

Initial Environmental Examination

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BHU: Secondary Towns Urban Development Project —Rangjung Intake and WTP Rehabilitation Subproject

Prepared by the Ministry of Works and Human Settlements of the Kingdom of Bhutan for the Asian Development Bank.

CURRENCY EQUIVALENTS

as of 16 March 2018)

Currency unit	–	ngultrum (Nu)
Nu1.00	=	\$0.015
\$1.00	=	Nu65.040

ABBREVIATIONS

ADB	Asian Development Bank
BDWQS	Bhutan Drinking Water Quality Standards
DHMS	Department of Hydro-Meteorological 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
NEC	National Environmental Commission
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
RWSS	rural water supply schemes
SPS	safeguard policy statement
TA	technical assistance
TOR	terms of reference
UNFCCC	United Nations Framework Convention on Climate Change
WTP	water treatment plant

WEIGHTS AND MEASURES

ha	–	hectare
HP	–	horsepower
km	–	kilometer
lpcd	–	liters per capita per day
lps	–	liter per second
m	–	meter
m ²	–	square meter

m ³	–	cubic meter
mg/L	–	milligrams per liter
mm	–	millimeter
MPN	–	most probable number
NTU	–	nephelometric turbidity unit
TCU	–	true color unit
ug/Ncm	–	microgram per normal cubic meter

NOTE

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

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EXECUTIVE SUMMARY

1. An environmental assessment was made for the proposed water supply subprojects as part of the Secondary Towns Urban Development Project (STUDP) for three selected secondary towns in Bhutan. The water supply subprojects are located in Dewathang and Samdrup Jongkhar; Shechamthang (Ranibagan) and Sarpang Tar (Sarpang); and Trashigang, and Rangjung. This environmental assessment was accomplished through ADB TA 8551-BHU.¹

2. An initial environmental examination (IEE) was carried out for the water intake and water treatment plant (WTP) rehabilitation subproject of STUDP for Rangjung. In accordance with ADB Safeguard Policy Statement (SPS), 2009, an initial screening was conducted using ADB's rapid environmental assessment checklist for water supply. Result 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. The assessment was also carried out within the policy, legal, and administrative frameworks relevant to water supply projects in Bhutan.

3. **Subproject scope and description.** This IEE covers the Rangjung intake and WTP rehabilitation subproject, which comprises the following components: (i) construction of one permanent reinforced cement concrete (RCC) intake; (ii) construction of grit chamber near existing collection tank; (iii) construction of ductile iron transmission main with total length of 7.5 kilometers (km); (iv) construction of eight break pressure tanks (BPTs) of which six are in current locations of exiting BPTs which will be decommissioned; (v) construction of one reservoir with capacity of 200 cubic meters (m³); (vi) augmenting capacity of existing WTP to 1 million liters per day (MLD) from existing 0.6 MLD; and (vii) installation of water supply meters. This subproject will complement another water supply subproject (Trashigang water distribution network improvement subproject) which is covered by a separate IEE. These subprojects will eventually serve the target communities in Trashigang urban area.

4. **Environmental and socioeconomic conditions.** Project implementation will not pose significant problems to the environment since the proposed routes of the pipelines are along the main roads parallel to the existing pipelines. Proposed sites of the intake and reservoir are in vacant lots owned by the government. Most areas immediately adjacent to the road where pipelines and transmission mains 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.

5. **Environmental impacts and environmental management plan.** Screening for environmental impacts is made through a review of the parameters associated with projects for water supply system 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 water supply systems in an already altered environment. The issue on impacts and risks to biodiversity conservation is not applicable to the

¹ ADB. 2013. *Technical Assistance to the Kingdom of Bhutan for the Improved Urban Environmental Infrastructure Project*. Manila.

subproject since the components will not be located in areas that are environmentally sensitive or that have precious ecology.

6. This IEE is based on preliminary design and will be updated based on final detailed design. The updated IEE will be submitted to ADB for review and disclosure. During detailed design and pre-construction phase, potential nuisances and problems to the public during construction shall be addressed by inclusion in the tender documents of specific provisions addressing these issues. Although there are no issues related to historical and cultural assets, a precautionary measure shall be taken by inclusion of provisions in tender and construction contract documents requiring the contractor to immediately stop excavation activities and promptly inform the authorities if archaeological and cultural assets are discovered.

7. Adverse environmental impacts during construction are temporary, less than significant, and can be easily mitigated. There will be no massive construction activities that can damage the environment. No cutting of trees will be done in forest areas. Water supply pipelaying 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 preventive measures to address: (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.

8. Environmental problems due to operation and maintenance of the proposed water supply system can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures. Public health risk due to delivery of poor water quality can be prevented in a broader scale by implementing a water safety plan as advocated by the World Health Organization and complying with the 2016 Bhutan Drinking Water Quality Standard. Chlorinators will be used for controlling microbial contamination and ensure adequate residual disinfection.

9. An environmental management plan (EMP) is developed to effectively manage any environmental issues arising from the subproject implementation. The EMP includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. The institutional set-up and arrangement identifies the requirements, responsible stakeholders and responsibilities during pre-construction, construction, and operation phases. The EMP applicable for each phase is presented in detail in tabular form with specific information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures and monitoring.

10. **Consultation and participation.** Project planning and the subsequent IEE preparation for the proposed water supply subproject recognized the need for public consultation and participation as central to effective environmental safeguard. Within the context of “meaningful consultation”, Trashigang 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, nongovernment organizations, 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. Trashigang 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.

11. **Grievance redress mechanism.** Implementation of the proposed water supply subprojects 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 Rangjung intake and WTP rehabilitation subproject. Trashigang thromde officials shall disclose the GRM during public consultations to be conducted throughout the subproject implementation period. The 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 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.

12. **Institutional and Implementation Arrangement.** The subproject will follow the overall institutional and implementation arrangement of STUDP. MOWHS is the executing agency and a project management unit (PMU) has been created under it, while municipalities (Trashigang thromde/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 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.

13. **Conclusion and recommendation.** The environmental screening process has highlighted the environmental issues and concerns of the proposed Rangjung intake and WTP rehabilitation subproject. The screening identified that the proposed sites are not within undisturbed landscapes because the proposed routes of the pipelines 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 locations of proposed reservoir and intake are in government owned properties and not near any sensitive area. Hence, the proposed subproject is essentially not a new incursion to an ecologically untouched or protected zone.

14. 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 water supply 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.

15. Therefore, as per ADB SPS, the categorization of Rangjung intake and WTP rehabilitation subproject as Category B for environment is confirmed. As such, no further environmental impact assessment is required.

16. The proposed Rangjung water supply subproject including intake, transmission and WTP rehabilitation as major components 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) 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; (viii) MOWHS shall update this IEE based on final detailed design and on any change in subproject scope, and submit to ADB for review and disclosure; and (ix) MOWHS shall conduct water source protection study and prepare water source protection plan.

I. INTRODUCTION

1. The percentage of urban population in Bhutan having access to improved water supply increased from 64% in 1990 to 99% in 2012, but sustainability and reliability of the urban water supply systems are the main challenges.¹ Among the 22 urban centers, 17 class B thromdes² depend entirely on surface water sources while the four class A Thromdes (Thimphu, Phuentsholing, Samdrup Jongkhar and Gelephu) and one class B Thromde (Paro) depend on both surface water and ground water sources. The duration of supply generally ranges from 4-12 hours daily. About 43% of the total urban population has water supply available for 24 hours, 46% for 8-12 hours and 11% for less than 8 hours.

2. Project preparatory technical assistance (PPTA) 8551-BHU³ Phase 2 was formulated for the preparation of the Secondary Towns Urban Development Project (STUDP) (formerly named as Improved Urban Environmental Infrastructure Project) for seven subprojects in three selected thromdes, namely: (i) Trashigang (including Rangjung); (ii) Sarpang (including 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 has been prepared as part of PPTA 8551-BHU Phase 2 activities in order to assess the potential environment impacts of the proposed Rangjung intake and water treatment plant (WTP) rehabilitation subproject in Rangjung. 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 use to support Trashigang Thromde in seeking necessary environmental clearances from relevant authorities for the subproject. Trashigang Thromde is the municipality that will oversee the implementation and operation of 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 the 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 water supply (Appendixes 1-2). Results of the assessment show that the project 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.

¹ World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), 2017. *Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines*. Geneva.

² Thromde in Dzongkha is a town or municipality or city.

³ ADB. 2013. *Technical Assistance to the Kingdom of Bhutan for the Improved Urban Environmental Infrastructure Project*. Manila.

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.

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 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 (EMP)

9. An 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: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 upon receipt; and
- (iii) environmental monitoring reports submitted by the project management unit (PMU) during project implementation upon receipt.

4. Pollution Prevention and Control Technologies

11. During the design, construction, and operation of the project the project management unit (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.

⁴ 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."

Table 1: Applicable WHO Ambient Air Quality Guidelines

Table 1.1.1: WHO Ambient Air Quality Guidelines ^{7, 8}		
	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO_2)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO_2)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM_{10}	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)
Particulate Matter $\text{PM}_{2.5}$	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)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

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

⁸ 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

Table 1.7.1- Noise Level Guidelines ⁵⁴		
	One Hour L _{Aeq} (dBA)	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational ⁵⁵	55	45
Industrial; commercial	70	70

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

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 Environment Assessment Act 2000 by setting out guidelines for securing an environmental clearance for a project. The Environment 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 (FNCA) 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. Waste Prevention and Management Act of Bhutan, 2009

21. 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.

8. The Local Government Act of Bhutan, 2009

22. 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.

9. Regulation for Environmental Clearance of Projects 2002

23. 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.

10. Forest and Nature Conservation Rules (FNCR) 2006

24. 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) to (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.

11. Rules and Regulations on Occupational Health and Safety 2006

25. 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.

12. Waste Prevention and Management Regulation 2012

26. 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.

13. The Water Regulation of Bhutan 2014

27. 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.

28. 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.

14. Thromde Rules 2011

29. 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.

15. Bhutan Building Rules 2002

30. 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

31. 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.

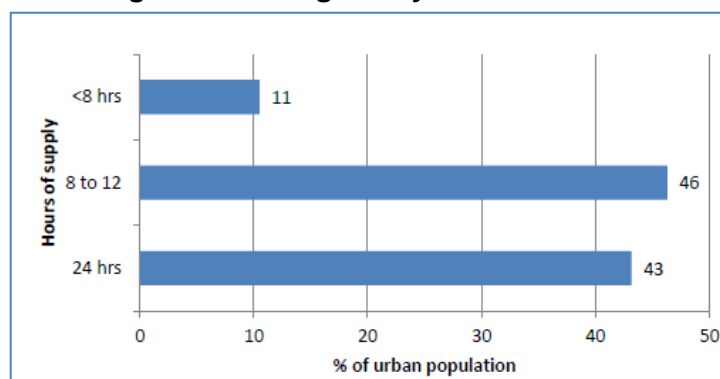
III. DESCRIPTION OF THE PROJECT

32. Although water network coverage in Bhutan is generally high, water duration in the selected towns under STUDP is characterized by intermittent supply that reflects the prevailing situation in the country. Water supply intervals range from 4-12 hours in majority of the project towns from the source, and most individual homes have water storage tanks. The duration of supply in terms of the number of towns is as follows and the details are given below:⁵

- (i) **24 hours** – Nine class B thromdes (Bumthang, Dagana, Gasa, Haa, Lhuentse, Pemagatshel, Tashiyangtse, Tashigang, Tongsa), 73% of Tshimasham and Tsimalakha, 58% of Thimphu Thromde (including 40% covered by community water supply), 16% of Phuentsholing Thromde, 15% of Gelephu Thromde and 28% of Samdrup Jongkhar Thromde;
- (ii) **8 to 12 hours** – Four class B thromdes (Tsirang, Wangduephodrang, Samtse, and Paro), 27% of Tshimasham & Tsimalakha, 42% of Thimphu thromde, 84% of Phuntsholing thromde and 85% of Gelephu Thromde; and
- (iii) **Less than 8 hours** – Four class B thromdes (Mongar, Punakha, Sarpang and Zhemgang) and 72% of Samdrup Jongkhar.

33. The water supplied to urban centers varies from more than 15 million liters per day (MLD) in Thimphu to 0.5 MLD for smaller towns like Gasa. The total water supplied by the 22 urban centers amounts to more than 60 MLD.

Figure 1: Average Daily Water Service



Source: Urban Water Supply Status and Plan, DES, MOWHS, October 2014.

34. The reasons for the intermittent supply in most of the towns are primarily due to the following factors:

⁵ Urban Water Supply Status and Plan, DES, MOWHS, October 2014.

- (i) **Poor demand management:** Lack of awareness on proper water management and system inefficiency, leakages, and suboptimal operation resulting from poor maintenance (lack of operation and maintenance fund and low capacity of maintenance staff);
- (ii) **Inadequate existing facilities to cover demand:** Population increase which is triggered by urban growth and rural-urban migration, and insufficient capital investment has always been one of the top concerns of municipalities;
- (iii) **Inadequate and unreliable sources (drying up of sources):** Unreliable sources have been the primary reason for inadequate supply. The recent phenomenon of global warming aggravated by catchment degradation has resulted in reporting of drying up of the sources for several towns; and
- (iv) **Remote location of intakes,** which necessitates the construction of long transmission pipelines through difficult terrain that are susceptible to landslides, erosion and severe leakages and bursts, etc. While having long water lines has been a long-standing practice in Bhutan, it is hardly intuitive given the presence of large rivers adjacent to certain towns such as in Punakha and Sarpang.

35. The major water quality problem in the urban centers is with microbiological contamination and turbidity. Most of the urban centers that use surface sources are provided with basic water treatment facilities which include sedimentation, filtration and disinfection. However, many of the WTPs are not operating properly due to either poor design or inadequate O&M.

36. For the ground water sources, only disinfection facilities are provided since the quality of ground water is supposed to be clean. Ground water however, may be contaminated with heavy metals such as arsenic, iron, zinc, etc. but has never been tested for heavy metals due to lack of equipment. About 74% of the urban populations are supplied with treated water while 26% are supplied with raw water. However, the sustainability of the ground water sources particularly the borewells in Phuentsholing and Gelephu are questionable since no detailed hydro-geological studies have been carried out.

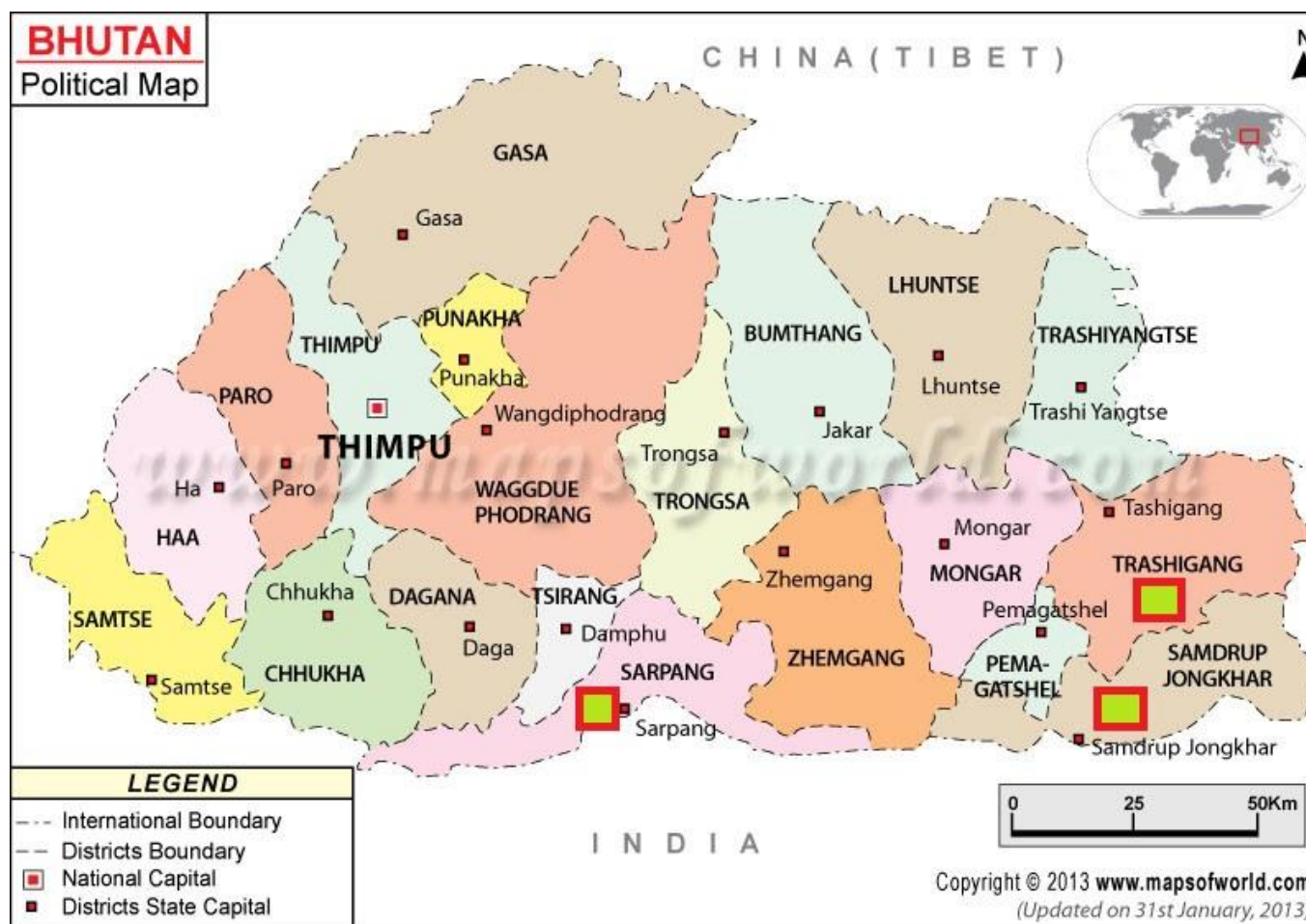
37. The steep topography of the country provides unique opportunities for gravity supply of water. Sources for drinking water are mainly surface sources in the form of streams/rivers and protected springs.

38. The water tariff for all the urban towns is very minimal that not even the operation and maintenance cost is recovered. The minimum tariff for domestic uses varies between Nu1.50 per cubic meter (m^3) to Nu2.90/ m^3 for the bigger towns and Nu1.25/ m^3 to Nu1.50/ m^3 for smaller towns. It is generally much higher for industrial and commercial uses than for domestic use. Of the 22 towns, Tsimasham and Tsimalakha, Gasa, Pemagatshel and Sarpang are not metered and are therefore not charged for the water supplied.

39. Water supply projects consisting of components such as intake systems, transmission lines, treatment plants, reservoirs and distribution are amongst other subprojects, selected for implementation in the project thromdes under STUDP. In particular, the water supply subproject for Rangjung involves construction of intake, replacement of transmission mains at some locations, and rehabilitation of existing WTP with the construction of additional reservoir.

40. The locations of all the water supply subprojects under STUDP, including the Rangjung subproject, are shown in Figure 2 below.

Figure 2: Map Showing the Location of Water Supply Subprojects under STUDP⁷



⁷ Map taken from ADB TA 8551-BHU: Improved Urban Environmental Infrastructure Project.

A. Location of Subproject

41. Trashigang town is the largest urban center in interior eastern Bhutan and the administrative center of Trashigang district, which is also the largest and formerly most populous dzongkhag in the country. Trashigang town is about 550 kilometers (km) east of Thimphu city along the East-West Highway and about 179 km north of Samdrup Jongkhar city, the main gateway to eastern Bhutan. The Trashigang Dzongkhag borders with the Indian State of Arunachal Pradesh to the east, Mongar to the west, Pemagatshel to the south and Trashiyangtse to the north.

42. Rangjung is a satellite town under Trashigang and is located about 17 km east of Trashigang on the road to Radhi and Phomgmey. Rangjung being the center for neighboring of villages of Phongmey, Radhi and other villages, there is considerable transit population. Of late, the people of the neighboring villages are seeing better economic opportunities and it has resulted in construction of houses and shops.

B. Components

43. The existing water supply system was commissioned in 2002, which is a gravity-fed system with the intake located on Thromang Stream about 6 km from the town (see Figure 3 below). Water is conveyed through a 75 millimeters (mm) GI pipeline to a slow sand filter and reservoir tank with a capacity of 132 m³, located above the town.

Figure 3: Rangjung Current Intake Location



Source: Google Earth.

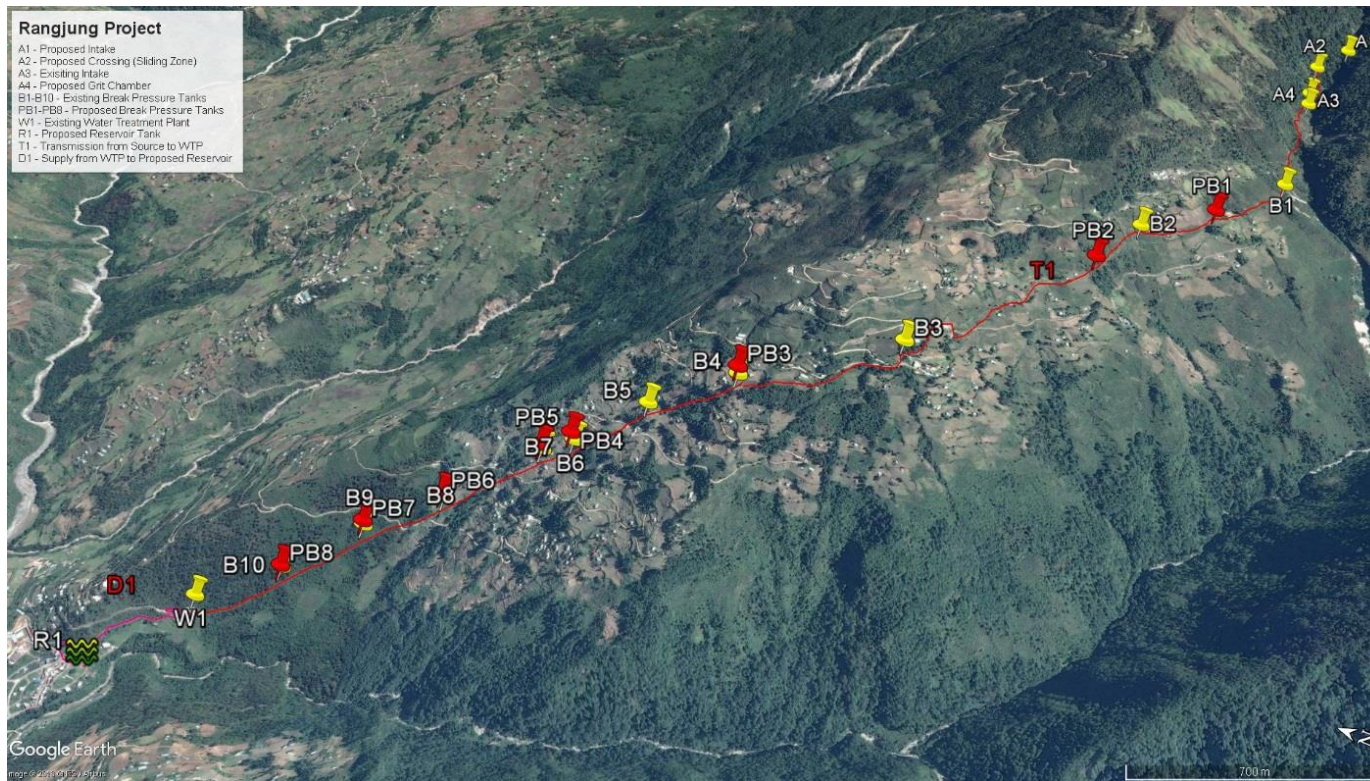
44. While there is no complaint of water quantity for most parts of the year, there are reports of acute shortages during big events such as the Rangjung Drupchen (prayer ceremony) which is a week-long event and Tshechu (Celebration of birth anniversary of Guru Rimpoche) which is a three-day event. Hence with the increasing population trend, the old SSF will not be able to cater to the demand. There is no pre-treatment for the slow sand filter and as a result, the filter gets frequently clogged during the monsoon season.

45. The subproject will include the following:

- (i) Construction of a permanent RCC intake;
- (ii) Construction of grit chamber with sedimentation tank;
- (iii) Construction of ductile iron transmission main;
- (iv) Construction of eight BPTs (six of which will be constructed on sites with existing BPTs which will be decommissioned);
- (v) Construction of 200 m³ RCC clear water reservoir;
- (vi) Augmenting capacity of existing WTP to 1 MLD capacity from current 0.6 MLD capacity; and
- (vii) Installation of meters.

46. Figure 4 shows the location of the subproject.

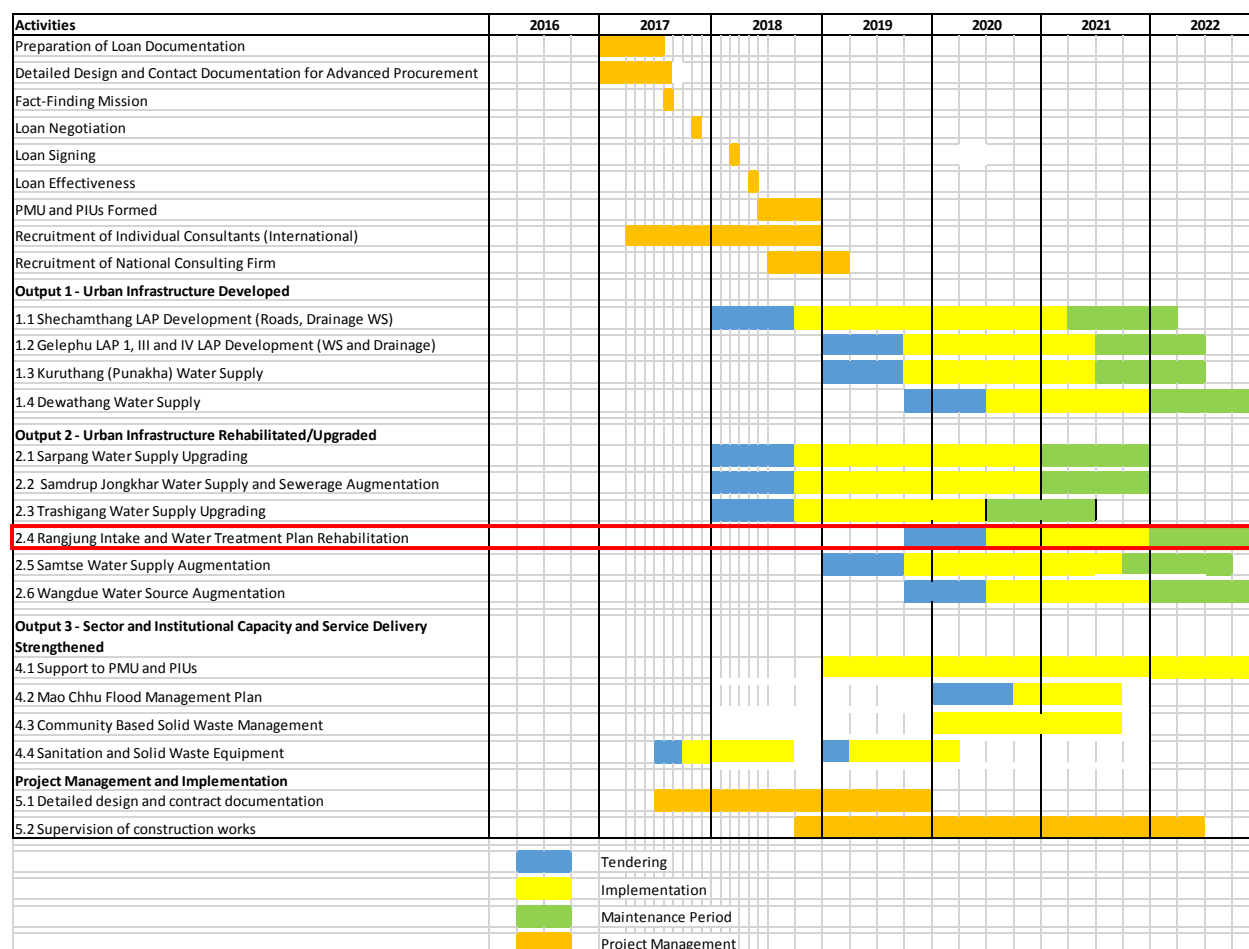
Figure 4: Location of Rangjung Water Supply Subproject



47. The upgraded/rehabilitated water supply system shall be operated and maintained by the Trashigang municipality. Construction is scheduled to start in the second quarter (Q2) of 2020 and is expected to be completed by end of 2021.

48. The timeline for development of water supply is shown below.

Figure 5: Overall Project Implementation Schedule



IV. DESCRIPTION OF THE ENVIRONMENT

49. A description of the existing environmental and socioeconomic conditions of the various projects area is presented in the following sub-sections:

A. Methodology Used for the Baseline Study

1. Data collection and stakeholder consultations

50. The data for the IEE were collected primarily from the PPTA Phase 2 Interim Report,⁸ structural plans of Trashigang thromde, Local Area Plans and other documents. In addition, field visit to the project sites was also 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 subproject components.

51. In the same period, several visits were made to assess the existing environmental conditions (physical and biological) at the project sites. A separate socioeconomic study was conducted to determine the demographic information, and other social safeguards information. Public consultations and discussions with relevant officials were also conducted at various project sites.

2. Data analysis and interpretation

52. The primary and secondary data collected 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.⁹ The relevant information is presented in the succeeding paragraphs. The details of the results from the data and their interpretations are presented in the following sections.

B. Physical Resources

53. Most of the Thromdes selected for the water supply subproject lie in southern and eastern parts of Bhutan bordering the state of Assam and West Bengal of India and two in western part of the country in the Punakha-Wangdue valley. We can basically club the thromdes according to their elevation and ecological characteristics. The three Thromdes of Punakha (Khuruthang), Wangdue (Bajo), and Trashigang (including Rangjung) represent part of the Inner Himalayas of Bhutan. Samtse, Sarpang (Shechamthang), Gelephu, and Samdrup Jongkhar (including Dewathang) are the thromdes in the southern lower foothills.

54. **Trashigang and Rangjung.** Trashigang town is about 480 km east of Thimphu city along the East-West Highway (190 km direct) and about 179 km north of Samdrup Jongkhar town, the main gateway to eastern Bhutan (60 km). The main Trashigang town is at around 27.332232° N Latitude and 91.551238° E Longitude at an elevation of about 1100 masl. Trashigang Dzongkhag borders with Indian State of Arunachal Pradesh to the east, Mongar to

⁸ ADB PPTA-8551 Bhutan: Improved Urban Environmental Infrastructure Project. October 2016.

⁹ 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.

the west, Pemagatshel to the south and Trashiyangtse to the north. Rangjung satellite town is 17 km north east of Trashing Thromde on the road to Radi and PhongmeyGewogs.

C. Geology and Geomorphology

55. 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.

56. 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.

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

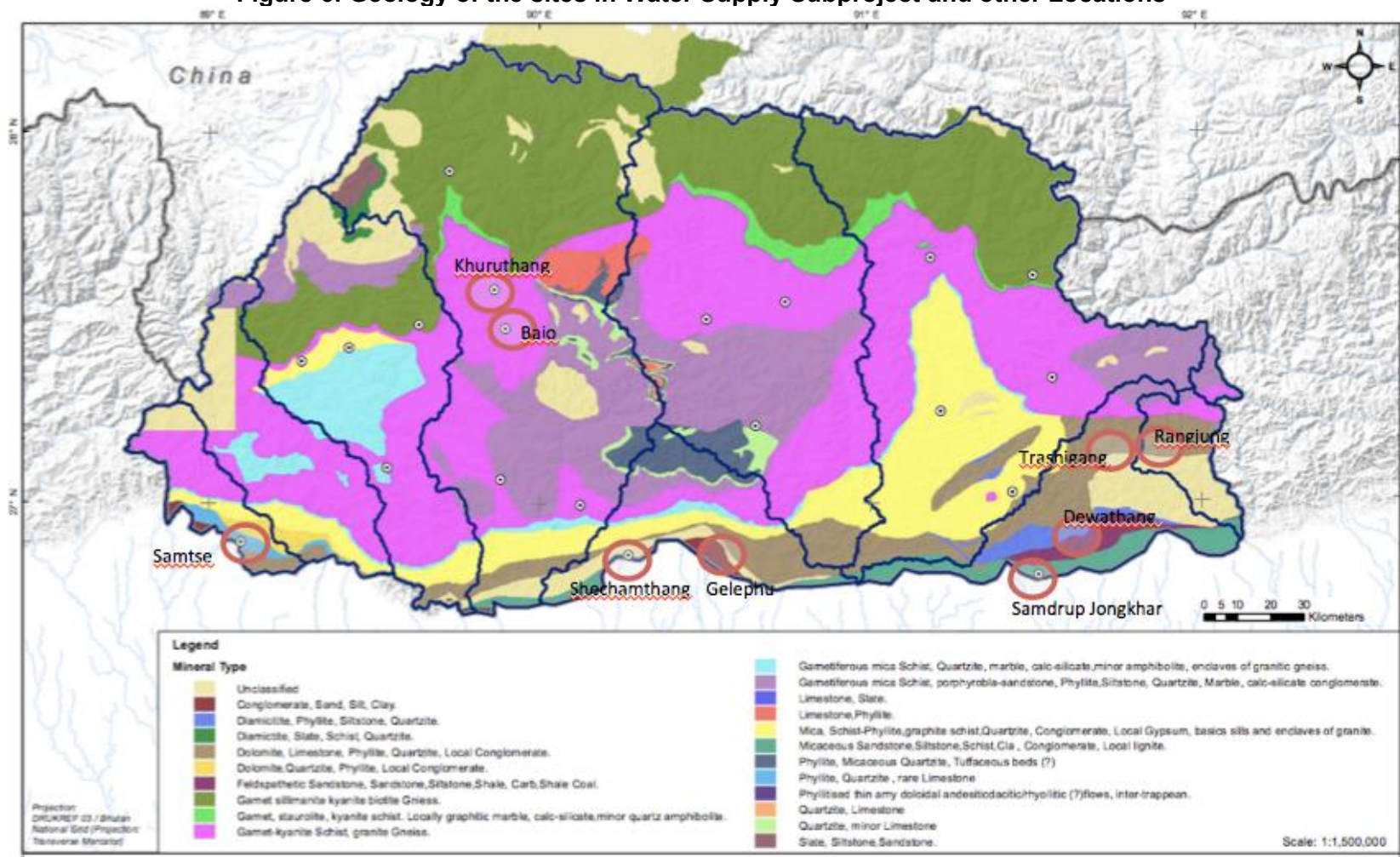
58. Shumar formation consists of meta-sedimentary rocks represented by phyllite, micaceous quartzite with rare limestone bands.

59. 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, calc-silicate and graphitic schist while rocks of Thimphu are represented generally by granite, gneiss, migmatites and occasionally by granite-mica schist, feldspathic schist and amphibolite.

60. 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.

61. The geology of the specific project locations are shown in Figure 6 below:

Figure 6: Geology of the sites in Water Supply Subproject and other Locations



Source: Map taken from ADB TA 8551-BHU: Improved Urban Environmental Infrastructure Project.

62. **Trashigang and Rangjung.** Trashigang and Rangjung has mostly Dolomite, Limestone, Phyllite, Quartzite and local conglomerate. There are also few bands of Mica, and Gypsum in certain areas.

D. Seismology¹⁰

63. 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. Soil

64. Soil types are greatly influenced by the nature of surface material formed from different kinds of nature processes such as glacial and peri-glacial deposition, colluvium, debris flows, river alluvia and windblown material. General trends are increase in leaching, acidification and podzolisation with increase in altitude together with slower decomposition and greater accumulation of organic matter.

65. **Trashigang (including Rangjung).** Trashigang is located in region of Orthic Acrisols. But the main urban area is in Dystric Cambisols.

F. Topography

66. 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 100-7000 masl.

67. **Trashigang (including Rangjung).** Trashigang dzongkhag is highly varying in terms of topography of the Inner Himalayas in the extreme east of Bhutan. It is renowned for its vertical slopes and hillside settlements. Trashigang town is perched in a hanging valley that features a tight ravine about 420 meters above the Dangme River. The terrain is north-west facing and predominantly steep averaging 20-30% slope and going as high as 70%. A spur divides the commercial area from the residential and institutional areas. Further downhill from the existing town and sitting atop yet another spur lies the Trashigang Dzong. The highest point in Trashigang Dzongkhag is 4500 m, while the Trashigang Town is at an altitude of 1070 m.

¹⁰ Source: Initial Environmental Examination report for the Paskaha Access Road and Alay Land Customs Station under the Bhutan SASEC Road Connectivity Project. March 2014.

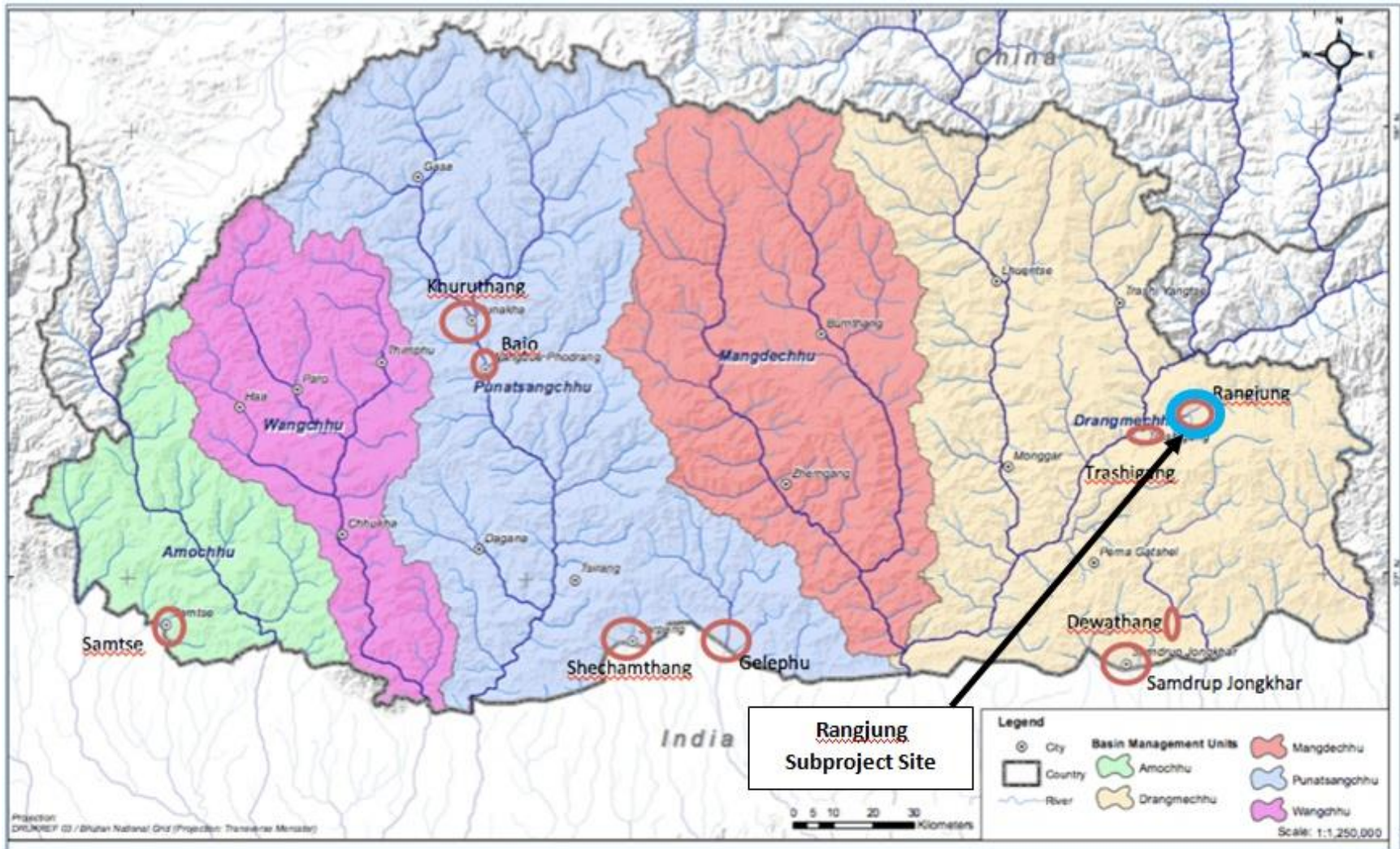
68. Rangjung is located at the bottom of the valley of the Gamri Chu at an altitude of 1130m above sea level and is a relatively flat, spacious, well-drained plateau located at the point of convergence of six Geogs.

G. Hydrology

69. Bhutan has four major river basin management systems: the Drangmechhu; the Mangdechhu; the Punatsangchhu; and the Wangchhu¹¹. Each flow swiftly out of the Himalayas, southerly through the Duars to join the Brahmaputra River in India. **Figure 7** illustrates project locations in relation to major river system of Bhutan.

¹¹ National IWRM Plan for Bhutan, NECS. ADB CDTA – Adapting to Climate Change Through Integrated Water Resources Management

Figure 7: Rangjung subproject location and other water supply subproject locations under Secondary Towns Urban Development Project and other proposed urban projects and River basins of Bhutan



Source: Map taken from ADB TA 8551-BHU: Improved Urban Environmental Infrastructure Project.

70. **Trashigang (including Rangjung).** Trashigang district is part of the Drangmechhu basin. The mighty Drangmechhu river is some 700 m distance from the Trashigang town, while a small stream called Methaydrangchhu drains right through the town and joins the Drangmechhu after the town.

71. Rangjung has a smaller stream of Kharti to the south and Gamrichhu to the west and that originates in the highlands of Trashigang Dzongkhag called Merak and Sakteng.

H. Climate

72. With the data from Department of Hydro-Meteorological Service, a rainfall map of Bhutan had been produced. Annual rainfall map of Bhutan is shown in Figure 8 which is followed by rainfall in the project locations on monthly basis. The maximum rainfall is in the southern foothills with total annual rainfalls of 3,000- 5,700 millimeters (mm) shown in dark yellow colors. The least rains are in the inner Himalayas with annual rainfall of 500-1,500mm. Rainfall pattern is shown in Figures 9.

Figure 8: Average Total Annual Rainfall across Bhutan

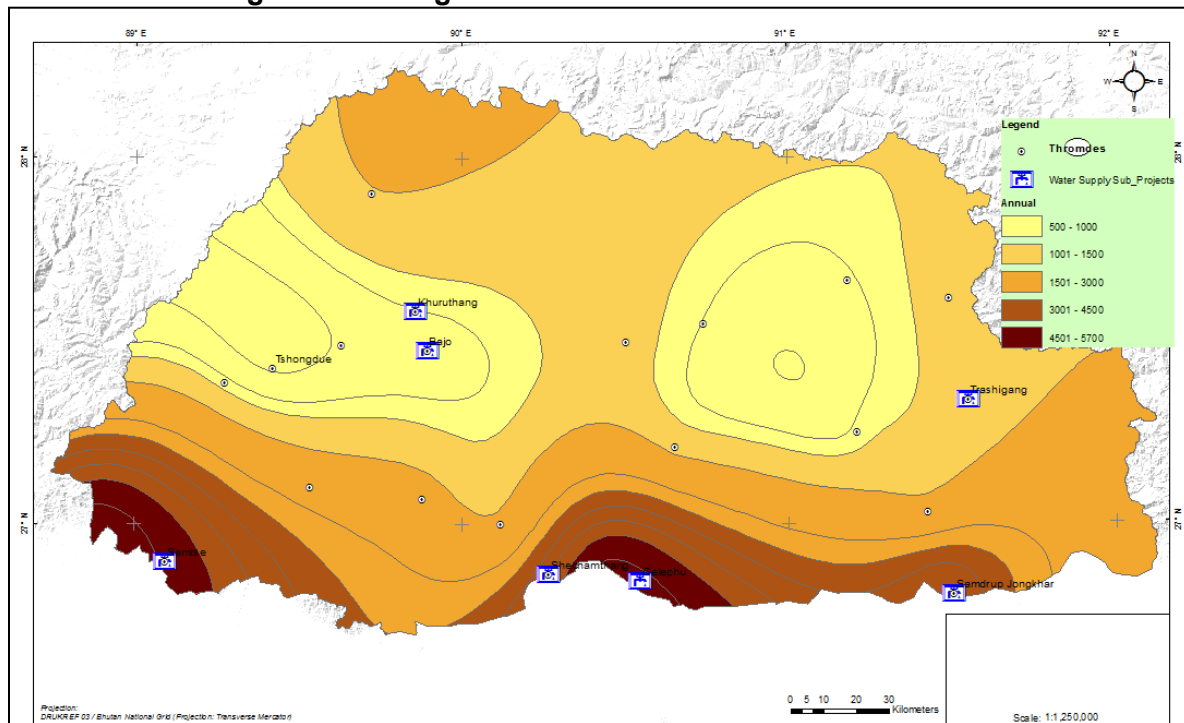
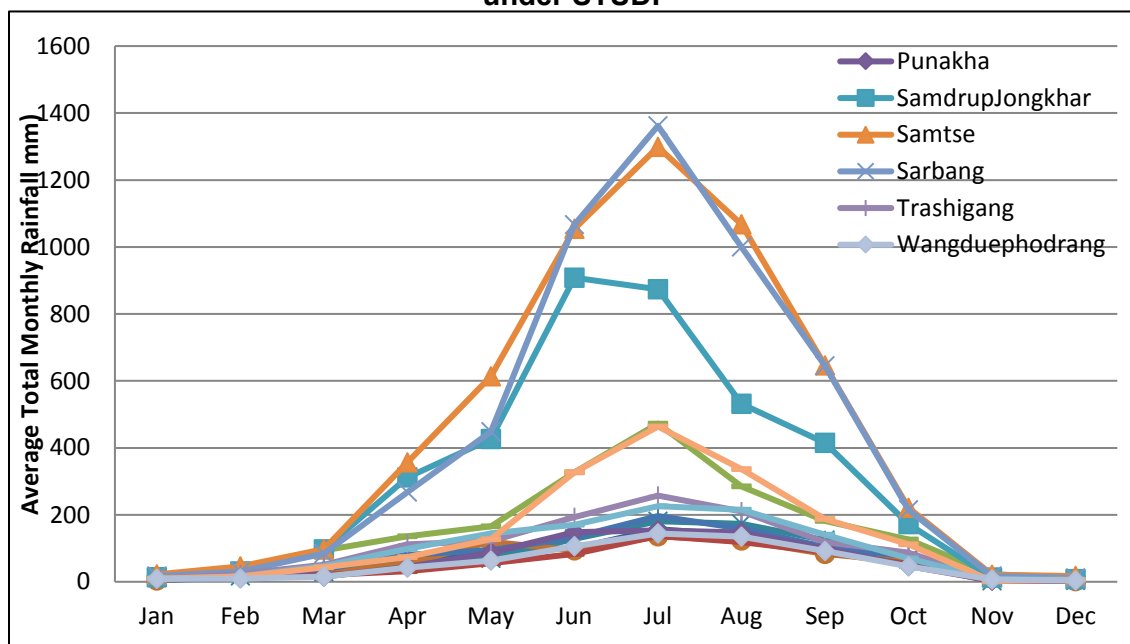
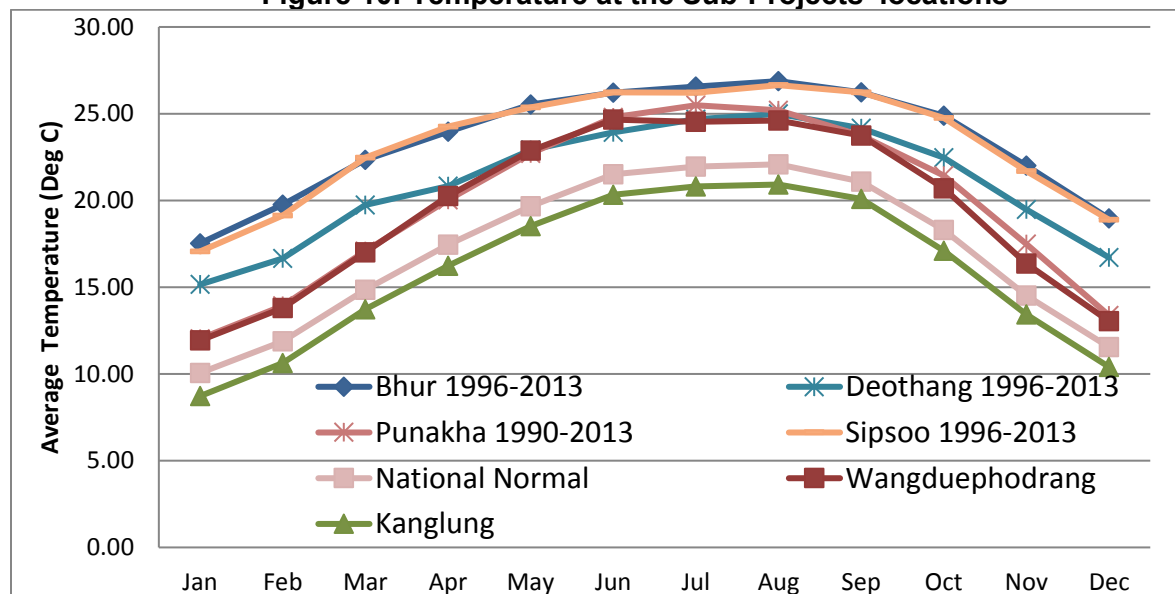


Figure 9: Rainfall Pattern in Trashigang (and Rangjung) and Other Subproject Locations under STUDP



73. The temperatures in Rangjung and other sub-project locations under STUDP are plotted in Figure 10. 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°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 10: Temperature at the Sub-Projects' locations



74. **Air Quality and Noise.** There are no available air quality data specific to Rangjung where the subproject components will be constructed. On the other hand, noise level at the proposed sites of the subproject were measured using mobile devices as shown in Figure 11 below. Maximum and average noise levels for the subproject locations are reflected in Table 3 below. The average noise level value is well within the national limits for mixed area (Ld-65dBA and Ln-55dBA). No subproject component will be located in any industrial zone. Table 4 illustrates the Noise Level limits from the NEC's Environmental Discharge Standard 2010.

Figure 11: Noise level measurements at site

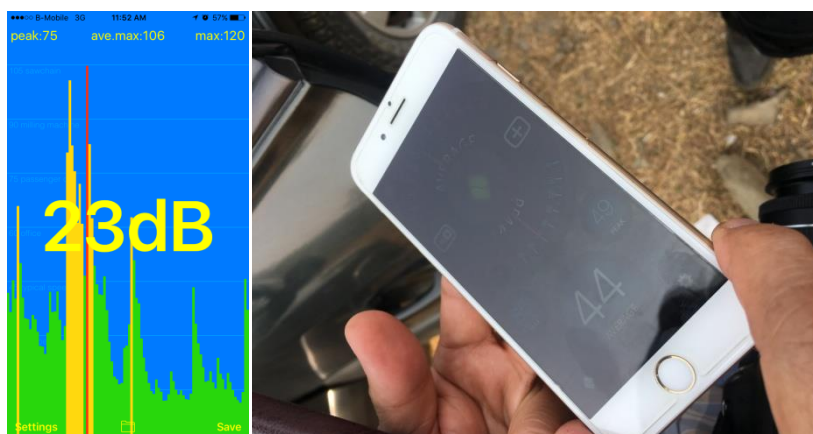


Table 3: Noise and Air Quality Data of project sites^a

Thromde	Noise (dBA) ^a		Air Quality (µg/m3)				CO
	Max	Avg	TSPM	PM10	SOx	NOx	
Rangjung	123	33					

^a Noise level measurement taken at daytime on 7 December 2016 during the Tshechu Festival

^b Measurements at site using dB meter, Dmitry Pushkarev.

Table 4: Noise a Level Limits, Environmental Discharge Standard 2010, National Environmental Commission

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.

75. Gathering of baseline air quality data may be conducted prior to implementation of the subproject. Results will be compared with the permissible limits set in the National Ambient Air Quality Standard for mixed area as provided in the Environmental Discharge Standard 2010, NEC. These national standards on air quality are reflected in Table 5 below.

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

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

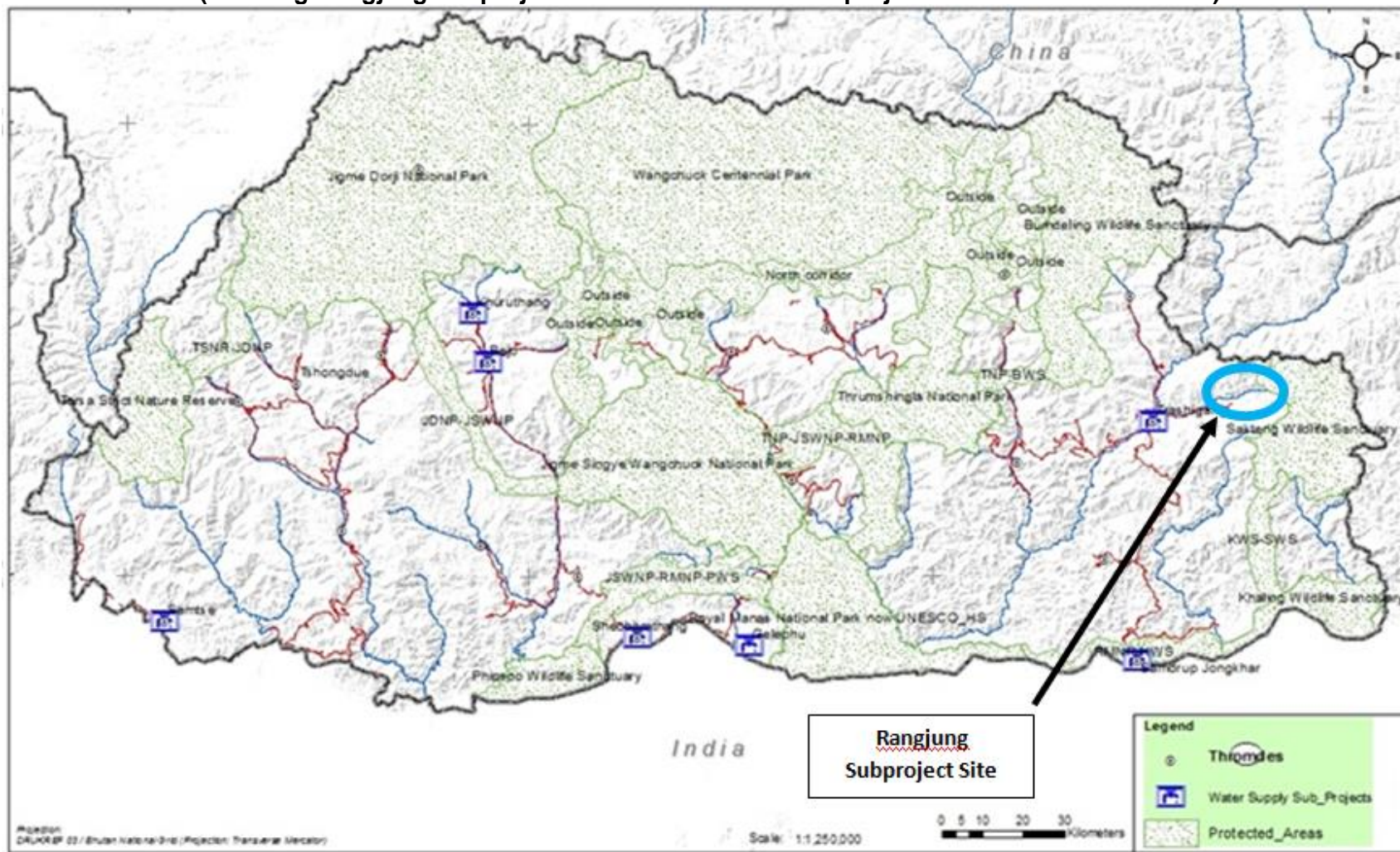
* Mixed Area means area where residential, commercial or both activities take place,

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

I. Ecological Resources

76. Protected areas in Bhutan cover about 51% of the land as shown in Figure 12. It is confirmed that locations of Rangjung subproject components and all other water supply 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.

Figure 12: Protected Areas of Bhutan
(Showing Rangjung Subproject Location and Other Subproject Locations Under STUDP)



Source: Map taken from ADB TA 8551-BHU: Improved Urban Environmental Infrastructure Project

1. Flora and Fauna Resources within Trashigang Thromde (and Rangjung) and other STUDP Subproject Sites

77. 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 project sites. Some of the plant and animal species found at the subproject district which is huge area that only indicates the general location and type of biodiversity are shown in Table 6 and Table 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 Found in Rangjung and Other Subproject Sites under STUDP

Local Name	Scientific Name
Alnus	<i>Alnus nepalensis</i>
Ambokay	<i>Monkey fruit tree</i>
Amliso	<i>Thysanolaena latifolia</i>
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 Scoparius</i>
Chap	<i>Michelia Champaca</i>
Cherata	<i>Swertia Chirayita</i>
Chest nut	<i>Castanea Fagaceae</i>
Chilauney	<i>Schima Wallichii</i>
Chir pine	<i>Pinus Roxburghii</i>
Chuletro	<i>Brassiopsis hainala</i>
Fern	<i>Dryopteris Cocheata</i>
Fern Tree	<i>Pteridophytes</i>
Gogan	<i>Sauravia Nepalinsis</i>
Gokul dhop	<i>Canarium Sikkimenis</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>

Local Name	Scientific Name
Male shield fern	<i>Dryopteris filix-Mas</i>
Malota	<i>Macaranga Pustlata</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 Quinquefolioussu</i>
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 Nepalisis</i>
Wild banana	<i>Muas Paradisica</i>

Table 7: Some Fauna Species Found in Rangjung and other Subproject Sites under STUDP

English Name	Scientific name
Golden langur	<i>Trachypithecus geei</i>
Rufous Necked Hornbill	<i>Buceros bicornis</i>
Rufous bellied hawk Eagle	<i>Lophotriorchis</i>
common leopard	<i>Panthera Pardus</i>
Barking Deer	<i>Indian Muntiac</i>
Goral	<i>Naemorhedus baileyi</i>
common pythons	<i>Pythonidae</i>
Leeches,	<i>Hirudinea</i>
Common lizard	<i>Zodiac vivipara</i>

78. Urban areas of Trashigang and Rangjung are built up and have only cool broad-leafed forests in the adjacent areas. The common trees are *Acer campbellii*, *Betula alnoides*, *Brassaiopsis alpine*, *Chirita lachenensis*, *Corylopsis himalayana*, *Elatostema monandrum*, *Exbucklandia populnea*, *Helwingia himalaica*, *Ilex fragilis*, *Lecanthus penduncularis*, *Lindera neesiana*, *Persea clarkeana*, *Pilea bracteosa*, *Rosa moschata*, *Rubus lineatus*, *Schisandra grandiflora*, *Symplocos dryophila*. The improvement works of the water supply and related infrastructure would not require any felling of trees.

2. Avifauna in Rangjung and Other Subproject Areas Under STUDP

79. 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 1200m is the richest in bird species.

80. 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 inhabited semi-urban areas. The list of birds that are found at the project areas is provided in Table 8 below based on historical data.

Table 8: Avifauna in Trashigang (and Rangjung) and Other Subproject Areas under Secondary Towns Urban Development Project

Scientific name	Common Name	Inner	South	FNCA Status	IUCN Status
<i>Aceros nipalensis</i>	Rufous-necked hornbill		√	Protected	Vulnerable
<i>Buceros bicornis</i>	great hornbill		√	-	Near Threatened
<i>Pavo cristatus</i>	Indian peafowl		√	-	Least Concern

Scientific name	Common Name	Inner	South	FNCA Status	IUCN Status
<i>Chaimarrornis</i>	white-capped water	√	√	-	-
<i>Garrulax albogularis</i>	White-throated	√			
<i>Garrulax leucolophus</i>	white-crested laughingthrush	√	√	-	-
<i>Pomatorhinus</i>	rusty-cheeked scimitar babbler	√	√	-	-

FNCA = Forest and Nature Conservation Act, IUCN = International Union for Conservation of Nature.
(Note: Area Inner – Inner Himalayas (Punakha, Wangdue, Trashigang), South – Sarpang, Gelephu, Samdrup Jongkhar, Samtse)

J. Economic Development of the Subproject Sites

1. Income and Expenditures

81. 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 Rangjung and other locations of subprojects under STUDP were determined and are shown in Table 9. Incomes range from Nu 5,913 in Rangjung to Nu 73,518/month in Bajo/Wangdue. Similarly, expenditures range from the lowest of Nu 9,261/month in Rangjung to highest of Nu 32,736/month in Bajo/Wangdue. 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

Town	Monthly Household Income (Nu/month)	Monthly Household Expenditure (Nu/month)
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
SamdrupJongkhar	38,640	17,156
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 report 2015 conducted under TA 8551: Improved urban environmental Infrastructure Project.

82. 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 the total poverty line of Bhutan in 2017 which stands at Nu2,195.95 per person per

month of which the food poverty line is Nu1,473.45/person/ month while the non-food allowance is Nu722.5/person/month.¹²

2. Educational Institutions and Services

83. Literacy rates for each of the project towns under STUDP, including Rangjung, 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.

Table 10: Literacy Rates for Project Towns Under STUDP

Town	Literacy Rate (%)		
	Male	Female	Total
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
Samdrup Jongkhar	83.95	60.74	74.51
Dewathang	73.19	50.55	62.54
Trashigang	84.58	67.83	76.95
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 report 2015 conducted under TA 8551: Improved urban environmental Infrastructure Project

3. Health Infrastructure and Services

84. 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.

85. 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. Rangjung 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.

¹² 2017. National Statistics Bureau, *Poverty Analysis Report*. Thimphu.

Table 11: Medical Facilities in Project Towns

Thromde	Nearest Hospital, Distance
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
SamdrupJongkhar	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

86. Rangjung has existing road networks. It draws electricity supply from the national grid and water from existing water supply infrastructure that is the focus of both Trashigang and Rangjung subprojects under STUDP.

5. Market

87. Rangjung has an existing or planned urban centers with already 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

88. Rangjung town is located 17.0 km east of Trashigang on the way to Radhi and Phomgmey. The town developed predominantly in the form of shops/residential accommodation on both sides of the road. It is located at the bottom of the valley of the Gamri Chhu at an altitude of 1,130 masl and is a relatively flat, spacious, well drained plateau located at the point of convergence of six Gewogs. The estimated population of Rangjung town in 2005 was 633¹³ including residents, the Rangjung High School and the Mini-Hydel. The overall demographics of Rangjung town consist of 351 (55.45%) males and 282 (44.55%) females. Literacy rates are higher amongst males than females at 73% compared with 60.32%, respectively.

Table 12: Demographic information

Category			Total
Gender	Male	351 (55.45%)	633 (100%)
	Female	282 (44.55%)	
Education			
Male	Literate	235 (73%)	384
Female		149 (60.32%)	

¹³ Population and Housing Census of Bhutan 2005.

Category			Total
Male	Illiterate	87 (27%)	185
Female		98 (39.68%)	

Source: Poverty and social analysis report 2015 conducted under TA 8551: Improved urban environmental Infrastructure Project.

7. Occupation and Income

89. The local economy in Rangjung is predominantly agricultural and the town has developed into a service center for a large agricultural hinterland. Rangjung is also an educational service center with one of the largest primary day schools east of Trashigang town and a High School which is an important sub-district center of secondary education for Trashigang town, Merak, Sakten, Shongpu, Radhi, Bidung and Phongmey Gewogs. The town is also facilitated with health service center through the Rangjung Grade - 1 BHU which is a key referral center in the eight surrounding Gewogs. Other significant establishments in Rangjung are the WoeseICholing Monastery which sits on a hilltop overlooking the town from the north and the Rangjung Mini-Hydel which produces 2.2 MW of electricity supplying Rangjung, Trashigang and Trashiyangtse.

90. The PSA 2015 showed that the household heads' major occupation in the town area of Rangjung is in business (80%), followed by civil service employment (20%). Of the female-headed households, none has indicated their occupation as housewife/keeper. Of the male-headed households 49.09% reported being gainfully occupied. For both male and female heads, the reported predominant occupations and main sources of income are business, civil servant or private sector employee. Agriculture is not all engaged even in by small proportion of households, which is logical as the subproject areas are mostly urban. Accordingly, the contribution of agriculture to total household income is minimal or nil. See Table 13 below.

Table 13: Occupation of Head of Household by Gender in Rangjung under Trashigang

Occupation	Male		Female		Total	
	No.	%	No.	%	No.	%
Agricultural worker	0	0	0	0	0	0
Business	11	68.75	5	75	16	80
Private Sect employ	0	0	0	0	0	0
Civil Service	3	31.25	1	25	4	20
Housewife	0	0	0	0	0	0
Others	0	0	0	0	0	0
Total	14	100	6	100	20	100

Source: PSA 2015.

91. The regular major contributor to the total annual income of sample households in Rangjung town is through income from shops. Rental of farming equipment as well as income from pensions are insignificant as shown in Table 14 below.

Table 14: Contribution of Sources of Income to Total Monthly Household Income

Sources	Amount per annum (Nu)
Fruit orchard	0
Rental of farming equipment/animals/land	0
Salaries and wages including from religious fee	0
Pensions	0
Shops	163,138.00
Average monthly income of reporting HHs	5,913.000

Source: Poverty and social analysis report 2015 conducted under TA 8551: Improved urban environmental Infrastructure Project.

K. Socio and Cultural Resources

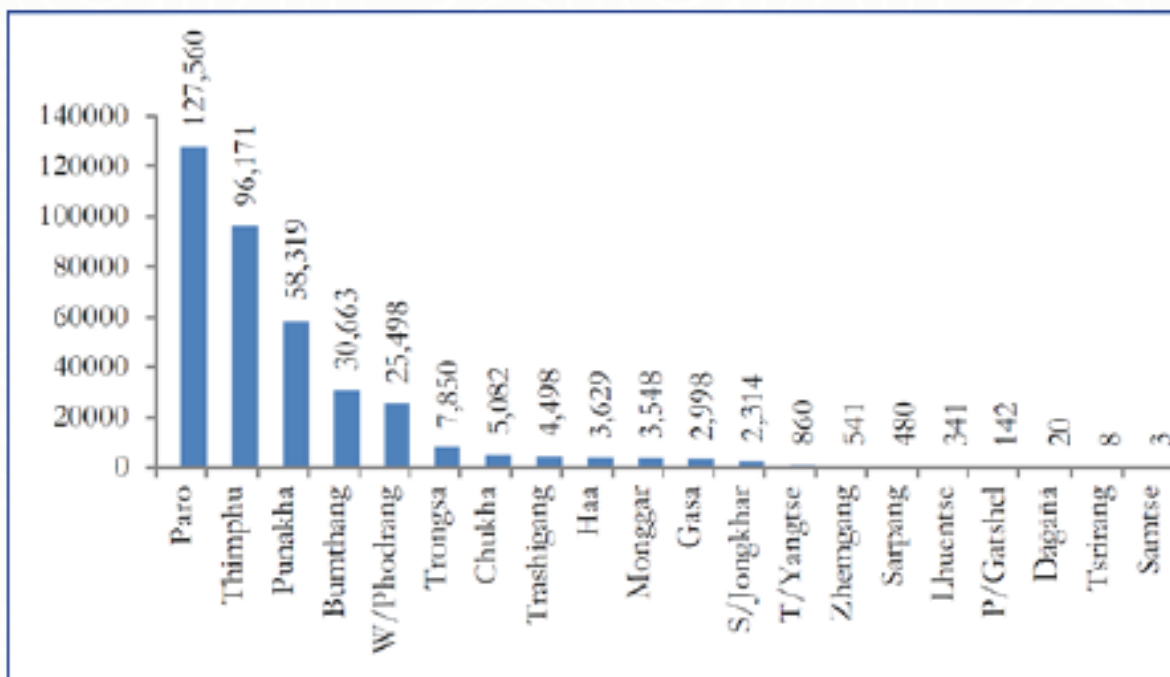
92. There are no religious, historical, cultural and archaeological sites that are highly sensitive and likely to be impacted at any of the subproject areas under STUDP. However, most subprojects are in vicinity of some religious and cultural heritage sites as shown in Table 15 below:

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 (monastery)
Bajo	Chhukhor manis near the intake, scared site on the way. Wangdue Dzong, Bajo Lhakhang

1. Tourism and Recreation

93. 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 13: Tourist Arrival per Thromde, 2014

2. Tourist arrivals by bed nights and Dzongkhag

94. 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

95. This IEE assesses the impacts of the proposed activities for water and WTP rehabilitation subproject on environmental attributes in Rangjung.

96. **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 water supply (Appendixes 1 and 2) and ADB Safeguard Policy Statement (SPS), 2009.

97. A comprehensive screening for environmental impacts is made through a review of the parameters associated with water supply projects against the components of the proposed subproject and the environment where the facilities will be located. A screening checklist was developed from various sources such as NEC checklists, ADB REA checklist for water supply,

and World Bank environmental assessment sourcebook. 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 exercise will help identify which topics do not require further attention.

98. **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.

99. Environmental impacts arising from decommissioning of the proposed water supply project 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

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
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 competing use of water resource	Δ -	Δ
Potential nuisance and problems to the public	● -	Δ
Loss of assets (IR concerns)	● -	Δ
CONSTRUCTION PHASE		
Modification of construction site topography	Δ -	Δ
Cutting of trees	Δ -	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

Environmental Impacts and Risks	Without Mitigation	With Mitigation
OPERATION AND MAINTENANCE PHASE		
Health hazard due to delivery of poor water quality	● -	Δ
Pollution from increased generation of sewage and sullage	● -	Δ
Noise and air pollution of pumping stations	Δ -	Δ
Ground subsidence due to over-pumping	● -	Δ
Noise and air pollution from water treatment plant	Δ -	Δ
Waste generation of filter beds (backwash)	Δ -	Δ
Pumping stations operational risk and safety	● -	Δ
Water treatment facility operational risk and safety	● -	Δ
Increase employment opportunities	Δ +	Δ

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

A. Design/Pre-Construction Phase Considerations

100. **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 residential, and agricultural landscapes. The proposed routes of the pipelines are usually parallel to existing lines or along main roads or highways from the source to a reservoir or water treatment plants and on to residential, institutional, and commercial areas. 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.

101. **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 either or combination of the following: (i) residential, or (ii) commercial; or (iii) institutional; or (iv) agricultural.

102. **Competing Use of Water Resource.** The proposed sources of water systems are surface waters that are already being tapped for domestic water supply and still have excess discharge capacities. The total water demand estimated is 1 MLD. This amounts to about 0.8% of the lean season flow of the river (i.e. ~1500 litres per second), clearly indicating the sustainability of the project with regards to water management.

103. **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. Consultations and information dissemination to potentially affected people have been done and shall be done as a continuing activity during the various phases of project implementation. 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 contract documents with the contractors.

104. **Loss of Assets.** Site-specific infrastructure components of the subproject such as intake and reservoir will be located in government properties. Most of the water distribution mains will be laid out underground, hence the disturbance to private property where they might pass through will be temporary and minimal. Moreover, the replacement of transmission mains will use the existing alignments making potential disturbance less intrusive.

B. Construction Phase Environmental Impacts

105. **Site Preparation.** Construction of the reservoirs and break pressure tanks will all be located in government property and will not involve modification of the construction site topography. Water supply transmission mains will follow as much as possible the existing site contour and existing alignments. There will be no cutting of trees in forest lands. Therefore, the issue on environmental impacts of site preparation is considered not significant. Likewise, potential removal of trees will not be an issue due to the following: (i) replacement of transmission mains will mostly be done in trenches along the right-of-way of existing roads and using existing alignments, and (ii) areas required for intake and reservoir are relatively small. 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.

106. **Mitigation.** It is not expected that trees will be cut because replacement of transmissions mains will be done on the existing alignments and along right of way.

107. **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.

108. **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.

109. **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.

110. **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.

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

112. **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.

113. **Nuisance or public inconvenience during pipelaying.** Public inconvenience could arise in pipelaying works due to prolonged period of water supply service interruptions. Dumping of construction materials and solid wastes in watercourses could degrade surface water quality and disturb the natural flow regime of these water bodies, which would eventually cause nuisance to the public.

114. **Mitigation.** The construction contractor shall be required: (i) to do installation of pipes within the shortest time possible to minimize water supply cut-off periods and/or use of night time schedules, as well as announcement of water supply interruptions two to three days prior to actual cut-off; and (ii) not to dump earth, stones, and solid wastes in watercourses to avoid adverse impact on water quality and flow regime.

115. **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.

116. **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.

117. **Local Air Pollution Due to Construction Activities.** Dust generation from trenching, earthworks, and soil preparation activities during dry periods is expected to give rise to 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.

118. **Mitigation.** The contractor shall be required to: (i) perform regular water spraying of the sites during dusty periods in order to reduce the generation of dusts; (ii) use equipment that are properly maintained; (iii) cover stockpiles that will be left idle for a long time to avoid dust generation due to wind action; and (iv) ensure that trucks transporting loose construction materials such as sand, gravel, spoils, and the like shall be provided with tarpaulin cover.

119. **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.

120. **Vehicular Traffic Congestion and Public Access.** Construction activities, such as transmission line pipelaying along the highways are expected to cause traffic slowdown and congestion since this kind of road work could constrict the passageway of vehicles. Replacement of transmission lines that cross the highway may also cause the temporary closure of about half the road and will lead to traffic congestion as well. This issue is therefore considered significant.

121. **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 in accordance with the traffic management plan; (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.

122. **Hazards to Public Due to Construction Activities.** Construction activities, such as pipelaying, 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 pipelaying trenches are normally left uncovered until pipeline testing is completed.

123. **Mitigation.** The contractor shall be required to implement a road safety plan incorporated in the 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.

124. **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.

125. **Mitigation.** The construction contractor shall be required to: (i) install proper sanitary facilities to prevent the indiscriminate discharge of sanitary wastes at the camps surroundings, (ii) implement proper solid waste management, and (iii) prevent surface runoffs from flowing 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.

126. 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.

127. Mitigation. After completion of construction activities, the contractor shall be required to (i) remove all temporary structures built during construction phase and other unused construction materials left; (ii) remove all construction wastes from the sites; and (iii) implement surface restoration.

128. 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; firefighting 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 firefighting 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.

129. **Increase Employment Opportunities at Work Sites.** Various construction activities for the intake structures, pumping stations, filter beds, reservoirs, and pipelines will require a number of workers. The impact would be beneficial and significant since employment opportunities in the area will increase.

130. **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

131. **Health Hazard Due to Delivery of Poor Water Quality.** Delivery of poor water quality will increase the health risk to water consumers. Threats to water quality are always present in all components of a water supply system, from the raw water sources up to the service connections. Threats of contamination in water sources may be due to the presence of bacteria, viruses, protozoa, or chemicals. This issue raises the need to provide a secure barrier to post-treatment contamination as the water is transported to the consumer. Failure to implement the appropriate management measures may result to adverse consequences threatening public health such as the case of a microbial outbreak.

132. **Mitigation.** As operator or managing entity of both Rangjung and Trashigang water supply subprojects, Trashigang thromde should manage the environmental risks associated with the operation of its entire water supply system. Prevent the delivery of poor quality water to

consumers by (i) ensuring that the water treatment plant and the distribution network are working according to design, capacity and efficiency, and (ii) implementing a water safety plan as advocated by WHO and the 2016 Bhutan Drinking Water Quality Standard (BDWQS). The latest water quality tests from December 2017 for Rangjung source Table 17 below. The results fall within the standards prescribed by BDWQS.

Table 17: Water Quality Test Results for Rangjung intake and clear water basin (near source)

Routine operation and maintenance of Rangjung Water supply system for the Month of December 2017									
Source		Water Treatment Plant			Clear water basin		Distribution		
Date	PH	Ph tank 1	Ph tank 2	Ph tank 3	Ph Reservoir	Chlorine	Cl2	Ph	Remarks
	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	0.5-0.9			
1/12/2017		-	8.1	8	8	0.65			
2/12/2017		-	8.2	8	8	0.53			
3/12/2017		-	8.2	8.2	8.1	0.92	0.11	8.1	BPC Office
4/12/2017		-	8.1	8.1		0.61	0.18	8.1	BPC Office
5/12/2017	8.5	-	8.3	8.2	8.2	1.02	0.14	8.3	BPC Office
6/12/2017		-	8.2	8.1	8.1	0.87			
7/12/2017		-	8.1	8.2	7.8	0.56			
8/12/2017		-	8.2	8.1	7.9	0.49			
9/12/2017		-	8.2	8.2	7.8	0.58			
10/12/2017		-	8.1	8.3	7.8	0.35			
11/12/2017		8.2	8	-	7.9	0.47			
12/12/2017		8.3	8	-	7.8	0.81			
13/12/2017		8.2	8	-	8	0.72	0.13	8.2	BHU Rangjung
14/12/2017		8.2	8.1	-	8	0.53	0.16	8.2	BHU Rangjung
15/12/2017		8.3	8	-	8.1	0.59	0.18	8.2	BHU Rangjung
16/12/2017		8.2	7.9	-	7.9	0.45			
17/12/2017		8.1	7.9	-	7.8	0.47			
18/12/2017		8.1	7.8	-	7.9	0.81			
19/12/2017		8.1	8.1	-	7.9	0.71	0.18	8.1	Rangjung C School
20/12/2017		7.9	8	-	7.9	0.9	0.21	8.2	Rangjung C School
21/12/2017	8.3	8	8	8	8	0.31	0.19	8.3	Rangjung C School
22/12/2017		8	8.1	8.1	8	0.49	0.16	7.9	Municipal office
23/12/2017		8	8.2	8.2	8	0.28	0.17	8	Municipal office
24/12/2017		8.2	8.1	8.1	8.1	0.58	0.21	8	Municipal office
25/12/2017		8.2	-	8.2	8.2	0.46			
26/12/2017		8.2	-	8.3	8.1	0.85	0.21	7.8	Amshing area
27/12/2017	8.5	8.1	-	8.2	8.2	0.49	0.17	8	Amshing area
28/12/2017		8.1	-	8.3	8.2	0.78	0.14	8.2	Amshing area
29/12/2017		8.1	-	8.2	8	0.54			
30/12/2017		8.2	-	8.2	8	0.62			
31/12/2017		8.2	-		8.1	0.43			

Source: Trashigang thromde.

133. A water safety plan shall enable Trashigang thromde to (i) prevent contamination of its water sources, (ii) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets, and (iii) prevent re-contamination during storage, distribution and handling of drinking water. It is an approach that will clearly show the desire of Trashigang in applying best practices in ensuring delivery of potable water to its consumers.

134. For controlling microbial contamination, a hypochlorinator will be installed near the intake and pumping stations and the water treatment facilities to ensure that water will be chlorinated and adequate residual disinfection will be maintained. This device uses a feed pump to inject controlled amount of chlorine solution into the water leaving treatment plant. This is safer than using chlorine gas. The standard for chlorine residual of the BDWQS is 0.2 – 0.5 mg/L at the distribution system.

135. **Pollution from Increased Generation of Sewage and Sullage.** Increasing the water supply to the service area will also increase the generation of sewage and sullage since most of the water used by consumers will become wastewater from the toilets, kitchens, and laundry areas. This wastewater will contribute to pollution of the surrounding areas. Without a mitigating measure, this impact would be significant.

136. **Mitigation.** Wastewater from the toilets, kitchens, and laundry areas are normally handled by the individual household septic tanks. The septic tank system will: (i) treat the wastewater and reduce the pollution potential, and (ii) reduce the people's exposure to untreated domestic wastewater.

137. **Waste Generation from Filter Beds.** A water filtration facility will generate wastewater in the form of filter backwash water. The process of continually renew the efficiency of the filter units will require repeated backwashing operation to unclog the filter beds. This activity will generate filter backwash water that contains the solids removed by the filter beds. In addition, sludge at the sedimentation basins has to be removed regularly in order to maintain the capacity of the basins. However, this issue is considered not significant since the proposed filter beds will be small. Nevertheless, the filter backwash water will be sent to the sedimentation basin. Settled sludge of the sedimentation basin shall be sent to large sludge ponds where the long detention time allows safe discharge of clear water.

138. **Disinfection of Partially Treated Water and Pumping of Treated Water.** As standard in water treatment process, disinfection is the last step of treatment employed prior to pumping and distribution to household users. Olden practice uses chlorine gas as disinfectant. However, chlorine gas is considered as a hazardous substance that needs special storage and handling. Misuse or mishandling of chlorine gas could lead to health and safety risk to workers at the water treatment plant and to the environment once leaked to the atmosphere. These risks shall be avoided in the water treatment by using sodium hypochlorite (NaOCl), the liquid form of chlorine. NaOCl is inherently a safer disinfectant. Its character can simply be put as household bleach or swimming pool chlorine.

139. **Water Treatment Facility Operational Risk and Safety.** The proposed water filtration facilities (filter beds) and pumping equipment will not inherently pose any significant risk to the environment and people. These facilities will not use flammable or toxic materials during normal operations. Conditions of extreme conditions of temperature and pressure are not to be expected. The only scenario that could pose hazardous situation is when chlorine gas is used as disinfectant.

140. **Mitigation.** The risk shall be avoided in the proposed water filtration facility (filter beds) by using sodium hypochlorite (NaOCl), the liquid form of chlorine. NaOCl is inherently a safer disinfectant. Its character can simply be put as household bleach or swimming pool chlorine.

141. **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.¹⁴ The guidelines include proper handling and storage of liquid chlorine.

142. **Increased Employment Opportunities.** Operation and maintenance of the pumping stations, reservoir, and pipelines will definitely require a number of workers. The impact would be beneficial since employment opportunities in the area will increase. However, the expected number of additional workers will be small since the additional water supply facilities are not labor intensive. This impact is therefore considered less significant.

143. **Potential Conflict on Water Uses.** As population increases, water demand will also increase and different water uses will emerge that may create conflict in the future.

144. **Mitigation.** Integrated water resources management within the watershed to improve the allocation and management of scarce water resources in the context of climate change will be initiated by the thromdes.

145. Overall, the proposed water supply subproject will have a beneficial net effect on the subproject area because it will ensure continuous water supply availability and improvement in the quality of life of people in the municipality.

146. After impacts and risk screening, Table 18 lists the environmental impacts and risks that requires mitigation and shall be carried to the EMP Section.

Table 18: Environmental Impacts and Risks for Inclusion in EMP

Environmental Impacts and Risks	Without Mitigation	With Mitigation
PRE-CONSTRUCTION PHASE		
Potential nuisance and problems to the public	● -	Δ
CONSTRUCTION PHASE		
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
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
OPERATION AND MAINTENANCE PHASE		
Health hazard due to delivery of poor water quality	● -	Δ
Pollution from increased generation of sewage and sullage	● -	Δ
Ground subsidence due to over-pumping	● -	Δ
Future scarcity of water and conflict in water uses due to climate change	● -	Δ

¹⁴ 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>

Environmental Impacts and Risks	Without Mitigation	With Mitigation
Water treatment facility operational risk and safety	● -	Δ
Pumping stations operational risk and safety	● -	Δ

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

147. 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

148. The cumulative impact assessment (CIA) examined the interaction between the project's 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 projects and/or activities can result in cumulative impacts, both positive and negative. The project's potential cumulative effects were considered with respect to valued components (VCs) in environmental and socioeconomic categories, in four areas:

- (i) any potential residual project 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 project; and
- (iv) future developments that are reasonably foreseeable and sufficiently certain to proceed.

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

150. Given that the water supply requirements of other municipalities will be met, and the sources considered adequate, there are no significant cumulative impacts expected on the future water supply.

151. 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. 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.

152. 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 damage to buildings due to ground vibrations is unlikely, there may be annoyance to receptors during construction. However, all construction activities will be undertaken during daytime when background noise is relatively higher. Hence, the impact of noise generated by the construction activities is expected to be minimal and tolerable. Further, the EMP provided measures to minimize any construction noise generated.

153. 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 alignment will be improved once construction is completed. Since only relatively small land area will be occupied by the eight new wells and four concrete reservoirs, plus the pipelines that will also be buried, 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 project area. This can be considered a long-term cumulative benefit of the subproject.

154. Upon completion of the subproject, the socio-community will benefit from improved water supply system. This is considered a long-term cumulative benefit.

155. 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.

156. The subproject will benefit the general public by contributing to the long-term improvement of water supply system and community livability in all sites to be served by the subproject.

VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

157. Ministry of Works and Human Settlements (MOWHS) has undertaken various activities concerning information disclosure, public consultation, and public participation for the proposed water supply project for Trashigang. These were done to achieve a meaningful stakeholders' consultation and ensure the successful implementation of the project.

158. During the planning phase, information regarding the proposed water supply project were disclosed to the public, including the conduct of a socioeconomic survey. Households in project areas were informed about the proposed project and interviewed for socioeconomic data. Survey of respondents also included those households without water service connection.

159. Key informant interviews and focus group discussions 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 the water supply project. Participants in the key informant and focus group discussions 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) NGOs.

160. **Public Consultation.** An initial public consultation was conducted on the proposed Rangjung intake and WTP rehabilitation subproject, including the proposed wastewater

treatment plant and sewerage subprojects that were eventually cancelled under STUDP. Stakeholders were encouraged to raise their social and environmental issues in relation to the proposed subprojects. Participants included: (i) concerned individuals, (ii) LAP officials, (iii) NGOs, (iv) municipal officials, and (v) village officials. As a result, stakeholders expressed support to the subprojects. Summary of the consultation outcomes is presented in Table 19, while the documentation is presented at the Appendixes 3-6.

161. **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 subproject implementation. 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 19: Summary of Consultation Outcomes

Name / Organization	Question	Response
Consultants	Does the local person support the proposed Project?	All participants pledged to give their full support for the said Project for everybody's welfare.
Consultants	Any critical issue or concern by the local people regarding the Project?	No critical issues were reported except for the land near the water source being used for grazing and temporary settlement which might cause contamination.
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)?	We are happy to collaborate and contribute.
Consultants	Any Cultural or Sacred sites in the proposed site?	none
Consultants	Any other issues?	1. Jamphel (Tshogpa) explained that the most common concern amongst the people was insufficient quantity of water. 2. VTI Principal enquired about the type of WTP and also expressed the need for more water for the Institute with the

Name / Organization	Question	Response
		possibility of expansion of the institute with additional 500 trainees & 50 faculty during the 12 th FYP

VII. GRIEVANCE REDRESS MECHANISM

162. 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).

163. 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 14 below and the Grievance Redress Committee (GRC) composition have been provided by MOWHS. See government notification in Appendix 7. 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.

164. **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 8.

165. **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 from affected household) 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.

166. 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.

167. **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.

168. **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.

169. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by municipalities (Trashigang for this subproject) that operate the water system.

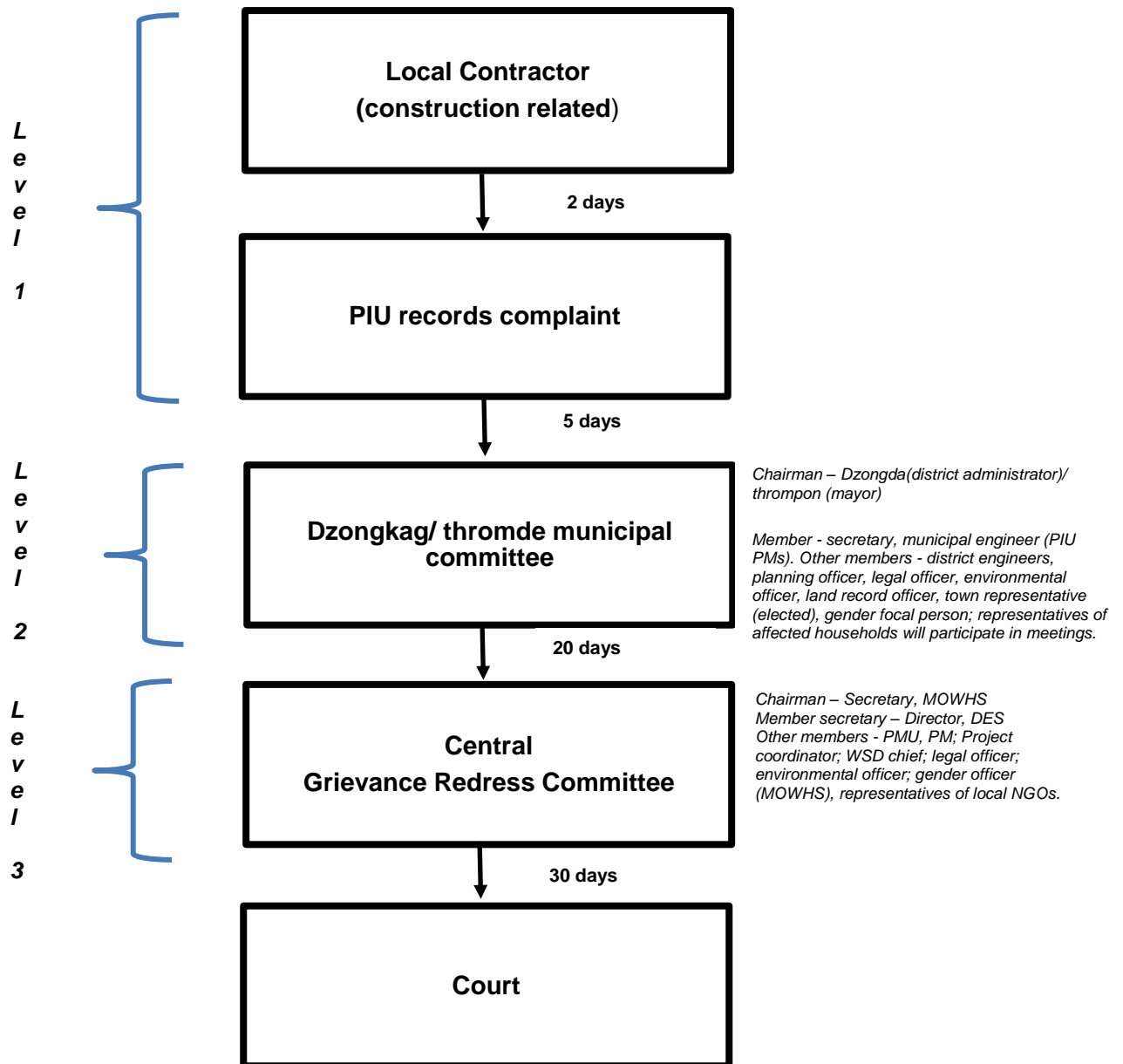
170. **Complaints to NECS.** Complaints about environmental performance of projects issued an Environmental Clearance can also be brought to the attention of NECS. The steps that NECS may follow in handling complaints are: (i) NECS shall verify if the complaint is within its jurisdiction (ii) within 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, (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.

171. 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.

172. In the event that the established GRM is not in a position to resolve 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 14: Grievance Redress Process



VIII. ENVIRONMENTAL MANAGEMENT PLAN

173. This section addresses the need for mitigation and management measures for the Rangjung intake and WTP rehabilitation 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

174. 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 Table 20 to Table 22 which cover water supply 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 20: Environmental Management Plan for Anticipated Impacts: Pre-Construction

Aspects/Fields	Anticipated Impacts	Mitigation Measure	Location	Responsible for Implementation/ Supervision	Mitigation Cost
PRE-CONSTRUCTION PHASE					
Excavation requirements	Potential damage to archaeological and cultural assets	Tender documents shall include a provision that will require construction activities to be stopped immediately upon discovery of any archaeological and cultural relics and authorities will be informed promptly	Pipeline 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	Pipelines routes, reservoir and pumping station	PIU, Design Consultants / MOWHS PMU	Part of detailed design cost
IR concerns	Loss of assets	Compensation and other assistance for loss assets and land acquisition; Consultation and information dissemination to affected people.	Pipelines routes, reservoir and pumping stations	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 water supply system shall conform with the requirements and the latest edition of the American Water Works Association (AWWA) Standards for wells, pipes, valves, and fittings. Likewise, hazard maps shall be consulted.	All structural components	Design Consultants / MOWHS PMU	Part of detailed design cost

Table 21: Environmental Management Plan for Anticipated Impacts: Construction

Aspects/Fields	Anticipated Impacts	Mitigation Measure	Location	Responsible for Implementation/ Supervision	Mitigation Cost
CONSTRUCTION PHASE					
Excavation works	Chance finds for archaeological	(i) Stop work immediately to allow further investigation; and	Pipelines routes, reservoir and	Contractor / PIU, PMU, Supervision	Incorporated in construction

Aspects/Fields	Anticipated Impacts	Mitigation Measure	Location	Responsible for Implementation/ Supervision	Mitigation Cost
	and cultural artifacts or assets	(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.	pumping station	Consultants	contract
Pipelaying 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	Pipelines routes, intake, reservoir	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Pipelaying	Nuisance / inconvenience to the public	Minimize water supply cut-off periods and /or use of nighttime schedules, as well as announcement of water supply interruptions two to three days prior to actual cut-off; no dumping of earth, stones, and solid wastes in watercourses	Pipelines routes,	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Pipelaying 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	Pipelines routes, intake, reservoir	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Pipelaying 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	Pipelines routes, intake, reservoir	Contractor / PIU, Supervision Consultants	Incorporated in construction contract

Aspects/Fields	Anticipated Impacts	Mitigation Measure	Location	Responsible for Implementation/ Supervision	Mitigation Cost
		materials; not smoke belchers equipment			
Pipelaying 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	Pipelines routes	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Pipelaying 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
Pipelaying and other civil works	Hazard to public due to construction activities	Implement road safety plan and safety measures including warning signs to alert people of hazards around the construction sites, barricades, and night lamps for open trenches in pipelaying	Pipelines routes, intake, reservoir	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
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	Pipelines routes, intake, reservoir	Contractor / PIU, Supervision Consultants	Incorporated in construction contract
Pipelaying and other civil works	Increase employment opportunities	Contractor required to give preference to local labor; workers recruitment to be coordinated with local officials	Pipelines routes, intake, reservoir	Contractor / PIU, Supervision Consultants	No cost

Table 22: Environmental Management Plan for Anticipated Impacts: Operation

Aspects/Fields	Anticipated Impacts	Mitigation Measure	Location	Responsible for Implementation/ Supervision	Mitigation Cost
OPERATION PHASE					
Water production	Health hazard due to delivery of poor water quality	Water disinfection using chlorine; water safety plan implementation	Pipelines, reservoirs, and pumping stations,	Mun. Engr / MOWHS PMU	Part of operation & maintenance costs
Water consumption	Pollution from increased generation of sewage and sullage	Septic tanks system of water consumers	Subproject water supply service area	Water consumer/ Municipal Environmental Officer	Cost of water consumers
Groundwater pumping	Potential ground subsidence due to excessive pumping	Groundwater pumping at lesser than the safe yield of each well	pumping stations	Mun. Engr. / MOWHS PMU	No cost
Water treatment plant operation	water treatment plant operational risk and safety	Adopt the World Bank EHS guidelines related to occupational health and safety for the operation of water and sanitation projects. Use liquid chlorine (sodium hypochlorite) instead of chlorine gas	Water treatment plant	Mun. Engr. / MOWHS PMU	Part of capital, operation & maintenance costs
Pumping station operation	Pumping station operational risk and safety	Adopt the World Bank EHS guidelines related to occupational health and safety for the operation of water and sanitation projects. Use liquid chlorine (sodium hypochlorite) instead of chlorine gas	Pumping station	Mun. Engr. / MOWHS PMU	Part of capital, operation & maintenance costs
Abstraction of groundwater	Scarcity of water supply and conflict in water uses	Hydrogeological studies show that the water supply sources are sustainable and are not in conflict with other users	Water supply intakes/wellheads	Mun. Engr. / MOWHS PMU	Part of operation cost

175. 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, (iv) water safety plan and compliance with drinking water standards, (v) source protection study and plan, and (vi) unanticipated environmental impacts.

176. **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 submission of a Contractor's Environmental Management Plan (CEMP). Tender documents and construction contracts shall therefore include provision to ensure contractor comply with the CEMP and the subproject's EMP as reflected in Table 20, Table 21 and Table 22.

177. **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 project management and supervision consultants (PMSC). 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.

178. 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.

179. **Water Safety Plan.** Municipal engineer and environment officer shall manage the environmental risk to its water supply system in a broader scale. As previously pointed out, the role of a water safety plan in addressing the risk cannot be overemphasized. This is an approach advocated by WHO for ensuring the delivery of safe drinking water to the consumers. Its need is also reflected in the 2007 BDWQS. The water safety plan shall enable the municipality to (i) prevent contamination of its water sources water, (ii) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets, and (iii) prevent re-contamination during storage, distribution and handling of drinking water. It is an approach that will clearly show the desire of the municipality in applying best practices in ensuring delivery of potable water to its consumers.

180. **Source Protection Study and Intake Protection Plan.** An input to the preparation of the water safety plan is the source protection study. This includes preparation of a source water assessment. The study will help identify risk to the water supply system. A source water

assessment is an evaluation of how susceptible a source may be to potential sources of contamination. Potential contaminant sources that could adversely affect the quality of water supply source are identified. Output of assessments will be used to prepare the intake protection plan. Intake protection is a way to prevent drinking water from becoming polluted by managing potential sources of contamination in the area with influence to the surface water supply. The intake protection plan includes designating the protection area or capture zone. An intake protection plan should be included in the water safety planning. However, the risk of water source contamination is low because the water source/ intake is not located close to any r built-up areas.

181. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during project implementation, thromde environment officer with support from 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

182. Table 23 presents the information on: (i) aspects or parameter to be monitored, (ii) location where monitoring is applicable, (iii) means of monitoring, (iv) frequency of monitoring, (v) responsibility of compliance monitoring, and (vi) cost of monitoring. PIU shall prepare quarterly environmental monitoring reports to be submitted to MOWHS management detailing the status of mitigating measures implementation.

Table 23: Environmental Monitoring Plan

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
PRE-CONSTRUCTION PHASE						
Specific provision in tender documents on archeological/ cultural relics	Pipeline trenches, civil works excavations	Verify draft and final documents	Twice – draft and final documents	Design consultants	MOWHS PMU	Part of project management in detailed design (minimal cost)
Consultation meetings; Specific provisions in tender documents on nuisance & problems to public	Pipelines routes, reservoir and pumping station	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)
Consultation meetings; payments to affected people	Pipelines routes, reservoir and pumping stations	Verify meetings documentation; Verify plans and IR payments	After completion of meetings; upon completion of payments	Design consultants	MOWHS PMU	Part of project management in detailed design (minimal cost)
CONSTRUCTION PHASE						
Total area to be exposed; runoff flowing into disturbed sites	Pipelines routes, reservoir and pumping station	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
Water supply interruptions; materials and solid wastes dumped in watercourses	Pipelines 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	Pipelines routes, reservoir and pumping station	Use of sound levels meter	Daily	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Dust, cover of stockpiles, smoke	Pipelines routes, reservoir and	Visual inspection of sites	Daily	Contractor	PIU; Construction supervision	Part of PIU implementation cost

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
belching	pumping station				consultants	and consultant's construction supervision contract
Road closure and traffic rerouting; materials stockpiles; road restoration	Pipelines routes	traffic plans verification	weekly	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
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	Pipelines routes, reservoir and pumping station	Visual inspection of sites	Daily	Contractor	PIU; Construction supervision consultants	Part of PIU implementation cost and consultant's construction supervision contract
Construction wastes	Pipelines routes, reservoir and pumping station	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	Pipelines routes, reservoir and pumping station	Verification of contractor's records	Once a month	Contractor	PIU	No cost
OPERATION PHASE						
E. Coli bacteria; BDWS physical & chemical	Pipelines, reservoirs, and pumping stations,	Water sampling and laboratory test	Monthly for bacteria; annual for physical & chemical	Mun. Engr.	MOWHS	Part of PIU's operation cost (USD300 /year)
Septic tank of water consumers	Subproject water supply service area	Visual inspection of sites	Once a year	Water consumer	Municipality	Minimal cost
Groundwater levels	Wells/ pumping stations	Use of groundwater level meter	Once a month	Mun. Engr.	MOWHS	Minimal cost to MOWHS

Aspects / Parameters to be monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility	Compliance Monitoring Responsibility	Monitoring Cost
Liquid chlorine usage	Water treatment plant	Verification of operation records	Once a year	Mun. Engr.	MOWHS	Minimal cost
Liquid chlorine usage	Pumping stations	Verification of operation records	Once a year	Mun. Engr.	MOWHS	Minimal cost

183. **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 24). 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, water supply system must meet the drinking water standards (2016 BDWQS) for bacteria count (*E. coli*), color, pH, turbidity, dissolved solids, hardness, alkalinity, manganese, iron, fluoride, chloride, sulfates, magnesium, calcium, carbonates, and bicarbonates.

Table 24: Project Performance Monitoring

Desired Outcomes	Aspects / Parameters to be monitored	Means of Monitoring	Frequency	Implementation	Compliance Monitoring	Monitoring Cost
PRE-CONSTRUCTION						
Detailed design is environmentally responsive	EMP requirements incorporated in detailed design	Verify detailed design documents; 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
CONSTRUCTION PHASE						
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
OPERATION PHASE						
Water quality meets drinking water standards	Required drinking water quality parameters	Water sampling and laboratory test	Monthly for bacteria; annual for physical & chemical	Mun. Engr.	MOWHS PMU	Part of PIU's operation cost (USD300 /year)

C. Implementation Arrangement

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

185. **Institutional Setup.** 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 (Trashigang 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.

186. **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 (international consultant to be hired when needed only) whose terms of reference, including the roles and responsibilities, is attached as Appendix 9;
- (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.

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

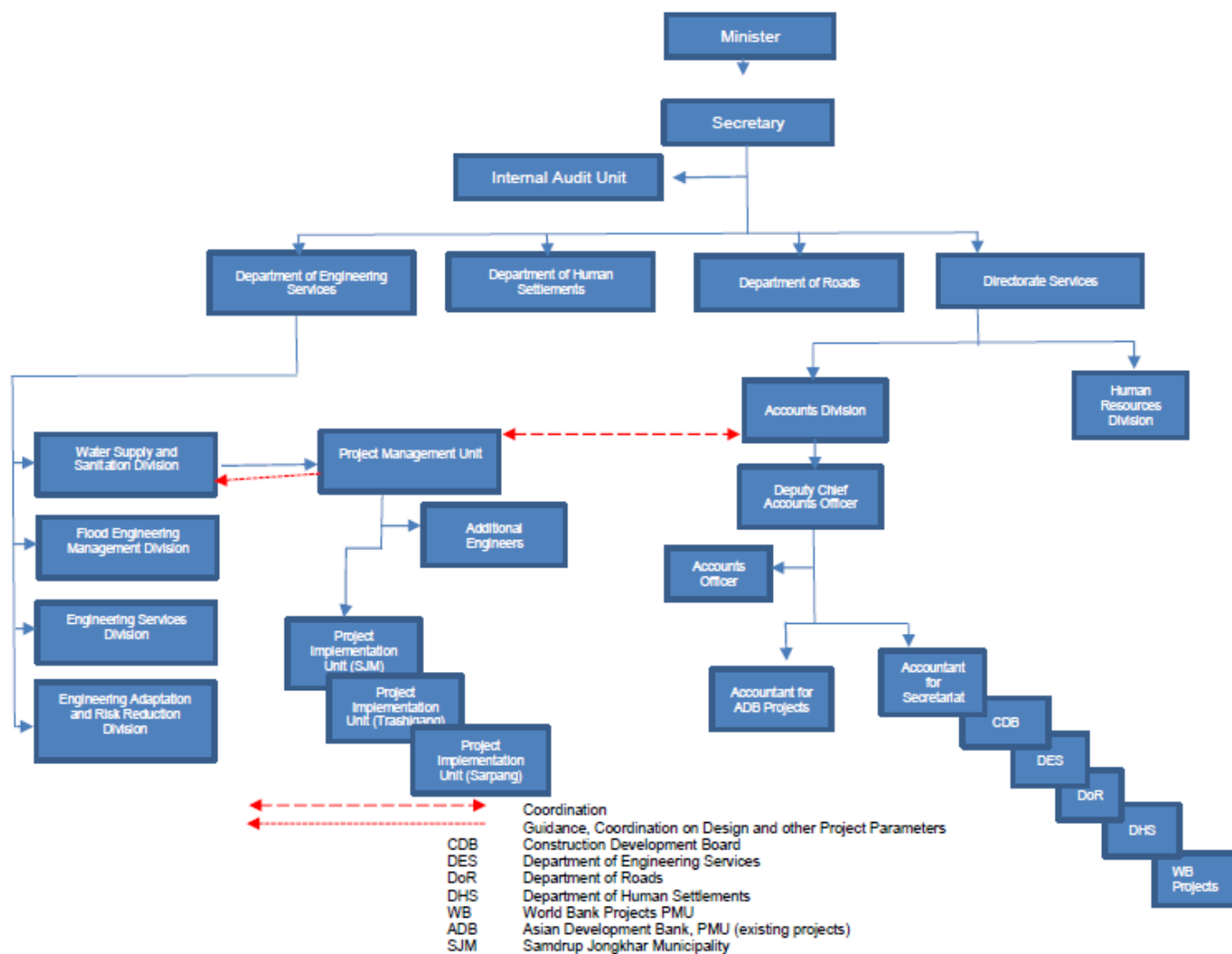
- (i) Coordinate and work with PIU for the conduct of public consultations and day-to-day monitoring of subproject implementation;
- (ii) Lead the conduct of training activities as per capacity development program discussed in this IEE, including the conduct of induction course for contractors covering 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.

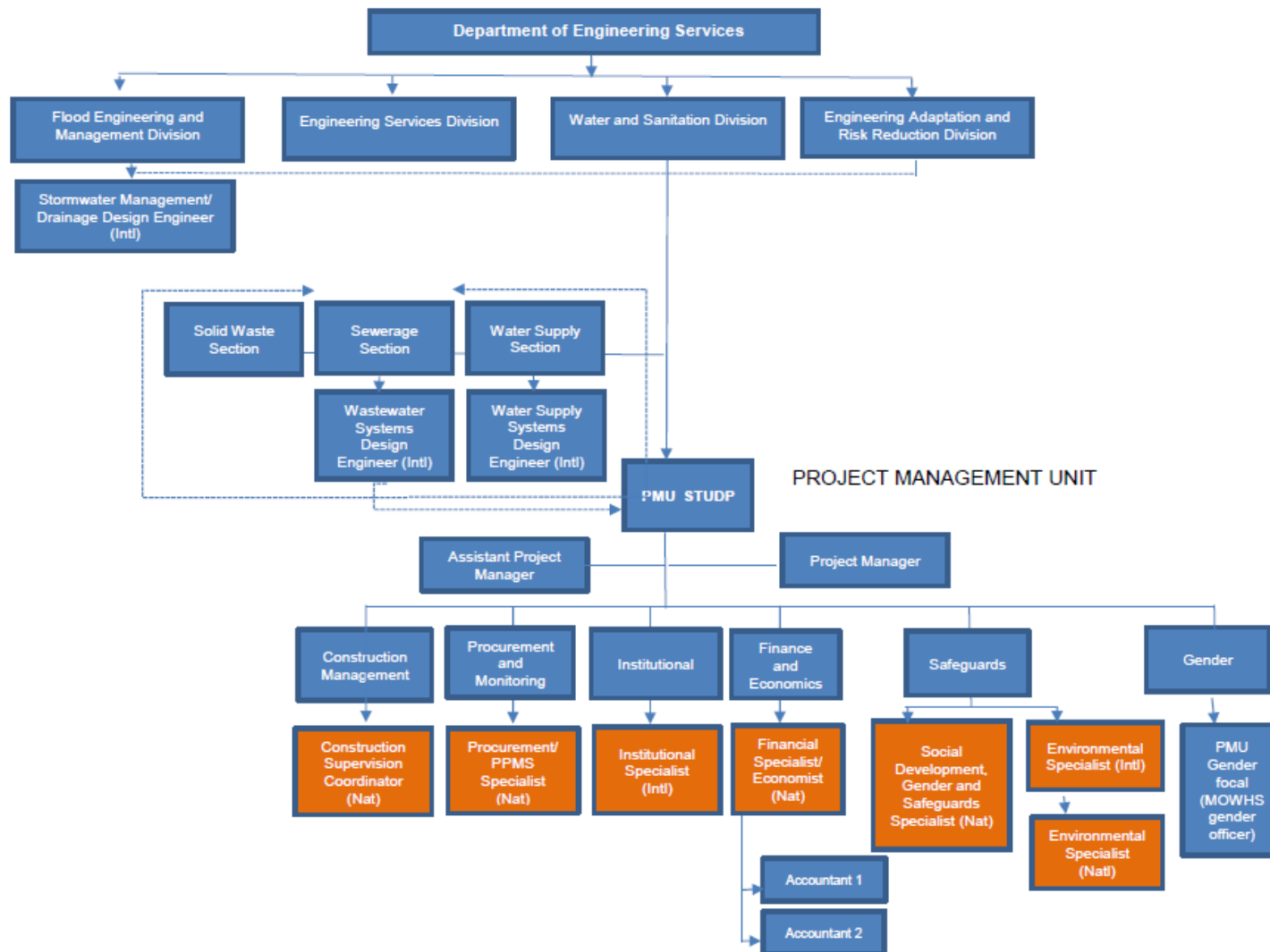
188. **Roles of the PIU (Trashigang thromde) in environmental safeguards:**

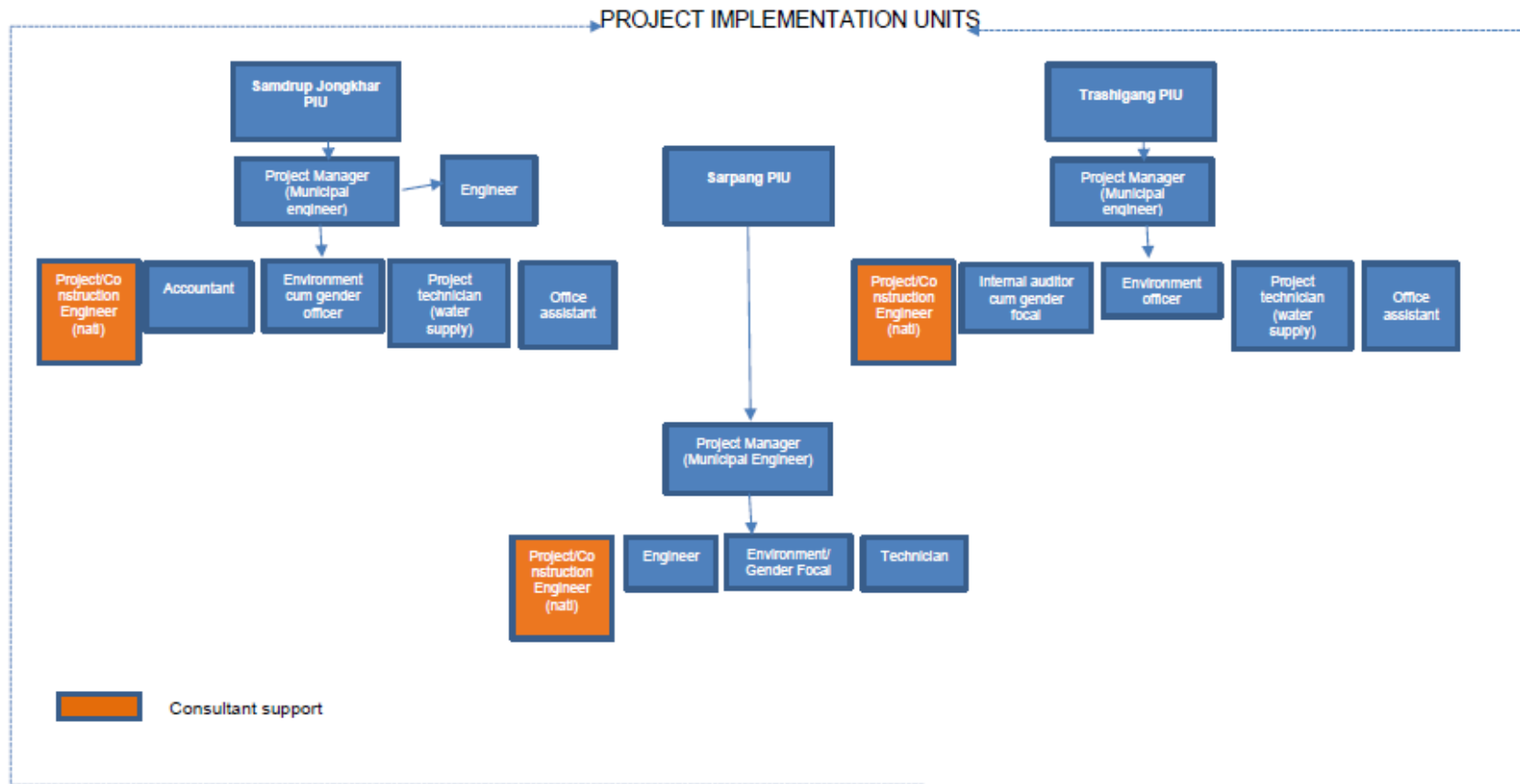
- (i) Oversee the effective implementation of the contractor's EMP (CEMP) by the contractor;
- (ii) Support implementation of the grievance redress mechanism and promptly address the complaints on environmental performance of the subproject during execution of the construction activities;

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

Figure 15: Institutional Setup







189. **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.

190. **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.¹⁵ The template for SEMR is attached as Appendix 10.

191. **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.

192. **Implementation Schedule.** As presented in the project description, the subprojects are scheduled to start in quarter 2 20208 and to be completed by end of 2021. PMU shall ensure that construction contract provisions related to the EMP shall be included in the tendering stage.

193. **Clearances and Permits.** Under present Bhutan regulations, the PIU (Trashigang Municipality) shall apply for an Environmental Certificates from the NECS for the proposed Rangjung intake and WTP rehabilitation subproject.

194. **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 Trashigang Municipality. The cost for periodic

¹⁵ 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".

environmental monitoring activities during construction and operation phases is an annual recurring expense that shall be borne by Trashigang Municipality as well.

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

196. **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 (Trashigang Municipality for this subproject).

D. Capacity Development Program

197. The PMSC 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 program¹⁶ along with the frequency of sessions is presented in **Table 25**.

Table 25: 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	<ul style="list-style-type: none"> • Roles and responsibilities of officials/ contractors/ consultants towards protection of environment • Environmental issues during construction • Implementation of EMP • Monitoring of EMP 	Experiences on EMP implementation – issues and challenges Best practices followed

¹⁶ This is an initial proposal. The Environment Specialist will design the program based on the assessment results.

Items	Pre-construction/prior to construction	Construction	
	environmental assessment report to comply with ADB requirements. Incorporation of EMP into the project design and contracts	implementation • Reporting requirements	
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

198. Sustainable development of Dewathang requires clean and potable water supply system. With the proposed water supply system under STUDP, the capacity to deliver safe drinking water and adequate water pipeline pressure will be provided.

199. The environmental screening process has highlighted the environmental issues and concerns of the proposed Rangjung intake and WTP rehabilitation subproject. The screening identified that the proposed sites are not within undisturbed landscapes because the proposed routes of the pipelines 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 locations of proposed reservoir and tanks are in government owned properties and not near any sensitive area. Hence, the proposed subproject is essentially not a new incursion to an ecologically untouched or protected zone.

200. 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 water supply 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.

201. Therefore, as per ADB SPS, the categorization of Rangjung intake and WTP rehabilitation subproject as Category B for Environment is confirmed. As such, no further environmental impact assessment is required.

202. The proposed water supply 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 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 detailed design and construction phases; (viii) MOWHS shall update this IEE based on final detailed design and on any change in subproject scope, and submit to ADB for review and disclosure; and (ix) MOWHS shall include water source protection measures in the water safety planning process.

Rapid Environmental Assessment (REA) Checklist - Trashigang

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:

Water Supply for Rangjung and Trashigang

Screening Questions	Yes	No	Remarks
A. PROJECT SITING 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		√	

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> SPECIAL AREA FOR PROTECTING BIODIVERSITY 		√	
<ul style="list-style-type: none"> BAY 		√	
B. POTENTIAL ENVIRONMENTAL IMPACTS Will the Project cause...			
<ul style="list-style-type: none"> pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff? 		√	Sakten Pasture land in the upstream source
<ul style="list-style-type: none"> impairment of historical/cultural monuments/areas and loss/damage to these sites? 		√	
<ul style="list-style-type: none"> hazard of land subsidence caused by excessive ground water pumping? 		√	
<ul style="list-style-type: none"> social conflicts arising from displacement of communities ? 		√	
<ul style="list-style-type: none"> conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters? 		√	
<ul style="list-style-type: none"> unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)? 		√	
<ul style="list-style-type: none"> delivery of unsafe water to distribution system? 		√	
<ul style="list-style-type: none"> inadequate protection of intake works or wells, leading to pollution of water supply? 	√		Intake located in narrow and steep in situ bed rock for Rangjung
<ul style="list-style-type: none"> over pumping of ground water, leading to salinization and ground subsidence? 		√	
<ul style="list-style-type: none"> excessive algal growth in storage reservoir? 		√	
<ul style="list-style-type: none"> increase in production of sewage beyond capabilities of community facilities? 		√	
<ul style="list-style-type: none"> Inadequate disposal of sludge from water treatment plants? 	√		Minimal
<ul style="list-style-type: none"> Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities? 		√	
<ul style="list-style-type: none"> Impairments associated with transmission lines and access roads? 		√	

Screening Questions	Yes	No	Remarks
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	
▪ Health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		√	
▪ dislocation or involuntary resettlement of people?		√	
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
▪ noise and dust from construction activities?	√		Temporary
▪ increased road traffic due to interference of construction activities?		√	Minimal
▪ continuing soil erosion/silt runoff from construction operations?		√	
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		√	Augmentation of WWTP proposed in the project for proper water treatment .
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	
▪ accidental leakage of chlorine gas?		√	
▪ excessive abstraction of water affecting downstream water users?		√	
▪ competing uses of water?		√	
▪ increased sewage flow due to increased water supply		√	
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		√	
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	

Screening Questions	Yes	No	Remarks
▪ social conflicts if workers from other regions or countries are hired?		√	Labour & Immigration regulation in place & shall be addressed in EMP
▪ 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 operation and construction?		√	
▪ 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?		√	

A Checklist for Preliminary Climate Risk Screening - Trashigang

Country/Project Title: ADB PPTA-8551 Bhutan

Sector : Trashigang and Rangjung Thromdes

Subsector: Water supply rehabilitation for Rangjung and network augmentation for Trashigang

Division/Department: Trashigang Municipality

Screening Questions		Score	Remarks ^a
Location and Design of project	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	Needs to be considered in the design
Materials and Maintenance	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) ?	1	Accounted for in O&M systems
Performance of project outputs	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	

^a 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

Other Comments:

Prepared by: _Jas B Basnet and ChhimiD

Minutes of the Public Consultation for Social and Environment Safeguards and Assessment in Rangjung

DOCUMENTATION OF PUBLIC CONSULTATION HELD ON March 03, 2017 Town Conference Hall, Rangjung Gewog, Trashigang, Bhutan

List of Participants Stakeholders/Participants

- Members of the community as per list attached as Appendix 18. Total of 54, participants from the public including Consultants were present at the meeting.
- Pema Dechen, Municipal Engineer
- Consultants from PRCS/Lahmeyer.

Agenda

2:00 –2:30 A.M	Registration	Secretariat
2:30–2: 45 A.M	Welcome Address	Pema Dechen, Municipal Engineer
2:45–3:00 A.M	Introduction of Participants	Sangay Wangdi, Social Assistant
3:00–3: 20 A.M	Presentation of Proposed Sub-Projects at Rangjung under Trashigang	Pema Dechen, Municipal Engineer, Trashigang
3:20–4:00 A.M	Open Forum	Kapil Pradhan, Rajesh Pradhan, Chhimi Dorji and others
4:00–4: 15 A.M	Thank you	Pema Dechen, Municipal Engineer, Trashigang
4: 15–4:30 A.M	Closing Remarks and Tea and Snacks	Pema Dechen, Municipal Engineer, Trashigang

Brief Minutes of the Public Consultation

Opening/ Presentation:

The public consultation/meeting started at 2: 30 PM. Ms. Pema Dechen, Municipal Engineer (ME) welcomed the participants and thanked them for their positive response and attending the meeting.

The Municipal Engineer (ME) presented the detailed aspects of the proposed and the current status of the Project at Rangjung. She highlighted that the Project will not affect any private assets.

The Social consultation team also thanked the participants and introduced the team members. The participants were briefly apprised of the project's possible social and environmental impacts.

Comments, Views, Issues and Concerns:

- Most participants were aware of the Project and mentioned that they are in complete support of Project. The Project site had been visited by both the Social and Environment team members in order to ascertain that the Project will not have an adverse impact both socially and environmentally.

- Members of the community present also provided their support and commitment to the Project and raised no negative issue with the proposed Project except with conditions that there should not be main trunk main alignment change. If in case the alignment change is anticipated then the private land owners may not accept disturbances to their land. It was agreed that the alignment shall be further studied and the best alignment will be finalized during the detail design phase.
- It was also confirmed that the site identified for the Project was government-owned and as a result no private land and assets are affected. However, the participants are little reluctant if the pipe layout will pass through different locations which may result in little dispute as the land owners may not accept their land being disturbed.
- Further, consultants asked the following questions and discussions transpired as below.

Name / Organization	Question	Response
Consultants	Does the local person support the proposed Project?	All participants pledged to give their full support for the said Project for everybody's welfare.
Consultants	Any critical issue or concern by the local people regarding the Project?	No critical issues were reported except for the land near the water source being used for grazing and temporary settlement which might cause contamination.
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)?	We are happy to collaborate and contribute.
Consultants	Any Cultural or Sacred sites in the proposed site?	none
Consultants	Any other issues?	1. Jamphel (Tshogpa) explained that the most common concern amongst the people was insufficient quantity of water. 2. VTI Principal enquired about the type of WTP and also expressed the need for more water for the Institute with the possibility of expansion of the institute with additional 500 trainees & 50 faculty during the 12 th FYP

Rangjung Public Clearance

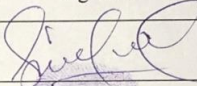

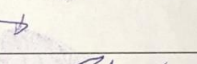
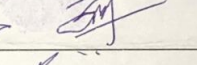

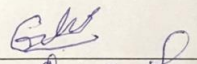
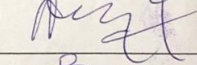
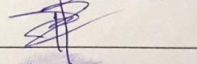
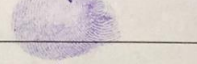
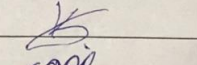
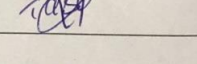
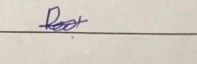
NO OBJECTION FROM THE PUBLIC (SOCIAL CLEARANCE)

This is based on our experience and presence in the public consultation held on
Rangjung, T/gay

We certify that the undersigned are fully aware and clearly understood the implications of the proposed Project at Samtse, of the Samtse Dzongkhag Administration, and Ministry of Works and Human Settlements.

Hence, we the following certify that there are no objections whatsoever to the undertaking of the said project and the public are in favor of the proposed project.

Done in Rangjung, T/gay....., this day: 03/03/2017.

Printed Name	Position/Office	Signature
Jam Pel	Bazar Tshogpa	
Wangdi	Tshogpa	
Phuntsho Dorji	Public	
Tobgay	"	
Phub Dorji	"	
Gagay	"	
Singay Dorji, Bazar Rangjung	"	
Phuntsho Sr	Medicinal	
Dorji Lhamo	Public	
Chodun	"	
Tabri Lhamo	Shopkeeper	
Dechen	"	

List of Participants to the Rangjung Public Consultation

Public Consultation for Social and Environment Safeguards and Assessment.

	PRINTED NAME	SEX F/M	AGE	VILLAGE/ ORGANIZATION/FIRM & DESIGNATION	CONTACT NUMBER/S & EMAIL ADDRESS	SIGNATURE/ THUMB PRINT
11	Ugyen Norbu	M	36	"	17684086	
12	Wangdi	M	70	"	17848699	
13	Kintey Rabgy	M	31	"	17076783	
14	Wangmo	F	56	"	—	
15	Kinzang dema	F	33	"	—	
16	Dorji Thaw	F	39	"	17791223	
17	Karma Chodung	F	43	"	17668485	
18	Dechen Pem	F	52	"	17614888	
19	Tshering	F	37	"	17701432	
20	Thukten Lamo	F	30	"	17525529	
21	Tshering choden	F	33	"	17595263	
22	Kezang dema	F	34	"	17461180	
23	Pema	F	50	"	—	

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Public Consultation for Social and Environment Safeguards and Assessment.

	PRINTED NAME	SEX F/M	AGE	VILLAGE/ ORGANIZATION/FIRM & DESIGNATION	CONTACT NUMBER/S & EMAIL ADDRESS	SIGNATURE/ THUMB PRINT
24	Dechen	F	39	Rangjung, Shopkeeper	16461202	
25	Cheki Lhamo	F	38	"	16461130	
26	Tashi Lhamo	F	32	"	17846576	
27	Dendup Dema	F	34	managme	16911169	
28	Pema Dema	F	37	shopkeeper	16461168	
29	Malam	F	61	"	16461134	
30	Sing Sing	F	37	"	17694661	
31	Pema Yangzom	F	29	"	17302350	
32	Nidup Zangmo	F	33	"	17992425	
33	Tashi Choden	F	20	"	17365209	
34	Cheki Lhamo	F	18	"	17313362	
35	Karma Thintey	M	29	shopkeeper	17480038	
36	Yasli Norbu	M	25	"	17546957	

Page 3 of 4

Public Consultation for Social and Environment Safeguards and Assessment.

	PRINTED NAME	SEX F/M	AGE	VILLAGE/ ORGANIZATION/FIRM & DESIGNATION	CONTACT NUMBER/S & EMAIL ADDRESS	SIGNATURE/ THUMB PRINT
37	Tshering Lhamo	F	58	Rangjung	1 -	
38	Uosku Zangmo	F	50	"	17394138	
39	Yeshi Wangmo	F	49	Rangjung Shopkeeper	17697527	
40	Penden	M	70	Rangjung	-	
41	Yeshi Choden	F	53	Rangjung Shopkeeper	01561142	
42	Seram	F	52	Rangjung	17558549	
43	Kiba	F	53	"	-	
44	Pama Tshering	M	39	Rangjung Shopkeeper	17288322	
45	Dechen Lhamo	F	32	Municipal	17668714	
46	Yeshi Choden	F	37	"	17913990	
47	Kelzang Benen	F	31	"	17716845	
48	Seti Yuden	F	26	Rangjung Shopkeeper	171319732	

Page 4 of 4

Public Consultation for Social and Environment Safeguards and Assessment.

	PRINTED NAME	SEX F/M	AGE	VILLAGE/ ORGANIZATION/FIRM & DESIGNATION	CONTACT NUMBER/S & EMAIL ADDRESS	SIGNATURE/ THUMB PRINT
49	Loyich Pradhan	M	51	ADB-7A-055T	17603661 rajpradhan2005@pr.	
50	Sangnyawangli	M	52	- do -	2522345 sangnyawangli217@gmail.com	
51	Babi Pradhan	M	24	- do -	17922910 babipradhan215@gmail.com	
52	Kapil Pradhan	M	38	- do -	17117171	
53	JB Basnet	M	58	- do -	basnet1959@gmail.com 17615808	
54	Chhinvi Dorji	M	34	- do -	17556306	
44						
45						
46						
47						
48						

Page 4 of 4

Photograph of Rangjung, Trashigang Public Consultation



Grievance Redress Mechanism and Grievance Redress Committee Notification



དཔལ་ལྷན་འབྲུག་གཞུང་། རྒྱལ་ཁོག་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-8551/8 195

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 13th November to 17th 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:

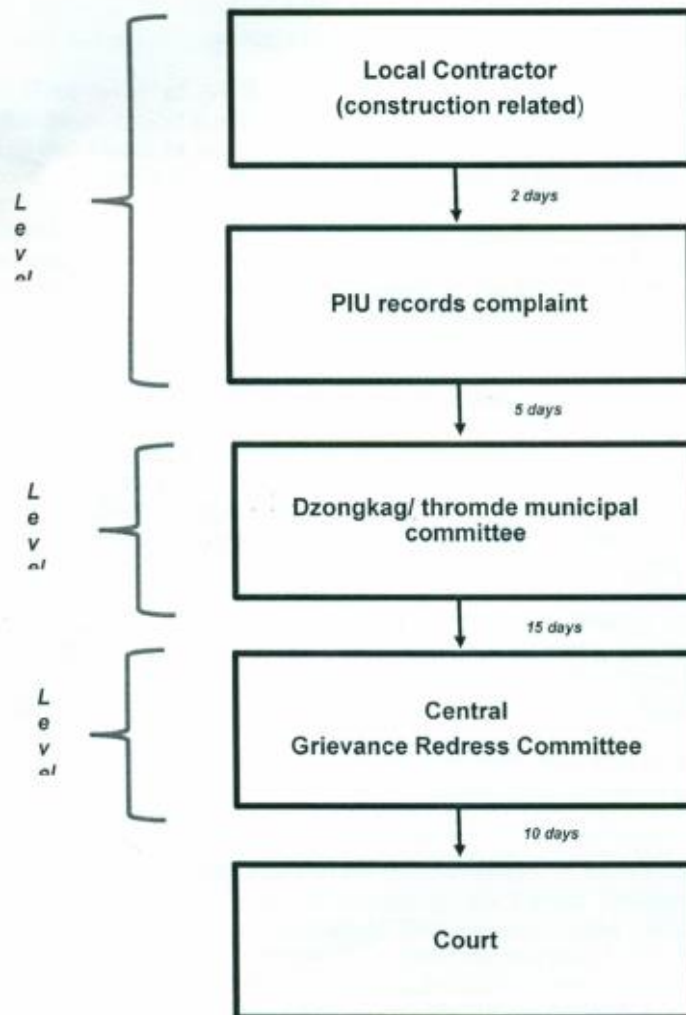


Figure 1: Grievance Redress Mechanism, STUDP

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. **2nd 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; (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. **3rd 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)/ thompon (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.

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

FOR OFFICIAL USE ONLY

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

Terms of Reference for Environmental Specialists to support Project Management Unit and Project Implementation Units

Environmental Specialist (International) ¹

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 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; and

¹ Will be engaged if required.

- (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, 14 person-months)

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. S/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 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); conduct regular site visits to monitor compliance to EMP provisions including adherence to occupational health and safety provisions and core labor standards;
- (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, 2009, 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, briefing them on preparation of site specific EMP and its' implementation, environmental monitoring requirements related to mitigation measures, and taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during 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 environmental impacts are adequately mitigated by the concerned parties;
- (xiii) Assist in reviewing compliance reports by contractors and submit regular environmental monitoring reports to the PMU Project Manager 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

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

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

- Overall project and sub-project progress and status
- 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/Completed/O&M) ^a	If On-going Construction	
				%Physical Progress	Expected Completion Date

^a If ongoing construction, include % of physical progress and expected date of completion.

Compliance status with National/State/Local statutory environmental requirements^a

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

^a 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.

^b Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

^c Specify if obtained, submitted and awaiting approval, application not yet submitted

^d Example: 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 IEEs)

- 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)		

- 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

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

Summary of Environmental Monitoring Activities (for the Reporting Period)¹

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
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

¹ 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:
 - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
 - Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
 - 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;
 - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
 - Confirm spill kits on site and site procedure for handling emergencies.
 - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
 - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
 - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
 - Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
 - 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 µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA _{eq} (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