taken by inclusion of provisions in tender and construction contract documents requiring the contractor to immediately stop excavation activities and promptly inform the authorities if archaeological and cultural assets are discovered.

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<sup>1</sup> Thromde in Dzongkha is a town or municipality or city.

<sup>2</sup> ADB. [Kingdom of Bhutan: Improved Urban Environmental Infrastructure Project](#).

8. Adverse environmental impacts during construction are temporary, less than significant, and can easily be mitigated. There will be no massive construction activities that can damage the environment. No cutting of trees will be done in forest areas. Laying of sewerlines is a low impact construction activity since trench excavation is shallow with narrow width. Excavated soil is backfilled to the trench after pipelaying. Required structures are relatively small in size. Typical construction issues are manageable with the implementation of a site management plan for: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience.

9. Environmental problems due to operation of the proposed sewerage/wastewater treatment systems can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures. Treatment of wastewater generally involves biological system that does not generate hazardous wastes. Treated wastewater is expected to comply with the Standards for Final Effluent from Sewerage Treatment Plant.<sup>3</sup>

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

11. **Consultation and participation.** Project planning and the subsequent IEE preparation for the proposed sewerage subproject recognized the need for public consultation and participation as central to effective environmental safeguard. Within the context of “meaningful consultation”, Samdrup Jongkhar thromde with assistance from the project preparatory technical assistance (PPTA) consultants initiated a process of consultation during subproject preparation and intends to continue it during the construction phase. Initial public consultation and information disclosure was conducted at or near the subproject sites with concerned individuals, target residents, and thromde officials. Details of the subproject components were presented to the stakeholders and their views on the respective proposals were gathered. As a result, stakeholders expressed support to the proposed subproject. Samdrup Jongkhar thromde will conduct public consultations and information disclosure as a continuing activity during the subproject implementation. Affected persons and other stakeholders are expected to attend these proposed future public consultations since proposed water tariffs would also be discussed. Thromde officials 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.

12. **Grievance redress mechanism.** Implementation of the proposed sewerage and sanitation subproject will be fully compliant to ADB’s safeguards requirement on grievance redress mechanism (GRM). A GRM has already been developed for STUDP, which will be followed by all subprojects, including Samdrup Jongkhar sewerage and WWTP subproject. Samdrup Jongkhar thromde officials shall disclose the GRM during public consultations to be conducted throughout the subproject implementation period. The GRM follows a tiered system,

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<sup>3</sup> The Samdrup Jongkhar thromde has procured a compact WWTP from its own funds in 2017. The treatment of wastewater and resulting effluent quality standards therefore fall outside the scope of this IEE.



starting at the local level. The GRM structure has been agreed with the concerned agencies and a notification of the GRM structure has been issued. Grievance Redress Committee (GRC) composition has been provided by the Ministry of Works and Human Settlements (MOWHS). The GRM will ensure that grievances and complaints regarding land acquisition, compensation and resettlement or other social and environmental issues will be addressed in a timely and satisfactory manner. People will be made aware of their rights and the detailed procedures for filing of grievances. The project implementation unit (PIU) will be undertaking outreach activities to make stakeholders aware of the GRM and will be published on the thromde/dzongkhag and MOWHS websites. GRM will also be displayed at notice boards in the PIU office.

**13. Institutional and implementation arrangement.** The subproject will follow the overall institutional and implementation arrangement of STUDP. The MOWHS is the executing agency and a project management unit (PMU) shall be created under it, while municipalities (Samdrup Jongkhar Municipality for this subproject) are the PIUs. MOWHS has overall responsibility for (i) project coordination, implementation, and liaison with ADB and other government offices; and (ii) coordination of implementation at the national level, including procurement of goods, works, and services for all STUDP subprojects. In support to MOWHS, the PMU will: (i) designate an Environment Officer who will oversee all subprojects under STUDP, including this subproject, and work closely with consultants and PIUs on the implementation of the EMP; (ii) supervise the Project Management and Supervision Consultants (PMSC) that will assist MOWHS and PMU during pre-construction and construction phases; (iii) ensure overall compliance with all government rules and regulations and other environmental requirements of all subprojects under STUDP; and (iv) ensure that IEEs are included in bidding documents and civil work contracts for all subprojects under STUDP. In support to MOWHS and PMU, the PMSC will: (i) coordinate and work with PIU for the conduct of public consultations and day-to-day monitoring of subproject implementation; (ii) lead the conduct of training activities as per capacity development program; (iii) ensure that IEEs are updated when there will be changes in scope or components or alignments under the subproject; (iv) assist MOWHS and PMU in fulfilling their roles and responsibilities; and (v) ensure disclosure of IEEs in locations accessible to the public and in form and language understood by the local stakeholders. The PIUs will: (i) oversee the effective implementation of the contractor's EMP (CEMP) by the contractor; (ii) support implementation of the grievance redress mechanism; (iii) with support from PMU and PMSC, conduct public consultations as a continuing activity during the implementation of the subproject; and (iv) with assistance from contractors, prepare regular reports of EMP implementation and submit to PMU. The contractor will: (i) submit contractor's EMP (CEMP) based on the EMP outlined in this IEE; (ii) ensure compliance with all applicable legislation and the requirements of the CEMP; (iii) ensure implementation of the CEMP, including costs for survey, site establishment, preliminary activities, construction, defect liability activities, and environmental mitigation measures related to CEMP implementation during construction and post-construction phases; (iv) ensure that any sub-contractors or suppliers, who are utilized within the context of a contract, comply with the environmental requirements of the CEMP and EMP. The contractor will be held responsible for non-compliance on their behalf; (v) in coordination with PMU and PIU, provide environmental awareness training to staff prior to any construction activities; (vi) borne the costs of any damages resulting from non-compliance with the CEMP and EMP; and (vii) appoint one full time environment and safety staff for implementation of EMP, community coordination, documentation of grievances received and resolutions at the project level in compliance with the project's GRM.

**14. Conclusion and recommendation.** The proposed subprojects on sewerage treatment systems will provide conveyance and treatment of sewage from domestic and commercial sources and aid in complement the WWTP that has already been installed by the thromde. The

combined components will reduce pollution loadings in the watercourses and generally improve the sanitation and public health in Samdrup Jongkhar municipality.

15. The environmental screening process has highlighted the environmental issues and concerns of the proposed Samdrup Jongkhar sewerage subproject. The screening identified that the proposed sites are not within undisturbed landscapes because the proposed routes of the sewerlines are along the highways or roads with existing right of ways, or areas that are presently regarded as either residential, commercial, or agricultural landscapes. The screening also identified that the location of proposed WWTP is in government owned properties. The proposed sites are not near any sensitive area. Hence, the proposed subproject is essentially not a new incursion to an ecologically untouched or protected zone.

16. Based on the screening for environmental impacts and risks, there are no significant negative environmental impacts and risks that cannot be mitigated. Consequently, assessment concludes that the proposed sewerage subproject can be implemented in an environmentally acceptable manner. The potential adverse impacts that are associated with the design, construction, and operation can be mitigated to standard levels through integration of proper engineering designs and implementation of the EMP as outlined in this IEE. The overall safeguards implementation arrangement is very comprehensive, well defined, and already in place. The training program for all the implementing stakeholders has already been outlined.

17. Therefore, as per ADB SPS, the categorization of Samdrup Jongkhar sewerage and WWTP subproject as Category B for Environment is confirmed. As such, no further environmental impact assessment is required.

18. The proposed Samdrup Jongkhar sewerage subproject is hereby recommended for implementation with emphasis on the following conditions: (i) EMP of the 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 conditions; (v) Contract provisions on operation of the GRM shall be included in construction contracts; (vi) MOWHS, with its functions, shall ensure that capability building shall be pursued; (vii) MOWHS shall continue the process of public consultation and information disclosure during the entire subproject implementation period; and (viii) MOWHS shall update this IEE should there be any change in subproject scope, and submit to ADB for review and disclosure.

## I. INTRODUCTION

1. Improved sanitation and sewerage systems are critical to implementing any genuine integrated water resource management approach that would maintain the satisfactory quality of water resources. However, sewerage coverage in the nominated towns under the Secondary Towns Urban Development Project is mixed.<sup>1</sup> Package 'eco-line' wastewater treatment plants (WWTP), which are customarily small- to –medium scale sewage treatment facilities, have been installed in Samdrup Jongkhar and Trashigang. Each of these WWTP covers about 50% of the households in the towns; the remaining half of local households utilize individual septic tanks.

2. The Secondary Towns Urban Development Project (STUDP) will support seven subprojects in three selected thromdes, namely: (i) Trashigang (including Rangjung); (ii) Sarpang (Sechamthang); and (iii) Samdrup Jongkhar (including Dewathang). The project is designed to achieve balanced and environmentally sustainable urban development in the identified priority towns by harnessing mixed development approaches that integrate the natural terrain and resources in urban planning, design, and construction. It also aims to employ a creative approach consistent with a rapidly growing urban Bhutan. The subprojects include water supply, sewerage and wastewater treatment, transport (including urban roads) and storm drainage.

3. This initial environmental examination (IEE) report was prepared as part of technical assistance (TA) 8551-BHU (Improved Urban Environmental infrastructure Project) in order to assess the potential environment impacts of the proposed Samdrup Jongkhar sewerage subproject. The assessment has been conducted in accordance with ADB Safeguard Policy Statement (SPS), 2009, with due consideration to environmental legislations and relevant laws of Royal Government of Bhutan. If needed, this IEE report may also be used to support Samdrup Jongkhar Thromde in seeking necessary environmental clearances from relevant authorities for the subproject.

4. Preparation of the IEE involved preliminary activities such as: (i) field visits to the proposed subproject areas; (ii) review of available information, and (iii) discussions with Ministry of Works and Human Settlements (MOWHS), the National Inventory Commission, National Statistics Bureau (NSB), Trashigang Thromde and other government agencies, and members of the communities within the subproject areas.

5. Alongside these preliminary activities, the categorization and specific potential environmental impacts of the proposed subproject have been identified and assessed using ADB's Rapid Environmental Assessment (REA) Checklist for sewerage and sanitation (Appendixes 1-2). Results of the assessment show that the subproject is unlikely to cause significant adverse environmental impacts. Thus, this IEE has been prepared in accordance with ADB SPS, 2009 requirements for Environment Category B projects.

6. Therefore, this IEE report examines the environmental conditions of proposed subproject locations and the potential environmental impacts of all activities in relation to subproject implementation from pre-construction to post-construction phases. This IEE further identifies all mitigation measures that need to be followed in order to avoid or mitigate any adverse environmental impacts and optimize any beneficial impacts of the subproject to the extent possible.

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<sup>1</sup> ADB. [Kingdom of Bhutan: Improved Urban Environmental Infrastructure Project](#) (TA 8551-BHU).

## II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

### A. ADB Policy

7. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in the ADB SPS, 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

#### 1. Screening and categorization

8. The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

- (i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA) is required;
- (ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An IEE is required;
- (iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed; and
- (iv) **Category FI.** A proposed project is classified as category financial intermediary (FI) if it involves investment of ADB funds to or through a FI. The FI must apply an environmental management system, unless all projects will result in insignificant impacts.

#### 2. Environmental Management Plan

9. An environmental management plan (EMP), which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

#### 3. Public disclosure

10. ADB will post the following safeguard documents on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation:<sup>2</sup>

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<sup>2</sup> As per ADB SPS, 2009, prior to disclosure on ADB website, ADB reviews the "borrower's/client's social and environmental assessment and plans to ensure that safeguard measures are in place to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts in compliance with ADB's safeguard policy principles and Safeguard Requirements 1-4."

- (i) for Environmental Category A projects, a draft EIA report at least 120 days before Board consideration;
- (ii) final or updated EIA and/or IEE; and
- (iii) environmental monitoring reports submitted by the project management unit (PMU) during project implementation.

#### **4. Pollution Prevention and Control Technologies**

11. During the design, construction, and operation of the project the PMU and project implementation units (PIUs) will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When the Royal Government of Bhutan regulations differ from these levels and measures, the executing agency will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS 2009.



**Table 1: Applicable WHO Ambient Air Quality Guidelines<sup>1</sup>**

<b>Table 1.1.1: WHO Ambient Air Quality Guidelines<sup>7, 8</sup></b>		
	<b>Averaging Period</b>	<b>Guideline value in <math>\mu\text{g}/\text{m}^3</math></b>
<b>Sulfur dioxide (SO<sub>2</sub>)</b>	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
<b>Nitrogen dioxide (NO<sub>2</sub>)</b>	1-year	40 (guideline)
	1-hour	200 (guideline)
<b>Particulate Matter PM<sub>10</sub></b>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
<b>Particulate Matter PM<sub>2.5</sub></b>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
<b>Ozone</b>	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

<sup>7</sup> World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99<sup>th</sup> percentile.

<sup>8</sup> Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

**Table 2: World Bank Group's Noise Level Guidelines**

<b>Table 1.7.1- Noise Level Guidelines<sup>54</sup></b>		
<b>Receptor</b>	<b>One Hour L<sub>Aeq</sub> (dBA)</b>	
	<b>Daytime 07:00 - 22:00</b>	<b>Nighttime 22:00 - 07:00</b>
<b>Residential; institutional; educational<sup>55</sup></b>	<b>55</b>	<b>45</b>
<b>Industrial; commercial</b>	<b>70</b>	<b>70</b>

<sup>54</sup> Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organization (WHO), 1999.

<sup>1</sup> World Bank Group's General Environmental, Health, and Safety Guidelines: [www.ifc.org/ehsguidelines](http://www.ifc.org/ehsguidelines).

## **B. Environmental Related Acts and Regulations of Bhutan**

12. 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. The policy, legal, and administrative frameworks relevant to the environmental assessment of water related infrastructure projects in Bhutan have been established by the following laws and regulations.

### **1. Constitution of the Kingdom of Bhutan 2008**

13. Article 5 of the Constitution of Bhutan outlines the responsibilities of government and people to protect and conserve the pristine environment and safeguard Bhutan's wildlife. The Constitution states that it is the fundamental duty of every citizen to protect, conserve, and improve the pristine environment and safeguard the biodiversity, reduce pollution and prevent ecological degradation, and promote ecologically balanced sustainable development while also pursuing environmentally friendly economic and social development. The government stands by the policy of maintaining a minimum of 60% forest cover all the time to ensure sustainable conservation of natural resources and reduce degradation of the ecosystem. The citation of Constitution is relevant as the project requires clearing of the Government Reserved Forest (GRF) in some areas and also with regard to pollution by the project.

### **2. Environment Assessment Act 2000**

14. The Environment Assessment Act outlines procedures for assessing the potential impact of projects on environment and formulates policies and measures to reduce potential adverse effects on the environment. Based on the above premise, the environmental clearance is required prior to the execution of any project that may entail adverse impacts on the environment. To this effect, the National Environmental Commission (NEC) is empowered to implement the Environmental Assessment Act 2000 by setting out guidelines for securing an environmental clearance for a project. The Environmental Assessment Act is applicable to this project considering foreseeable impacts on the surrounding environment.

### **3. National Environment Protection Act, 2007**

15. National Environment Protection Act (NEPA) 2007 provides an effective system of conserving and protecting the environment of Bhutan. This system comprises NEC or other designated Competent Authorities and advisory committee members responsible for regulating and promoting sustainable development in an equitable manner. This Act creates a framework to develop measures and standards to protect environmental quality of the country.

16. The renewable (e.g. forest, water, air, biodiversity) and non-renewable (soil and rocks/minerals) natural resources shall not be fully compromised in order to just achieve sustainable development. The Act governs sustainable use of resources and guides to reduce waste generation while also adopting sound management plan for safe and proper disposal of wastes. The Act fixes accountability to the person polluting environment or causing ecological harm for the cost of containment, avoidance, abatement, medical compensation, mitigation, remediation and restoration.



#### **4. Forest and Nature Conservation Act 1995**

17. The enactment of the Forest and Nature Conservation Act (FNCA) in 1995 supersedes the first environmental legislation in Bhutan, i.e., the Forest Act of 1969. The FNCA contains policies prohibiting certain activities in the forested areas and allow other activities under special permits from the Department of Forests and Park Services. Clause 10 (a) i) – x) outlines types of activities, e.g., forest clearing, tree felling, wildlife hunting, and polluting that are prohibited in the GRF. Clause 22 mentions that all wild animals whether enlisted under Schedule I (totally protected species) or not, cannot be hunted and killed, injured, captured, or collected unless conditions requiring self-defense and other genuine reasons exist. The FNCA recognizes all forests in Bhutan are part of the GRF and prohibits development works unless permissible by law. This Act will be applicable to the proposed subprojects.

#### **5. Land Act 2007**

18. The Land Act of 1979 provides the basis for land tenure in Bhutan. It was revised in 2007 to restructure many provisions in the Land Act. This revision happened with the establishment of National Land Commission Secretariat (NLCS), an autonomous agency mandated to deal with matters pertaining to land registration. The other major change under this revision is the categorization of land from 20 to 7 including i) chuzhing (wetland), ii) kamzhing (dry land) including orchard, iii) khimsa (residential land), iv) industrial land, v) commercial land, vi) recreational and vii) institutional land. Under this revision, an authority on land management (resolve disputes, process land transactions, and convert land categories) has been decentralized to local governance, e.g., Geog Tshogdue, Dzongkhag Tshogdue, and Thromde.

19. The Act reserves the right to acquire the land by the government if the land is deemed important for the country. When this happens, the affected individual, family, or community will be entitled for full compensation in the form of substitution from the same Dzongkhag or cash compensation depending on the type of land. This project will involve leasing of government land and hence the applicability of this Act.

#### **6. Water Act of Bhutan 2011**

20. The Water Act is enacted to ensure water resources are protected, managed, and conserved in the most efficient, sustainable, and equitable manner. As it is stated that the government is the trustee of the nation's water resources, it will work towards protecting, conserving, and/or managing water resources in accordance with the principles set out in this Act. This Act comes into play as water is the basic necessity for employees of the local areas and it also sets up drinking water as a priority and to ensure minimum pollution of water resources.

#### **7. Road Act of the Kingdom of Bhutan 2013**

21. Road Act of 2013 was re-enacted after repealing the Road Act of 2004 to plan and establish safe and efficient system of road network in the country. Because this project will also involve construction of access road and internal road network, this Act will come into play when planning, designing, surveying, and obtaining approval from respective agencies.

#### **8. Waste Prevention and Management Act of Bhutan, 2009**

22. Waste Prevention and Management Act of Bhutan, 2009 contains the holistic institutional framework to prevent and manage waste in Bhutan. This Act recognizes principles, mechanisms,

and responsibilities for reducing, segregating and disposing wastes. The NEC as the apex regulatory body for waste prevention and management monitors whether the wastes are managed in an environment friendly manner or not, as well as prohibit the manufacture of products that are associated with generation of hazardous wastes.

## **9. The Local Government Act of Bhutan, 2009**

23. The Local Government Act has provisions to undertake activities consistent with other relevant laws and policies of the country that are formulated towards conserving environment within its jurisdiction and reduce the impact on public health and accelerate socioeconomic development. This Act has relevance to the project in terms of protection of local population from health hazards, if any, and bring socioeconomic upliftment in the local area. It is also the principal document for delineation of power between the local governments and the national agencies.

24. At the current juncture, the total land area under forest cover stands at ca. 70% which is more than what the Constitution of Kingdom of Bhutan mandates, i.e., minimum of 60% forest cover of the total area at all times. This strategy is relevant to this project since it would be necessary to deal with reclamation (for dump yard of excavated materials) and efforts to compensate for forest clearing and counter balance carbon emission.

## **10. National Strategy and Action Plan for Low Carbon Development 2012**

25. During the Fifteenth Session of Conference of Parties (COP15) of the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen, the Royal Government of Bhutan made a pledge to remain carbon neutral. This meant that greenhouse gas (GHG) emissions in the country will remain below the sequestration capacity of its forests for all times. This followed the preparation of National Strategy and Action Plan for Low Carbon Development, a document presenting a long-term national strategy and action plan for low carbon development. This includes interventions and action plans to fulfil commitments to remain carbon neutral through the promotion of green growth.

26. At the current juncture, the total land area under forest cover stands at ca. 70% which is more than what the Constitution of Kingdom of Bhutan mandates, i.e., minimum of 60% forest cover of the total area at all times. This strategy is relevant to this project since it would be necessary to deal with reclamation (for dump yard of excavated materials) and efforts to compensate for forest clearing and counter balance carbon emission.

## **11. Regulation for Environmental Clearance of Projects 2002**

27. The Regulation for the Environmental Clearance of Projects 2002 outlines procedures and responsibilities for implementing and supplementing the Environmental Assessment Act, 2000 to issue environmental clearances. The NEC along with other competent authorities are agencies for administering and granting environmental clearance under the current legal framework. This regulation ensures that this project is implemented in compliance with the sustainable development policy of the government so that potential damage to the environment is mitigated and that the local community to benefit from this project. The regulation mandates establishment of an environmental unit under the project, conduct public consultation, and obtain environmental clearance within the specified period.

## **12. Forest and Nature Conservation Rules (FNCR) 2006**

28. The updated FNCR 2006 of Bhutan specifies rules for clearing and felling of trees and blasting. Section 14 clauses 1 and 2 describe prohibitive and restrictive activities in the forest land. Section 55 outlines procedures for sourcing stone, gravel, sand, peat, and soil from the forested areas. Clause 61 (1)–(5) describe various forms of prohibitions within protected areas and highlight special requirements to get green signal for specific development activity. Clause 64 provides information on activities that may impact wildlife conservation initiatives. This regulation requires obtaining of forestry clearance prior to the clearing and felling of trees and the actual operation of the mines.

## **13. Rules and Regulations on Occupational Health and Safety 2006**

29. The Rules and Regulations on Occupational Health and Safety (OHS) aims to assure safe working environment for employees at the project site. These rules and regulations are relevant during the development and operation phases of the project.

## **14. Waste Prevention and Management Regulation 2012**

30. This regulation identifies roles of the Implementing Agency (the Thromdes) to introduce appropriate waste management system beginning from every organization level concerning collection, segregation, treatment, storage, transportation, recycling and safe disposal of solid, liquid and gaseous wastes. This regulation shall control and prohibit haphazard dumping of waste. This regulation will ensure disposal of waste at designated site and uphold initiatives to segregate, reuse and recycle.

## **15. The Water Regulation of Bhutan 2014**

31. This regulation shall ensure the protection, conservation and management of watersheds for sustainable water supply and minimize other environmental side effects. This regulation is relevant given projects have potential to pollute water and changing of water course and also for watershed protection.

32. 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.

## **16. Thromde Rules 2011**

33. This is the principle document that prescribes the working procedures of Thromdes in Bhutan through implementation of the Local Government Act of 2009, and other related acts and regulations. The rules cover on how Thromdes should be formed, managed, regulated and also covers on property valuations and assessments for pooling or compensation.

## **17. Bhutan Building Rules 2002**

34. All constructions in the country are required to follow the Bhutan Building Rules and its various amendments. In the urban areas, building construction permits are issued based on conformity to the rules. Monitoring and eventual certification of building occupancy are also

governed by this rule. For the current project, the rules come into picture as buildings in the urban areas in particular are required to follow these rules and any plans are based off of these rules.

### **C. International Environmental Agreements**

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

## **III. DESCRIPTION OF THE PROJECT**

### **A. Location**

36. Samdrup Jongkhar local area plan (LAP) 1 has its existing sewerage system and wastewater treatment plant (WWTP) that were commissioned at the start of 2015. Prior to that, all sanitation comprised on-site septic tanks and soakpits only. The vast majority of properties are now connected to the system. The main reason why some properties were not connected is the difference in elevations.

37. This existing WWTP of LAP 1 is situated in southeast near the Dungsam Chhu and the border with India (see Figure 1). It comprises a single chamber buffer tank, an equalizing tank and two compact Eco-Line 9N aerobic wastewater treatment units. The on-site septic tanks are now bypassed so bathroom wastewater now goes direct to the sewer. As a consequence, the sewage arriving at the WWTP is highly contaminated with solid waste, as is the sludge that collects in the buffer tank. Kitchen grey water is still discharged to the surface drains.

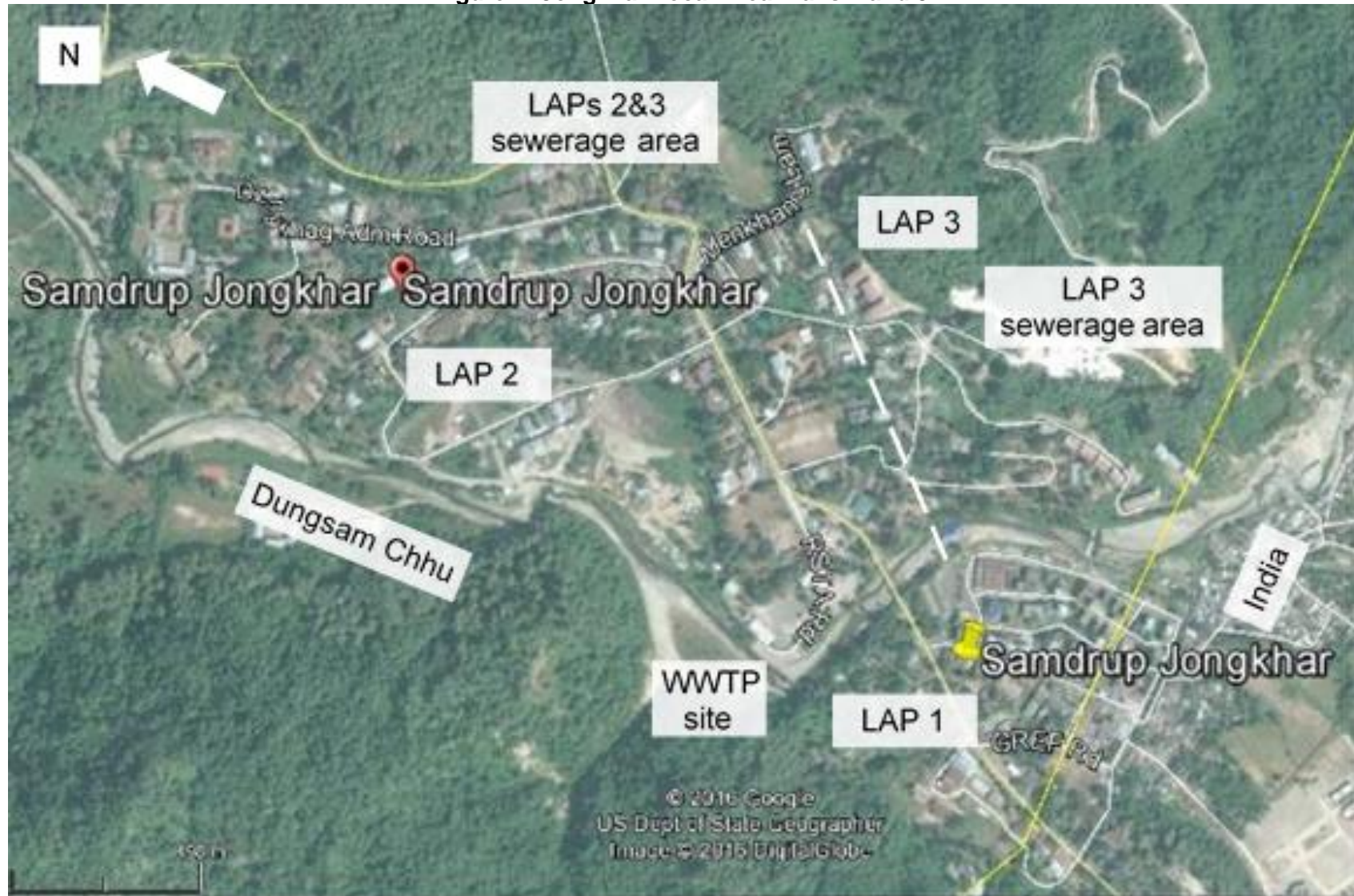
38. This subproject covers a sewer network that is being developed to serve the LAP 2 area and part of LAP 3 (see Figure 2). This sewer network will connect to a second WWTP which is similar to the LAP 1 WWTP, but comprises two nos. 10N Eco-Line units. This WWTP is not part of the subproject components as this has already been procured by the thromde in 2017 and has already been installed on site.

Figure 1: Satellite Image of Samdrup Jongkhar Local Area Plan 1





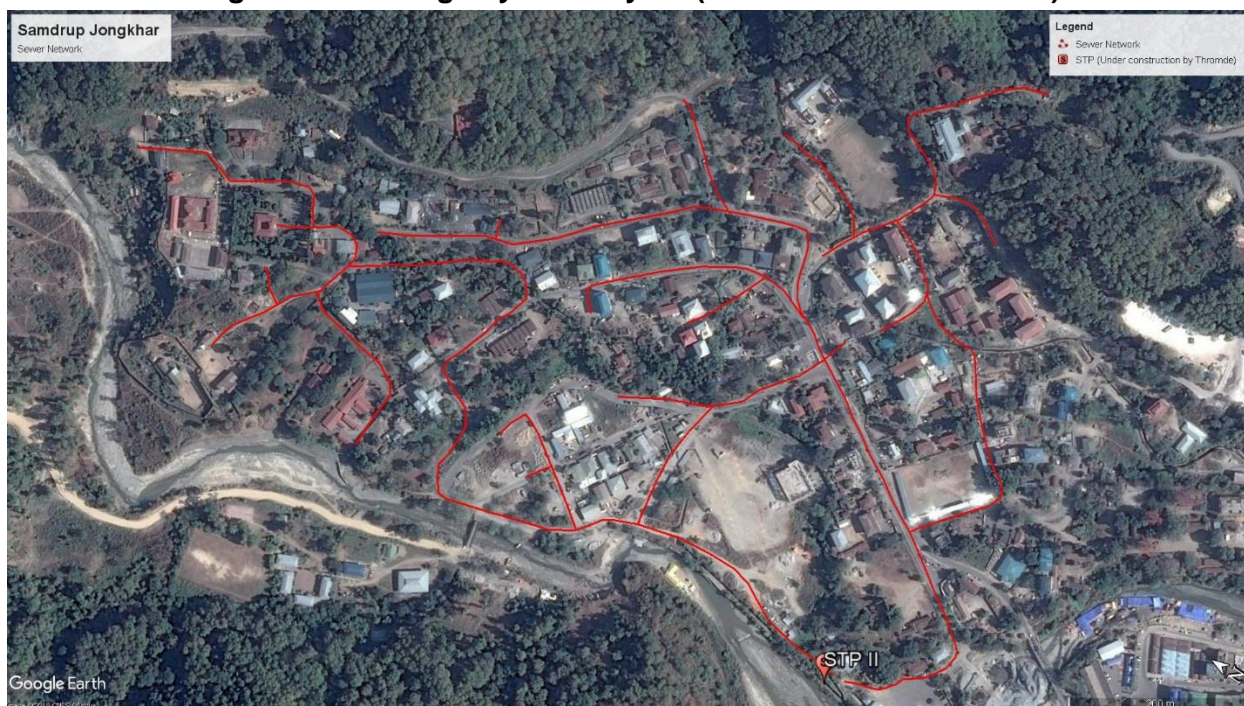
Figure 2: Jongkhar Local Area Plans 2 and 3



## B. Components

39. Figure 3 shows the sewer lines alignments that will be developed in LAP 2 and 3 under STUDP. Sewerage network cannot be constructed in part of LAP 3 because of inadequate invert levels. The LAP 3 population that will not be served with sewerage following the completion of LAPs 2 and 3 sewerage system is currently estimated to be about 400 – 500 people. This is based on the estimated number of dwellings in the area and the average household size of 4.3.<sup>7</sup>

**Figure 3: Sewerage System Layout (Local Area Plans 2 and 3)**



Source: PMU, STUDP, derived from Google maps.

40. The components of the proposed subproject are:
- (i) Construction of 4.5 kilometers (km) sewerage system with manholes, etc. to connect 250 households to the proposed WWTP; and
  - (ii) Construction of access roads, fencing, drainage, operator's quarters.

## C. Sewerage/WWTP Construction

41. Construction shall require: (i) site clearing and marking of alignments for the sewerlines; (ii) stockpiling of construction materials; (iii) site preparation, clearing of the site (shrubs etc); (iv) excavating and trenching for the laying of sewerlines; (v) laying of the sewerlines along the excavations/trenches and backfilling; (vi) cleaning and closure of construction sites; and (vii) testing and commissioning. Construction of the sewerage network of Samdrup Jongkhar will start in fourth quarter of 2018 and expected to be completed by fourth quarter of 2020.

<sup>7</sup> Samdrup Jongkhar Structure Plan.



## D. Operation and Maintenance Activities

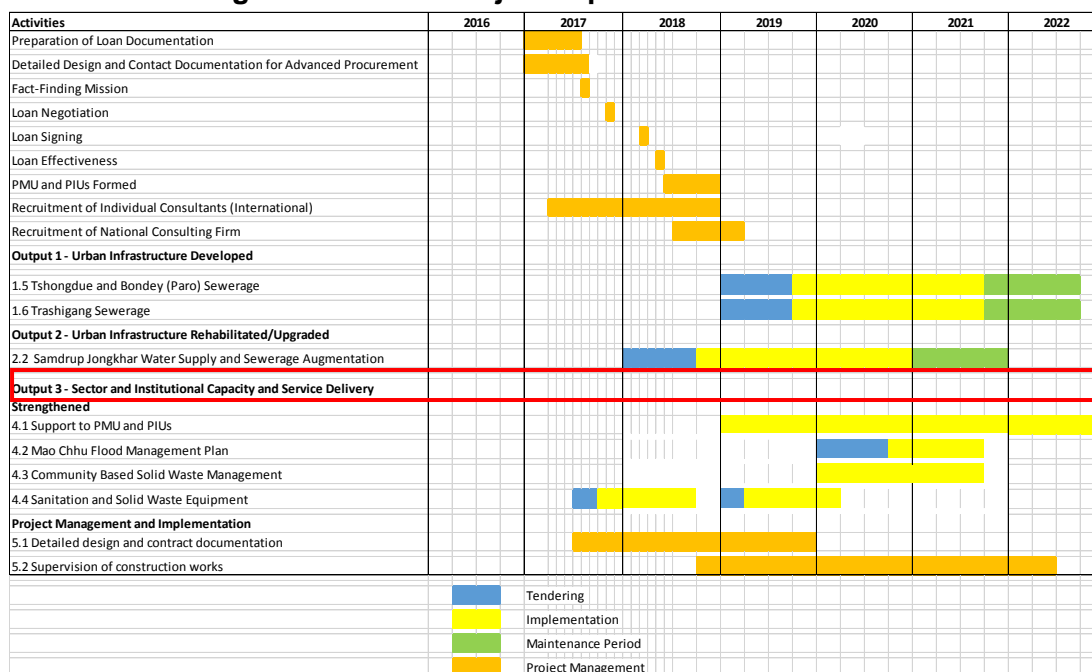
42. The proposed sewerage system and WWTP shall be operated and maintained by the Samdrup Jongkhar Thromde. Regular maintenance of the sewerline in the form of leak repair and possible clogging will be conducted to maintain the functionality and integrity of the sewerage system at all times. Other maintenance works will be done after flooding episodes to ensure that the integrity of the lines.

43. Regular O&M of the WWTP will involve daily monitoring of the quality of the wastewater flowing into the plants (influent) and the quality of the treated wastewater (effluent) to ensure efficient operation of the plants. Process control procedures will also be conducted regularly especially when changes in the quality of influent is observed so that the proper operational adjustments can be instituted. Periodic maintenance of the electromechanical parts, such as the aerators, clarifier motors and others will be conducted to keep the plants in optimum operating condition.

## E. Proposed Development Program

44. The timeline for development of sewerage system and WWTP is shown Figure 4.

**Figure 4: Overall Project Implementation Schedule**



## IV. DESCRIPTION OF THE ENVIRONMENT

45. A description of the existing environmental and socioeconomic conditions of the various subproject areas is presented in the succeeding sub-sections.



## **A. Methodology Used for the Baseline Study**

### **1. Data collection and stakeholder consultations.**

46. The data for the IEE were collected primarily from the PPTA reports (footnote 1), structural plans of the respective Thromdes, LAPs, and other documents. In addition to this, field visit to the project sites had also been carried out in February – March 2017 to collect both primary and secondary data of the project details, site information and to understand the probable impacts of the projects. Public consultations and discussions with appropriate officials were also conducted at various subproject sites as presented in Appendices 1-16.

47. Several visits to the subproject sites were made in February and March 2017 to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed subproject. A separate socioeconomic study was conducted to determine the demographic information, and other social safeguards.

## **B. Data analysis and interpretation**

48. The primary and secondary data from various sources have been analyzed using simple excel tools to quantify the various parameters such as benefits and impacts. For the purpose of visualization, the data from various sources are also laid out on geographic information system (GIS) using ArcGIS.<sup>8</sup> The details of the results from the data and their interpretations are presented in the following sections. The relevant information is presented in the succeeding paragraphs.

## **C. Geology and Physical Resources**

49. The Bhutan Himalaya can be tectonically divided into three east west trending belts:

- (i) The southern frontal belt, which includes the lesser Himalaya and the foothills (Siwalik);
- (ii) The central crystalline belt, which includes greater Himalaya and the lesser Himalaya; and
- (iii) The Tethyan belt, which includes portion of the greater Himalaya and portion of lesser Himalaya.

50. The southern frontal belt borders with India in the south and comprises a very narrow strip of Tertiary Siwalik rocks represented by sandstone, mudstone, siltstone and boulder conglomerates. The Lesser Himalaya north of the Main Boundary Fault/Thrust (MBT) is represented by the rocks of Permian-Paleozoic formations. These formations from south to north are the Damuda, Baxa Group and the Shumar.

51. Damuda Formation consists of sandstones, shale with coal seams, felspathic quartzite and carbonaceous shale Buxa Group consists of dolomite, variegated quartzite and conglomerates represented by different formations like Jainti, Manas, Phuentsholing and Panghari.

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<sup>8</sup> The GIS layers and mapping base are from National Atlas of River Basins and Water Infrastructure in Bhutan, ADB TA 8623 BHU: Adapting to Climate Change through IWRM March 2016, NEC Bhutan and ADB.

52. Shumar formation consists of meta-sedimentary rocks represented by phyllite, micaceous quartzite with rare limestone bands.

53. The central Crystalline Belt over thrusts the southern frontal belt through the Main Central Thrust (MCT). This belt covers most of the Bhutan's Himalayan area, represented by high grade metamorphic and intrusive rocks of Paro-Thimphu group (Pre-Cambrian to Tertiary). Rocks of Paro are represented by quartzite, quartz-mica schist, marble, calcisilicate and graphitic schist while rocks of Thimphu are represented generally by granite, gneiss, migmatites and occasionally by granite-mica schist, feldspathic schist and amphibolite.

54. The Tethyan Belt covers portions of Northern Higher Himalaya range, Crystalline Belt of the central and eastern part of Bhutan Himalaya. It consists of various rock information's and is represented by sedimentary rocks (Pre-Cambrian to Cretaceous) intruded by Tertiary granites. The main rock types of this belt are shale, phyllite, slate, calcareous phyllite, quartzite and limestone with intrusive granite.

#### **D. Seismology<sup>9</sup>**

55. Bhutan is prone to a number of natural hazards due to fragile geological conditions, steep sloping terrain, great elevation differences, variable climatic conditions and active tectonic processes taking place in the Himalayas. There is no detailed seismic micro-zonation of the country. However, since the north-eastern parts of India (next to Bhutan) fall under seismic zone V (seismically most active), it can reasonably be assumed that Bhutan is contiguous with this zone and either in seismic zone IV or V. Hence, there is a threat of a significant earthquake. However, considering the small nature of pipelaying works and other infrastructures under the subproject, geohazard risk is not significant. Transmission and distribution pipes will use robust materials, such as ductile iron pipes, to withstand seismic events. Further, bracings at critical junctions will be provided to mitigate impact of landslides caused by earthquakes.

#### **E. Topography**

56. Topographical features of the country comprise of the High Himalayas in the northern region with many peaks and plateaus, north-south running ranges and deep valleys in the central region called the inner Himalayas, and foothills in the south of the country. The country extends some 300km east west and 100 km north-south crow flying distance with elevation ranges from 100-7,000 meters above sea level.

#### **F. Hydrology**

57. Bhutan has four major river basin management systems: the Drangmechhu; the Mangdechhu; the Punatsangchhu; and the Wangchhu.<sup>10</sup> Each flows swiftly out of the Himalayas, southerly through the Duars to join the Brahmaputra River in India. Samdrup Jongkhar, Dewathang, Trashigang and Ranjung are located in southern part the Drangmechhu basin.

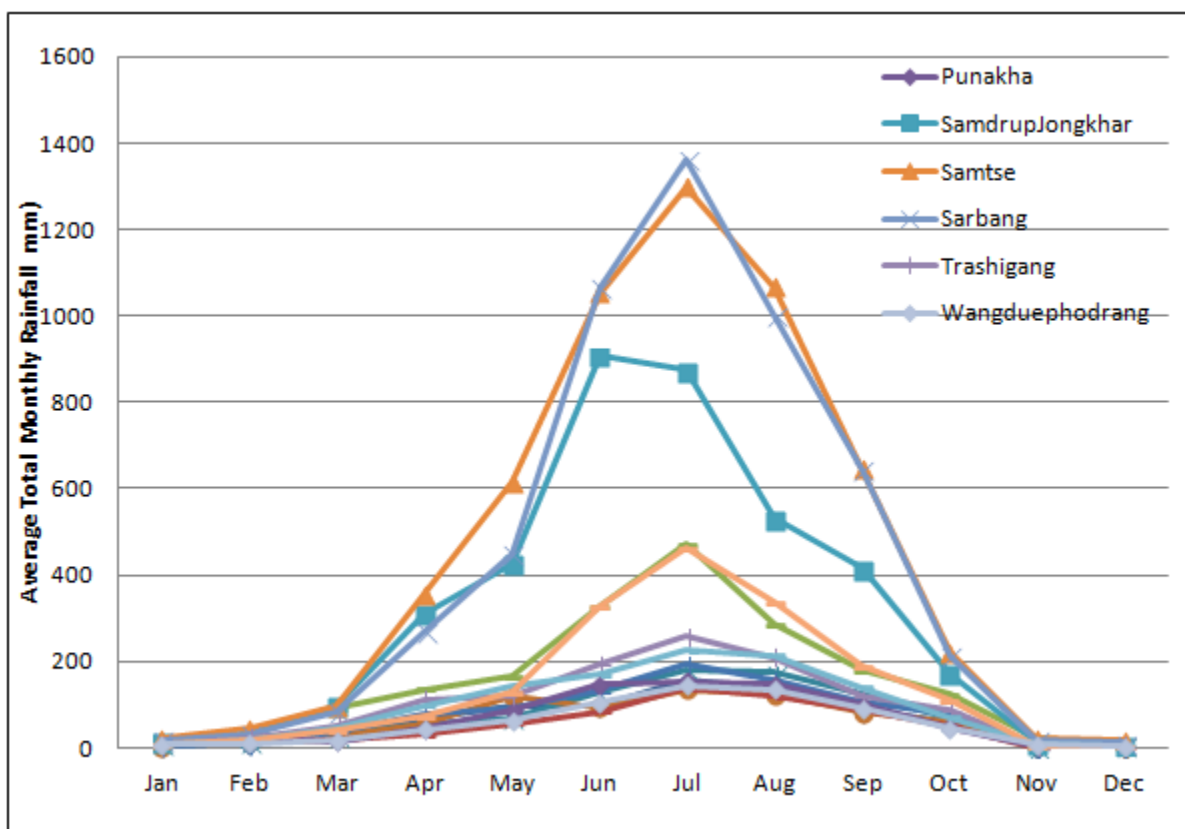
<sup>9</sup> Source: Initial Environmental Examination report for the Paskaha Access Road and Alay Land Customs Station under the Bhutan SASEC Road Connectivity Project. March 2014.

<sup>10</sup> National Integrated Water Resources Management Plan for Bhutan, National Environment Commission Secretariat. ADB CDTA – Adapting to Climate Change Through Integrated Water Resources Management.

## G. Climate

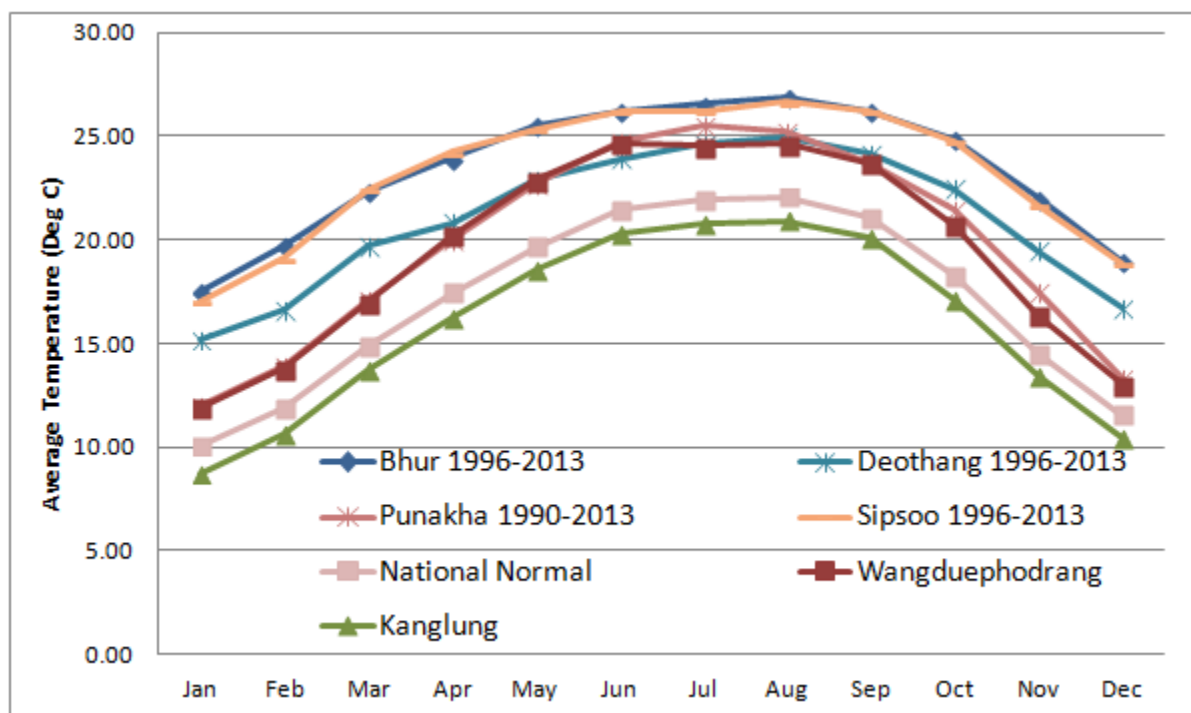
58. With the data from Department of Hydro-Meteorological Service, a rainfall map of Bhutan had been produced. The maximum rainfall is in the southern foothills with total annual rainfalls of 3,000–5,700 millimeters (mm). The least rains are in the inner Himalayas with annual rainfall of 500-1,500 mm. Rainful pattern is shown in Figure 5.

**Figure 5: Rainfall Pattern in Samdrup Jongkhar and other Subproject locations under Secondary Towns Urban Development Project**



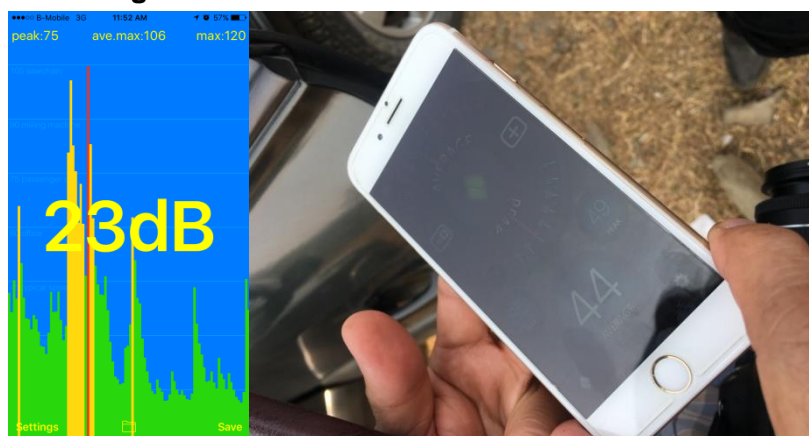
59. The temperature at the subproject locations are plotted in Figure 6. The hottest month is July-August all across the country, while the cold month is January, February, November, and December. Bhur representing Gelephu and Sarpang, and Sipsoo representing Samtse are the warmest [average monthly minimum temperatures of about 17 degrees Celsius (°C) and maximum of 27°C]. Kanglung, representing Trashigang and Rangjung is coldest among the project areas (average monthly minimum temperatures of about 9°C and maximum of 21°C) shown in figure below.

**Figure 6: Temperature at the Subprojects' Locations**



60. **Air Quality and Noise.** There are no available air quality data specific to the areas where subproject components will be constructed. However, indicative sound levels were measured using mobile devices and air quality data collected from secondary sources. Average Noise levels for the subproject locations are illustrated in Table 3 are well within the national limits for mixed area (Ld-65dBA and Ln-55dBA). No subproject component will be located in industrial zone. Table 4 illustrates the Noise Level limits from the NEC's Environmental Discharge Standard 2010.

**Figure 7: Noise level measurements at site**



**Table 3: Noise and Air Quality Data of Project Sites<sup>a</sup>**

Thromdes	Noise (dBA) <sup>b</sup>		Air Quality (µg/m <sup>3</sup> )				CO
	Max	Avg	TSPM	PM10	SOx	NOx	
Shechamthang (Ranibagan) & Sarpang Tar (Sarpang)	119	36					
Gelephu (Sarpang)	200	45	43.7	40.6	BDL	BDL	BDL <sup>c</sup>
Trashigang	188	25	71.05	87.75	BDL	BDL	BDL
Rangjung	123	33					
Dewathang	110	24					
Samdrup Jongkhar	177	47					
Samtse (Samtse)	191	56					
Kuruthang	186	48					
Kabesa (Punakha)	111	26					
Bajo (Wangdue)	89	22					

<sup>a</sup> Noise level measurement taken at daytime on 7 December 2016 during the Tshechu Festival.

<sup>b</sup> Measurements at site using dB Meter, Dmitriy Pushkarev.

<sup>c</sup> Source: ADB, Royal Government of Bhutan ATCEP-AF Project, IEE, March 2016.

**Table 4: Noise a Level Limits, Environmental Discharge Standard 2010, NEC**

Location	Day	Night
Industrial area	75 dBA	65 dBA
Mixed area	65 dBA	55 dBA
Sensitive are	55 dBA	45 dBA

dBA = A-weighted decibel.

61. The air quality data from the few sites where some information was available have been collected and displayed in Table 5. TSPM and PM10 levels were below the National Ambient Air Quality Standard for mixed area provided in the Environmental Discharge Standard 2010, NEC. In the case of SOx, NOx and CO are not detected at the sites which indicates that the ambient air qualities are good for the two sites currently. The national standard on air quality is in Table 3 below.

**Table 5: NEC's Ambient Air Quality Standards (Maximum Permissible Limits in  $\mu\text{g}/\text{m}^3$ )**

Parameter	Industrial Area	Mixed Area*	Sensitive Area**
<b>Total Suspended Particulate Matter</b>			
24 Hour Average	500	200	100
Yearly Average	360	140	70
<b>Respirable Particulate Matter (PM 10)</b>			
24 Hour Average	200	100	75
Yearly Average	120	60	50
<b>Sulfur Dioxide</b>			
24 Hour Average	120	80	30
Yearly Average	80	60	15
<b>Nitrogen Oxides</b>			
24 Hour Average	120	80	30
Yearly Average	80	60	15
<b>Carbon Monoxide</b>			
8 Hour Average	5000	2000	1000
1 hour Average	10000	4000	2000

\* Mixed Area means area where residential, commercial or both activities take place,

\*\* Sensitive Area means area where sensitive targets are in place like hospitals, schools, sensitive ecosystems.

## H. Ecological Resources

62. Protected areas in Bhutan cover about 51% of the land.<sup>11</sup> It is confirmed that locations of Samdrup Jongkhar subproject components and all other subprojects under STUDP are not within any of the protected areas of Bhutan. All subprojects are located in urban and built up areas, which are not part of protected areas of the country. Samdrup Jongkhar district falls partly in a biological corridor between Royal Manas National Park and Khaling Wildlife Sanctuary. But the urban area/ town of Samdrup Jongkhar is outside of the corridor.

### 1. Flora and Fauna Resources within Samdrup Jongkhar Thromde and other STUDP Subproject Sites

63. No endangered or protected plant species as listed in Schedule I – Forest and Nature Conservation Rules of Bhutan (2000) is observed or reported in all the subproject sites. Some of the plant and animal species found at the subproject districts which is huge area (that only indicates the general location and type of biodiversity) are shown in Tables 6 and 7. Although found to be wandering within the district, the golden langur (see Table 7) in particular, do not stay at or around the subproject sites.

**Table 6: Flora Species in Samdrup Jongkhar and other Subproject Sites under the Secondary Towns Urban Development Project and other proposed urban project sites**

Local Name	Scientific Name
Alnus	<i>Alnus nepalensis</i>
Ambokay	<i>Monkey fruit tree</i>
Amliso	<i>Thysanolaena latifolia</i>

<sup>11</sup> Wangchuk, L. *Fact about Bhutan*, 2nd ed.; Absolute Bhutan Books: Thimphu, Bhutan, 2010.

Local Name	Scientific Name
Amliso	<i>Thysanolaena Maxima</i>
Bamboo	<i>Bambusoideae</i>
Banana	<i>Musa xParadisiaca</i>
Beetle Nut	<i>Areca nut</i>
Bhalayo	<i>Rhusgriffthii</i>
Broom stick	<i>Cytisus Scoparious</i>
Chap	<i>MicheliaChampaca</i>
Cherata	<i>Swertia Chirayaita</i>
Chest nut	<i>Castanea Fagaceae</i>
Chilauney	<i>Schima Wallichii</i>
Chir pine	<i>PinusRoxburghii</i>
Chuletro	<i>Brassiopsis hainala</i>
Fern	<i>Dryopteris Cocheata</i>
Fern Tree	<i>Pteridophytes</i>
Gogan	<i>Sauravia Nepalinsis</i>
Gokul dhop	<i>CanariumSikkimenis</i>
Guras	<i>Rhododendron</i>
Jack fruit	<i>Artocarpus heterophyllus</i>
Kabro	<i>Ficus Lacor</i>
kadam	<i>Anthocephalus Kadamba</i>
Kamlee (grass)	<i>Pilea Symmeria</i>
Katus( Oak)	<i>Castanopsis Indica</i>
Khanayo	<i>Ficus semicordata</i>
Lampatey	<i>Terminalia Myrocarpa</i>
lemon	<i>Citrus Medica</i>
Litchi fruit	<i>Nephelium lappaceum</i>
Malato	<i>Macaranga spp</i>
Male shield fern	<i>Dryopteris filix-Mas</i>
Malota	<i>MacarangaPustlata</i>
Malota	<i>Macaranga spp</i>
Mango	<i>Magnifera indica</i>
Mauwa	<i>Engelhardia spicata</i>
Morongay (Poinious Plant)	<i>Anarcardiaceae</i>
Nebaro	<i>Ficas rosenbergii</i>
Oak	<i>Quercus</i>
Pakasaj	<i>Rerminalia crenulata</i>
paksaj	<i>Terminalia tomentosa</i>
Panax Ginseng	<i>Panax Quinquefolious</i>

Local Name	Scientific Name
Phaledo	<i>Erythrina Indica</i>
Piple	<i>Populus Ciliata</i>
Rasp berry	<i>Rubus Pentagunus</i>
Sal	<i>Shorea Robusta</i>
Sethi Kath	<i>Sethi kath</i>
Setikath	<i>Endospermum chanensis</i>
Seto siris	<i>Albezza procera</i>
Simal	<i>Bombax ceiba</i>
Simal	<i>Bombacaeae</i>
Siris	<i>Albizia lebbek</i>
Sisnu (Himalayan nettle)	<i>Girardina diversifolia</i>
Sunakhari	<i>Epiphylic Orchid</i>
Teak	<i>Tectona Grandis</i>
Thakal	<i>Cycas peetinate</i>
Thootne	<i>Ficas hipsida</i>
Titaypati	<i>Artemisia plant</i>
Tooni	<i>Cendrela febrifuga</i>
Tooni	<i>Toona ciliate</i>
Tooni	<i>Cendrela febrifuga</i>
tree Fern	<i>Cythea</i>
Utis	<i>Alnus Nepalis</i>
Wild banana	<i>Muas Paradisica</i>

**Table 7: Some Fauna Species in Samdrup Jongkhar and Other Subproject Sites under Secondary Towns Urban Development Project**

English Name	Scientific name
Golden langur	<i>Trachypithecus geei</i>
Rofous Necked Hornbill	<i>Bucerosbicornis</i>
Rofous bellied hawk Egle	<i>Lophotriorchis</i>
common leopard	<i>Panthere Pardus</i>
Barking Dear	<i>Indian Muntajac</i>
Goral	<i>Naemorhedus baileyi</i>
common pythons	<i>Pythonidae</i>
Leeches,	<i>Hirudinea</i>
Common lizard	<i>Zodiac vivipara</i>



## 2. Avifauna in Samdrup Jongkhar and Other Subproject Areas Under STUDP

64. The subtropical forests of Sarpang, Gelephu and Samtse are rich in birds and mammals. Mammals such as elephant, barking deer, rhesus macaque, Bengal fox, hares, jungle cat etc inhabit the area. Elephant which known to occasionally visit the areas are totally protected under Schedule I of FNCA and is categorized as endangered in IUCN red list. The sub-tropical forest along the foothills up to 1,200 m is the richest in bird species.

65. In the slightly colder, cool broad-leafed forests of Trashigang, Punakha and Wangdue Phodrang mammals such as Assamese Macaque, wild boar, barking deer, goral, Himalayan Serow, Sambar, leopard etc. are known to inhabit the areas further away from the human habitation. Leopard is protected species under schedule I of Forest and Nature Conservation Act (FNCA) but it is categorized as lower risk under IUCN categorization. But none of the endangered and classified species are found around the project sites as the project areas are in habituated semi - urban areas. The list of birds that are found the project area is provided in the Table 8 below based on historical data.

**Table 8: Avifauna in Samdrup Jongkhar and Other Subproject Areas under the Secondary Towns Urban Development Project**

Scientific name	Common Name	Inner	South	FNCA Status	IUCN Status
<i>Buceros bicornis</i>	great hornbill		√	-	Near Threatene
<i>Pavo cristatus</i>	Indian peafowl		√	-	Least Concer
<i>Chaimarrornis leucocephalus</i>	white-capped water	√	√	-	-
<i>Garrulax albogularis</i>	White-throated	√			
<i>Garrulax leucolophus</i>	white-crested laughingthrush	√	√	-	-
<i>Pomatorhinus erythrogeus</i>	rusty-cheeked scimitar babbler	√	√	-	-

(Note: Area Inner – Inner Himalayas (Punakha, Wangdue, Trashigang), South – Sarpang, Gelephu, Samdrup Jongkhar, Samtse)

### I. Economic Development

#### 1. Income and Expenditures

66. As an urban project the general beneficiaries of the projects are the urban populace who are mostly into business. Other residents are working for the various services and public sectors in the areas. The income and expenditure of respondent households in Trashigang and other locations of subprojects under STUDP and proposed future urban projects were determined and are shown in Table 9. Incomes range from Nu5,913 in Rangjung to Nu73,518/month in Bajo/Wangdue. Similarly, expenditures range from the lowest of Nu9,261/month in Rangjung to highest of Nu32,736/month in Bajo/Wangdue. In particular, average monthly household income for Samdrup Jongkhar is at upper range with the amount of Nu38,640 and monthly household expenditure of Nu17,156. There is a wide variation between the towns which may be explained by the randomness of the survey. Incomes are relatively high in almost all towns compared to rural areas across the country as the survey work was targeted primarily in urban centers mainly with the business community and working families.

**Table 9: Income and Expenditure of Respondent Household Heads**

<b>Town</b>	<b>Monthly Household Income (Nu/month)</b>	<b>Monthly Household Expenditure (Nu/month)</b>
Sarpang	13,938	13,251
Paro	50,624	25,931
Punakha	29,490	30,634
Samtse	34,695	11,836
Gelephu	58,881	24,715
<b>Samdrup Jongkhar</b>	<b>38,640</b>	<b>17,156</b>
Dewathang	40,016	10,029
Trashigang	28,187	15,624
Rangjung	5,913	9,261
Bajo	73,528	32,736

Source: Poverty and Social Analysis (PSA) Survey 2015-2016.

67. Poverty is usually defined as an income that is inadequate to meet the minimum expenditure associated with the maintenance of a family. Since the poverty and social analysis (PSA) survey was carried out in core urban town area, the poverty rate per month per person is way above than the total poverty line of Bhutan 2017 which stands at Nu2,195.95 per person per month of which the food poverty line is Nu1,473.45 per person per month while the non-food allowance is Nu722.5 per person per month.<sup>12</sup>

## **2. Educational Institutions and Services**

68. Literacy rates for each of the Project towns are shown below in Table 10. The overall literacy rate for all towns is 73.12%. Males have a higher literacy rate than females at 81.11% compared with 63.81%. Literacy rates general fall with the range of 35% to 85%, although the small, largely rural town of Pam has much lower rates of literacy as could be expected. Samdrup Jongkhar has a literacy rate of 83.95% for males and 60.74% for women.

**Table 10: Literacy Rates for Project Towns**

<b>Town</b>	<b>Literacy Rate (%)</b>		
	<b>Male</b>	<b>Female</b>	<b>Total</b>
Sarpang	85.63	68.69	77.54
Paro	82.93	67.18	76.30
Punakha	89.89	81.63	85.95
Samtse	83.77	65.19	74.20
Gelephu	78.36	59.86	70.53
<b>Samdrup Jongkhar</b>	<b>83.95</b>	<b>60.74</b>	<b>74.51</b>
Dewathang	73.19	50.55	62.54
Trashigang	<b>84.58</b>	<b>67.83</b>	<b>76.95</b>
Rangjung	73.0	60.32	71.24
Pam	28.96	42.22	35.35
Bajo	79.74	61.00	71.57
Overall	81.11	63.81	73.12

Source: Poverty and Social Analysis (PSA) Report, 2015 conducted under TA 8551

<sup>12</sup> National Statistics Bureau. 2017. *Poverty Analysis Report*. Thimphu. This is considering average household size of 4.1.

### 3. Health Infrastructure and Services

69. Health in Bhutan is one of the government's highest priorities in its scheme of development and modernization. As a component of Gross National Happiness (GNH), affordable and accessible health care is central to the public policy of Bhutan. The Constitution of Bhutan ensures a "safe and healthy environment," by providing "free access to basic public health services" in both modern and traditional medicines. As of 2013, there were 32 hospitals across Bhutan and most Dzongkhags are facilitated with at least one hospital, except for Gasa. There are also smaller medical facilities available in each dzongkhag such as basic health unit and outreach clinic.

70. Presently, there are referral hospitals, district hospitals, basic health units and outreach clinics in Bhutan. The emergency cases are usually referred to the referral hospital either in Thimphu in western Bhutan or in Mongar which is situated in the eastern Bhutan. Samdrup Jongkhar and other subproject locations under STUDP are in the Dzongkhag centers and have district hospitals in the vicinity. The list of facilities is shown in Table 11.

**Table 11: Medical Facilities in Project Towns**

<b>Thromde</b>	<b>Nearest Hospital, Distance</b>
Sarpang	Sarpang District Hospital, <2km
Paro	Paro District Hospital, <3km.
Punakha	Punakha District Hospital, <5km.
Samtse	Samtse District Hospital, <2km.
Gelephu	Gelephu Regional Hospital, Within Thromde
Samdrup Jongkhar	Samdrup Jongkhar District Hospital, <2km.
Dewathang	Deothang Hospital, <1km
Trashigang	Trashigang District Hospital, <2km.
Rangjung	Rangjung BHU <2 km.
Bajo	Wangdue district Hospital, <5km

### 4. Basic Amenities and services

71. Samdrup Jongkhar and all the towns in the project areas under STUDP are covered with road networks. Samdrup Jongkhar is well connected with internal road corridors. However, water supply and sewerage infrastructure is inadequate. Samdrup Jongkhar and all other towns under STUDP are connected with electricity supplies from the national grid.

### 5. Market

72. Samdrup Jongkhar has an existing or planned urban center with few commercial activities. The market such as weekend vegetable market is observed to be open once a week, although vegetables are always available throughout the week. This is due to excellent farm-to-market roads and transport facilities set up by the government. However, this situation may not hold true during monsoon season due to frequent road obstructions.

### 6. Demography

73. Samdrup Jongkhar municipal area consists of Samdrup Jongkhar and Dewathang with areas of 1.90 square kilometer (km<sup>2</sup>) and 2.39 km<sup>2</sup>, respectively. Samdrup Jongkhar municipality is growing rapidly, but has not been supported by the corresponding infrastructure requirements. This had led to a weakening quality of life due to insufficient municipal service delivery, traffic

congestion, pollution and environmental degradation. In order to regulate this unguided development, a structure plan was developed in 2007 and updated in June 2013. An ADB-supported Urban Infrastructure Project (UIP) working on the Water Supply Master system of the Samdrup Jongkhar Municipality is currently ongoing under Loan 2816.<sup>13</sup> The total population of Samdrup Jongkhar Thromde is 5,952 – 3,202 (53.80%) males and 2,750 (46.20%) females. The male literacy rate is higher than that of females at 83.95% compared with 60.74%.

**Table 12: Demographic Information**

Category			Total
Gender	Male	3,202 (53.80%)	5,952 (100%)
	Female	2,750 (46.20%)	
Education			
Male	Literate	2,364 (83.95%)	3,857
Female		1,493 (60.74%)	
Male	Illiterate	452 (16.05%)	1,317
Female		865 (39.26%)	

Source: Poverty and Social Analysis (PSA) Report, 2015 conducted under TA 8551.

## 7. Occupation and Income

74. The PSA 2015 showed that the majority of household heads' major occupation in the sub-project area of Samdrup Jongkhar is in business (68%), civil service 31% and private sector employment (1%). As is apparent from the table below for both male and female heads, the reported predominant occupations and main sources of income are through business, civil servants or private sector employee. Agriculture is not at all engaged in by 100% respondents which is logical as the subproject areas are mostly urban. Accordingly, contribution of agriculture to total household income is minimal. See Table 13 below.

75. The regular major contributor to the total annual income of sample households in Samdrup Jongkhar is through business followed by salaries and wages. Rental of farming equipment as well as income from pensions are not significant as shown in Table 14 below.

**Table 13: Occupation of Head of Household by Gender in SamdrupJongkhar**

Occupation	Male		Female		Total	
	No.	%	No.	%	No.	%
Agricultural worker	-	-	-	-	-	-
Business	57	64.77	11	91.67	68	68
Private Sector employee	1	1.14	-	0	1	1
Civil Service	30	34.09	1	8.33	31	31
Housewife	0	0	0	0	0	0
Others	0	0	0	0	0	0
Total	88	100	12	100	100	100

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**Table 14: Contribution of Sources of Income to Total Annual Household Income**

Sources	Amount per annum (Nu)
Fruit orchard	00

<sup>13</sup> ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Bhutan for the Urban Infrastructure Project*. Manila.

Rental of farming equipment/animals/land	00
Salaries and wages	567,800.00
Pensions	00
Shops	4,981,000.00
Average monthly income of reporting HHs	<b>38,640.84</b>

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## J. Socio and Cultural Resources

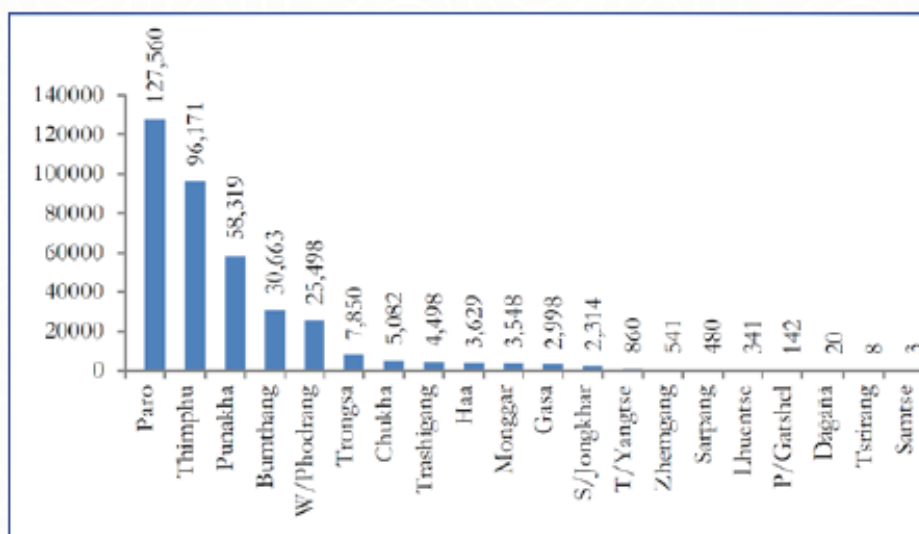
76. There are no religious, historical, cultural and archaeological sites within proposed project areas that are highly sensitive and likely to be impacted at any of the Project Thromdes. However, the projects are in vicinity of some religious and cultural entities in each of the Thromdes are listed as below:

**Table 15: Important sites in Project Towns**

Thromde	Cultural Highlights that will be impacted by projects
Shechamthang, Sarpang	none
Paro - Tshongdue	Ugyen Pelri Palace, Airport, Tshongdue Lhakhang, Khangkhu Lhakhang.
Paro- Bondey	Bondey Lhakhang, National highway and access to international airport.
Punakha	Khuru Lhakhang, Ugyen Academy, Khuru MS School.
Samtse	Shiva Mandir, Royal Guesthouse,
Gelephu	Tali Dratshang.
SamdrupJongkhar	None.
Dewathang	RBA Camp
Trashigang	Trashigang Dzong,
Rangjung	Rangjung Yoesel Choling Lhakhang
Bajo	Chhukhor manis near the intake, scared site on the way. Wangdue Dzong, Bajo Lhakhang

### 1. Tourism and Recreation

77. Paro, Thimphu, Punakha, Wangdue Phodrang, and Bumthang districts are the most popular destinations for tourists in Bhutan. The top four destinations are all located in the western part of the country. On the other hand, Pema Gatshal, Dagana, Tsirang and Sarpang received the fewest number of tourists in 2014. Incidentally, all of them are located in the Southern part of country. The Eastern districts also received very limited number of tourists. The Central districts, though they received far fewer tourists compared to the West, fared quite well compared to the Eastern and the Southern parts of the country. Compared to 2013, the number of tourists increased drastically in 2014, but disproportionately more in the popular districts of Paro, Thimphu and Punakha.

**Figure 8: Tourist Arrival per Thromde, 2014**

## 2. Tourist arrivals by bed nights and Dzongkhag

78. The highest tourist arrival in the country is in Paro due to the international airport and its proximity to the capital city of Thimphu. There are also places of cultural and recreational interests in Punakha, and Wangdue. Trashigang, and Samdrup Jongkhar are on the main east-west-south highway and have decent tourist arrivals. Sarpang is on the route to Zhemgang and part of the ecotourism initiatives in the Manas region. Samtse receive comparatively least tourists than any other districts.

## V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

79. This IEE assesses the impacts of the proposed activities for sewerage and sanitation subproject on environmental attributes in Samdrup Jongkhar.

80. **Methodology.** Issues for consideration have been raised by the following means: (i) input from interested and affected parties; (ii) desk research of information relevant to the proposed project; (iii) site visit and professional assessment by the environment specialist; and (iv) evaluation of proposed design and potential impacts based on the environment specialist's past experiences. Categorization of the project and formulation of mitigation measures have been guided by ADB's Rapid Environmental Assessment (REA) Checklist for Sewerage and Sewage Treatment (Appendixes 1 and 2) and ADB Safeguard Policy Statement (SPS), 2009.

81. A comprehensive screening for environmental impacts is made through a review of the parameters associated with sewerage subproject against the components of the proposed subprojects and the environment where the facilities will be located. A screening checklist was developed from various sources such as NEC checklists, ADB's "Rapid Environmental Assessment (REA) Checklist for Sewage Treatment, 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.

82. **Assessment of the Impacts.** 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 16. It shows the impact types and magnitudes for both positive and negative impacts without the mitigating measures and the resulting situations when mitigating measures will be implemented. Discussions of each issue are presented in the succeeding sections. For ease of identification, a summary of the environmental impacts that should be carried to the section for environmental management plan (EMP) is presented at the end of this section.

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

**Table 16: Summary of Environmental Impact Screening**

<b>Environmental Impacts and Risks</b>	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>PRE-CONSTRUCTION PHASE</b>		
Encroachment to environmentally sensitive areas	na	na
Impacts and risks to biodiversity conservation	na	na
Encroachment to historical areas and cultural areas	Δ -	Δ
Potential nuisance and problems to the public	● -	Δ
Loss of assets (IR concerns)	● -	Δ
<b>CONSTRUCTION PHASE</b>		
Modification of construction site topography	Δ -	Δ
Cutting of trees	● -	Δ
Privately owned property in WWTP sites	● -	Δ
Displacement of Rare or Endangered Species	na	na
Soil erosion and sediments of construction sites	● -	Δ
Nuisance/ public inconvenience in pipelaying	● -	Δ
Noise from construction equipment	● -	Δ
Local air pollution due to construction activities	● -	Δ
Oil and other hazardous materials releases	Δ -	Δ
Vehicular traffic congestion and public access	● -	Δ
Hazards to public due to construction activities	● -	Δ
Pollution and health risk due to workers camp	● -	Δ
Increase employment opportunity in work sites	● +	● +
Improper closure of construction sites	● -	Δ
<b>OPERATION AND MAINTENANCE PHASE</b>		
Pollution from improperly treated sewage/wastewater	● -	Δ
Noise and air pollution of pumping stations	Δ -	Δ
Noise and air pollution from wastewater treatment plant	Δ -	Δ
Pumping stations operational risk and safety	● -	Δ
Water treatment facility operational risk and safety	● -	Δ
Increase employment opportunities	Δ +	Δ

<b>Environmental Impacts and Risks</b>	<b>Without Mitigation</b>	<b>With Mitigation</b>
Solid waste from dried sludge	● -	Δ
Natural risks such as flooding	● -	Δ

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

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

84. **Encroachments.** The subproject's components will not be located in areas that are environmentally sensitive and areas with historical and cultural importance. As described in the environmental baseline, the proposed sites are mostly vacant lots in residential, and agricultural landscapes. The proposed routes of the sewerlines are usually along roads or parallel to existing drainage canals. There are no known archaeological and cultural assets in these proposed sites. 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.

85. **Impacts and Risks to Biodiversity Conservation.** The issue on impacts and risks to biodiversity conservation is not applicable to the subproject sites, since the subproject's components will not be located in areas that are environmentally sensitive. The sites are not in undisturbed or declared protected areas, but in landscapes that over the years have been inhabited by people whose various activities defined the present land uses as combination of any of the following: (i) residential, or (ii) commercial; or (iii) institutional; or (iv) agricultural.

86. **Nuisance and Problems to the Public.** Potential nuisances and problems to the public during construction can best be avoided if proactively addressed during detailed design and pre-construction phase. Consultation and information dissemination to potentially affected people shall be done during detailed design. Tender documents shall include provisions addressing potential nuisances and problems to the public during construction. These include environmental management provisions on the following issues: (i) erosion and sediment runoff, (ii) noise and dust, (iii) vehicular traffic, (iv) construction wastes, (v) oil and fuel spillages, (vi) construction camps, and (vii) public safety and convenience. In addition, prior to site works, the contractor shall coordinate with the appropriate agencies in the procurement of required clearances with regard to electricity, telephone lines and other utilities/structures that may be affected by construction activities. These shall all be reflected in the construction contracts.

87. **Loss of Assets.** Proposed sewer lines are located along road right of ways which are free from encumbrances and encroachments. The sewerlines will be laid out underground, hence the disturbance during construction will be temporary and minimal.

## **B. Construction Phase Environmental Impacts**

88. **Site Preparation.** Sewerlines will follow as much as possible the existing site contour and along existing drainage canals. This issue is therefore considered not significant. There will be no cutting of trees involved in forest areas, except may be in urban areas where lot owners have planted trees that are along the alignment of the subprojects. Removal of trees will not be an issue due to: (i) sewerlines will mostly be laid in trenches along the right-of-way of existing roads parallel to existing drainage lines. The issue on displacement of rare or endangered species is not applicable to this subproject since there are no known rare or endangered species within the proposed sites.



89. **Mitigation.** It is not expected that trees will be cut because the sewerlines will be along the existing roads.

90. **Source of materials.** Significant amount of gravel, sand and aggregate, will be required for this subproject. The sources of these materials might have generated negative impact to the environment.

91. **Mitigation.** The contractor will be required to:

- (i) source gravels from Natural Resource Development Corporation Ltd. (NRDCL) approved, existing and operational quarries, or import from overseas companies with authority to export such materials; and
- (ii) no direct quarrying in the project areas.

92. **Archaeological and cultural resources – chance finds.** As mentioned above, subproject areas are not potential archaeological area and therefore no impacts is envisaged. However, in the remote possibility that archaeological artifacts or assets are found during excavation activities, chance find procedure will be followed.

93. **Mitigation.** In any event of a likely chance find, the following procedure will be followed by the contractor:

- (i) Stop work immediately to allow further investigation; and
- (ii) If the site supervisor determines that the item is of potential significance, an officer from the Ministry of Home and Cultural Affairs (MOHCA) will be invited to inspect the site and work will be stopped. Until MOHCA has responded to this invitation, work will not re-commence in this location until agreement has been reached between MOHCA, PMU and PIU as to any required mitigation measures, which may include excavation.

94. **Soil Erosion and Sediment of Construction Sites.** During rainy periods, exposed soil at the construction site can easily be washed away by runoff and carried to the natural drainage system. Hence, soil erosion of the construction sites could occur if preventive measures are not instituted.

95. **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) sediment traps, and (iv) temporary sediment basins. Whenever possible, total exposed area shall be minimized.

96. **Construction Noise.** Potential sources of noise are the construction equipment, such as trucks and other equipment, which can generate noise of 80 dB(A) from a distance of 30 meters. Loud noise sources such as blasting are not expected in the construction activities of the subprojects. This issue is important if the proposed pipeline routes are in residential areas.

97. **Mitigation.** Nuisance from equipment noise can be mitigated with the use of sound suppression devices for the equipment. In areas near any house or noise-sensitive sites, noisy equipment shall not be operated during nighttime to early morning (2200H – 0600H). Noise levels due to construction activities should not exceed 55 dB(A) near schools and other sensitive areas,

and 45 dBA during nighttime (2200H – 0600H). Workers using noisy equipment shall be provided with earplugs.

98. **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. This issue is considered significant during dry periods. Another potential source of air pollution are large stockpiles of construction materials such as soil and aggregates. Without any mitigating measures, dust generation could be significant during dry periods.

99. **Mitigation.** The contractor shall be required to perform regular water spraying of the sites during dusty periods in order to reduce the generation of dusts. The contractor 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. Trucks transporting loose construction materials such as sand, gravel, spoils, and the like shall be provided with tarpaulin cover.

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

101. **Vehicular Traffic Congestion and Public Access.** Construction activities, such as digging for the laying of sewerlines, may cause traffic congestion in heavily traveled highways and narrow streets. It may hinder public access. Diggings along the highways are expected to cause traffic congestion since vehicles using the highway and sewerline alignment might be in the road shoulders or within the pavement. Installation of lines crossing the highway to the other side may cause the temporary closure of half the road and will lead to traffic congestion. This issue is therefore considered significant.

102. **Mitigation.** Contractors shall be required to: (i) prepare a traffic management plan; (ii) closely coordinate with local authorities for the closure of roads or rerouting of vehicular traffic; (iii) consider the schedules of local activities with heavy presence of people such as festivities, processions, parades, etc. in the timing of construction activities; (iv) do proper stockpiling and immediate disposal of spoils to avoid nuisance and traffic/access obstruction; and (v) do immediate restoration of roads and other areas affected by pipe laying, construction activities and vehicles.

103. **Hazards to Public and Construction Workers Due to Construction Activities.** Construction activities, such as laying of sewerlines, along the roads may result to hazardous driving conditions since vehicles would still be using the road while construction activities are ongoing. The movement of construction vehicles and excavations would pose some hazards to the driving public. There is also risk of people falling into open trenches since excavations are sometimes left uncovered.

104. **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.

105. **Pollution and Health Risk Due to Workers Camp.** The contractor is expected to erect temporary workers' camps during construction phase. 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' camps will provide the conditions for vermin and other disease vectors to easily multiply and infect the workers. This may lead to the transmission of diseases from the workers' camps to other areas. These conditions will increase public health risk.

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

107. **Occupational Health and Safety.** To reduce day to day risks associated with working with heavy equipment in trafficked areas, contractor will be required to appoint health and safety officers for each site and to ensure regular briefing of the construction workforce on health and safety issues. Contractor shall establish their occupational health and safety plan to be adopted at each site following international best practices and the World Bank EHS guidelines on construction and decommissioning activities. As minimum and whichever are applicable, the occupational health and safety plan shall ensure the following:

- (i) Communication and Training
  - a. Training of all workers on occupational health and safety prior to construction works;
  - b. Conduct of orientation to visitors on health and safety procedures at work sites;
  - c. Signages strategically installed to identify all areas at work sites, including hazard or danger areas;
  - d. Proper labeling of equipment and containers at construction and storage sites; and
  - e. Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid; communication with, and transport to, the nearest hospital with an accident / emergency department; monitoring equipment; rescue equipment; fire fighting equipment; and communication with nearest fire brigade station.
- (ii) Physical Hazards
  - a. Use of personal protective equipment (PPE) by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly;
  - b. Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear;
  - c. Use of bracing or trench shoring on deep excavation works;
  - d. Adequate lighting in dark working areas and areas with night works;

- e. Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only;
  - f. Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators; and
  - g. Use of air pollution source equipment and vehicles that are well maintained and with valid permits.
- (iii) General Facility Design and Operation
- a. Regular checking of integrity of workplace structures to avoid collapse or failure;
  - b. Ensuring workplace can withstand severe weather conditions;
  - c. Enough work spaces available for workers, including exit routes during emergencies;
  - d. Fire precautions and fire fighting equipment installed;
  - e. First aid stations and kits are available. Trained personnel should be available at all times who can provide first aid measures to victims of accidents;
  - f. Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only;
  - g. Good working environment temperature maintained;
  - h. Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and
  - i. Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur.
  - j.

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

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

110. **Increase Employment Opportunities at Work Sites.** Various construction activities for the wastewater treatment plants, and trenching/laying of sewerlines will require a number of workers. The impact would be beneficial and significant since employment opportunities in the area will increase.

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

### C. Operation Phase Environmental Impacts

112. **Noise and Water Pollution from the Sewerlines.** Pumping stations will be not be significant sources of mechanical noise along the sewerlines. Submersible pumps used at some points along the lines will generate minimal noise. Localized water pollution due to leakage of sewage from the lines if leaks occur along the lines.

113. **Mitigation.** Regular monitoring of the sewerlines will be conducted to ensure that the lines are not clogged or have some leaks. Periodic maintenance, especially immediately after flooding episodes occur will also be undertaken to ensure the integrity of the sewerage system at all times.

114. **Wastewater Treatment Facility Operational Risk and Safety.**<sup>14</sup> The proposed treatment plant will not inherently pose any significant risk to the environment and people. It will not use flammable materials during normal operations. Conditions of extreme conditions of temperature and pressure are not to be expected. Accidental spillage of liquid chlorine of sodium hypochlorite (NaOCl) used as disinfectant may pose minor health risk.

115. **Mitigation.** The minor risk of spillage of NaOCl will be prevented by proper containment and labeling and using corrosive resistant plastic containers. NaOCl is inherently a safer disinfectant. Its character can simply be put as household bleach or swimming pool chlorine.

116. **Occupational health and safety.** The operator of the water supply subproject will adopt the World Bank EHS guidelines related to occupational health and safety for the operation of water and sanitation projects.<sup>15</sup> The guidelines include proper handling and storage of liquid chlorine.

117. **Pollution of Receiving Bodies of Water during Malfunction of the Treatment Plant.** Wastewater treatment plants (WWTPs) will be designed and constructed to meet the Standards for Final Effluent from Sewerage Treatment Plant (2010), the significant parameters of which are Biochemical Oxygen Demand of 30 milligrams per liter (mg/L), Total Suspended Solids of 100 mg/L, and Fecal Coliform of 1,000 MPN/100 milliliters (ml). However, during the life of the WWTP, there would be occasions of malfunctioning of the electromechanical parts of the plant especially during the latter part of its operational life. This condition will stop the operation of the plant leading to discharge of wastewater into the receiving body of water.

118. **Mitigation.** Regular O&M of the WWTPs will be conducted, including daily monitoring of the influent and effluent qualities and by following the process control procedures regularly. Preventive maintenance of electromechanical parts will be done on scheduled regular basis. Parts that have served its economic life will be replaced or refurbished before they malfunction. However, if and when electromechanical failure of the wastewater treatment plants occurs, the incoming raw wastewater will be partially treated in the equalization tank and settling tank and disinfected with NaOCl prior to discharge to the river. This emergency procedure will reduce the pollution load of the wastewater while repair of the malfunctioning parts is being done.

<sup>14</sup> Although the WWTP is not included in the scope of the sub-project, this IEE does provide EMP measures for the O&M of the plant for the benefit of the Samdrup Jongkhar thromde who will manage these facilities. The thromde will have an O&M contract with private operator for the WWTP.

<sup>15</sup> World Bank Group. Environmental, Health, and Safety Guidelines for Water and Sanitation. <http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES>.

119. **Odor from the WWTP.** Foul odor from WWTPs due to anaerobic condition are of particular concern to the health of the workers and surrounding communities.

120. **Mitigation.** Foul odor is a result of improper operation of the WWTPs. To ensure efficient performance of all sections of the treatment plant, the prescribed process control and monitoring in the various sections of the treatment system will be conducted regularly, including dissolved oxygen monitoring, settleability test, among others.

121. **Generation of Excess Sludge by the Plant.** Excess sludge from settling tanks will be dried in sludge drying beds and held in storage areas at the site. These areas are protected with lining to ensure that no groundwater contamination occurs. However, with the relative small volume of sludge to be generated, potential impact for groundwater contamination is unlikely.

122. **Increased Employment Opportunities.** Operation and maintenance of the WWTPs and the sewerlines 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 Sewerage/WWTP subprojects are not labor intensive. This impact is therefore considered less significant.

123. **Flooding and Higher Temperature due to Climate Change.** The Department of Hydromet Services (DHMS) is the national center for weather, climate and water resources in Bhutan. Depending on the altitude, the climate varies from semi-tropical to alpine [for every 1,000 meters (m) height increase, the temperature drops about 7 degrees Celcius (°C)]. In southern Bhutan, the climate is tropical in the monsoon season and may range from 15°C in winter to 30°C. The east is also warmer than the west in summer. The center enjoys sub-tropical climate with very cool winters while the northern parts of the country have harsh climate including snowfall two or three times every winter.

124. **Mitigation.** For any potential flooding, the facility area of the WWTP shall be provided with drainage system sufficient to accommodate and convey storm water to storm drain or to receiving body of water without being contaminated by untreated wastewater.

125. After impacts and risk screening, Table 17 lists the environmental impacts and risks that requires mitigation and shall be carried to the EMP Section.

**Table 17: Environmental Impacts and Risks for Inclusion in EMP**

<b>Environmental Impacts and Risks</b>	<b>Without Mitigation</b>	<b>With Mitigation</b>
<b>PRE-CONSTRUCTION PHASE</b>		
Potential nuisance and problems to the public	● –	Δ
Privately owned WWTP sites	● –	Δ
<b>CONSTRUCTION PHASE</b>		
Soil erosion and sediments of construction sites	● –	Δ
Nuisance/ public inconvenience in laying sewerlines	● –	Δ
Noise from construction equipment	● –	Δ
Local air pollution due to construction activities	● –	Δ
Vehicular traffic congestion and public access	● –	Δ
Hazards to public due to construction activities	● –	Δ
Pollution and health risk due to workers camp	● –	Δ
Increase employment opportunity in work sites	● +	● +

<b>Environmental Impacts and Risks</b>	<b>Without Mitigation</b>	<b>With Mitigation</b>
Improper closure of construction sites	● -	Δ
<b>OPERATION AND MAINTENANCE PHASE</b>		
Leakage from the sewerlines	● -	Δ
Wastewater treatment facility operational risk and safety	● -	Δ
Pollution due to malfunction of the treatment plant	● -	Δ
Increase employment opportunities	● +	● +
Flooding and higher temperature due climate change	● -	Δ

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

126. The subproject is unlikely to cause significant adverse impacts. However, there are no impacts that are significant or complex in nature, or that needs an in-depth study to assess the impact. The potential adverse impacts that are associated with design, construction, and O&M can be mitigated to acceptable levels with the recommended mitigation measures.

#### **D. Cumulative Impact Assessment**

127. The cumulative impact assessment examined the interaction between the subprojects' residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing, and reasonably foreseeable future projects or activities. The interaction of residual effects associated with multiple subprojects and/or activities can result in cumulative impacts, both positive and negative. The subprojects' potential cumulative effects were considered with respect to valued components in environmental and socioeconomic categories, in four areas:

- (i) of any potential residual subproject effects that may occur incrementally over time;
- (ii) consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the project;
- (iii) potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed subproject; and
- (iv) future developments that are reasonably foreseeable and sufficiently certain to proceed.

128. The subproject has identified the valued components as water quality, noise, traffic management, socioeconomic and socio-community components, and human health. There are no foreseeable projects that will overlap with the subproject. The spatial boundary of the project is the area along the pipe alignment, existing right of ways, and pump sites.

129. Since the wastewater treatment facilities are enhancement measures to address the generation of sewage from the increasing population, there are no significant cumulative impacts expected on future water supply.

130. Air quality effects will occur during construction. Consequently, although emissions of common air contaminants and fugitive dust may be elevated in proximity to active work sites, this impact will be short-term and localized to the immediate vicinity of the alignment of the sewerlines. Greenhouse gas (GHG) emissions may increase as a result of project activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, landfilling of residual wastes). Given the project's relatively minor contribution to common air contaminants and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible.

131. Noise levels during construction in the immediate proximity of most work sites are expected to increase. The duration of this exposure will be relatively brief. This exposure represents a temporary, localized, adverse residual effect of low to moderate significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction. Noise levels associated with the project O&M will be largely imperceptible, as the pump is submersible and located in relatively small sites within the barangay.

132. Land use/traffic management concerns will occur spatially during construction. Site-specific mitigation measures will be implemented to address temporary disruptions to land use and access, traffic delays and detours, and increased volumes of construction-related traffic. Traffic movement along the sewerline alignment will improve once construction is completed. Since only relatively small land area will be occupied by the sewerlines and the WWTPs, it will not conflict with existing or planned land use. However, following improvement in infrastructures and services, added residential developments, commercial, and business facilities and increased densities are expected to develop and enhance the subproject areas. This can be considered a long-term cumulative benefit of the subproject.

133. Upon completion of the subprojects, the general sanitary condition of the communities will also improve and the pollution of the receiving bodies of water will be reduced. This is considered a long-term cumulative benefit.

134. No adverse residual effects to human health will occur as a result of subproject construction or operation. While exposure to elevated noise levels and fugitive dust and common air pollutants will occur in proximity to project work sites during construction, due to their short-term, localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health.

## **VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION**

135. MOWHS has undertaken various activities concerning information disclosure, public consultation, and public participation for the proposed sewerage systems and wastewater treatment subprojects. These were done to achieve a meaningful stakeholders' consultation and ensure the subprojects success.

136. During the planning phase, information regarding the proposed sewerage subprojects were disclosed to the public such as in the conduct of a socioeconomic survey. Households in subproject areas were informed about the proposed subprojects and interviewed for socioeconomic data.

137. Key informant interviews and focus group discussions (FGDs) with LAP officials and municipal officials were conducted to get their cooperation and gather information relative to poverty incidence and concentration, and identify needs and recommendations on sewerage/WWTP. Participants in the key informant and FGDs included the following: (i) staff of the municipalities, (ii) local health officials, (iii) gender focal persons of municipalities, (iv) village officials, (v) local environment offices, and (vi) nongovernment organizations (NGOs).

138. **Public Consultation.** Public consultations were conducted on the proposed sewerage/WWTP subprojects with the stakeholders and requested their views. A total of 178 stakeholders' representatives participated (Samdrup Jongkhar: 25 people—17 males and 8



females). Stakeholders were encouraged to raise their social and environmental issues. Participants included: (i) concerned individuals, (ii) LAP officials, (iii) NGOs, (iv) municipal officials, and (v) village officials. Stakeholders expressed support to the subprojects. Summary of the consultation outcomes is presented in Table 18, while the documentations are presented in Appendixes 3-7.

139. **Future Disclosure and Consultations.** During detailed design, the project office and the MOWHS will again conduct public consultations and information disclosure. Large group of stakeholders are expected to attend these proposed consultations since proposed water tariffs will also be discussed. Views of the stakeholders will be considered in the overall design process. Stakeholders' consultations shall be continued throughout the duration of the construction phase. MOWHS 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 18: Summary of Consultation Outcomes**

<b>Name / Organization</b>	<b>Question</b>	<b>Response</b>
<b>Consultants</b>	Does the local person support the proposed Project?	All participants pledged their full support for the said Project.
Consultants	Any critical issue or concern by the local people regarding the Project?	No issues or concerns.
Consultants	Any loss of residential or commercial structures due to the Project?	None
Consultants	Any loss of Community life (like market place, public playground) or Community Activities that will be affected?	None
Consultants	Would there be land acquisition that would result in resettlement, or would affect parks, forest, etc.?	None
Consultants	Will the Project location adversely affect water resources?	No issues or concerns are foreseen.
Consultants	Any other issues you want to share (security, cooperation from local communities)?	The participants are happy to collaborate and contribute.
Consultants	Any Cultural or Sacred sites in the proposed site	None

## **VII. GRIEVANCE REDRESS MECHANISM**

140. Local grievance redress mechanism is important in the implementation of the proposed subproject since any complaint and concern 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 environmental performance of projects during the construction phase can best be handled by an ad-hoc committee at the local level where the subproject is located for expeditious resolutions to the complaints. Complaints during the operation phase can be brought to the attention of the MOWHS or National Environmental Commission Secretariat (NECS).

141. The Project Grievance Redress Mechanism (GRM) follows a tiered system, starting at the local level. The GRM structure has been agreed with the concerned agencies and a notification of the GRM structure as shown in Figure 9 below and the Grievance Redress Committee (GRC) composition have been provided by MOWHS. See government notification in Appendix 8. The GRM will ensure that grievances and complaints regarding land acquisition, compensation and resettlement or other social and environmental issues will be addressed in a timely and satisfactory manner. People in the towns will be made aware of their rights and the detailed procedures for filing of grievances. PIUs will be undertaking outreach activities to make people aware of the GRM and will be published on the thromde/ dzongkhag and MOWHS websites. GRM will also be displayed at notice boards in the PIU offices.

142. **First level of GRM.** Aggrieved persons may first approach the contractor's site representative/ project manager in case of complaints related to construction related nuisances. The complaint must be recorded in the site register and contractor should provide a resolution to the complaint within 2 days. In case, the complaint is not resolved at this level, the aggrieved persons can then file a complaint with the PIU office. Aggrieved persons are entitled to lodge complaints regarding any aspect of the land acquisition, entitlements, benefits or rates of payment as well as any project related social or environmental issues. Complaints can be made verbally or in written form. Complaints made to the PIU should be resolved within 3 days. All complaints must be recorded by the PIU, including actions taken to resolve the complaint. Complaints, their nature and resolution should be mentioned in the quarterly progress reports. A sample grievance registration form is appended as Appendix 9.

143. **Second level of GRM.** At this level, the PIU Manager/Municipal level will coordinate with the Dzongkhag/thromde municipal Committee which should be in place prior to project implementation. This committee will be comprised of: (i) Dzongda (district administrator) or thompon (mayor) as Chairman; (ii) municipal engineer (PIU Project managers) as Member secretary; (iii) District engineers; (iv) district/ municipal planning officer; (v) district/municipal legal officer; (vi) district/municipal environmental officer; (vii) district/ municipal land record officer, (viii) town representatives (elected); and (ix) gender focal person of PIUs. The aggrieved person who filed the complaint (or representative/s from the affected household/s) will be called to present his/her case and deliberation on the case will be done through proper hearing or mediation. It will be the responsibility of the dzongkhag/ thromde committee to resolve the issue within 15 days from the date the complaint is received. Minutes of meeting of the Dzongkhag/thromde committee meeting will be kept and resolution provided will be recorded for purposes of project monitoring.

144. If the complaint is unresolved at this level, the PMU, PIU or the District Administrator will inform the aggrieved person accordingly and assist them in elevating the complaint to the PMU/ Central Grievance Committee.

145. **Third level of GRM.** Grievances not redressed at the Dzongkhag/ thromde municipal committee within 15 days will be brought to the Central Grievance Redress Committee at MOWHS level. The Central Grievance Redress Committee will comprise of: (i) Secretary, MOWHS (Chairman); (ii) Director, DES (Member secretary); (iii) Project manager, PMU; (iv) Project coordinator, PMU; (v) Water and Sanitation Division chief; (vi) legal officer, MOWHS; (vii) environmental officer, MOWHS; (viii) gender officer (MOWHS); and (ix) representatives from local NGOs. It will be the responsibility of the dzongkhag/ thromde committee to resolve the issue within 10 days from the date the complaint is received. In the event, the grievance is still not resolved; the matter may be elevated by the aggrieved person to an appropriate court of law. The court will

have the final authority to approve or reject the case. Aggrieved persons may seek recourse through legal system at any stage of the GRM process.

146. **Recordkeeping.** Records will be kept by the PIU of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected, and final outcome.

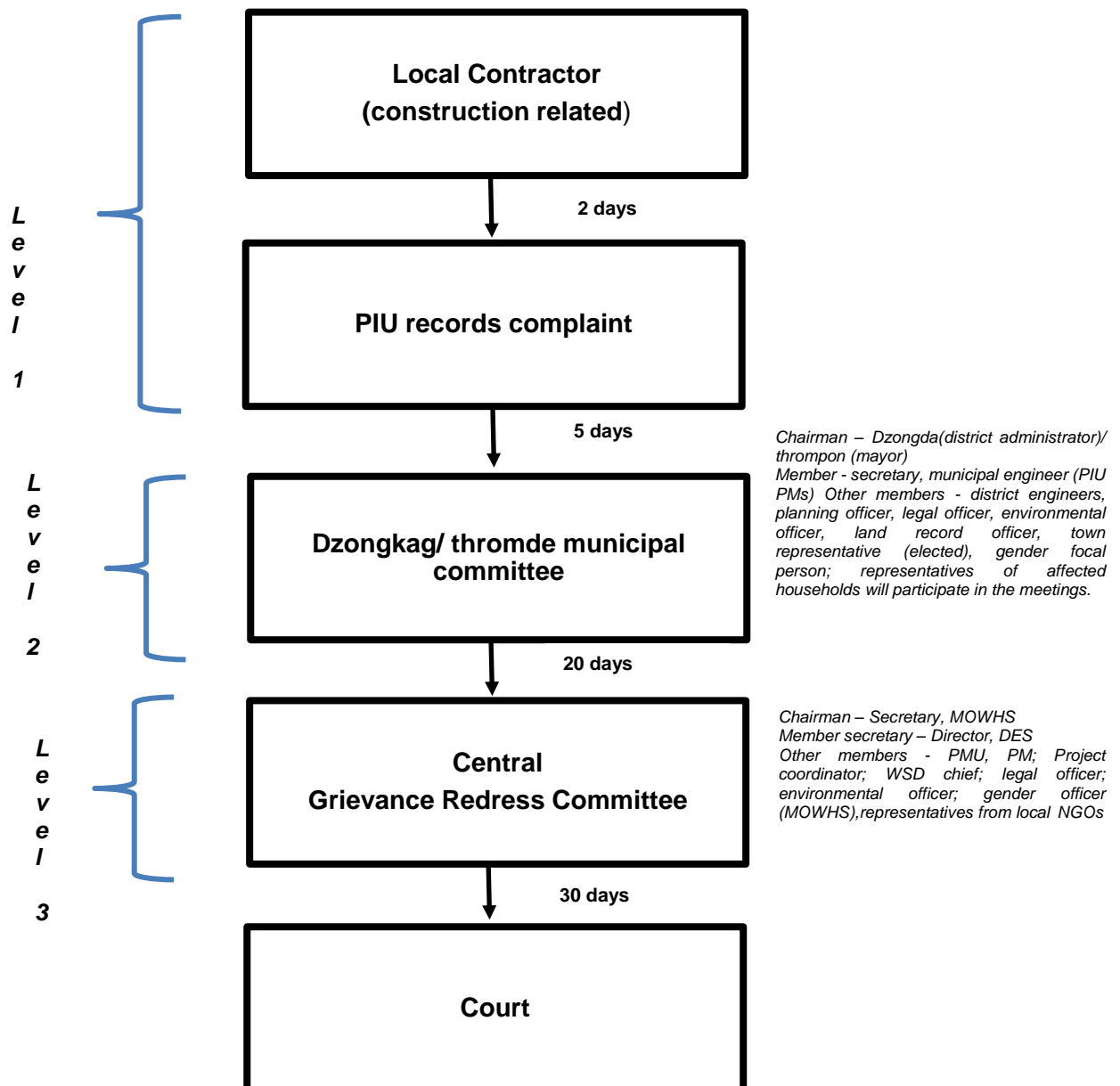
147. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by the municipalities (Samdrup Jongkhar for this subproject) that will operate and maintain the sewerage and sanitation system.

148. **Complaints to NECS.** Complaints about environmental performance of projects issued an Environmental Clearance can also be brought to the attention of NECS. The steps that NECS may follow in handling complaints are: (i) NECS shall verify if the complaint is within its jurisdiction, (ii) within 72 hours from receipt of a complaint NECS will send the proponent a Notice of Alleged Violation and requests for an official reply as to why the proponent should not be penalized, and (iii) NECS may conduct field validation, site inspection and verification or other activities to assess or validate the complaint. The proponent is allowed to respond within 7 days. Proponent's failure to respond to the NAV and further notices will force NECS to take legal actions. NECS may issue a Cease and Desist Order to project proponents which shall be effective immediately based on: (i) violations under the National Assessment Act of 2000 and its implementing rules and regulations, and (ii) situations that present grave or irreparable damage to the environment. NECS may also suspend or cancel the proponent's Environmental Clearance if the terms and conditions have been violated the National Environment Protection Act of 2007.

149. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage. This can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

150. In the event that the established GRM is not in a position to resolved the issue, the affected persons can also use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer at ADB headquarters. The complaint can be submitted in any of the official languages of ADB's Developing Member Countries. The ADB Accountability Mechanism information will be included in the Project Information Document to be distributed to the affected communities, as part of the project GRM.

Figure 9: Grievance Redress Process



## VIII. ENVIRONMENTAL MANAGEMENT PLAN

151. This section addresses the need for mitigation and management measures for the Samdrup Jongkhar sewerage and wastewater treatment subproject. Information includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. Institutional set-up is presented in the implementation arrangement and discusses the roles during implementation and the required

monitoring. It also outlines the requirements and responsibilities during pre-construction, construction, and operation phases.

#### **A. Environmental Mitigation**

152. Some details of mitigating measures are already discussed in Section V where the need for mitigation of each impact was determined in the screening process. More comprehensive EMPs are shown in Tables 19–21 which cover sewerage at various stages of the project (pre-construction, construction and post-construction/O&M stages). These present 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.

**Table 19: Environmental Management Plan for Anticipated Impacts: Pre-Construction**

Aspects/ Fields	Anticipated Impacts	Mitigation Measure	Location	Responsibility Implementation/ Supervision	Mitigation Cost
<b>PRE-CONSTRUCTION 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.	Sewerline trenches, civil works excavations	Design Consultants / MOWHS Project Management Unit (PMU)	Part of detailed design cost
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.	Sewerline routes	PIU, Design Consultants / MOWHS PMU	Part of detailed design cost
IR concerns	Loss of assets	Compensation and other assistance for loss assets and land swapping; Consultation and information dissemination to affected people.	Sewerline routes	PIU, Design Consultants / MOWHS PMU	Part of detailed design cost
Preparation of detailed engineering design	Natural hazards, such as earthquake, flood	Structural integrity of the sewerage system shall conform with the requirements structural requirements of Bhutan Building Rules.	All structural components	Design Consultants / MOWHS PMU	Part of detailed design cost

**Table 20: Environmental Management Plan for Anticipated Impacts: Construction**

Aspects/ Fields	Anticipated Impacts	Mitigation Measure	Location	Responsibility Implementation/ Supervision	Mitigation Cost
<b>CONSTRUCTION PHASE</b>					
Excavation works	Chance finds for archaeological and cultural artifacts or assets	(i) Stop work immediately to allow further investigation; and (ii) If the site supervisor determines that the item is of potential significance, an officer from the Ministry of Home and Cultural Affairs (MOHCA) will be invited to inspect the site and work will be stopped. Until MOHCA has responded to this invitation, work will not re-commence in this location until agreement has	Pipelines routes, reservoir and pumping station	Contractor / PIU, PMU, Supervision Consultants	Incorporated in construction contract

Aspects/ Fields	Anticipated Impacts	Mitigation Measure	Location	Responsibility Implementation/ Supervision	Mitigation Cost
		been reached between MOHCA, PMU and PIU as to any required mitigation measures, which may include excavation.			
Laying of sewerlines and other civil works	Soil erosion and sediments of construction sites during rainy periods	Total area exposed shall be minimized; use of structural erosion prevention and sediment control practices which may include: interceptor dikes, pipe slope drains, straw bale barriers, sediment traps, and temporary sediment basins	Sewerline routes	Contractor / PIU, Supervision Consultants	Incorporated in cost of construction
Laying of sewerlines and other civil works	Nuisance from noise of construction equipment	Consultation with affected areas; not to operate noisy equipment during nighttime (22:00 – 06:00); sound suppression for equipment; ear plugs for workers	Sewerline routes	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Laying of sewerlines 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; tarpaulin cover for trucks transporting loose construction materials; not smoke belchers equipment	Sewerline routes	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Laying of sewerlines and other civil works	Traffic congestion and hindrance to access	Close coordination with local authorities in road closure and traffic rerouting; contractor's traffic plan; proper stockpiling of materials and immediate disposal of spoils; immediate restoration of roads and affected areas	Sewerline routes	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Laying of sewerlines 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 such as temporary diversion drains, catch drains, and silt-traps	Workers camp	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Laying of sewerlines and other civil works	Hazard to public and construction workers 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 pipelaying	Sewerline routes and WWTPs	Contractor / PIU, Supervision Consultants	Incorporated in construction contract

Aspects/ Fields	Anticipated Impacts	Mitigation Measure	Location	Responsibility Implementation/ Supervision	Mitigation Cost
		Deep excavation works will be provided with wall bracing or trench shoring and no deep exaction works will be done during heavy rains			
Pipelaying and other civil works	Occupational health and safety risks	Implement the occupational health and safety plan to be adopted at each site following international best practices and the World Bank EHS guidelines on construction and decommissioning activities	All subproject sites	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Rehabilitation and closure of construction sites	Improper closure of construction sites	Removal of all construction wastes and implement surface restoration	Sewerline routes	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Laying of sewerlines and other civil works	Increase employment opportunities	Contractor required to give preference to local labor; workers recruitment to be coordinated with local officials	Sewerline routes	Contractor / PIU, Supervision Consultants	No cost

**Table 21: Environmental Management Plan for Anticipated Impacts: Operation**

Aspects/ Fields	Anticipated Impacts	Mitigation Measure	Location	Responsibility Implementation/ Supervision	Mitigation Cost
<b>OPERATION PHASE</b>					
WWTP operation	WWTP operational risk and safety	<p>Proper containment and labeling and using corrosive resistant plastic containers.</p> <p>Adopt the World Bank EHS guidelines related to occupational health and safety for the operation of water and sanitation projects.</p> <p>Use liquid chlorine (sodium hypochlorite) instead of chlorine gas</p>	WWTPs	Mun. Engr. / MOWHS PMU	Part of capital, operation & maintenance costs
WWTP operation	Pollution of receiving bodies of water during malfunction	Regular preventive maintenance of electromechanical parts of the plant and observance of process control procedures. In case of failure, partial treatment in equalization and settling tanks and disinfection of wastewater before discharge	WWTPs	Mun. Engr. / MOWHS PMU	Part of operation & maintenance costs



<b>Aspects/ Fields</b>	<b>Anticipated Impacts</b>	<b>Mitigation Measure</b>	<b>Location</b>	<b>Responsibility Implementation/ Supervision</b>	<b>Mitigation Cost</b>
WWTP operation	Flooding and high temperature due to climate change	Construction of concrete embankment along riverbank near the plant	WWTP	Mun. Engr. / MOWHS PMU	Part of capital cost

153. 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, (iii) construction site management plan, (iv) compliance with effluent standards, and (v) unanticipated environmental impacts.

154. **Tender Documents and Construction Contracts.** Environmentally responsible procurement advocates the inclusion in construction contract documents the provisions addressing the management of environmental impacts and risk during construction. This includes the contractor's submittal of a Contractor's Environmental Management Plan (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, and (vii) public safety and convenience.

155. **Contractor's EMP.** During construction, each contractor will be guided by its detailed CEMP. This shall be based on the subproject's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by PIU, MOWHS PMU, and other monitoring parties. Inclusion in construction contract documents the provisions requiring the contractor to submit a CEMP is important since the contractor will be legally required to allocate a budget for mitigation measures implementation. The CEMP will allow PIU construction supervision engineer to focus on what are specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the CEMP, PIU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules.

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

157. **Compliance with the Standard for Final Effluent.** Municipal engineer and environment officer shall manage the operation of the WWTPs. As previously pointed out, the treatment plants will be designed and constructed to meet the effluent standards. WWTP operators will be trained in the proper operation of the plants, including the conduct of in-plant monitoring and process control. It is an approach that will clearly show the desire of the municipality in applying best practices in ensuring that the treated effluent will always be compliant with the effluent standards.

158. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during project implementation, municipal engineer 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**

159. Table 22 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 municipal PIU shall prepare quarterly environmental monitoring reports to be submitted to MOWHS management detailing the status of mitigating measures implementation.

**Table 22: Environmental Monitoring Plan**

<b>Aspects / Parameters to be monitored</b>	<b>Location</b>	<b>Means of Monitoring</b>	<b>Frequency</b>	<b>Implementation Responsibility</b>	<b>Compliance Monitoring Responsibility</b>	<b>Monitoring Cost</b>
<b>PRE-CONSTRUCTION PHASE</b>						
Consultation meetings; Specific provisions in tender documents on nuisance & problems to public	Sewerline routes	Verify meetings documentation; Verify draft and final documents	After completion of meetings; Twice – draft and final documents	Design consultants	MOWHS PMU	Part of project management in detailed design (minimal cost)
<b>CONSTRUCTION PHASE</b>						
Total area to be exposed; runoff flowing into disturbed sites	Sewerline routes	Visual inspection of sites; plans verification	Daily during rainy periods	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Materials and solid wastes dumped in watercourses	Sewerline routes	Visual inspection of sites; work schedules verification	Daily	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Noise levels not to exceed 50 dBA near school, 55 dBA in other areas, and 45 dBA during nighttime	Sewerline routes	Use of sound level meter	Daily	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Dust, cover of stockpiles, smoke belching	Sewerline routes	Visual inspection of sites	Daily	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Road closure and traffic rerouting; materials stockpiles; road restoration	Sewerline routes	Traffic plans verification	weekly	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract

<b>Aspects / Parameters to be monitored</b>	<b>Location</b>	<b>Means of Monitoring</b>	<b>Frequency</b>	<b>Implementation Responsibility</b>	<b>Compliance Monitoring Responsibility</b>	<b>Monitoring Cost</b>
Sanitary toilets, garbage bins, runoff controls	Workers camps	Visual inspection of camps	Once before start of construction and once monthly	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Road safety plan; sign, barricades and night lamps	Sewerline routes	Visual inspection of sites	Daily	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Construction wastes	Sewerline routes	Visual inspection of sites	Once before final stage of demobilization	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Number of local labor employed	Sewerline routes	Verification of contractor's records	Once a month	Contractor	PIU	No cost
<b>OPERATION PHASE</b>						
Leakage monitoring of sewerlines	Along sewerlines	Visual inspection of lines	Once a year & after flooding	Mun. Engr.	MOWHS	Part of O&M
BOD, TSS and fecal coliform of treated effluent	WWTP outfall	Water sampling and laboratory analysis	Monthly	Mun. Engr.	MOWHS	Part of municipality's operation cost (\$1,000 /year)
Liquid chlorine usage	WWTP	Verification of operation records	Once a year	Mun. Engr.	MOWHS	Minimal cost

Legend: BOD = biochemical oxygen demand; TSS=total suspended solids

160. **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 23). Tendering process advocating environmentally responsible procurement is a desired outcome during the pre-construction phase. This can easily be verified by checking if EMP requirements are incorporated in construction contracts. Construction phase desired outcomes include effective management of environmental impacts and reduce risk to public. For the operation phase, treated effluent must meet the effluent standards for biochemical oxygen demand, total suspended solids, and fecal coliform.

**Table 23: Project Performance Monitoring**

<b>Desired Outcomes</b>	<b>Aspects / Parameters to be monitored</b>	<b>Means of Monitoring</b>	<b>Frequency</b>	<b>Implementation</b>	<b>Compliance Monitoring</b>	<b>Monitoring Cost</b>
<b>PRE-CONSTRUCTION</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	MOWHS 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	Mun. Engr.	MOWHS PMU	Minimal cost
<b>CONSTRUCTION PHASE</b>						
Effective management of environmental impacts during construction	Number of public complaints on construction activities	Verification of contractor's records; MOWHS coordination with local officials	Once a month	Contractor	Construction supervision consultants, MOWHS PMU	Part of consultant's construction supervision contract
Reduce risk to public during construction	Number of accidents involving construction activities	Verification of contractor's records; MOWHS coordination with local officials	Once a month	Contractor	Construction supervision consultants, MOWHS PMU	Part of consultant's construction supervision contract
<b>OPERATION PHASE</b>						
Effluent quality meets the prescribed standards	BOD, TSS, fecal coliform	Water sampling and laboratory analysis	Monthly for bacteria; annual for physical & chemical	Mun. Engr.	MOWHS PMU	Part of municipality's operation cost (USD300 /year)

Legend: BOD=biochemical oxygen demand; TSS= total suspended solids

### C. Implementation Arrangement

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

162. **Institutional Setup - Project Management Unit and Project Implementation Unit.** The subproject will follow the overall institutional and implementation arrangement of STUDP. MOWHS is the executing agency through a project management unit (PMU) created under it, while municipalities (Samdrup Jongkhar Municipality for this subproject) are the project implementing units (PIUs). MOWHS has overall responsibility for (i) project coordination, implementation, and liaison with ADB and other government offices, including semi-annual reporting to ADB; and (ii) coordination of implementation at the national level, including procurement of goods, works, and services for all STUDP subprojects.

163. **Roles of the PMU in environmental safeguards:**

- (i) Designate an Environment Officer who will oversee all subprojects under STUDP, including this subproject, and work closely with consultants and PIUs on the implementation of the EMP;
- (ii) Supervise the Project Management and Supervision Consultants (PMSC) that will assist MOWHS and PMU during pre-construction and construction phases. PMSC will have a team of environmental consultants whose terms of reference, including the roles and responsibilities, is attached as Appendix 10;
- (iii) With assistance from PMSC, PIUs, and contractors, ensure overall compliance with all government rules and regulations and other environmental requirements of all subprojects under STUDP; and
- (iv) With assistance from PMSC, ensure that IEEs are included in bidding documents and civil work contracts for all subprojects under STUDP.

164. **Roles of PMSC in environmental safeguards:**

- (i) Coordinate and work with PIU for the conduct of public consultations and day-to-day monitoring of subproject implementation;
- (ii) Lead the conduct of training activities as per capacity development program discussed in this IEE, including the conduct of induction course for contractors covering all aspects of the EMP and GRM implementation;
- (iii) Ensure that IEEs are updated when there will be changes in scope or components or alignments under the subproject;
- (iv) Assist MOWHS and PMU in the following aspects:
  - a. ensuring overall compliance with government rules and regulations and other environmental requirements for the subproject;
  - b. ensuring that measures of climate change impacts are integrated in the design of subproject components; and
  - c. preparing the semi-annual environmental monitoring reports for ADB.
- (v) Ensure disclosure of IEEs in locations accessible to the public and in form and language understood by the local stakeholders.

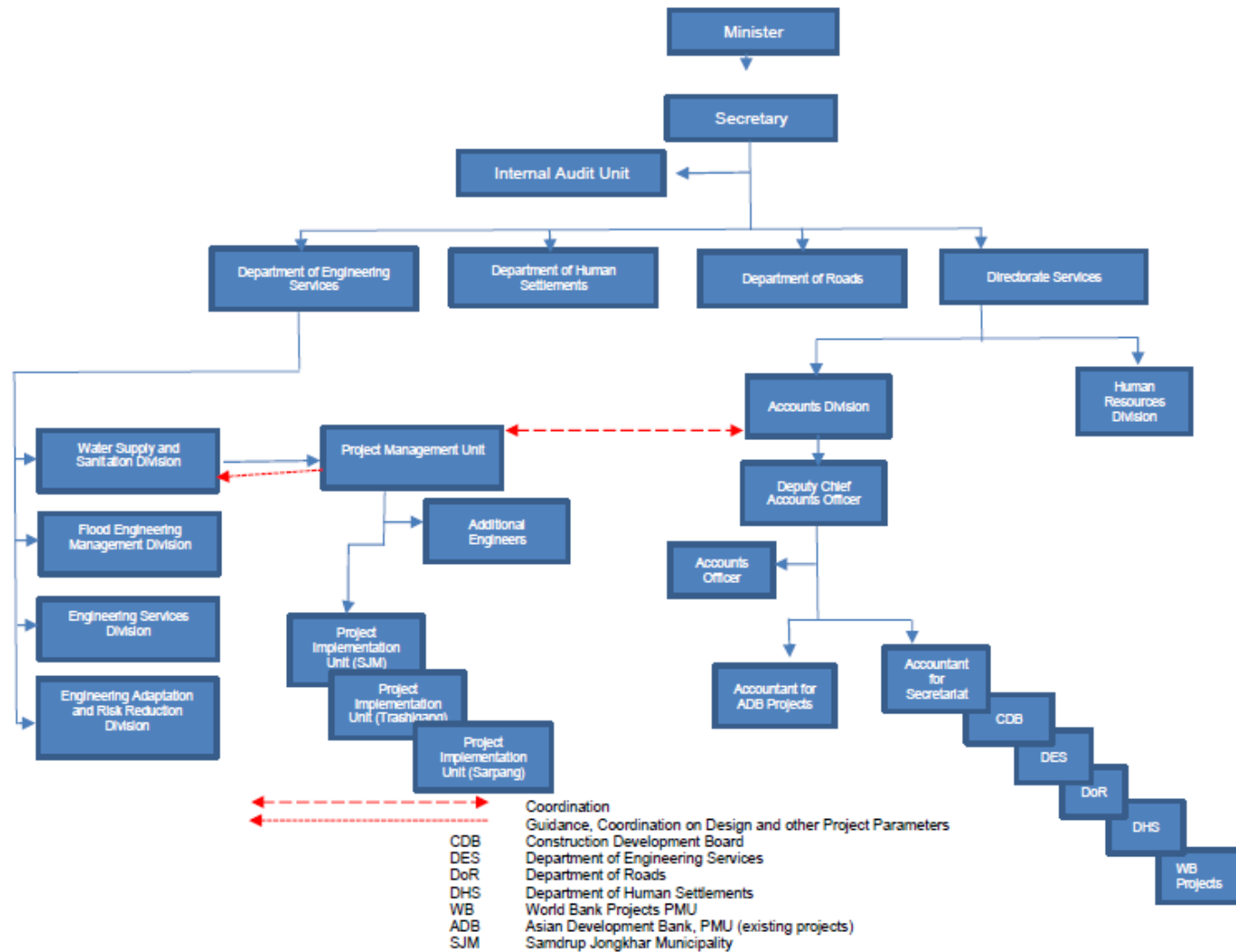
165. **Roles of the PIU (Samdrup Jongkhar thromde) in environmental safeguards:**

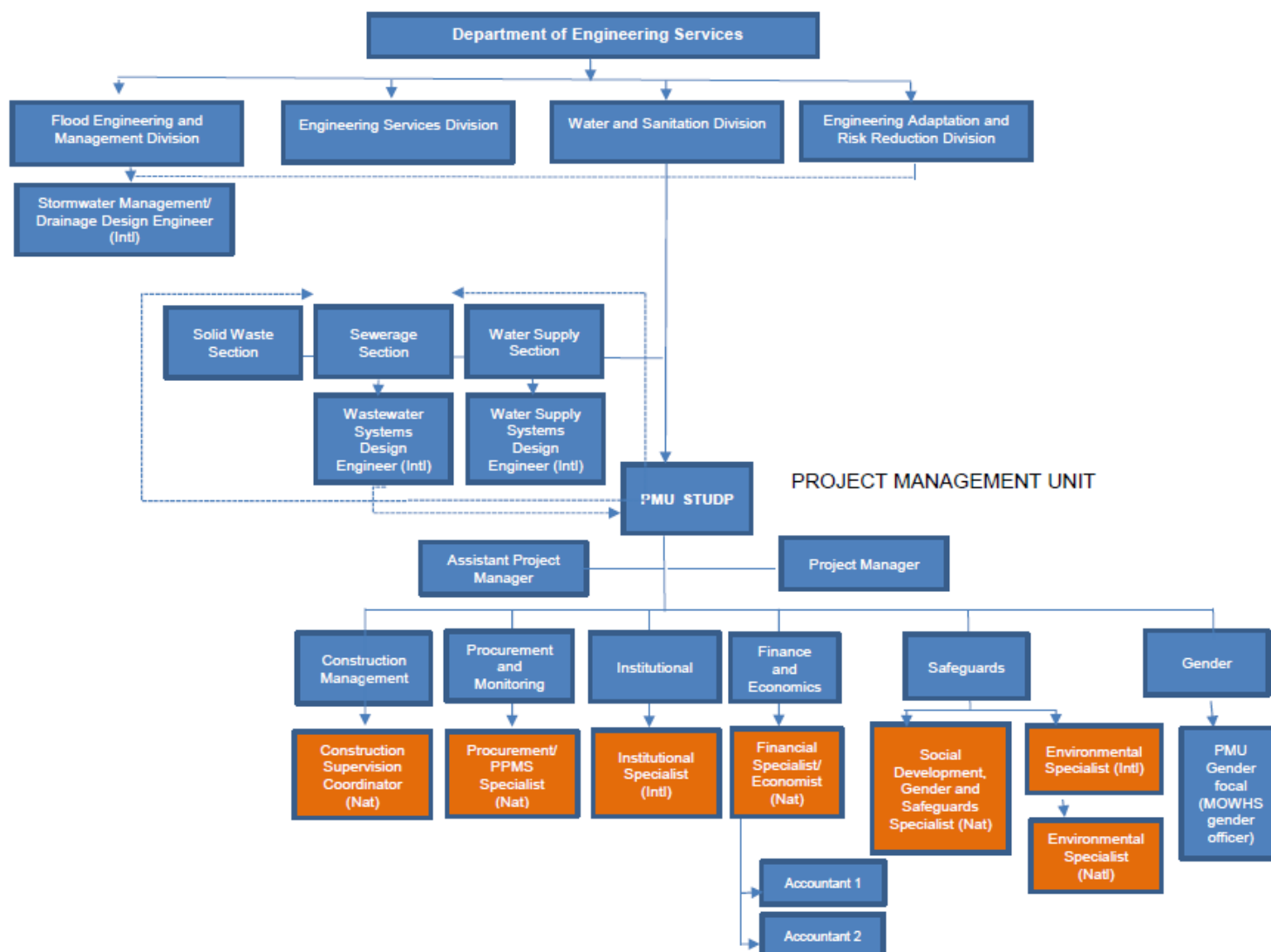
- (vi) Oversee the effective implementation of the contractor's EMP (CEMP) by the contractor;
- (vii) Support implementation of the grievance redress mechanism and promptly address the complaints on environmental performance of the subproject during execution of the construction activities;

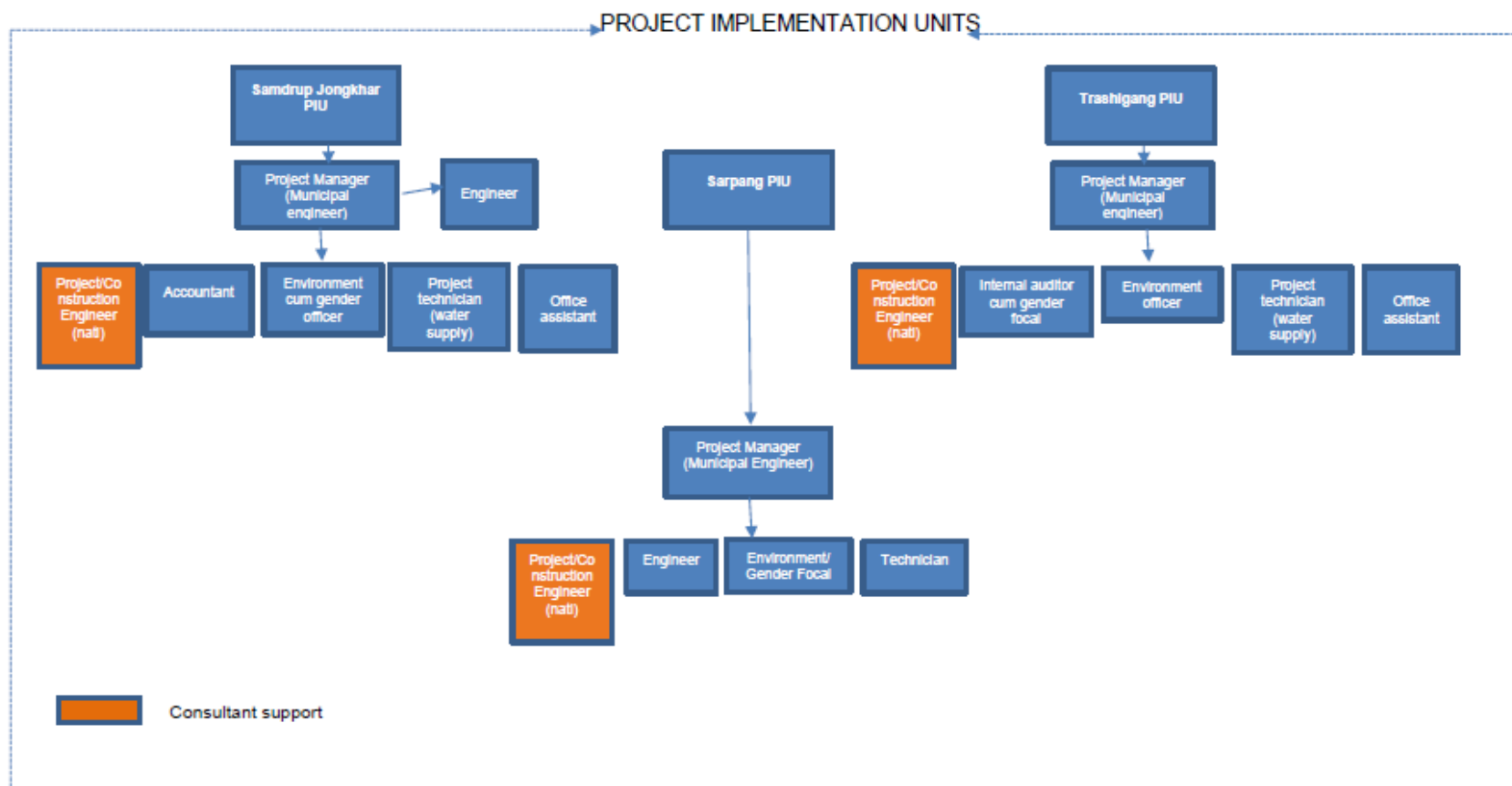


- (viii) With support from PMU and PMSC, conduct public consultations as a continuing activity during the implementation of the subproject; and
- (ix) With support from the contractors, prepare regular reports on the implementation of the EMP and submit to PMU.

Figure 10: Institutional Setup







166. **Roles of Contractor.** Overall, the contractor will have the following responsibilities:
- (i) Submit contractor's EMP (CEMP) based on the EMP outlined in this IEE;
  - (ii) Ensure compliance with all applicable legislation and the requirements of the CEMP;
  - (iii) Ensure implementation of the CEMP, including costs for survey, site establishment, preliminary activities, construction, defect liability activities, and environmental mitigation measures related to CEMP implementation during construction and post-construction phases;
  - (iv) Ensure that any sub-contractors or suppliers, who are utilized within the context of a contract, comply with the environmental requirements of the CEMP and EMP. The contractor will be held responsible for non-compliance on their behalf;
  - (v) In coordination with PMU and PIU, provide environmental awareness training to staff prior to any construction activities;
  - (vi) Borne the costs of any damages resulting from non-compliance with the CEMP and EMP; and
  - (vii) Appoint one full time environment and safety staff for implementation of EMP, community coordination, documentation of grievances received and resolutions at the project level in compliance with the project's GRM.

167. **Environmental Monitoring Reports.** During the construction period, the construction supervision consultants, together with the PIU, shall prepare monthly environmental monitoring reports to be submitted to MOWHS. The contractor shall submit to the PIU a monthly environmental monitoring report. Based on the monthly reports, the PMU with assistance from PMSC shall prepare semi-annual environmental monitoring reports (SEMRs), which shall be submitted by MOWHS to ADB. During post-construction/operation phase and until ADB issues a project completion report, MOWHS shall continue to submit SEMRs to ADB.<sup>16</sup> The template for SEMR is attached as Appendix 11.

168. **Corrective action plan.** In the event of non-compliance/s identified during the monitoring activities, contractor will prepare a time-bound corrective action plan and budget, and submit to PMU for approval. The approved corrective action plan will be additional basis for the subsequent monitoring activities. A copy of this approved corrective action plan will be included in next immediately due semi-annual environmental monitoring report of MOWHS to ADB.

169. **Implementation Schedule.** As presented in the project description, the subproject is scheduled to start in 2018 and to be completed by 2022. PMU shall ensure that construction contract provisions related to the EMP shall be included in the tendering stage.

170. **Clearances and Permits.** Under present Bhutan regulations, the PIU (Samdrup Jongkhar Municipality) shall apply for an Environmental Certificates from the NECS for the proposed Samdrup Jongkhar sewerage subproject.

171. **Other Environmental Costs.** Other environmental costs outside those borne by contractor are also expected. For example, securing the environmental clearances may also incur costs and these shall be borne by Samdrup Jongkhar Municipality. The cost for periodic environmental monitoring activities during construction and operation phases is an annual recurring expense that shall be borne by Samdrup Jongkhar Municipality as well.

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<sup>16</sup> Para. 30 of ADB Operations Manual Section F1 states that "ADB's monitoring and supervision activities are carried out on an ongoing basis until a project completion report (PCR) is issued".

172. The costs for public consultations and information disclosure, and capacity building are major costs that are covered by the project.

173. **Defect Liability Period.** Consistent with contractor's responsibilities enumerated above, all monitoring during defect liability period of O&M phase will be conducted by contractor at its own cost. Any other additional costs will be at the expense of PIU (Samdrup Jongkhar Municipality for this subproject).

#### D. Capacity Development Program

174. The Project Management and Supervision Consultants (PMS) located within the PMU are responsible for all training activities on environmental awareness and management in accordance with both ADB and government requirements. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the requirements of the project. The proposed training program<sup>17</sup> along with the frequency of sessions is presented in Table 24.

**Table 24: Training Program for Environmental Management**

Items	Pre-construction/prior to construction	Construction	
Training Title	Orientation workshop	Orientation program/ workshop for contractors and supervisory staffs	Experiences and best practices sharing
Purpose	To aware the participants of the environmental safeguard requirements of ADB and Royal Government of Bhutan and how the project will meet these requirements	To build the capacity of the staffs for effective implementation of the designed EMPs aimed at meeting the environmental safeguard compliance of ADB and government	To share the experiences and best practices aimed at learning lessons and improving implementation of EMP
Contents	Module 1: Orientation on ADB Safeguards Policy Statement and Government of Bhutan Environmental Laws and Regulations  Module 2: Environmental Assessment Process ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements. Review of environmental assessment report to comply with ADB requirements.	(i) Roles and responsibilities of officials/ contractors/ consultants towards protection of environment (ii) Environmental issues during construction (iii) Implementation of EMP (iv) Monitoring of EMP implementation (v) Reporting requirements	Experiences on EMP implementation – issues and challenges Best practices followed

<sup>17</sup> This is an initial proposal. The Environment Specialist will design the program based on the assessment results.

Items	Pre-construction/prior to construction	Construction	
	Incorporation of EMP into the project design and contracts		
Duration	1 day	1 day	1 day on a regular period to be determined by PMU, PIUs, and Consultants
Participants	MOWHS, PMU, and PMU staffs (technical and environmental) involved in the project implementation	PMU/ PIUs Contractors	PMU /PIUs Contractors

## IX. CONCLUSIONS AND RECOMMENDATIONS

175. The environmental screening process has highlighted the environmental issues and concerns of the proposed Samdrup Jongkhar sewerage subproject. The screening identified that the proposed sites are not within undisturbed landscapes because the proposed routes of the sewerlines are along the highways or roads within existing right of ways and pass through urban environments. The pipe locations are not near any sensitive area. Hence, the proposed subproject is essentially not a new incursion to an ecologically untouched or protected zone.

176. Based on the screening for environmental impacts and risks, there are no significant negative environmental impacts and risks that cannot be mitigated. Consequently, this assessment concludes that the proposed sewerage subproject can be implemented in an environmentally acceptable manner. The potential adverse impacts that are associated with the design, construction, and operation can be mitigated to standard levels through integration of proper engineering designs and implementation of the EMP outlined in this IEE. The overall safeguards implementation arrangement is very comprehensive, well defined, and already in place. The training program for all the implementing stakeholders has already been outlined.

177. Therefore, as per ADB SPS, the categorization of Samdrup Jongkhar sewerage and WWTP subproject as Category B for Environment is confirmed. As such, no further environmental impact assessment is required.

178. The proposed sewerage subproject is hereby recommended for implementation with emphasis on the following conditions: (i) EMP of the subprojects shall be included in the design process; (ii) Contracts of design consultants shall have provisions requiring the consultants to consider EMP recommendations in the design process; (iii) Tendering process shall advocate environmentally responsible procurement by ensuring the inclusion of EMP provisions in the bidding and construction contract documents; (iv) Contractor's submittal of a CEMP shall be included in the construction contract conditions; (v) Contract provisions on operation of the GRM shall be included in construction contracts; (vi) MOWHS, with its functions, shall ensure that capability building shall be pursued; (vii) MOWHS shall continue the process of public consultation and information disclosure during detailed design and construction phases; and (viii) MOWHS shall update this IEE should there be any change in subproject scope, and submit to ADB for review and disclosure.

## RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST – SAMDRUP JONGKHAR

**Instructions:**

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (SDES) for endorsement by the Director, SDES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

**Country/Project Title:**

Bhutan: Secondary Towns Urban Development Project

**Sector Division:**

SamdrupJongkhar Sanitation & Sewage project (STP – LAP3 and LAP2)

<b>A. PROJECT SITING</b> IS THE PROJECT AREA...			
▪ DENSELY POPULATED?		√	
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?		√	
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?			
• CULTURAL HERITAGE SITE		√	
• PROTECTED AREA		√	
• WETLAND		√	
• MANGROVE		√	
• ESTUARINE		√	
• BUFFER ZONE OF PROTECTED AREA		√	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY		√	
• BAY		√	
<b>B. POTENTIAL ENVIRONMENTAL IMPACTS</b> WILL THE PROJECT CAUSE...			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?		√	



	Yes	No	Remarks
▪ dislocation or involuntary resettlement of people?		√	
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		√	
▪ overflows and flooding of neighboring properties with raw sewage?		√	
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		√	
▪ noise and vibration due to blasting and other civil works?		√	
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?		√	
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		√	
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		√	
▪ road blocking and temporary flooding due to land excavation during the rainy season?		√	
▪ noise and dust from construction activities?	√		<b>Temporary</b>
▪ traffic disturbances due to construction material transport and wastes?		√	
▪ temporary silt runoff due to construction?		√	
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?		√	
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		√	
▪ contamination of surface and ground waters due to sludge disposal on land?		√	<b>STP shall be compact digester. It is already existign and is not being funded under the project</b>

	Yes	No	Remarks
<ul style="list-style-type: none"> <li>health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?</li> </ul>		√	
<ul style="list-style-type: none"> <li>large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?</li> </ul>	√		
<ul style="list-style-type: none"> <li>social conflicts between construction workers from other areas and community workers?</li> </ul>		√	<b>Labor Law is in Place</b>
<ul style="list-style-type: none"> <li>risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?</li> </ul>		√	
<ul style="list-style-type: none"> <li>community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?</li> </ul>		√	

## CHECKLIST FOR PRELIMINARY CLIMATE RISK SCREENING – SAMDRUP JONGKHAR

**Country/Project Title:** ADB PPTA-8551 Bhutan

**Sector:** LAP 2 and LAP3

**Subsector:** Augmentation of Sewage Treatment Plant (STP)

**Division/Department:** Samdrup Jongkhar Thromde

Screening Questions		Score	Remarks <sup>a</sup>
<b>Location and Design of project</b>	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	
<b>Materials and Maintenance</b>	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
<b>Performance of project outputs</b>	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

<sup>a</sup> If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

**Result of Initial Screening (Low, Medium, High):** Low

**Prepared by:** Jas B Basnet and Chhimi Dorj

## PUBLIC ANNOUNCEMENT – DEWATHANG AND SAMDRUP JONGKHAR



བསམ་གྲུབ་ལྗོངས་མཐར་ཐྱོན་ལྷན་ཁག་  
THROMDE ADMINISTRATION  
SAMDRUP JONGKHAR



SJT/PIU -ADB/26/2016-2017/87

Date: 6/03/2017

The Thromde Tshogpas, S/ Jongkhar Thromde  
Samdrup Jongkhar Bar/ Samdrup Jongkhar Maed / Dewathang Bangtsho /Dewathang Kipse/  
Dewathang Samdrupgatshe

## Sub: Notification

Sir,

Please find enclosed herewith the letter no. DES/PMUPPTA-8551/2016-17/248 dated 9 February 2017 from Phub Rinzin Offg Director DES, MoWHS, Thimphu regarding the **Social and Environment Assessment of the proposed ADB 8551-BHU Project.**

As such, you are kindly requested to inform the general public accordingly.

Thanking you.

Your Sincerely

(Mani Kumar Rizal)  
Project Manager

CC to:

1. Dasho Thrompon, SJT, for kind notification.
2. Executive Secretary, SJT, for kind notification.
3. Human Resource officer, SJT, for information.
4. Accounts officer, SJT, for information.
5. Officer Copy.

PABX: +975 7 251616, 251619, 251629 Fax: +975 7 251305 Website: [www.sjthromde.gov.bt](http://www.sjthromde.gov.bt)

## MINUTES OF THE PUBLIC CONSULTATION FOR SOCIAL AND ENVIRONMENT SAFEGUARDS AND ASSESSMENT IN SAMDRUP JONGKHAR

### DOCUMENTATION OF PUBLIC CONSULTATION HELD ON 08 MAR 2017 Youth Development Fund (YDF) Hall, SamdrupJongkhar

#### List of Participants Stakeholders/Participants

- i) Total of 28 participants from the public including Consultants and members were present at the meeting
- ii) Mani Kumar Rizal, Municipal Engineer
- iii) Consultants from PRCS/Lahmeyer

#### Agenda

9:15 – 10: 00 A.M	Registration	Secretariat
10:00 – 10:30 A.M	Welcome Address	Mr. Mani Kr. Rizal, Municipal Engineer, SamdrupJongkhar
10:30 – 10:45 A.M	Introduction of Participants	Mr. Mani Kr. Rizal and Sangay Wangdi, Social Assistant
10:45 – 11:30 A.M	Presentation of Proposed Sub-Projects at Dewathang under SamdrupJongkhar	Mani Kr. Rizal, Municipal Engineer, SamdrupJongkhar
11:30 – 12:00 A.M	Open Forum	Mani Kr. Rizal, Rajesh Pradhan, Sangay Wangdi and Environmental team members
12:00 – 12:30 A.M	Closing Remarks	Mani Kr. Rizal, ME, SamdrupJongkhar

#### Brief Minutes of the Public Consultation

##### Opening/Presentation:

The public consultation/meeting started at 10: 00A.M. Mr. Mani Kr. Rizal, Municipal Engineer (ME), SamdrupJongkhar welcomed the participants and thanked them for positively responding to the Dzongkhag's invitation.

The SamdrupJongkhar Municipal Engineer (ME) presented the detailed aspects of the proposed subproject and the current status of the subproject at SamdrupJongkhar town. He highlighted that the subproject will not affect any private assets. Besides, the present water source located at 4.0 Km away from SamdrupJongkhar en-route to Trashigang is identified and construction of intake weir is underway. The construction work of Water Treatment Plant (WTP) under Package 1 under ADB funded Project 2816 is under Construction. The trunk main lay out is proposed to be laid along the bypass highway and the land is confirmed as Thromde (RGoB) owned. Once the construction of WTP is complete SamdrupJongkhar town will receive adequate water supply. Further, the rehabilitation of the current reservoir tanks (3 nos.) are also funded by ADB. Regarding Sewage Treatment Plant (STP) which is also one of the sub-projects under ADB funding is under process. The land for the construction of STP shall be identified on government land and will soon be confirmed. Currently the planned program is under process and will be further looked into during detail design phase.

The Social and Environmental team thanked the participants and introduced the team members. The team explained on the possible social and environmental impacts the projects could have on the community. But since no private assets were affected and no possible environmental issues were foreseen, the Project will not have any likely adverse impacts.

#### **Comments, Views, Issues and Concerns:**

1. 80% participants were aware of the Project and all the participants present at the meeting expressed complete support of the Project. The Project site had been visited by Both the Social and Environment team members guided by the Municipal engineer staff. The proposed sites were visited one day earlier in order to plan for discussion the next day Public consultation. The Consultant team observed that the sub-project will not have any adverse impact both socially and environmentally on any private assets. This was relayed to the participants during public consultation.
2. Community representatives also provided their support and commitment to the Project and did not raise any negative issue with the proposed Project.
3. Further, consultation on the following questions and discussions transpired as below.

<b>Name/ Organization</b>	<b>Question</b>	<b>Response</b>
<b>Consultants</b>	Does the local person support the proposed Project?	All participants pledged their full support for the said Project.
Consultants	Any critical issue or concern by the local people regarding the Project?	No issues or concerns.
Consultants	Any loss of residential or commercial structures due to the Project?	None
Consultants	Any loss of Community life (like market place, public playground) or Community Activities that will be affected?	None
Consultants	Would there be land acquisition that would result in resettlement, or would affect parks, forest, etc.?	None
Consultants	Will the Project location adversely affect water resources?	No issues or concerns are foreseen.
Consultants	Any other issues you want to share (security, cooperation from local communities)?	The participants are happy to collaborate and contribute.
Consultants	Any Cultural or Sacred sites in the proposed site	None







**PHOTOGRAPHS OF SAMDRUP JONGKHAR PUBLIC CONSULTATION**

## GRIEVANCE REDRESS MECHANISM AND GRIEVANCE REDRESS COMMITTEE NOTIFICATION



དཔལ་ལྷན་འབྲུག་གཞུང་། འབས་ཏོག་ལྷན་ཁག།  
**ROYAL GOVERNMENT OF BHUTAN**  
**MINISTRY OF WORKS & HUMAN SETTLEMENT**  
DEPARTMENT ENGINEERING SERVICES  
THIMPHU: BHUTAN

"Construction Industry: Solutions through innovation and improved technology"

DES/PMU/ ADB-8551/8 95

4.12. 2017

The Director,  
Urban Development and Water Division,  
South Asia Department,  
Asian Development Bank  
6 ADB Avenue, Mandaluyong City  
1550 Metro Manila, Philippines

Sub: Grievance Redress Mechanism

Dear Sir,

The Ministry of Works and Human Settlement would like to inform that the Grievance Redress Mechanism (GRM) has been established in the Ministry and in the Project Implementation Units. The objective of the establishment of the GRM is to redress the social, environmental and other grievances of the aggrieved persons during the implementation of the Secondary Towns Urban Development Project (STUDP) BHU-8551. The flow chart, structure of the GRM committee, the procedure that would be followed is attached.

This is as per the agreement reached with the ADB during the mission from 13<sup>th</sup> November to 17<sup>th</sup> November 2017.

Thank you,

Yours sincerely,

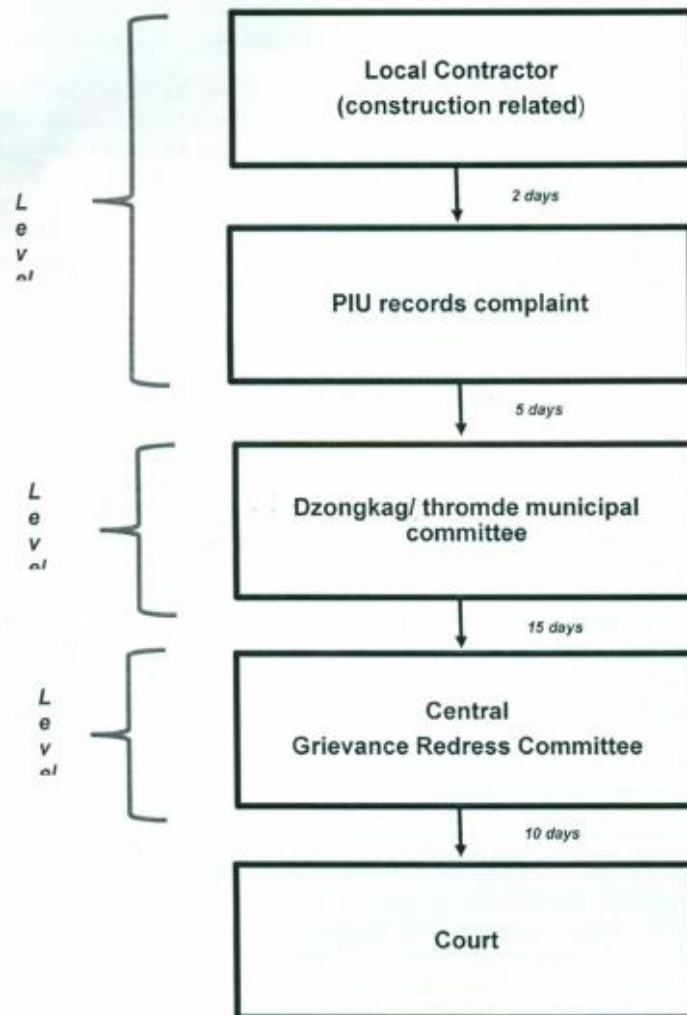
  
(Phuntsho Wangdi)  
**Secretary**

Cc:

1. Dasho Dzongda Trashigang and Sarpang Dzongkhag
2. The Executive Secretary Samdrup Jongkhar Thromde, Samdrup Jongkhar
3. Director, Department of Engineering Services, MoWHS, Thimphu
4. Shinjini Mehta, Urban Development Specialist, SAUW, ADB, Manila, Philippines.
5. Chief Engineer, WSD, DES
6. Project Manager, ADB-8551, WSD, DES

**Grievance Redress Mechanism, STUDP**

Flow chart:



**Figure 1: Grievance Redress Mechanism, STUDP**

**Procedure and composition of GRM Committee**

1. The Project Grievance Redress Mechanism follows a tiered system, starting at the local level. The GRM structure has been agreed with the concerned agencies and a notification of the GRM structure and composition has been provided by the Ministry of Works and Human Settlements (MOWHS)



). The GRM will ensure that grievances and complaints regarding land acquisition, compensation and resettlement or other social and environmental issues will be addressed in a timely and satisfactory manner. People in the towns will be made aware of their rights and the detailed procedures for filing of grievances. PIUs will be undertaking outreach activities to make people aware of the GRM and will be published on the thromde/ dzongkhag and MOWHS websites. GRM will also be displayed at notice boards in the PIU offices.

2. **First level of GRM.** Aggrieved persons may first approach the contractor's site representative/ project manager in case of complaints related to construction related nuisances. The complaint must be recorded in the site register and contractor should provide a resolution to the complaint within 2 days. In case, the complaint is not resolved at this level, the aggrieved persons can then file a complaint with the PIU office. Aggrieved persons are entitled to lodge complaints regarding any aspect of the land acquisition, entitlements, benefits or rates of payment as well as any project related social or environmental issues. Complaints can be made verbally or in written form. Complaints made to the PIU should be resolved within 3 days. All complaints must be recorded by the PIU, including actions taken to resolve the complaint. Complaints, their nature and resolution should be mentioned in the quarterly progress reports.

3. **2<sup>nd</sup> level of GRM:** At this level, the PIU Manager/Municipal level will coordinate with the Dzongkhag/ thromde municipal Committee which should be in place prior to project implementation. This committee will be comprised of : (i) Dzongda (district administrator) or thrompon (mayor) as Chairman; (ii) municipal engineer (PIU Project managers) as Member secretary; (iii) District engineers; (iii) district/ municipal planning officer; (iv) district/ municipal legal officer; (v) district/ municipal environmental officer; (vi) district/ municipal land record officer, (vii) town representatives (elected); and (viii) gender focal person of PIUs; The aggrieved person / or the representative who filed the complaint will be called to present his case and deliberation on the case will be done through proper hearing or mediation. It will be the responsibility of the dzongkhag/ thromde committee to resolve the issue within 15 days from the date the complaint is received. Minutes of meeting of the Dzongkhag/ thromde committee meeting will be kept and resolution provided will be recorded for purposes of project monitoring.

4. If the complaint is unresolved at this level, the PMU, PIU or the District Administrator will inform the aggrieved person accordingly and assist them in elevating the complaint to the PMU/ Central Grievance Committee.

5. **3<sup>rd</sup> level of GRM.** Grievances not redressed at the Dzongkhag/ thromde municipal committee within 15 days will be brought to the Central Grievance Redress Committee at MOWHS level. The Central Grievance Redress Committee will comprise of: (i) Secretary, MOWHS (Chairman); (ii) Director, DES (Member secretary); (iii) Project manager, PMU; (iv) Project coordinator, PMU; (v) Water and Sanitation Division chief; (vi) legal officer, MOWHS; (viii) environmental officer, MOWHS; (ix) gender officer (MOWHS); (x) representatives from local NGOs; It will be the responsibility of the Central committee to resolve the issue within 10 days from the date the complaint is received. In the event, the grievance is still not resolved; the matter may be elevated by the aggrieved person to an appropriate court of law. The court will have the final authority to approve or reject the case. Aggrieved persons may seek recourse through legal system at any stage of the GRM process.

Composition of Dzongkhag/ thromde  
Municipal Committee.

Chairman – Dzongda (district administrator)/  
thrompon (mayor)  
Member – secretary- municipal engineer  
(PIU PMs)  
Other members - district engineers, planning  
officer, legal officer, environmental officer,  
land record officer, town representative  
(elected), gender focal person, ,

Composition of central Grievance Redress  
Committee

Chairman – Secretary, MOWHS  
Member secretary – Director, DES  
Other members- PMU, PM, Project coordinator,  
WSD chief, legal officer, environmental officer,  
gender officer (MOWHS)  
representatives from NGOs



### SAMPLE GRIEVANCE REDRESS FORM

The \_\_\_\_\_ Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing **\*(CONFIDENTIAL)\*** above your name. Thank you.

<b>Date</b>	<b>Place of Registration</b>				
<b>Contact Information/Personal Details</b>					
<b>Name</b>		<b>Gender</b>	* Male * Female	<b>Age</b>	
<b>Home Address</b>					
<b>Place</b>					
<b>Phone no.</b>					
<b>E-mail</b>					
<b>Complaint/Suggestion/Comment/Question</b> Please provide the details (who, what, where, and how) of your grievance below:					
If included as attachment/note/letter, please tick here:					
<b>How do you want us to reach you for feedback or update on your comment/grievance?</b>					

### FOR OFFICIAL USE ONLY

<b>Registered by:</b> (Name of Official registering grievance)	
<b>Mode of communication:</b> Note/Letter E-mail Verbal/Telephonic	
<b>Reviewed by:</b> (Names/Positions of Officials Reviewing Grievance)	
<b>Action Taken:</b>	
<b>Whether Action Taken Disclosed:</b>	Yes No
<b>Means of Disclosure:</b>	

## **TERMS OF REFERENCE FOR ENVIRONMENTAL SPECIALISTS TO SUPPORT THE PROJECT MANAGEMENT UNIT AND PROJECT IMPLEMENTATION UNITS**

### **Environmental Specialist (International)**

She/he will have preferably a post-graduate degree in environmental sciences or equivalent, with 10 years' experience in environmental safeguards and in overseeing of project implementation/monitoring/ compliance. She/he should be conversant with national environmental regulations and ADB safeguard requirements. The candidate should possess good communication (oral and written), interpersonal and teamwork skills. Experience working in in South Asia is preferred.

He/she will work closely with his/her national counterpart:

The duties and tasks of the Environmental Specialist include, but not limited to:

- (i) Ensure that all ADB and/or the government's safeguard and environment regulations/statutory requirements and related issues are properly incorporated into the design and implementation phases of the project.
- (ii) Update the initial environmental examination (IEE) and environmental management plan (EMP) during detailed design stage, where necessary.
- (iii) Implement a system for monitoring the environmental safeguards, prepare indicators for monitoring the important parameters of the safeguards (for inclusion in the PPMS) (reflected in the IEE).
- (iv) Work with the Institutional Specialist in preparing a Training Plan, incorporate all training requirements to ensure no duplication of efforts and to maximize available resources.
- (v) Conduct an orientation workshop for the MOWHS, and Thromde/Dzongkag officials involved in the project implementation on ADB Safeguards Policy Statement, RGOB environmental laws and regulations, and environmental assessment process.
- (vi) Train contractors and PIU, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.
- (vii) Monitor compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (e.g., permits), as relevant.
- (viii) Oversee implementation of the EMP during construction, including environmental, health and safety monitoring of contractors.
- (ix) Coordinate with the safeguard specialist and PIUs on mitigation measures involving the community and affected persons.
- (x) Take corrective actions when necessary to ensure no environmental impacts.
- (xi) With the national counterpart, review compliance reports by contractors and submit regular environmental monitoring reports to the PMU PM.
- (xii) Work with the national counterpart in the setting up and implementation of Grievance Redress Mechanism as reflected in the IEE.
- (xiii) Ensure timely preparation and submission of compliance reports related to the environmental safeguard details during the implementation phase which maybe (but not necessarily limited to) semi-annual environmental Monitoring Reports, and such details related to the project completion reports, etc.

### **Environmental Specialist (National)—recruited through Project management and Supervision consultant**

S/he will have preferably

She/he will have preferably a post-graduate degree in environmental sciences or equivalent, with 8 years' experience in environmental safeguards and in overseeing of project implementation/monitoring/compliance. She/he should be conversant with national environmental regulations and ADB safeguard requirements. The candidate should possess good communication (oral and written), interpersonal and teamwork skills.

He/she will work closely with his/her international counterpart who will be hired as an individual consultant. The duties and task of the Environmental Specialist includes, but not limited to:

- (i) Help ensure that all ADB and/or Government safeguard and environment regulations/statutory requirements and related issues are properly incorporated into the design and implementation phases of the project;
- (ii) Assist in updating the initial environmental examination (IEE) and environmental management plan (EMP) during detailed design stage;
- (iii) Include the EMP in bidding documents and civil works contracts;
- (iv) Implement system for monitoring the environmental safeguards, assist in preparing indicators for monitoring the important parameters of the safeguards for inclusion in the PPMS (reflected in the IEE);
- (v) Work with the Institutional Specialist in preparing a Training Plan, assist in incorporating all training requirements to ensure no duplication of efforts and to maximize available resources;
- (vi) Organize an orientation workshop for the MOWHS, and Thromde/Dzongkhag officials involved in the project implementation on ADB Safeguards Policy Statement, RGOB environmental laws and regulations, and environmental assessment process;
- (vii) Assist in obtaining (and renewing) necessary environmental clearances for projects prior to commencement of construction works;
- (viii) Assist in the training of contractors and PIU, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
- (ix) Enforce and monitor compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (e.g., permits), as relevant;
- (x) Oversee implementation of the EMP during construction, including environmental, health and safety monitoring of contractors;
- (xi) Coordinate with the safeguard specialist and PIUs on mitigation measures involving the community and affected persons;
- (xii) Take corrective actions when necessary to ensure no environmental impacts;
- (xiii) Assist in reviewing compliance reports by contractors and submit regular environmental monitoring reports to the PMU PM and any other compliance reports related to the environmental safeguard details during the implementation phase and such details related to the project completion reports, etc;
- (xiv) Address any grievances through the grievance redress mechanism in a timely manner as per the IEEs. Prepare record of such grievances for inclusion in the quarterly progress reports;
- (xv) Prepare compliance reports related to environmental safeguards during the implementation phase which maybe (but not necessarily limited to) monthly and quarterly reports, semi-annual environmental safeguards monitoring reports, and such details related to the project completion reports, etc; and
- (xvi) Any other works assigned by PMU/PIU.

## TEMPLATE FOR SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT

### Introduction

- A. Overall project description and objectives
- B. Environmental category as per ADB Safeguard Policy Statement, 2009
- C. Environmental category of each subproject as per national laws and regulations

#### 1. Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number	Roles
1. PMU				
2. PIUs				
3. Consultants				

- D. Overall project and sub-project progress and status
- E. Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/ List of Works	Contract Status (specify if under bidding or contract awarded)	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Complete d/O&M) <sup>a</sup>	If On-going Construction	
				%Physical Progress	Expected Completion Date

<sup>a</sup> If on-going construction, include %physical progress and expected date of completion.



Compliance status with National/State/Local statutory environmental requirements<sup>a</sup>

Package No.	Subproject Name	Statutory Environmental Requirements <sup>b</sup>	Status of Compliance <sup>c</sup>	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish <sup>d</sup>

<sup>a</sup> All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

<sup>b</sup> Specify (environmental clearance, permit/consent to establish, forest clearance, etc.).

<sup>c</sup> Specify if obtained, submitted and awaiting approval, application not yet submitted

<sup>d</sup> Examples: environmental clearance requires ambient air quality monitoring; forest clearance/tree-cutting permit requires 2 trees for every tree, etc.

## Compliance status with environmental loan covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

## Compliance status with the environmental management plan (refer to EMP tables in approved IEE/s)

1. Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

## Package-wise IEE Documentation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

2. For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.

## Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	Contractor	Nodal Person	Email Address	Contact Number

3. With reference to approved EMP/site-specific EMP/construction EMP, complete the table below:

Summary of Environmental Monitoring Activities (for the Reporting Period)<sup>a</sup>

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
<b>Design Phase</b>						
<b>Pre-Construction Phase</b>						
<b>Construction Phase</b>						
<b>Operational Phase</b>						

<sup>a</sup> Attach Laboratory Results and Sampling Map/Locations.

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

Approach and methodology for environmental monitoring of the project

- Briefly describe the approach and methodology used for environmental monitoring of each sub-project.

Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)

- Discuss the general condition of surroundings at the project site, with consideration of the following, whichever are applicable:
  - (i) Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.

- (ii) Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
  - (iii) Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these are intact following heavy rain;
  - (iv) Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
  - (v) Confirm spill kits on site and site procedure for handling emergencies.
  - (vi) Identify any chemical stored on site and provide information on storage condition. Attach photograph.
  - (vii) Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
  - (viii) Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  - (ix) Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
  - (x) Indicate if there are any activities being under taken out of working hours and how that is being managed.
- Briefly discuss the basis for environmental parameters monitoring.
  - Indicate type of environmental parameters to be monitored and identify the location.
  - Indicate the method of monitoring and equipment used.
  - Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements.

*As a minimum the results should be presented as per the tables below.*

#### Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

#### Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity $\mu\text{S/cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

## Noise Quality Results

Site No.	Date of Testing	Site Location	LA <sub>eq</sub> (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA <sub>eq</sub> (dBA) (Monitoring Results)	
			Day Time	Night Time

## Grievance Redress Mechanism

Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

## Complaints Received during the Reporting Period

Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

## SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

## APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors
- Others

**SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT**

Project Name  
Contract Number

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
TITLE: \_\_\_\_\_ DMA: \_\_\_\_\_  
LOCATION: \_\_\_\_\_ GROUP: \_\_\_\_\_

WEATHER CONDITION:

INITIAL SITE CONDITION: \_\_\_\_\_

CONCLUDING SITE CONDITION:

Satisfactory \_\_\_\_\_ Unsatisfactory \_\_\_\_\_ Incident \_\_\_\_\_ Resolved \_\_\_\_\_ Unresolved \_\_\_\_\_

INCIDENT:  
Nature of incident:

Intervention Steps:

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

**Inspection**

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition

Yes

☐

No

☐

Signature

**Sign off**

\_\_\_\_\_