Initial Environmental Examination

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Bhutan: Inclusive and Resilient Urban Development Project

Output 1: Inclusive and Resilient Urban Infrastructure in Ammochhu Local Area Plan Improved

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CURRENCY EQUIVALENTS

(as of 18 February 2026)

Currency unit	–	Bhutanese Ngultrum (Nu.)
Nu.1.00	=	$ 0.011
$1.00	=	Nu.90.54

ABBREVIATIONS

ADB	-	Asian Development Bank
BARHKH	-	Building Adaptation and Resilience in the Hindu Kush Himalayas
BBR	-	Bhutan Building Regulation
BOQ	-	bill of quantities
DDMC	-	Dzongkhag Disaster Management Committee
DECC	-	Department of Environment and Climate Change
DOFPS	-	Department of Forest and Park Services
EA	-	executing agency
EC	-	environmental clearance
EHS	-	environmental health and safety
EIA	-	environmental impact assessment
EMP	-	environmental management plan
EMR	-	Environmental Monitoring Report
FNCA	-	Forest and Nature Conservation Act
FNCR	-	Forest and Nature Conservation Rules
FYP	-	five-year plan
GI	-	Galvanized iron
GRC	-	Grievance Redress Committee
GRM	-	grievance redress mechanism
HDPE	-	High density polyethylene
IEE	-	Initial Environmental Examination
IFC	-	International Finance Corporation
KBA	-	Key biodiversity area
LDOF	-	Landslide dam outburst floods
LED	-	Light emitting diode
MoIT	-	Ministry of Infrastructure and Transport
MoWHS	-	Ministry of Works and Human Settlement
NEC	-	National Environment Commission
NEPA	-	National Environment Protection Act
OHS	-	occupational health and safety
PAVA	-	Property Assessment and Evaluation Agency
PCR	-	Phuentsholing-Chamkuna Road
PMU	-	project management unit
PPE	-	personal protective equipment
PSP	-	Phuentsholing Structural Plan
PTD	-	Phuentsholing Township Development Project
RCC	-	Reinforced cement concrete
REA	-	rapid environmental assessment
RECOP	-	Regulation for Environmental Clearance of Projects
RGOB	-	Royal Government of Bhutan
SEMP	-	Site-specific Environmental Management Plan
SPS	-	safeguard policy statement

SRFL	-	State reserve forest land
STP	-	Sewage Treatment Plant
UNDP	-	United Nations Development Programme
WHO	-	World Health Organization

WEIGHTS AND MEASURES

km	-	kilometer
m	-	meter
km^2	-	square kilometer
m^2	-	square meter

NOTE

In this report, "$" refers to United States dollar.

Dzongkha Terms

Dzongkha Term	Translation
Chhu	River/Water
Chiwog	Sub-Block (Basic Electoral Precinct)
Dungkhag	Sub-District
Dzong	Fortress (Administrative Centers of each Dzongkhag)
Dzongkhag	District
Gewog	Administrative Block
Goenpa	Monastery
Lhakhang	Temple
Dungkhor	Blessed Spinning Prayer Wheel
Shedra	Monastic School
Thromde	Second Level Administrative Division /Municipal
Tsachu	Hot Spring
Tshogpa	Community Representative
Thuemi	Representative of the local community

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EXECUTIVE SUMMARY

The proposed ADB funded Inclusive and Resilient Urban Development Project (IRUDP) project is aligned with the following impact: inclusive, resilient, and sustainable human settlement promoted (Bhutan National Human Settlement Strategy 2017 and National Human Settlement Policy of Bhutan 2019). This project is in continuation of ongoing ADB funded by Green and Resilient Housing Sector Project (GRAHSP) implemented by the National Housing Development Corporation Limited (NHDCL). The proposed IRUDP will have the following outcome: municipal services in Phuentsholing, and affordable housing for low-income and vulnerable groups in Thimphu and Phuentsholing enhanced. The Ministry of Finance is the executing agency (EA). Project will include the following three outputs:

(i) **Output 1: Inclusive and resilient urban infrastructure in Ammochhu Local Area Plan improved** (Essential municipal infrastructure and services in Ammochhu Local Area Plan (LAP) will be newly constructed and upgraded to enhance Phuentsholing's livability, service delivery, and climate resilience. The output will be implemented by Phuentsholing Thromde).

(ii) **Output 2: Adequate, affordable, and resilient housing units constructed and allotted for low-income households** (Affordable and climate-resilient housing units will be constructed to improve access to safe and adequate housing for low-income and vulnerable households in Thimphu and Phuentsholing. The output will be implemented by NHDCL. The housing component will be financed through a $3 million grant from the Japan Fund for Prosperous and Resilient Asia and the Pacific. JFPR).[1]

(iii) **Output 3: Urban policies and planning, regulatory frameworks, and governance mechanisms strengthened** (Targeted technical assistance (TA) will strengthen urban policies, regulatory frameworks, and governance mechanisms of Phuentsholing Thromde, Dungkhag Administration, NHDCL, and other relevant agencies).

Scope of the Project. This draft IEE covers activities under Output 1. The project site, Ammochhu LAP, is spread over an area of 99 acre (~40 hectares) in the northern part of the Town, with Damdara hill to its east and Phuentsholing–Chakuna Road on the west. The site is gently sloping from east to west, towards Ammochhu River. Phuentsholing Thromde planned Ammochhu LAP in 2014 and it was approved by the National Commission on Human Settlements in 2019. This LAP forms part of the Phuentsholing structure plan (2013-28), and about 64% of LAP falls within the Urban Village 1 (UV-1) precinct, designated for high- and medium-density mixed-use development, and about 5% in green and open spaces. Ammochhu LAP is part of the Phuentsholing structure plan of Phuentsholing town, which includes 12 LAPs and Thromde core area. Under this subproject, essential municipal infrastructure, and services in Ammochhu LAP will be newly constructed. The updated infrastructure is consistent with the Phuentsholing Structure Plan and the Ammochhu LAP's long-term development framework. It is aimed at supporting Phuentsholing's long-term population horizon of about 80,000 by the year 2037.[2] Key infrastructure components include:

(i) **Stormwater Drainage**. RCC drains (Major Secondary and Small Roadside types) with manholes every 5 meters, placed beneath footpaths and along key avenues, connected to eight PCR outfalls;

[1] JFPR is a possible funding source subject to the approval of the Government of Japan.
[2] Current population in Ammochhu Local Area Plan is approximately 1,500.

(ii) **Water Distribution Network**. Gridiron network of GI pipes (100mm/150mm) for continuous supply, featuring fire hydrants and consumer connections via HDPE sleeves, routed within utility ducts or next to storm drains;
(iii) **Sewer System**. HDPE gravity flow pipes (160mm–315mm) and 450mm RCC Hume pipes under outfalls, connecting manholes to a main sewer trunk along Western Avenue leading to the Phuentsholing Township Development Project (PTDP) system;
(iv) **Service Utility Duct**. RCC duct (1.2m x 1.2m) for underground electric and telecom cables, with manholes every 15 meters, positioned throughout the main avenues;
(v) **Road Works**. Construction of 7.96 km of roads (R-1 to R-15), using mostly flexible bituminous pavement; Central Avenue features a cobblestone surface, with varying rights of way for different road types;
(vi) **Street Lighting**. 8m steel octagonal poles with 90W LED lights on standard roads; 3.5m decorative poles with 60W lamps on Central Avenue;
(vii) **Footpaths**. Roadside footpaths (3.4m wide on Central/Eastern, 3m on Western Avenue), designed to accommodate drains and ducts underneath where space allows;
(viii) **Embankment Wall**. RCC cantilever/retaining walls at PCR outfalls, especially at Outfalls 3 and 5 and along trapezoidal sections, to support embankments where space is limited and
(ix) **Culverts**. Twenty-two major crossings designed as U-shape box culverts or with thicker slabs, enabling future road works without dismantling outfalls.

Categorization. Based on ADB's rapid environmental assessment (REA) checklist for urban development, the project is unlikely to generate environmentally significant adverse impacts for three reasons: the project is located in the core of the Thromde and is surrounded by settlement on both sides, it is not located near any protected or critical or natural terrestrial habitat, and most impacts identified have been found to be predictable, manageable and temporary. Consequently, the project has been classified as Category B per ADB Safeguard Policy Statement (SPS), 2009, and this IEE has been prepared to meet the requirements for Category B projects. Per national requirements Phuentsholing Thromde shall obtain environmental clearance from Department of Environment and Climate Change (DECC).

Description of the Environment. Project site, Ammochhu LAP, is spread over an area of 99 acre (~40 hectares) in the northern part of the Town, with Damdara hill to its east and Phuentsholing–Chamkuna Road on the west. The site is gently sloping from east to west, towards Ammochhu River. Slope is comparatively steeper toward the hillside. PTDP site abuts Ammochhu River and PCR separated PTDP and Ammochhu LAP. Land use of the site is urban. There are no environmentally or culturally sensitive areas within or adjacent to the project site. Damdara hill is covered with thick vegetation and trees; however, this is not a forest area, and wildlife is limited. The project does not encroach into the hilly area. Though there is no proper infrastructure like paved roads, there are few residential and commercial buildings. Several engineering and repair workshops, material stockyards, operate temporarily, which will be shifted out to designated areas as there is no industrial land use in the LAP. Tree cover within the project area is sparse; however, a small number of trees will need to be removed along eastern edge of the proposed road.

Assessment of Environmental Impacts and Proposed Mitigation Measures. The IEE has been prepared based on review of detailed project reports and relevant national legislation, understanding of project design, site visits to understand baseline conditions, review of secondary literature, and consultations with the implementing agency. Public consultation reports and data

on baseline environmental parameters such as air, water, and noise, and available permits were also reviewed.

Phuentsholing is prone to landslides and flooding. The planned development incorporates protective measures (e.g., PTDP embankment and river training works for fluvial flooding from the Ammochhu River), Phuentsholing will continue to face a range of hazards under present and future climatic conditions. Ammochhu LAP situated in the foothills of Damdara hill is also vulnerable, especially to flooding, debris flow induced by landslides in the upper hills. There are various outflow drainage channels that traverse Ammochhu LAP, and the PTDP and discharge into Ammochhu River. Outfalls carry debris and sediment and pose risk to drainage channels and flooding of the surrounding areas. Accordingly, IRUDP will apply a risk-informed approach to planning, design and implementation to avoid increasing existing vulnerabilities, creating new risks through maladaptation, or locking-in development in high-risk areas. This will include integrating climate change allowances and appropriate safety margins into relevant infrastructure designs, and strengthening non-structural measures (e.g., land-use controls and development sequencing under the Ammochhu LAP, risk communication, and preparedness and response arrangements, to manage residual risk over the asset life. Flood risk considerations have been incorporated into the land preparation and infrastructure development plans for the LAP. Under the subproject, the outfall channels have been designed with improved sections, sediment, or debris traps, supported by retaining walls to withstand the anticipated flows.

To comprehensively address Phuentsholing vulnerabilities and risks posed by slope instability, landslides, floods, debris flows, and landslide dam outburst floods (LDOFs), two studies (geohazard study part of a United Nations Development Program (UNDP) funded program and Building Adaptation and Resilience in Hindu Kush Himalayas (BARHKH) under an ADB technical assistance, TA) are underway in Phuentsholing. These studies also cover vulnerable areas above the Ammochhu LAP. To address any residual risks, it is important that findings and recommendations of these studies are duly considered, integrated into Ammochhu LAP development, and implemented. Detailed designs shall be reviewed, including climate change allowances and safety margins, validated, and/or updated accordingly. Phuentsholing Thromde shall ensure that any recommendations and additional works in the studies to improve the slope stability and minimize debris flow, which are beyond the scope of the subproject, shall be carefully identified, and an implementation plan drawn up with funding sources. This shall be firmed up prior to bidding for Ammochhu LAP infrastructure. Consultations with Ammochhu LAP, and other stakeholders from PTDP, Phuentsholing core town and other LAPs shall be continued, feedback if any shall be considered in finalizing the designs and implementation. Measures to manage residual risks to residents and assets from failure of flood and other hazard defenses such as strict land use zoning, development controls and enforcement, extended range hazard early warning systems (HEWS), raised public awareness of risks and responses through drills and emergency preparedness, and evacuation routes to shelters and training shall be incorporated into Ammochchu LAP.

As with all infrastructure projects, there are potential risks and impacts associated with construction. There are risks associated with worker recruitment and labor management such as discrimination, forced or child labor, and work-related issues. Contractors will need to provision workers with adequate facilities in terms of accommodation, drinking water, electricity, and sanitation. This means that land will need to be leased to build worker camps and site offices and to store materials. Project activities will entail working on steep slopes, and workers will be exposed to weather conditions, machines, equipment or long hours resulting in Occupational Health and Safety concerns.

In addition to raw materials for construction, contractors will need to source water and electricity. Excavation, infrastructure work, and material transportation will generate noise, dust, and air emissions during the construction phase. The influx of workers to the project sites may result in social conflicts, and there are potential risks of disease transmission, especially if workers are not screened beforehand. There is also the risk of unintentional damage to utilities, water supply lines, and existing public infrastructure such as footpaths during the process of excavation. Excavated trenches can pose a risk to the community, and passersby and improperly managed waste can result in illness and disease. Several measures to minimize impacts on community health and safety have been proposed at the work site and for workers to follow, from physical measures such as installation of barricades to briefing and training workers.

There are no environmentally or culturally sensitive areas that will be impacted by the project. Project will require removal of 12 trees, of local species. Permission will be obtained, and compensatory tree plantation will be carried out. Construction activities can result in disruption of utilities and services, and the project will be required to provide prior information and restoration of services.

The operation phase will have certain risks and impacts primarily related to the maintenance or repair of infrastructures. These include occupational health and safety concerns for maintenance personnel, the potential for unexpected natural disasters, and infrastructure damage resulting from nearby private construction activities. To address these challenges, it is essential to allocate sufficient budget for operations and maintenance, implement robust occupational health and safety (OHS) protocols as indicated in the EMP, and strengthen coordination and rapid response during emergencies. Additionally, clear guidelines will be developed for both private landowners and government agencies to follow, aiming to minimize the risk of damage to the newly built infrastructure.

Provision of infrastructure in LAP will lead to an increase in population and increase the load on municipal services. The existing systems, together with PTDP infrastructure, will be adequate to meet the demand. Ammochhu LAP is part of the Phuentsholing structure plan, therefore this is envisaged development, and Thromde will expand the services and increase the capacities gradually as the demand grows. Phuentsholing Thromde shall formulate and implement infrastructure augmentation plans, especially for water supply, sewerage, and solid waste management, considering overall population growth, demand for services and available supply levels, as per Phuentsholing structure plan.

Information Disclosure and Consultation. The Project has undertaken meaningful consultations during the project preparatory stage. Stakeholder consultation meetings were conducted in November and December 2025, in which local community, representatives, and project staff participated. Project-related information, potential impacts, and mitigation measures were explained to the participants. Participants supported the project, and expressed few concerns related to construction disturbances. Project team provided the proposed mitigations measures, EMP implementation, availability of grievance redress mechanism (GRM) to receive and redress any project related grievances. Stakeholder engagement will be a continuing activity of the PMU throughout Project implementation.

Grievance Redress Mechanism. The Project will adopt a GRM that shall be set up to register grievances of the people regarding technical, social, and environmental aspects. The process will be designed to be transparent, gender responsive, culturally appropriate, and commensurate to the risks and adverse impacts of the Project, as well as readily accessible to all segments of the affected people. The Project GRM will not supersede any legal government grievance

procedures. Affected people are to be informed about the mechanism through media and public outlets. This participatory process shall ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process.

Safeguards Implementation Arrangements. Phuentsholing Thromde will establish a Project Management Unit (PMU) led by a Project Director. The Environmental Officer of the Phuentsholing Thromde will support the PMU in environmental safeguards. The Environmental Officer will be supported by site engineers, who will also oversee implementation of environmental management plans. The PMU will have responsibility for overseeing subproject management, including overseeing EMP implementation. Contractor will include an environmental, health and safety (EHS) supervisor. EMP will be included in the bids for implementation. The Contractor will obtain all other statutory clearances prior to commencement of civil works, prepare and implement a site-specific SEMP based on the EMP of this IEE.

Monitoring and Reporting. The PMU will be responsible for monitoring and reporting. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PMU. PMU will monitor the implementation, ensure compliance, and will submit semi-annual environmental monitoring reports (EMR) to ADB, which will be disclosed on ADB and Phuentsholing Thromde websites.

Conclusion and Recommendation. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009). To comply with the national regulations, Phuentsholing Thromde will submit the IEE/EIA to DECC and obtain environmental clearance prior to invitation of bids. Phuentsholing Thromde must obtain all other necessary statutory clearances, permits and approvals, prior to bidding or start of construction as applicable. Following recommendations shall be applicable:

(i) Review, validate, and/or update the subproject designs with the findings and recommendations of the UNDP and Building Adaptation and Resilience in the Hindu Kush Himalayas (BARHKH) studies upon completion;
(ii) Plan for implementation of additional measures, if any, beyond the scope of IRUDP, recommended by the studies to improve slope stability, reduce risks of landslides, debris flows, and LDOFs incidents affecting Ammochhu LAP, and prepare implementation plan including identifying funding sources;
(iii) Conduct / continue public consultations with Ammochhu LAP and wider stakeholders on Ammochhu LAP design, risk mitigation studies and measures;
(iv) Update IEE to reflect final updated / validated designs and submit to ADB for review and disclosure, prior to invitation of bids; the approved updated IEE shall be attached to the bid and contract documents;
(v) Obtain environmental clearance from DECC, prior to invitation of bids;
(vi) No work can commence until (a) updated IEE, if needed, is approved by ADB is provided to the Contractor, and (b) the SEMP prepared by the Contractor is approved by PMU or PMU; and
(vii) In the event of any design change during subproject implementation period, the IEE shall be updated to include assessment of impacts due to the design change, any corrective actions, associated cost, and revised schedule.

I. INTRODUCTION

A. Background

1. Phuentsholing, located on Bhutan's southwestern border with India and adjacent to the Ammochhu River, is the country's second largest city and economic capital and primary trading hub. It faces significant urbanization pressure. The government aims to transform Phuentsholing into an economically vibrant, ecologically sustainable, and energy-efficient center, fostering economic diversification, employment, and income generation. Rapid urban expansion, unplanned extensions of residential and commercial establishments, and repeated natural hazard events—especially flooding and landslides—have highlighted critical infrastructure gaps that must be addressed to ensure safety, resilience, and sustainable urban development. The city faces critical challenges. A growing population and limited physical area have created an acute shortage of land for development and expansion. The western edge of the city is vulnerable to the Ammochhu River flow, that has caused significant erosion, sedimentation, and land loss, threatened the sustainability, and restricted the growth potential of the city's economy.

2. While Phuentsholing Township Development Project's (PTDP) reclamation of the 100-year floodplain has reduced flood risks, vulnerabilities persist, including landslides, poor drainage, and inadequate protective infrastructure. Situated adjacent to the PTDP, the Ammochhu Local Area Plan (LAP), formulated in 2014 over 99-acre (about 40 hectares) land, represents a critical growth zone adjacent to the Phuentsholing Township Development Project. The Ammochhu area, which is the most economically active zone of Phuentsholing Thromde, lacks several essential urban services and climate-resilient infrastructure systems. Rapid population growth in the Ammochhu LAP, accelerated by allocations of National Housing Development Corporation Limited housing units and upcoming land sales under the Phuentsholing Township Development Project's, is expected to intensify densification of urban development. The city's population is projected to grow from approximately 30,000 in 2022 to over 80,000 by 2037, and the Ammochhu LAP is expected to cater to approximately 20,000 people.[1] However, Ammochhu LAP's current infrastructure and basic urban services, such as road connectivity, drainage, water supply, wastewater and solid waste management, remain inadequate to meet demand. Without integrated planning and resilient infrastructure, unplanned growth will exacerbate existing vulnerabilities to flood, landslides, and environmental degradation.

3. This Inclusive and Resilient Urban Development Project (IRUDP) builds on ADB's longstanding engagement in Phuentsholing. Earlier support under Urban Infrastructure Development Project in 2006 upgraded basic infrastructure, including roads, drainage, street lighting, pedestrian connectivity, and public facilities, creating conditions for more structured growth and community services.[2] The subsequent Phuentsholing Township Development Project , South Asia Subregional Economic Cooperation Road Connectivity Project, the Climate-Resilient Omchhu River Basin Project, and the Green and Resilient Affordable Housing Sector Project further reclaimed land, strengthened flood and erosion protection, construction of arterial road, and initiated landslide protection and affordable housing supply, enabling safer and inclusive expansion of the city. Collectively, these investments highlight the importance of integrated land use planning, disaster-resilient infrastructure, and inclusive service delivery, which this project will now continue and scale up in Ammochhu LAP and affordable housing project.

4. Lessons from ADB financed projects such as the PTDP informed the project's design for outputs 1 and 3, as detailed below, addressing constraints in serviced-land readiness, integrated infrastructure delivery, and institutional coordination through strengthened urban planning and governance frameworks. Complementary experience from the ADB financed Climate-Resilient

Omchhu River Basin Project enhances resilience against floods and slope instability in infrastructure design.

B. Proposed Inclusive and Resilient Urban Development Project

5. The proposed IRUDP project is aligned with the following impact: inclusive, resilient and sustainable human settlement promoted (Bhutan National Human Settlement Strategy 2017 and National Human Settlement Policy of Bhutan 2019).[3] This project is in continuation of ongoing ADB funded by Green and Resilient Housing Sector Project (GRAHSP) implemented by the National Housing Development Corporation Limited (NHDCL). IRUDP will have the following outcome: municipal services in Phuentsholing, and affordable housing for low-income and vulnerable groups in Thimphu and Phuentsholing enhanced. Project includes following three outputs:

(i) **Output 1: Inclusive and resilient urban infrastructure in Ammochhu Local Area Plan improved.** Essential municipal infrastructure and services in Ammochhu Local Area Plan will be newly constructed and upgraded to enhance Phuentsholing's livability, service delivery, and climate resilience. The output will be implemented by Phuentsholing Thromde and delivered through integrated infrastructure investments covering at least 75% of the Ammochhu Local Area Plan area, including outfalls, stormwater drainage, water supply and sewer systems, road and footpath networks with street lighting, service utility ducts, solid waste management, and climate-resilient embankment protection structures such as culverts and retaining walls connected to the outfalls. The updated infrastructure will reduce service deficits and strengthen municipal systems against floods, riverbank erosion, and landslides, and will be designed to meet national standards for climate and disaster resilience, safety, inclusion, and reliability. Infrastructure design will incorporate socially inclusive and gender-responsive features, including safe pedestrian routes, adequate lighting, and universal accessibility, to ensure equitable access for women and vulnerable groups. Consistent with the Phuentsholing Structure Plan and the Ammochhu Local Area Plan's long-term development framework, the improved infrastructure will support a planned service population of 20,000 residents within the Ammochhu Local Area Plan and support Phuentsholing's long-term population horizon of about 80,000 by 2037.[4]

(ii) **Output 2: Adequate, affordable, and resilient housing units constructed and allotted for low-income households.** Affordable and climate-resilient housing units will be constructed to improve access to safe and adequate housing for low-income and vulnerable households in Thimphu and Phuentsholing. The output will be implemented by National Housing Development Corporation Limited and delivered through the construction of new rental and affordable housing units by National Housing Development Corporation Limited, incorporating energy-efficient, disaster-resilient, and inclusive design features that meet national building codes and accessibility standards. These investments will expand the supply of adequate housing and reduce overcrowding and informal tenancy among low-income and vulnerable groups. Housing allocation will prioritize vulnerable households, including women-headed households, persons with disabilities, and other groups

[3] Royal Government of Bhutan, Ministry of Works and Human Settlement 2017. *National Human Settlement Strategy 2017*; and Royal Government of Bhutan, Ministry of Works and Human Settlement 2019. *National Human Settlement Policy of Bhutan*.

[4] Phuentsholing Thromde. 2013.. *Phuentsholing Structure Plan 2013-2018 (vol.01)*.

facing rental market insecurity, based on transparent eligibility criteria. The output assumes continued government support for housing maintenance, tenant management systems, and fair and transparent allocation processes. The housing component will be financed through a $3 million grant from the Japan Fund for Prosperous and Resilient Asia and the Pacific (JFPR).[5]

(iii) **Output 3: Urban policies and planning, regulatory frameworks, and governance mechanisms strengthened. U**rban policies, regulatory frameworks, and governance mechanisms of Phuentsholing Thromde, Dungkhag Administration, National Housing Development Corporation Limited, and other relevant agencies will be strengthened. Activities will include structured capacity development on integrated spatial planning and urban design, development control regulations, land management strategies, and financial management supported by a strengthened governance framework. Poverty and social analysis and GESI-related evidence, including sex-, age-, disability-, and income-disaggregated date, will be systemically used as a key inputs, alongside other technical, economic, environmental, and climate-resilience consideration to strengthen inclusive and climate-resilient urban development. The output will enhance institutional capacity, improve coordination, and mainstream poverty and GESI considerations in urban planning and decision-making, contributing to more responsive, equitable and resilient municipal services.

C. Proposed Ammochhu LAP Subproject

6. This IEE deals with the Ammochhu LAP subproject under Output 1 of IRUDP. Subproject comprises an integrated package of urban infrastructure investments aimed at improving essential municipal infrastructure and services in Ammochhu LAP. Major components include the construction of a stormwater drainage system to safely convey runoff and reduce localized flooding; development of a water distribution network to ensure reliable potable water supply; installation of a sewer system to improve sanitation and wastewater management; and provision of service utility ducts to safely accommodate underground utilities and minimize future road cutting. The project also includes internal roads, footpaths, and street lighting to enhance pedestrian safety, accessibility, and nighttime visibility. To protect against erosion, slope instability, and flood damage, embankment walls and culverts will be built as critical climate-resilient infrastructure. Together, these components form a coordinated urban infrastructure system that supports sustainable urban growth, improves service delivery, enhances public safety, and increases the overall resilience of the urban environment to climate and disaster risks.

7. Project site, Ammochhu LAP, is spread over an area of 99 acre (~40 hectares) in the northern part of the Town, adjacent to the ADB funded PTDP site abutting Ammochhu River. The Phuentsholing–Samtse Highway separates the PTDP from the LAP. Phuentsholing Thromde planned Ammochhu LAP in 2014 and it was approved by the National Commission on Human Settlements in 2019. This LAP forms part of the Phuentsholing structure plan (2013-2028), and about 64% of LAP falls within the Urban Village 1 (UV-1) precinct, designated for high- and medium-density mixed-use development, and about 5% in green and open spaces[6]. Though there is no proper infrastructure like roads, at present, Ammochhu LAP is partially developed, with few residential and commercial buildings developed as per LAP. There are many engineering and repair workshops and stockyards; these are temporary. There is no industrial land use in Ammochhu LAP, and respective owners already know and have plans to move to other

[5] JFPR is a possible funding source subject to the approval of the Government of Japan.
[6] Phuentsholing Thromde, RGOB. 2022. Ammochhu Urban Design and Detailed Infrastructure Design Volume I.

designated areas in Phuentsholing. There are no environmentally sensitive areas within the LAP. The LAP site is on the foothills of Damdara, part of which is under Chamkuna LAP, and is covered with trees. LAP will not encroach into this area.

D. Purpose of the IEE

8. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguards Policy Statement (2009). Accordingly, this initial environmental examination IEE has been conducted to assess the environmental impacts and provide mitigation and monitoring measures to ensure that there are no significant impacts because of the subproject. The potential environmental impacts of the subproject have been assessed using ADB REA Checklist for Urban Development (**Error! Reference source not found.**). Then potential negative impacts were i dentified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this IEE has been prepared in accordance with ADB SPS requirements for environment Category B projects.

9. This IEE is based on a detailed design report of Ammochhu LAP, prepared by Phuentsholing Thromde. The IEE is based mainly on field reconnaissance surveys and secondary information sources. Limited field monitoring (environmental) survey was conducted. The environmental monitoring program developed as part of the EMP will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation is an integral part of the IEE. This IEE will be updated during the detailed design validation and finalization stage to reflect any changes in the subproject. The revised IEE shall supersede the earlier version of IEE and shall be contractually applicable to the contractor after approval from PMU and ADB.

E. Methodology

10. The methodology used for the preparation of IEE is presented as follows:

(i) Review of project-related documents including the Detailed Project Reports, designs, presentations on the proposed development works, literature pertaining to project baseline (statistical reports, regulations, annual reports, structural plans, state of the environment report, journal articles and related project documents such as monitoring reports of neighboring projects) These documents were used to prepare the baseline chapters and to understand regulatory requirements

(ii) Site visits to the project site to assess existing environmental conditions, understand the area of impact, observe and document biodiversity, and ascertain location of landslide areas. The consultant also carried out primary data collection at specific sites covering air, noise, and water quality parameters as well as biodiversity based on which project baselines were developed

(iii) Several consultations with the staff of Phuentsholing Thromde (Urban planning, Environment, Engineers, and Water Division) to better understand existing conditions, project components, activities, institutional arrangements, grievance redress mechanism and understand project benefits, impacts, and timelines

(iv) Analysis of the direct, indirect, and cumulative environmental and social impacts of the project during project planning, design, construction, and operation phases

(v) Based on the impact assessment, appropriate mitigation measures were determined and proposed to ameliorate potential impacts, in line with the mitigation hierarchy.

F. Structure of the Report

11. This IEE is presented in following ten (10) sections excluding the executive summary:

(i) **Chapter 1. Introduction,** which includes the Background, Outcome and Outputs of the Project, Purpose of the IEE, Methodology and Structure of the Report;
(ii) **Chapter 2. Policy Legal and Administrative Framework,** which includes ADB Safeguard Policy Statement, Environment Legislation Framework, National Environmental Act and Legislation, Legislation relating to Occupational Health and Safety, Relevant International Conventions and Treaties, Gaps in Legal and Guiding Instruments, Permits and Clearances and Applicable Environmental Standards;
(iii) **Chapter 3. Description of the Project,** which focuses primarily on subproject location and area, subproject rationale, subproject alternatives, subproject development plan and subproject components, subproject phase, and schedule and resource utilization;
(iv) **Chapter 6. Analysis of Alternatives,** which discusses how the alternatives were assessed in terms of site location, design and technology, environmental implications of alternatives, including implication of No-Project alternative
(v) **Chapter 4. Description of the Environment,** which includes a description of the baseline information, subproject influence area, land environment, water environment, air environment, noise environment, ecological environment, socio-economic environment, and physical and cultural resources;
(vi) **Chapter 5. Anticipated Environmental Impact and Mitigation Measures**, which includes introduction, impact assessment, anticipated impacts and mitigation measures during pre-construction, construction and operation phases, cumulative impacts and mitigation, environmental benefits and enhancement measures, and a summary of impacts and mitigation;
(vii) **Chapter 7. Information, Disclosure, Consultation and Participation,** which details the process and the approach and methodology for preliminary consultations, and discusses future consultations during detailed design stage and information disclosure;
(viii) **Chapter 8. Grievance Redress Mechanism for the Project;**
(ix) **Chapter 9. Environmental Management Plan,** which includes the institutional arrangement, roles, and responsibilities of stakeholders including contractors and monitoring and reporting obligations; and
(x) **Chapter 10. Conclusion,** which provides overall analysis, conclusion, and recommendations of the IEE.

II. POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB's Safeguard Policy Statement, 2009

12. ADB's Safeguard Policy Statement (SPS, 2009) governs the environment and social safeguards of ADB's operations. The goal of the SPS is to promote the environmental and social sustainability of ADB supported projects by protecting people and their environment from potential adverse impacts and enhancing the benefits provided. The SPS requirements for environmental safeguards support the integration of environmental considerations into the project decision-making process. These requirements are triggered if a proposed subproject is likely to have environmental impacts and risks to the physical, biological, socioeconomic, and/or physical cultural resources in the subproject's area of influence.[7] Project screening and categorization using the sector-based rapid environmental assessment (REA) checklists determines the categorization of the Project based on the significance of the Project's potential environmental impacts and risks.

13. **Categorization**. ADB assigns one of the following environmental categories to the proposed project:

(i) **Category A**. The project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Impacts may affect an area larger than the sites or facilities subject to physical work. An environmental impact assessment (EIA), including an environmental management plan (EMP), has to be prepared by the borrower/client.

(ii) **Category B**. The project's potential environmental impacts are less adverse and fewer in number than those in category A. Impacts are site-specific, few of which, if any, are irreversible. Impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE), including an EMP, has to be prepared by the borrower/client.

(iii) **Category C**. The project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required. No environmental assessment is required, although environmental implications need to be reviewed.

(iv) **Category FI**. The project involves the investment of ADB funds to or through a financial intermediary

14. Initial screening using the REA checklist indicates that the subproject will not cause any significant negative environmental impacts, and that most impacts are site specific and temporary. While Bhutan is a biodiversity hotspot, the project location within an urban area/human settlement. There are no legally protected areas or areas recognized as having high biodiversity value (e.g., key biodiversity areas, important bird area) in or near the project site. Adverse impacts are mostly related to construction activities. Therefore, the subproject is classified as Category B for Environment per ADB SPS and accordingly this IEE has been prepared.

15. **Mitigation measures and Environmental Management Plan.** Once potential impacts and risks are identified, mitigation measures are required to be developed for each impact and risk. As a rule, a mitigation hierarchy is followed, starting with avoidance, minimization, mitigation, and lastly, compensatory measures to offset significant residual impacts. Key environmental considerations can also be incorporated upfront into the project design.

[7] ADB. 2009. Safeguard Policy Statement. Manila.

16. **Meaningful Consultation**. ADB SPS, 2009 requires borrower to conduct meaningful consultation[8] with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

17. **Information Disclosure**. The IEE and a summary translated into local language for the project affected people and other stakeholders will be put in an accessible place (e.g., local government offices, libraries, community centers, etc.). The following safeguard documents will be put up in ADB's website so that the affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation:

(i) Draft IEE;
(ii) Final or updated IEE upon receipt; and
(iii) Environmental monitoring reports submitted by the Phuentsholing Thromde during project implementation upon receipt.

18. **Grievance Redress Mechanism (GRM)**. ADB SPS requires borrowers to establish a mechanism to receive and facilitate resolution of affected people's concerns, complaints, and grievances about the subproject's performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

19. **Monitoring and Reporting**. Borrowers shall monitor, measure, and document the implementation progress of the EMP. If necessary, the borrower shall identify the necessary corrective actions and reflect them in a corrective action plan. Borrower shall prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. Reporting will continue at the minimum on an annual basis during operation until project completion.

20. **Occupational Health and Safety**. ADB SPS requires the borrower[9] to ensure that workers[10] are provided with a safe and healthy working environment, considering risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including: (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment;(v) enforcing appropriate protocols necessary to prevent the spread of communicable diseases; (vi) documenting and reporting occupational accidents, diseases, and incidents; and

[8] Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;1 (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

[9] In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensure that the responsibilities on occupational health and safety are included in the contract documents.

[10] Including non-employee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

(vi) having emergency prevention, preparedness, and response arrangements in place. PMU shall ensure to apply preventive and protective measures consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. [11]

21. **Community Health and Safety**. ADB SPS requires the borrower to identify and assess risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and shall establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts. The borrower shall ensure to apply preventive and protective measures for both occupational and community health and safety consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. PMU shall also adhere to necessary protocols in response to emerging infectious diseases consistent with the guidelines of relevant government healthcare agencies and the World Health Organization.

22. **Physical Cultural Resources**. Borrower is responsible for siting and designing the subproject to avoid considerable damage to physical cultural resources. ADB SPS requires that such resources likely to be affected by the subproject are identified, and qualified and experienced experts assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

23. **Pollution Prevention and Control Technologies**. During the design, construction, and operation of the project, PMU, shall 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 Environmental, Health and Safety Guidelines (footnote 10). These standards contain performance levels and measures that are normally acceptable and applicable to the project infrastructures. When the government's regulations differ from these levels and measures, the project shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, PMU, will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

24. **Bidding and Contract Documents**. The EMP, shall be included in bidding and contract documents. The PMU shall also ensure that bidding and contract documents include specific provisions requiring contractors to (i) comply with all conditions required by ADB, and (ii) to submit to PMU, for review and approval, a site-specific environmental management plan (SEMP). No works can commence prior to approval of SEMP. A copy of the EMP and/or approved SEMP will be always kept on site during the construction period. Non-compliance with, or any deviation from, the conditions set out in the EMP and/or SEMP constitutes a failure in compliance and shall require corrective actions.

25. **Conditions for Award of Contract and Commencement of Work**. PMU shall not award any works contract under the subproject until (i) relevant provisions from the EMP are incorporated into the works contract; (ii) this IEE report is updated to reflect any changes in

[11] World Bank Group. 2007. Environmental, Health, and Safety General Guidelines. Washington DC; https://www.ifc.org-ehs-guidelines.

subproject's final detailed design and PMU has obtained ADB's clearance of such updated IEE report and disclosed; and (iii) other necessary permits from relevant government agencies have been obtained. For "design, build, and operate" type contracts, PMU shall ensure no works for a subproject which involves environmental impacts shall commence until (i) relevant provisions from the EMP are incorporated into the works contract; and (ii) this IEE report is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance for such updated IEE.

26. **Unanticipated Environmental Impacts**. Where unanticipated environmental impacts become apparent during subproject implementation, ADB SPS, 2009 requires the borrower to update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation

B. National Legislation

1. Constitution of Bhutan 2008

27. Bhutan's Constitution safeguards both its environment and its citizens' rights. Article 5, Section 2(d) dictates perpetual 60% of forest cover for the nation's total land area, while Article 5(2) obliges the Government to provide a safe and healthy environment. Furthermore, Article 7 grants all Bhutanese citizens the rights to life, liberty, security, freedom of speech, opinion, expression, and information, as well as freedom of thought, conscience, and religion. Article 9(3) reinforces these protections by ensuring fundamental human rights, freedom, dignity, and freedom from discrimination, oppression, and violence for all individuals.

28. **Relevance to the Project**. The project shall respect the constitution's requirements to protect and conserve the environment as well as citizens' fundamental rights and ensure that these are considered during all stages of the project.

2. Environmental Assessment Act, 2000

29. The Environmental Assessment Act (2000) establishes procedures for prior consideration, assessment, and documentation of all potential environmental and social impacts during project formulation. It outlines procedures for assessing the potential impact of projects on the environment and formulates policies and measures to reduce potential adverse effects on the environment. Based on the above premise, environmental clearance is required prior to the execution of any project that may entail adverse impacts on the environment. The Department of Environment & Climate Change (DECC), previously the National Environmental Commission (NEC), is empowered to implement the Environmental Assessment Act 2000 by setting out guidelines for securing an environmental clearance for a project.

30. **Relevance to the Project**. The project will be assessed in terms of its potential environmental impacts and seek environmental clearance (EC) through preparation of the EIA. The assessment will include provisions for mitigating any potential environmental impact of the project.

31. **The Regulation for Environmental Clearance of Projects, 2016 (RECOP, 2016)** repeals RECOP, 2002 and outlines procedures and responsibilities for implementing and supplementing the Environmental Assessment Act, 2000 to issue environmental clearances. The Guide for environmental clearance application procedure, 2022 outlines the process for project categorization and seeking environmental clearance. Approval or issuance of environmental clearance is dependent on (i) project type/activity and (ii) project location, which in turn dictates

the level of environmental sensitivity and assessment required, the Competent Authority that will review, and the required clearance process to be followed.

32. **Project Category.** Projects are classified according to the "List of Activities that the Competent Authorities can screen and issue Environmental Clearance and List of activities not requiring Environmental Clearance 2016" to determine the required level of assessment and documentation. Projects/activities are categorized into green, blue, or red categories

Table 1: Project Categories

Project category	Environmental assessment process	Competent Authority	Remarks
GREEN	Exempted from Environmental Assessment (EA) process	Not required.	The proponent must obtain approvals/clearances/development consents from concerned agencies as required under relevant legislation
BLUE	Initial Environmental Examination (IEE) required	Designated Competent Authority or DECC as applicable	
RED	Environmental Impact Assessment (EIA) required based on the terms of reference (TOR) approved by the DECC	EIA shall be reviewed and assessed by DECC	
Unlisted activity or lack of Environment Officer		Activity shall be assessed at IEE level, and shall be reviewed and assessed by DECC	

DECC = Department of Environment and Climate Change

33. **Relevance to the Project.** Local area plans (LAPs) fall under red category and requires Environmental Impact Assessment study to obtain environmental clearance from the DECC. The Ammochhu LAP was approved by the National Commission for Human Settlements in 2019. Phuentsholing Thromde is currently in the process of obtaining environmental clearance. As per the RECOP, 2016, a separate EC is not required for infrastructure development within LAP that already has an EC. Therefore, once EC is obtained for LAP, this subproject does not require a separate EC.

3. National Environmental Protection Act 2007

34. The National Environmental Protection Act, 2007 (NEPA) is the umbrella act on environmental conservation in Bhutan. It established the role of the National Environment Commission (NEC)[12] or its successors to protect Bhutan's environment. It mandates that environmental conservation receives equal priority with economic development in line with the Government's Middle Path Strategy. It also established the role of the Competent Authorities within Ministries, Thromdes (municipality) or Districts to screen, review and issue or deny environmental clearance, a mandatory requirement for any development activity. The Act promotes the precautionary principle, waste management principles, polluter pays principle, participatory approach, right to information about the state of the environment, right to seek legal redress if a person's health and safety is affected and payment for environmental services.

[12] The NEC is now the Department of Environment and Climate Change.

35. **Relevance to the Project.** The Project must comply with environmental standards and ensure pollution control and waste management.

4. Water Act of Bhutan 2011 and the Water Regulation of Bhutan 2014

36. Bhutan's Water Act emphasizes the economic and environmental management of water as a crucial natural resource. This comprehensive legislation guides water use across various sectors, aiming to guarantee every Bhutanese citizen access to sufficient, safe, and affordable water for improved quality of life. The Act mandates that as state property, water resources must be protected, conserved, and managed economically efficiently, equitably, and in an environmentally sustainable manner. In terms of priority for water abstraction and use, the Act 2011 accords to the highest priority for drinking and sanitation followed by agriculture, energy, industry, tourism, recreation and finally, other uses. It also necessitates obtaining approval for water abstraction. The Regulation further provides for: specific requirements and procedures for drinking water, irrigation water, national integrated water resources management plan and river basin management plan; functions of river basin committees; timber extraction from a watershed area; community settlement within watershed area; dispute settlement and appeals; offences and penalties. Except in accordance with Environmental Clearance, rivers and streams must be maintained in their own natural courses.

37. **Relevance to the Project.** Without an EC, no development activities shall be allowed within a buffer zone of one hundred (100) feet,[13] measured from the determinable high flood level of either side, of any water body/river. According to the regulation, the Thromde water supply system will be the only source of potable water supply system within Thromde jurisdiction and any temporary new water users from an existing water facility must seek the permit for such water use from the Thromde. The Act also restricts effluent discharge into water sources unless it meets established standards. However, the Environment Standards 2020 currently apply only to industrial effluent and sewage treatment plants, not household sewage. To prevent property damage, sanitary nuisance and diseases within human settlements, houses (in this case construction camps) are required to design and maintain a proper drainage facility around its premises for the discharge of effluents and other runoff.

5. Waste Prevention and Management Act of Bhutan 2009 and the Waste Prevention and Management Rules 2012 (Amended 2016)

38. The Waste Prevention and Management Act of Bhutan 2009 and the Waste Prevention and Management Regulation 2012 (amended 2016) provide the necessary institutional framework for waste management. The act and regulation emphasize on reduction of waste generation at source, and promote segregation, reuse, recycling, storage, transportation, environmentally-sound treatment, and disposal. It promotes the precautionary, polluter pay, 3R, and waste management hierarchy. Every person is responsible for the safe storage and disposal of waste, and must comply and cooperate with waste segregation, reduction, reuse standards, and initiatives.

39. Solid waste[14] is categorized into non-hazardous waste, hazardous waste, medical waste, e-waste, and other waste. The Rules require all businesses to provide appropriate bins for waste

[13] A buffer zone of a water body will be measured along the topography of its bank starting from its determinable high flood level and in case of a watercourse in a flat topography that keeps changing its course, the buffer zone will be measured from the widest determinable bank and not from the determinable high flood level.

[14] Solid waste- means all discarded household, commercial waste, non-hazardous institutional, industrial waste, street sweepings, construction debris, agriculture waste, and other non-hazardous/ non-toxic solid waste.

collection and storage of biodegradable and non-biodegradable waste (waste segregation) and to maintain cleanliness of the premises and its surroundings. At construction sites, construction and excavated waste are required to be safely stored at the site without inconveniencing the public and transported to designated sites (as identified by the local authority) without any spillage along the way.

40. Where hazardous waste is generated, implementing agencies are required to establish a systematic and safe disposal process for hazardous waste. Such must be segregated from non-hazardous waste, labelled, stored separately, and appropriately pre-treated and safely transported to an approved disposal site. At the workplace, clear warning symbols and labels must indicate associated risk while handling. Detailed records of any incidents involving injury; accidents must be maintained. Sufficient and consistent supply of appropriate personal protective equipment must be provided for all personnel handling hazardous waste, and its continuous use must be enforced. Hazardous waste cannot be exported without the importing country's consent.

41. **Relevance to the Project**. During the project, the Contractor must be responsible for all domestic and construction waste, comply with Thromde waste disposal norms, seek the necessary approval for disposal of construction waste and excavated waste, and maintain appropriate records of waste generated and disposed of.

6. Revised Regulation on Substances that deplete the Ozone layer and Hydrofluorocarbons (HFCs) 2021

42. This regulation lays out the framework for Bhutan to fulfill its obligations to the Vienna Convention and the Montreal Protocol (including the Kigali Amendment) by regulating the production, import and export of ozone depleting substances (ODS) and hydrofluorocarbons (HFCs). Substances that are prohibited from being produced or imported are listed in Annex A while those that are restricted are listed in Annex B. Persons intending to import HCFC/R22 and HFC refrigerants, HFC chemicals are required to fill in registration for import requirements and are also required to submit annual reports on the sale and use of controlled substances.

43. **Relevance to the Project**. Not relevant for the project since the project will not be importing or utilizing such materials.

7. Forest and Nature Conservation Act (FNCA) 2023 and the Forest and Nature Conservation Rules (FNCR) 2023

44. Under this act, forest cover means ‘land with trees spanning more than 0.5 ha with trees higher than 5 meters and a canopy cover of more than 10 percent.’ Any activity being undertaken within State Reserved Forest Land (SRFL) requires a permit from the Department of Forest and Park Services (DOFPS). The Forest Act and Regulation restrict the taking, killing, injuring, collecting, cultivating, or trading of any wild flora and fauna listed in Schedule 1 of the Act, except for scientific research and population management. The cultivation, collection, or trade of wild flora listed in Schedule II and III of this Act is permitted based on the procedure prescribed in the Rules. Under Rule 14, forest clearances are not allotted within declared critical watershed areas and wetland or areas containing high forests unless an impact assessment has been carried out. Restrictions on issuance are based on slope (if the slope is greater than 45 degrees, within 100 feet of the bank or edge of any river, stream, water course, or water source, within 600 feet uphill or 300 feet downhill of a motorable road), unless authorized by the Department. The authority to issue forest clearances is as follows: Department level (if the proposed area falls under protected area, or more than 7 acres of land or more than 7 km of road); Division or Park Office (between

3-7 acres of land or 3-7 km of road; and Range Office (up to 3 acres of land or 3km of road). Forest clearances are valid for the period of the project or activity. It the activity for which the clearance was granted has not commenced after one year after issuance; the forestry clearance can be revoked.

45. **Tree cutting.** To cut trees on non-forest land/urban forest within areas under Thromde authority, the clearance for tree felling can be issued by the respective Thromde but are marked for cutting by the DoFPS. For areas outside Thromde, tree cutting application must be submitted to the **Range Office of DOFPS** for approval. Prior to cutting trees, trees must be verified and marked by the forestry staff, and only those trees that are marked can be removed.

46. **Relevance to the Project.** There are no forest areas in the project site, therefore no forest clearance is required. Tree cutting permission will be required. Ammochhu LAP is under Phuentsholing Thromde, and therefore the clearance for tree felling can be issued by the Thromde, but trees need to be verified and marked for cutting by the DoFPS. The Environment Division of Thromde will facilitate tree cutting permission.

8. Local Government Act of Bhutan 2009

47. The Local Government (LG) Act of Bhutan (2009) promotes decentralization and devolution of power and authority to the Local Governments that represent the interests of local communities. The Dzongkhag Tshogdu[15] and the Gewog (Block) Tshogde (Council) and the Thromde Tsogde are the highest decision-making bodies at the *dzongkhag*, *gewog,* and Thromde level. As per Chapter 14 of the Local Government Act, all activities undertaken by different sectors of the government must be routed through and coordinated by Local Government offices. Section 213 requires that all national agencies conduct periodic consultations with the Local Government before any project or program is implemented in their jurisdiction, as well as involve Local Governments both in the planning and implementation of national projects.

48. The LG Act establishes the criteria for classification of Thromdes. The Act describes two types of Dzongkhag Thromdes that are either Class A or Class B Thromdes and Dzongkhag Yenlag Thromde.[16] This classification is based on the total resident population, density, total Thromde area, and livelihood of most of the population. The Act describes the powers and functions of Thromde Tshogde. Thus, according to the LG Act, Phuentsoling is a Class A Thromde and must therefore abide by the Thromde Act and Rules, described in the succeeding section.

49. **Relevance to the Project.** Relevant to the project as Thromde Tshogde has the authority to make decisions pertaining to the Thromde where the project interventions are located.

9. Thromde Act of Bhutan 2007 and Thromde Rules 2011

50. This Act outlines the criteria for establishment of the various classes of Thromdes. There are two types of Dzongkhag Thromdes: (i) Dzongkhag Thromde which comprises Class A Thromde, Class B Thromde, and Dzongkhag Yenlag Thromde. With its resident population of more than 10,000 people, the area, and the non-agrarian livelihood of most of the population, Phuentsholing is classified as a Class A Thromde. The Thromde is the designated Competent Authority to grant environmental or development consent for activities within the Thromde unless

[15] A Dzongkhag Tshogdu means the District Council Source, while the Gewog Tshogde means the County Committee (Source: Department of Local Governance, Ministry of Home and Cultural Affairs https://www.dlg.mohca.gov.bt/).
[16] Criteria for designating Thromdes.

it is beyond its mandate or regulated by other Acts. Where activities are proposed by the Thromde, then environmental clearance must be sought from the Department of Environment and Climate Change.

51. The Thromde is responsible for planned and harmonious development within its boundaries. This includes implementing environmental controls, protection, and conservation; preventing and managing disasters and fires; maintaining monuments, memorials, heritage sites; surveying land and buildings; and controlling development (including architecture and building height) according to any existing Local Area Plan. It is also responsible for the provision of drinking water, drainage, sewerage systems, waste management, and tree felling within its boundaries.

52. All development within the Thromde must be in line with the Phuentsholing Structure Plan 2013-2028 which lays down the basic structure and guidelines for the future development of the town. The Plan is based on eight principles: community and stakeholder consultation, walkable neighborhood, creating attractive communities with keen sense of place, mix land use, fair and cost-effective development, preserve open spaces, nature and critical environmental areas, provide transportation options, and create a range of housing opportunities.[17]

53. **Relevance to the Project.** Relevant to the project as Thromde Tshogde has the authority to make decisions pertaining to the Thromde, and the project must therefore adhere to the Thromde Tshogde's directives regarding the project.

10. Phuentsholing Development Control Regulations 2013 and the Phuentsholing Structure Plan 2013-2028

54. The Development Control Regulations are formulated to control development on both government and private land, based on the Phuentsholing Structure Plan (PSP) 2013-2028.[18] Under the PSP, land use is defined by precincts and 11 Local Area Plans (LAPs). The type of development (including maximum permissible height, coverage, setback) allowed on a particular site depends on the site location within each precinct and LAP.

55. **Relevance to the Project.** The regulations and related structure plan are relevant to the project as the project activities will provide value addition to future development activities in line with the structural plan. Ammochhu LAP is part of the Phuentsholing Structure Plan (2013-2028).

11. Bhutan Green Design Guidelines 2013

56. All construction works within municipal limits must be in line with the Local Area Plan for that Municipality/Thromde and the design of buildings must comply with Bhutan Building Rules (2002, amended in 2018) which apply to all urban areas. The Bhutan Building Rules (2002, revised in 2018) outlines the process of grant of building permits and Building Code of Bhutan (2003, revised in 2018) lays down a set of minimum standards for the construction of public works buildings and housing settlement. It sets out the technical requirements, standards and design considerations that apply to the construction of buildings, including compliance with green building designs, earthquake resistance, water supply, and fire safety. The BBR does not permit construction in the following:

[17] Phuentsholing Thromde. Phuentsholing Structural Plan PSP: 2013-2028.
[18] Department of Human Settlement, 2016. Compliance and development review Phuentsholing Throm. MOWHS.

(i) In an environmentally sensitive area, or along or obstructing a water course or natural drainage;
(ii) Within 15 meters of the edge of a major stream or within 30 meters of the bank or the edge of a river, measured from the highest recorded water level; and
(iii) If it had an adverse impact on the scenic views, the historical and cultural significant attributes of the area or the overall ambience of the traditional settlement.

57. The Bhutan Green Design Guidelines 2013 was prepared by the MoIT (previously MoWHS) to provide guidance to architects, engineers and builders on practical green building design and construction principles and solutions that can be adopted in Bhutan. It promotes the use of low energy local construction methods and natural resources coupled with designs that was adapted to respond to the local climatic environment combined with vernacular architecture in Bhutan.

58. **Relevance to the Project:** The project design and selection of materials must be based on climatic conditions, site suitability and usage while ensuring sustainability and climate resilience in compliance with the Guidelines.

12. Labor and Employment Act of Bhutan 2007 and Rules pertaining to Worker Management and Occupational Health and Safety

59. The Act applies to matters relating to labor and employment in Bhutan. It prohibits 'forced or compulsory' labor and 'worst forms of child' labor. Discrimination against an employee regarding their wages and working conditions and prohibition against sexual harassment are also prohibited (Chapter II, Sections 6, 9, 11, 12, 16, 17, 18 & 19). The Act also touches on compensation and benefits of employees (Chapter VI) and Chapter IX deals with Occupational Health and Safety. Some important provisions are listed below:

(i) An employer shall compensate all his or her employees in case of a fatality due to work accident or occupational disease, total permanent disablement, or temporary partial disablement. The employer is not liable if the accident is due to willful disobedience of an employee or removal or disregard by the employee to use appropriate PPE provided.
(ii) Employers are also required to immediately notify the Chief Labor Administrator, any fatality or any other serious bodily injury or disease requiring medical treatment, causing a loss of production, or working time at the workplace. In case of death, the nearest Police station must be notified. Within 5 working days, a report on the accidents or fatalities must be submitted to the Chief Labor Administrator.
(iii) An employer of an enterprise with 12 or more employees must establish a workplace grievance procedure for use at each workplace.
(iv) The Occupational Health and Safety and Welfare Rules and Regulations of 2022 mandate that all workplaces under the Labor and Employment Act of 2007 comply with specific legal requirements. These regulations aim to protect employees from work-related hazards by establishing workplace safety, health, and welfare standards.
(v) Employer responsibilities are outlined in Chapter 3, while Chapters 4 and 5 detail health and safety requirements for the workplace itself. The workplace environment is addressed in Chapter 6, followed by regulations concerning

machinery in Chapter 7. Fire safety, health, welfare, reporting obligations, and compensation are covered in Chapters 13 through 18.

(vi) The Schedules provide practical guidance through examples of safety signs and symbols, PPE requirements, permissible exposure limits, safety data sheets, minimum first aid kit contents, and even specifications for the number of required toilets.

(vii) A designated safety officer must submit a monthly report to the employer/manager detailing their activities. These reports are to be kept at the workplace and made available for inspection by a Labor Inspector upon request (Sections 44-45). Based on these safety reports, employers are obligated to implement necessary corrective actions.

(viii) Construction companies must adhere to the Regulation on Occupational Health and Safety for the Construction Industry 2022, alongside relevant sections of the Regulation on Occupational Health, Safety and Welfare, 2022. Employing individuals under 18 for construction work is prohibited. Companies with 12 or more construction workers need a written health and safety policy as per the Regulation on Occupational Health, Safety and Welfare, 2012. A health and safety committee is mandatory for sites with over 50 employees. Key safety measures include providing personal protective equipment, ensuring electrical safety with proper earthing and earth leakage circuit breakers for temporary installations, displaying warning signs, managing traffic, ensuring structural stability of temporary structures, providing adequate lighting and access, managing material storage, ensuring safe machine operation, providing worker accommodation, and managing waste disposal.

(ix) The Rules and Regulations on Foreign Workers Management, 2024, covers all aspects pertaining to foreign worker employment in the country. It mandates that employers secure pre-recruitment approval from the Chief Labor Administrator (CLA) via an online system based on eligibility. Work permits and medical examinations are mandatory for all foreign workers prior to employment. It also details the requirements to be followed by employers of foreign workers and includes a code of Conduct and Ethics.

(x) There are several guidelines such as the Integrated Foreign Workers Recruitment and Management Guideline 2023 (revised 2024), the Comprehensive Guide to Workers Compensation and Guideline on Investigation and Reporting of workplace accidents (2024).

60. **Relevance to the Project.** Construction activities will involve the recruitment of both national and foreign workers and the establishment of worker facilities. Workers will be exposed to occupational health and safety risks, particularly when working near main roads, undertaking excavation works, operating machinery, and through prolonged exposure to noise and dust. The project is subject to the provisions of this Act and its associated regulations and guidelines, and all contractors and subcontractors shall be required to comply fully with these requirements to ensure safe working conditions, especially during works at the outfall area and when operating machinery.

13. Disaster Management Act 2013

61. The Disaster Management Act, 2013 repeals the 2006 National Disaster Risk Management Framework. This Act establishes a new framework to strengthen the institutional capacity for disaster management of the country and to better mainstream disaster risk reduction strategies at relevant institutions. The purpose of this Act is to provide for: (i) the establishment

and strengthening of institutional capacity for disaster management; (ii) mainstreaming of disaster risk reduction; (iii) an integrated and coordinated disaster management focusing on community participation; and (iv) matters incidental thereto. The Act describes the composition, function, and powers of the different authorities, including in relation to the private sector, and prioritizes mainstreaming disaster risk reduction into development plans, policies, programs, and projects as well as ensuring agencies receive adequate budgets. Through this Act, Dzongkhag Disaster Management Planning Guidelines were issued to guide the Dzongkhags, through the Dzongkhag Disaster Management Committees, to plan, develop and implement their respective Dzongkhag Contingency Plan. The planning process is expected to include hazard mapping to identify the most hazard-prone areas of the Dzongkhag so that future developments, interventions, and risk mitigation measures can be planned accordingly. The Act mandates that all development projects undergo screening and be made disaster resilient

62. **Relevance to the Project.** Phuentsholing Thromde prepared a disaster risk profile and action plan for 2018-2022, based on the Disaster Management Act, 2013, outlining strategies for awareness, risk reduction, preparedness, and resilience concerning prioritized hazards. The proposed project aligns with the spirit of this Act and responds well to the strategies laid out in the plan.

14. Cultural Heritage Act of Bhutan (2016)

63. The Cultural Heritage Act of Bhutan (2016) identifies the entire country as a cultural landscape. According to the Act, “Cultural Heritage” comprises: (i) movable cultural property; (ii) heritage site; and (iii) intangible cultural heritage. If valuable cultural properties are discovered during the construction of roads, buildings, or other works, the discovery must be immediately reported to the Department of Culture through the concerned Dzongkhag.

64. **Relevance to the project.** There are no sites of cultural heritage in or near the subproject sites. Although the chances are low, since the work entails excavation work, the project will incorporate chance find procedures to be followed by PMU and the Contractor

C. Environmental Standards and Guidelines

65. The Environmental Standards 2020 issued by the NEC (now the Department of Environment and Climate Change or DECC) set the permissible emission standards for ambient air quality, workplace emission, vehicular emission, and noise limits. These standards differ for Mixed Areas and Sensitive Areas.[19] The Water Act restricts the discharge of effluents directly or indirectly into any water source unless it is within the effluent discharge standard. However, the Environment Standards 2020 are only applicable to industrial effluent discharge and for sewage treatment plants and not applicable for household sewage. The Drinking Water Quality Standards, 2016, developed in accordance with Section 13 (f) and Section 42 (a) and (b) of the Water Act of Bhutan, 2011 describe the quality parameters set for drinking water and the maximum permissible limit for each of the set parameters, to limit the level of contaminants in drinking water.

[19] A mixed area means an area where residential, commercial or both activities take place while a sensitive area means an area where sensitive targets such as hospitals, schools, and sensitive ecosystems are located (Environmental Standards, 2020).

Table 2: Ambient Air Quality Standards

Parameter	Unit	Averaging Period*	Bhutan's Ambient Air Quality Standard, 2020**(µg/m³)			WHO Air Quality Guidelines 2021
			Industrial Area	Mixed Area***	Sensitive Area****	
Total Suspended Particles (TSP)		24-hour	500	200	100	No standard
	µg/m³	Annual	360	140	70	
Particulate Matter $PM_{2.5}$	µg/m³	24-hour	60	60	60	15
		1-year	40	40	40	5
Particulate Matter PM_{10}	µg/m³	24-hour	200	100	75	45
		Annual	120	60	50	15
Sulfur Dioxide (SO_2)	µg/m³	24-hour	200	100	75	40
		Annual	120	60	50	Not specified
Nitrogen Oxides (NO_2)	µg/m³	24-hour	120	80	30	25
		Annual	80	60	15	10
Carbon Monoxide (CO)	mg/m³	8-hour	5,000	2,000	1,000	4
		1-hour	10,000	4,000	2,000	Not specified
Ozone		8-hour	100	100	100	
		1-hour	180	180	180	

* Due to short term duration of civil works, the shortest period will be more practical to use.

** Taken from Environmental Standards, National Environment Commission, Royal Government of Bhutan, November 2010.

*** 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.

^ Source: Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

^^ Source: Air Quality Guidelines for Europe, Second Edition, 2000; WHO Regional Office for Europe, Copenhagen

Table 3: Ambient Noise Standards

Receptor/ Source	National Noise Standard Guidelines, 2012* (dB)		WHO Guidelines Value For Noise Levels Measured Out of Doors** (One Hour LA_q in dBA)	
	Day***	Night****	07:00 – 22:00	22:00 – 07:00
Industrial area	75	65	70	70
Mixed area	65	55		
Sensitive area	55	45	55	45

* Taken from Environmental Standards, National Environment Commission, Royal Government of Bhutan, November 2010.

** Guidelines for Community Noise, WHO, 1999.Source: Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

*** Day time is from 0600 hours to 2200 hours (human activities).

**** Nighttime is from 2200 hours to 0600 hours (no human activities).

Table 4: Effluent Discharge Standards

Parameters	Unit	National Standards, mg/l [a]
Biochemical Oxygen Demand	mg/l	30.0
Total Suspended Solids	mg/l	100
Fecal Coliform	CFU/100ml	1,000
pH	pH scale	6.5 – 9.0
Chemical Oxygen Demand	mg/l	125

Standards for Sewage Treatment Plant Effluent. Taken from Environmental Standards, National Environment Commission, Royal Government of Bhutan, November 2010.

66. Table 4 provides the standards for effluent for sewage treatment plant which may be the one applicable standard for any potential discharges (overflows) from septic systems (septic tanks and soak pits) if installed. In addition, the septic system should comply with the recommendations of World Bank's Environmental, Health, and Safety (EHS) Guidelines, as follows:

(i) Properly designed and installed in accordance with local regulations and guidance to prevent any hazard to public health or contamination of land, surface, or groundwater;
(ii) Well maintained to allow effective operation;
(iii) Installed in areas with sufficient soil percolation for the design wastewater loading rate; and
(iv) Installed in areas of stable soils that are level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters.

Table 5: National Drinking Water Quality Standards, 2016

Group	National Drinking Water Quality Standards, 2016* (for Urban Drinking Water Supply)			WHO Guidelines for Drinking-Water Quality, 4th Edition, 2011**
	Parameter	Unit	Max. Concentration Limits	
Physical	Turbidity	NTU	5	-
	pH		6.5 – 8.5	none
	Color (TCU)	Hazen Unit	15	none
	Taste and Odor		Non- objectionable	-
Chemical	Iron	mg/l	0.3	-
	Manganese	mg/l	0.4	-
	Arsenic	mg/l	0.01	0.01
	Fluoride^	mg/l	1.5	1.5
	Lead	mg/l	0.01	0.01
	Nitrate	mg/l	50	50
	Calcium	mg/l	75	-
	Mercury	mg/l	0.006	0.006
	Residual Chlorine	mg/l	0.2 - 0.5	5 ^^
	Sulphate	mg/l	250	-
Microbiological	E-coli	CFU/100ml	0	Must not be detectable in any 100 ml sample

* Taken from Bhutan Drinking Water Quality Standard, 2016, National Environment Commission, Royal Government of Bhutan, 8 March 2016.
** Health-based guideline values
^ To be tested for ground and spring water only.
^^ From WHO (2003) Chlorine in Drinking-water, which states that this value is conservative.

Table 6: Workplace emissions standards

Parameter	Period	Unit of measure	Standard
Total suspended particulate matter TSPM	8-hour average	mg/m3	10
Respirable suspended particulate matter RSPM (PM_{10})	8-hour average	mg/m3	5
$PM_{2.5}$ *	24-hour average	mg/m3	25
	1 Year average	mg/m3	10
Sulfur dioxide (SO2)	8-hour average	mg/m3	1
Nitrogen Oxide (NOx)	8-hour average	mg/m3	1
Carbon monoxide (CO)	1 hour average	mg/m3	5
Pb 17**	1 hour average	mg/m3	0.0005
Ozone***	8-hour average	mg/m3	0.08

Source: Environmental Standards, National Environment Commission, Royal Government of Bhutan, November 2010.
PM 2.5 *- Gravimetric/light-scattering/beta attenuation-based instruments
**National Institute of Occupational Safety and Health (NIOSH) Method 7303
***UV Photometric/Chemiluminescence/Chemical Method

Table 7: Motor vehicle emission standards

Fuel Type	Vehicle registered prior to Jan 1, 2005	Vehicle registered after Jan 1, 2005	Vehicle registered prior to Jan 1, 2021	Vehicle registered after Jan 1, 2021 (Approval type: Euro 6/BS VI)
Petrol (%CO)	4.5%	4.0%	4.0%	0.5%
Diesel (%HSU)	75%	70%	70%	50%

Source: Environmental Standards, National Environment Commission, Royal Government of Bhutan, November 2010.

Table 8: Vehicular noise level limits

Sl. #	Type of Vehicle	Noise level limits dB(A)
	Two-Wheeler	
1.1	Displacement up to 80cc	75
1.2	Displacement more than 80cc but up to 175cc	77
1.3	Displacement more than 175cc	80
2	Vehicles used for carriage of passengers and capable of having not more than nine seats including the driver's seat	74
3	Vehicles used for carriage of passengers and capable of having more than nine seats, including the driver's seat and a maximum gross vehicle weight (GVW) of more than 3.5 tonnes	
3.1	With engine power less than 150 KW	78
3.2	With engine power more than 150 KW	80
4	Vehicles used for carriage of passengers and capable of having more than nine seats, including the driver's seat: vehicles used for carriage goods	
4.1	With maximum GVW not exceeding 2 tonnes	76
4.2	With maximum GVW greater than 3 tonnes but not exceeding 3.5 tons	77
	Vehicles used for carriage of transport of goods with a maximum GVW exceeding 3.5 tons	
5.1	With engine power less than 75 KW	77
5.2	With engine power more than 75 KW or above but not less than 150 kv.	78

Source: Environmental Standards, National Environment Commission, Royal Government of Bhutan, November 2010

D. International Conventions and Treaties

67. Bhutan is a party to several multilateral environmental agreements. Of the conventions that are listed, the most relevant to the project are the UN Framework Convention on Climate Change; the UN Convention on Biological Diversity; Convention Concerning the Protection of the World Cultural and Natural Heritage and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. There are no elements of the project that contravene the direction and intentions of these conventions.

Table 9: International Environmental Agreements

#	International convention	Date of ratification or accession	Applicability to the project
1	Convention on Biological Diversity (1992)	August 1995	Applicable. As part of Bhutan's commitment to the CBD, the project must ensure that riverine habitats and ecosystems are also protected. ,
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington 1973) – also known as CITES	August 2002	This Convention is not applicable as there will be no extraction, sale, import or export of fauna and flora under this project
3	The Nagoya Protocol	September 2013	
4	International Plant Protection Convention	June 1994	Bhutan must regulate plant product trade and prevent pest introduction. As the sites already have many weeds and invasive species, the project must ensure that these do not spread to other areas.
5	Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris 1972)	October 2001	To safeguard all religious, cultural, and heritage sites, all development projects are required to maintain a minimum distance from such sites. There is no such site in the project area.
6	Convention on Safeguarding of the Intangible Cultural Heritage	October 2005	
7	Vienna Convention for the Protection of the Ozone Layer	August 2004	The project has been designed to ensure that all structures are climate resilient, and no substances that deplete the ozone layer will be used. The Project is also deemed aligned with the goals of the Paris Agreement in reducing GHG emissions and improving countries' adaptive capacity.
8	UN Framework Convention on Climate Change	August 1995	
9	Kyoto Protocol to the United Nations Framework Convention on Climate Change	August 2002	
10	Montreal Protocol on Substances that Deplete the Ozone Layer	April 2004	
11	Paris Agreement	September 2017	
12	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	August 2002	The export of hazardous waste is subject to the prior written consent of the country of import and is applicable to the project. No waste will be exported out of the country.
13	United Nations Convention to Combat Desertification	August 2003	The project will enable Bhutan to fulfill its commitment to sustainable management and the strategies to protect and revegetate landslide

#	International convention	Date of ratification or accession	Applicability to the project
			areas will reduce the risk of desertification and combat land degradation.
13	The Cartagena Protocol on Biosafety to the UN Convention on Biological Diversity	September 2002	Not relevant to the project as there will be no import or export of plant material.

E. Compliance with National Legislation

68. The key findings of the legislative review indicate that the following approvals and processes are required for this project.

Table 10: Summary of Relevant Compliance Requirements

Regulation	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to project	Implementation Phase	Responsibility
Bhutan Constitution 2008	Many relevant articles covering ensuring environmental and social measures	All agencies	Maintenance of 60% forest cover for all times to come, and ensuring people's right to work, avoidance of discrimination, exploitation and right to a safe and healthy environment	All phases	PMU, PIU, Contractor
Penal Code of Bhutan 2004	No specific permit required	Royal Court of Justice/Royal Bhutan Police	The project must comply with provisions related to Environment Pollution, Criminal Nuisance, Reckless endangerment, damage to public property and bribery, and Official Misconduct during project execution.	All phases	PMU, PIU, Contractor
Environmental Assessment Act 2000 Regulation for The Environmental Clearance of Projects (RECOP) 2016 Environmental Standards 2020	Environment Clearance	DECC	Project is categorized as Red Category requiring an EIA. The EIA will be submitted to the DECC for Environmental Clearance. The provisions of the EMP will be followed during project implementation to ensure compliance with this Act.	All phases	PMU
	Compliance with national environmental standards	DECC	The subproject is expected to emit pollutants during construction and operation phases and will be required to comply with applicable standards. Applicable environmental standards for the subproject are ambient air, noise level limits, and drinking water quality. The Project must ensure applicable environmental standards during construction.	Construction Phase	PMU and Contractor

Regulation	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to project	Implementation Phase	Responsibility
Cultural Heritage Bill of Bhutan 2016 and EA Act 2000	Consent and chance find procedure	Local Government and Dzongkhag, DCDD	The project must seek the consent of the local community in case any religious and cultural site is affected by the project. Chance Find Procedures are to be followed in case the need arises	Pre-construction and Construction Phase	PMU, PIU, Contractor
Waste Prevention and Management Act of Bhutan 2009 Waste Prevention and Management Regulation 2012 (amended 2016)	Waste disposal permit	Phuentsholing Thromde	The project is a potential generator of solid waste during construction and operation phases. To ensure proper waste segregation, collection, storage and disposal, the contractor must comply with the waste collection schedule under implementation by Thromde, as well as process for approval and ensure disposal of construction waste in designated sites approved by Thromde	Pre-construction and Construction Phase	PMU, PIU, Contractor
Water Act of Bhutan 2011 Water Regulation of Bhutan 2014 National Drinking Water Quality Standards, 2016	Water supply will be part of the building approval process Compliance with effluent discharge standards for worker camps	Department of Water	No specific permit required, but since the project will generate wastewater, the project must ensure that compliance with the requirements of the Act and Regulation. The project will monitor the quality of water at regular intervals and take corrective actions if deterioration is caused by the project. Also, Contractor must ensure that workers are provided with water that complies with National drinking water quality standards.	Pre-construction and Construction Phase	PMU, PIU, Contractor
Forest and Nature Conservation Act	Forest clearance for	Thromde	The Thromde will coordinate with the Department of Forest to mark trees along the road right way. Only	Pre-construction Phase	PMU, PIU, Contractor

Regulation	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to project	Implementation Phase	Responsibility
2023 and Regulation 2022	removal of trees		those trees that are marked will be removed		
Labor and Employment Act (LEA) 2007 Regulation on Working Conditions 2022 Regulation on Occupational Health, Safety and Welfare 2022 Regulation on Occupational Health and Safety for the Construction Industry 2022	Foreign worker permit lays out obligations and rights of Employers	Department of Labor	The project will involve contractors and workers and must ensure that Contractor(s) comply with the relevant provisions of this Act and Regulations, process for import of foreign workers, comply with Regulations governing worker recruitment, risk assessment, and provision of OHS measures and promotion of a safe work environment, while minimizing risks to neighboring communities.	Pre-construction and Construction Phase	PMU, PIU, Contractor
Safety Code 2021	Compliance with safety code - sets minimum safety requirements to protect workers engaged in electrical work.	DOL	Contractor(s) must comply with the safety code and ensure electrical workers are certified.	Construction and Operation Phase	PMU, PIU, Contractor
Road Safety and Transport Act 1999 and Road Safety and Transport Regulations 2021	Ensure safe use of roads and highways	Bhutan Construction and Transport Authority (BCTA)	Material transporters and the contractor will be required to follow regulations regarding speed limits, licenses, maximum carriage for vehicles and restrictions on driving while intoxicated or use psychotropic substances	Construction Phase	PMU, PIU, Contractor
Disaster Management Act of Bhutan 2013	Provides the legal framework for integrating	Department of Local Government and	The project will incorporate climate- and disaster-resilient features to improve safety and sustainability.	Pre-construction Construction and Operation Phase	PMU, PIU, Contractor

Regulation	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to project	Implementation Phase	Responsibility
	disaster risk reduction into development planning and ensuring the safety of infrastructure	Disaster Management	Additional measures to mitigate Disasters will be incorporated by Thromde for the Operation Phase		
Land Act 2007 and Land Acquisition and Compensation Rules and Regulations 2022	Governs land administration, ownership, and use	NLCS	The Thromde has already undertaken land pooling for the LAP. In case any additional private land is impacted, the provisions of the Land Act and Compensation Rules will be complied with. In case private land is leased by the Contractor, appropriate agreements will be prepared and followed	Pre-construction	PMU, PIU, Contractor
Bhutan Building Regulation 2023	Establishes fundamental rules and minimum safety standards for all Bhutanese building infrastructure.	Thromde	Requires the project design to comply with building regulations to secure building construction approval / permit. The Thromde will also ensure that all upcoming structures are aligned with the BBR, 2023	Pre-construction, Construction and Operation Phase	PMU

III. DESCRIPTION OF THE PROJECT

A. Subproject Location and Area

69. Covering an area of 38,394 sq.km,[20] Bhutan comprises 20 districts. Proposed subproject site, Ammochhu LAP, is in Phuentsholing town, situated in Chhukha District in the south-western part of the country. It is the western point of entry by road and the primary gateway from India to Bhutan and because of this, it has easy access to cheap labor and raw material. It is the western commercial and economic capital as well as an industrial hub. The town's built-up area extends contiguously to the West, reaching the border with Samtse. Proposed subproject targets the inclusive and resilient urban infrastructure at Ammochhu Local Area Plan[21] spread over 99 acres in Phuentsholing. Phuentsholing Thromde is a municipality / urban local government (Thromde) and is the implementing agency for the Ammochhu LAP subproject.

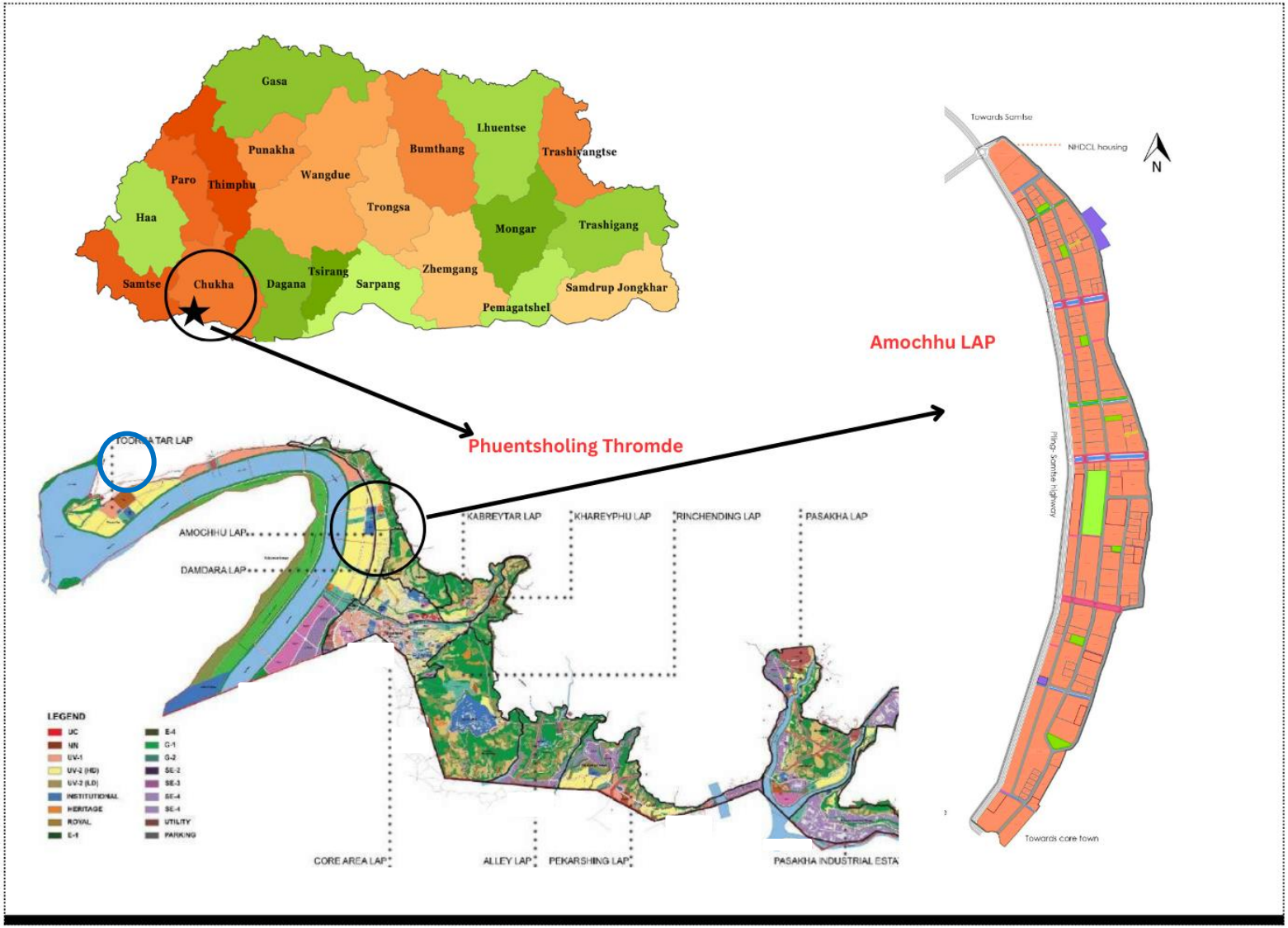
70. Phuentsholing Thromde extends from Ammochhu to Pasakha along the southwestern foothills. It comprises six constituencies (Demkhongs), each represented by an elected representative (Tshogpa). Phuentsholing was established as a Class A Thromde by the Parliament in 2010 with an area of 15.6 km^2. [22] Since then, the planning and design of the Thromde has been based on the Phuentsholing Urban Development Plan (PUDP) 2002-2017 and the Phuentsholing Structure Plan (PSP) 2013-2028.[23] Under the latter (PSP), the Thromde area was defined by precincts and 12 Local Area Plans (LAPs), which includes the project site-the Ammochhu LAP.

71. The Ammochhu LAP is bounded by the Ammochhu river to the west, the Core town to the south and Damdara to the east. The LAP area starts from the NHDCL housing colony of Bangay in the north to the newly constructed bridge over Omchhu (Omchhu Bridge-II). From the east, the LAP area starts from foothills of the slopes of Dhamdara and borders the Phuentsholing- Samtse Highway on the West, lying adjacent to the Phuentsholing Township Development Project (PTDP), embodying the flat floodplains along the left bank of Ammochhu river. The Phuentsholing-Samtse Highway forms a natural boundary between the Phuntsholing Township Development Project (PTDP) and the Ammochhu LAP.

72. Ammochhu LAP was formulated by Phuentsholing Thromde in 2014. The LAP was reviewed and approved by the National Commission of Human Settlements (NCHS) in 2019. The NCHS review entailed a comprehensive consideration of various aspects: Phuentsholing Structure Plan, Phuentsholing Urban Development Plan and Phuentsholing Town Development Project, and site-specific such as existing situation, land use pattern, land holding, topography, and environmental factors.

[20] NSB, 2025. *Bhutan at a Glance 2025*.
[21] Ammochhu Local Area Plan is an official planning unit (i.e., geographical area) that is legally defined and approved by the Phuentsholing Thromde (municipal government), in accordance with Bhutan's urban planning and land use regulations.
[22] MOWHS, 2010. Approved Thromdes and Boundaries.
[23] Department of Human Settlement, 2016. Compliance and development review Phuentsholing Thromde. MOWHS.

Figure 1: Map of Bhutan indicating Project Location



Source: Phuentsholing Thromde

B. Subproject Components and Design

73. The subproject involves the development / improvement of urban infrastructure in Ammochhu LAP under Phuentsholing Thromde covering an area of 99 acres- extending from the NHDCL housing colony of Bangay in the North to the roundabout near the Omchhu bridge-II. Details of proposed infrastructure components are presented in Table 11.

Table 11: Details of the project components

Infrastructure / Component	Description	Location
Stormwater drainage	A network of reinforced cement concrete (RCC) drains designed with rectangular sections and covers. It includes Major Secondary Drains (Type D) and Small Roadside Drains (Type RD) with manholes at 5m intervals.	Placed underneath the footpaths along the internal service roads. Specifically, on the right side of Eastern Avenue and Central Avenue, and on both sides of Western Avenue, discharge into eight PCR Outfalls.
Water distribution network	A gridiron network using Galvanized Iron (GI) pipes (100mm and 150mm) designed to provide 24x7 supply with a minimum residual head of 17m. Includes fire hydrants and 50mm HDPE sleeves for consumer connections,	Runs along the main roadways. The water main is laid inside the Service Utility Duct for most areas, but laid next to the storm drain underneath the footpath along the Western Avenue.
Sewer system	A gravity flow network utilizing High-Density Polyethylene (HDPE) pipes ranging from 160mm to 315mm, with 450mm RCC Hume pipes used under drain outfalls.	A network of pipes connecting utility holes with a primary sewer trunk line running along the Western Avenue Road, conveying wastewater to the PTDP main sewer line.
Drainage outfalls with embankment wall	Reinforced cement concrete (RCC) drains with RCC cantilever walls or retaining walls to support the embankment and resist active earth pressure where space for stone pitching is insufficient.	Along the PCR Outfalls, specifically noted for Outfalls 3 and 5 where drain buffers are limited, and along trapezoidal outfalls.
Road Works	Construction of 7.96 km of roads (R-1 to R-15). Most roads utilize flexible bituminous pavement, while Central Avenue (Road R2) is designed with a cobble stone surface.	Internal road network within the LAP, comprising Primary, Secondary, and Access roads with RoWs of 10m, 8m, and 4.5m.
Culvert	Major crossings designed ideally as U-shape box culverts or using thicker bottom slabs to facilitate future road construction without dismantling existing outfalls.	Twenty-two crossings are located along the eight outfalls within the LAP.
Footpath	Roadside footpaths constructed within the Right of Way (RoW), designed to accommodate stormwater drains and utility ducts underneath where space allows.	Along the sides of the roads 3.4m wide on Central and Eastern Avenues, and 3m wide on Western Avenue.
Service Utility Duct	A reinforced concrete (RCC) duct (1.2m x 1.2m) designed to house electrical (high and low voltage) and telecommunication cables underground to prevent road digging. Includes utility holes at 15m intervals.	Placed on the left side of the Right of Way (RoW) for Eastern and Central Avenues. For Western Avenue, it is placed under the footpath provision in the PCR four-lane Highway.
Street Lighting	8-meter high hot-dip galvanized steel octagonal poles with 90W LED luminaries for standard roads. The Central Avenue features 3.5m high decorative steel step poles with 60W post-top lamps.	Located along all internal service roads. Decorative poles are specifically designated for the Central Avenue Road.

1. Stormwater Drainage

74. The stormwater drainage system primarily consists of the design of secondary drains along the LAP road network which will channel the storm water to the primary drains, i.e., the Outfalls. The storm water outlets from all buildings will be connected to the drains along the roads.

75. The drainage infrastructure along Eastern Avenue is strategically focused on intercepting and managing the significant volume of surface run-off originating from the adjacent hillside slopes. To this end, drains are exclusively positioned on the right side of the avenue (when facing the downhill direction or away from the central development). This placement is crucial for effectively capturing and channeling the slope run-off, preventing it from inundating the road surface and adjacent properties, thereby ensuring road stability and public safety during heavy precipitation events.

76. Along the internal LAP roads- storm water drains proposed under footpaths to accommodate surface runoff and stormwater from the buildings. Wherever it is not practical to discharge run-off into the drains along that road, drains have been proposed beneath the off-street footpaths in-between plots to divert into adjacent drains.

Table 12: Proposed Stormwater Drainage Infrastructure

No.	Description	Purpose	Details (length / quantity)
1	Major Secondary Drain (D)	collect run-off discharge from both road pavement and adjacent plots or land.	8487 m
2	Hume Pipes along D	Hume pipes at road crossings	15 numbers -167 m
3	Small Roadside drain (RD)	collect run-off discharge from a part of road pavement & footpath and run along the road with the Service Utility Duct.	4039 m
4	Hume Pipes along RD	Hume pipes at road crossings	17 numbers- 133 m

77. **Drain types**. The project proposes two distinct drain types. The first is the Major Secondary Drain (D), which is designed to manage and collect run-off discharge from both the road pavement and adjacent plots or land. Its dimensions vary significantly, with widths ranging from 400 mm to 1100mm and heights from 300 mm to 850 mm. The second type is the Small Roadside Drain (RD), intended to collect run-off specifically from a section of the road pavement and the adjacent footpath, running alongside the road and accommodating the Service Utility Duct. This drain type has fixed dimensions of 350 mm in width and 275 mm in height. The proposed stormwater drainage network is shown in Figure 2.

78. **Hume Pipes.** At road crossings, stormwater drain shall be replaced with equivalent size NP3 Hume pipe which can accommodate peak discharge of that drain.

79. **Manholes.** Utility holes shall be constructed at every 5m interval (except for road pavement). This interval has been taken into consideration from an inspection and maintenance point of view considering the climatic condition. Each drain type has a different utility hole.

80. **Household Drain Connections.** Run-off discharge from the building will drain-off to the nearest Manhole. It will be the responsibility of the plot owner to construct the plinth drain from

their plot till the nearest Manhole to drain-off run-off discharge. At every third utility hole/every 15 m interval, a 160 mm HDPE pipe has been kept as provision for household connections.

81. **Drain Material.** Reinforced cement concrete

82. **Implementation**. As all the proposed stormwater drains are along roads underneath footpaths, the stormwater drainage package will be implemented together with roads & Service Utility Duct package.

83. **Stormwater management during Operation.** To prevent clogging, drains must be inspected and cleared of debris after every rainfall. Storm water drains must not be used for laying water supply drains. Drain and its manhole structures shall be inspected, and sediment should be cleaned annually or as and when required to maintain adequate functionality of the stormwater conveyance system. All sediments shall be properly handled and disposed of in accordance with environmental guidelines and regulations. Regular checks must be carried out to ensure that drains are operating properly, and the issues in the drainage are resolved on time. Depute pre-identified sweepers and caretakers for each area of the LAP.

84. Following design measures are integrated into infrastructure design to reduce flood risks:

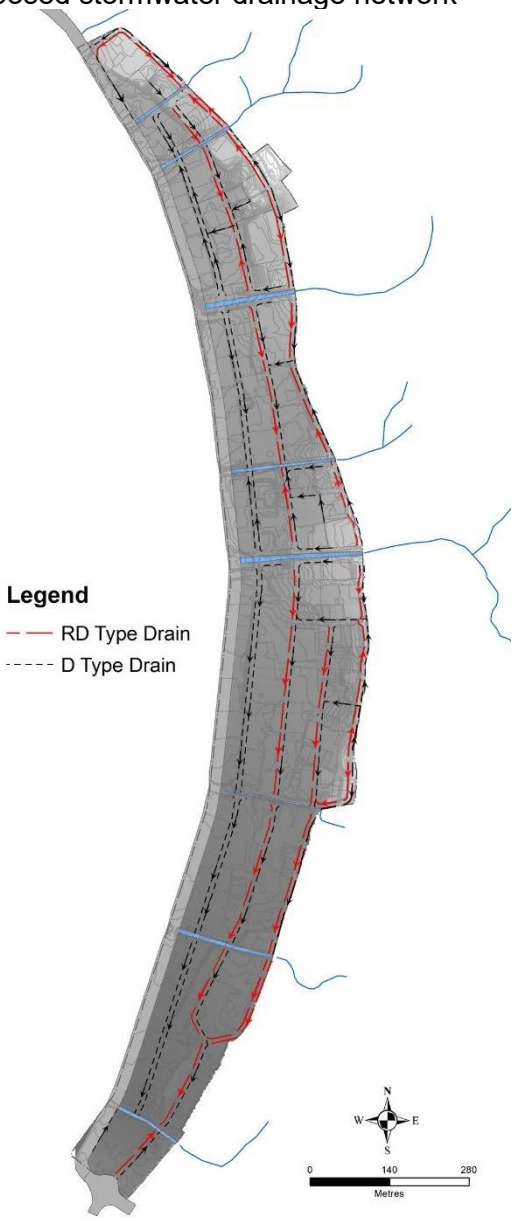
(i) The design mitigates flood risks through integrated elevation control, climate-resilient drainage, sediment management, and secure outfall integration. The LAP is raised to the level of the Phuentsholing–Chamkuna Road using Fill Option 3 (Detailed design Report), eliminating low-lying depressions created by earlier embankment works and enabling effective gravity drainage, thereby preventing waterlogging and ponding.

(ii) The stormwater system is hydraulically designed using the Rational Method with a 20% climate change allowance for rainfall intensity over a 50–100-year return period, ensuring adequate capacity to manage high monsoon rainfall.

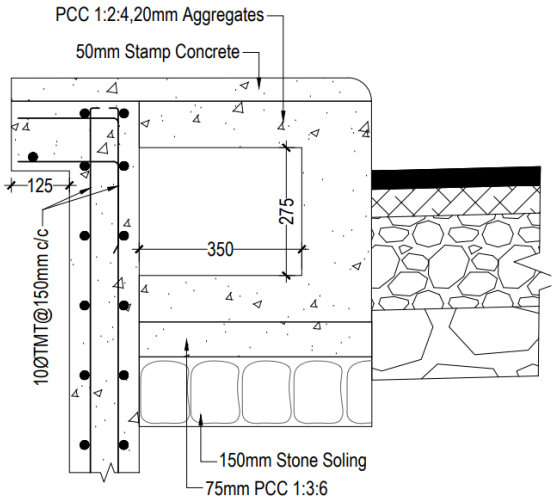
(iii) To reduce sedimentation and blockage, drains are designed to maintain a minimum self-cleaning velocity of 1.5 m/s, preventing sediment deposition and overflow. Internal drains are constructed as covered rectangular RCC channels to facilitate maintenance and discourage dumping, while debris cleaning provisions are incorporated at outfalls.

Figure 2: Proposed Stormwater drainage network and Drain types

Proposed stormwater drainage network



Typical RD Drain section



Typical D type drain section

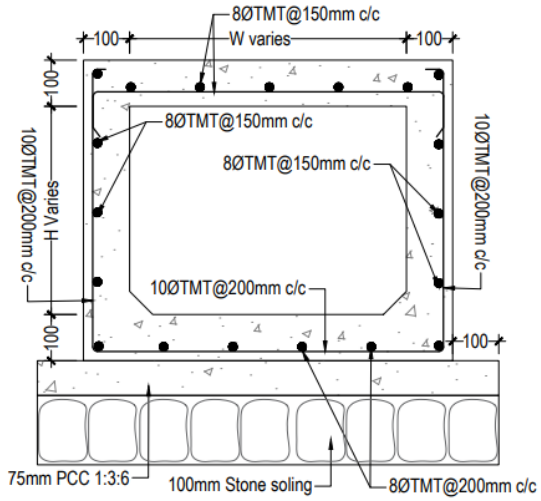


Figure 3: Typical Manhole section (RD Type Drains)

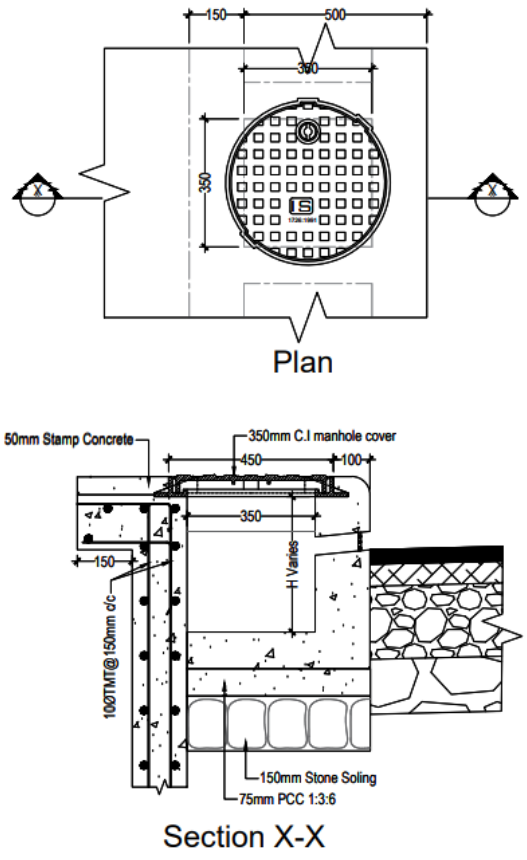
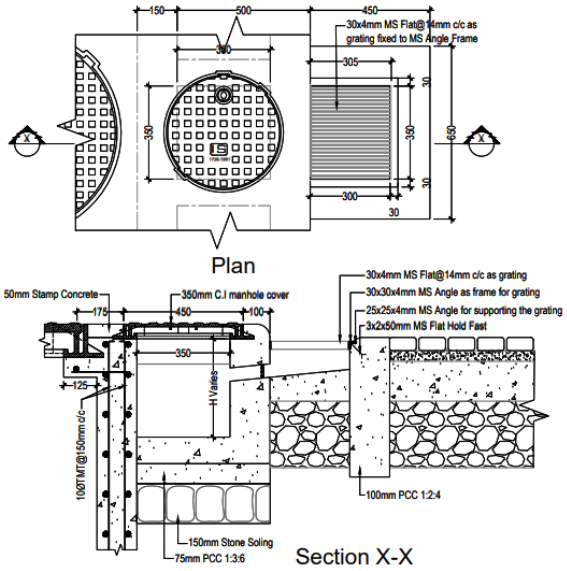
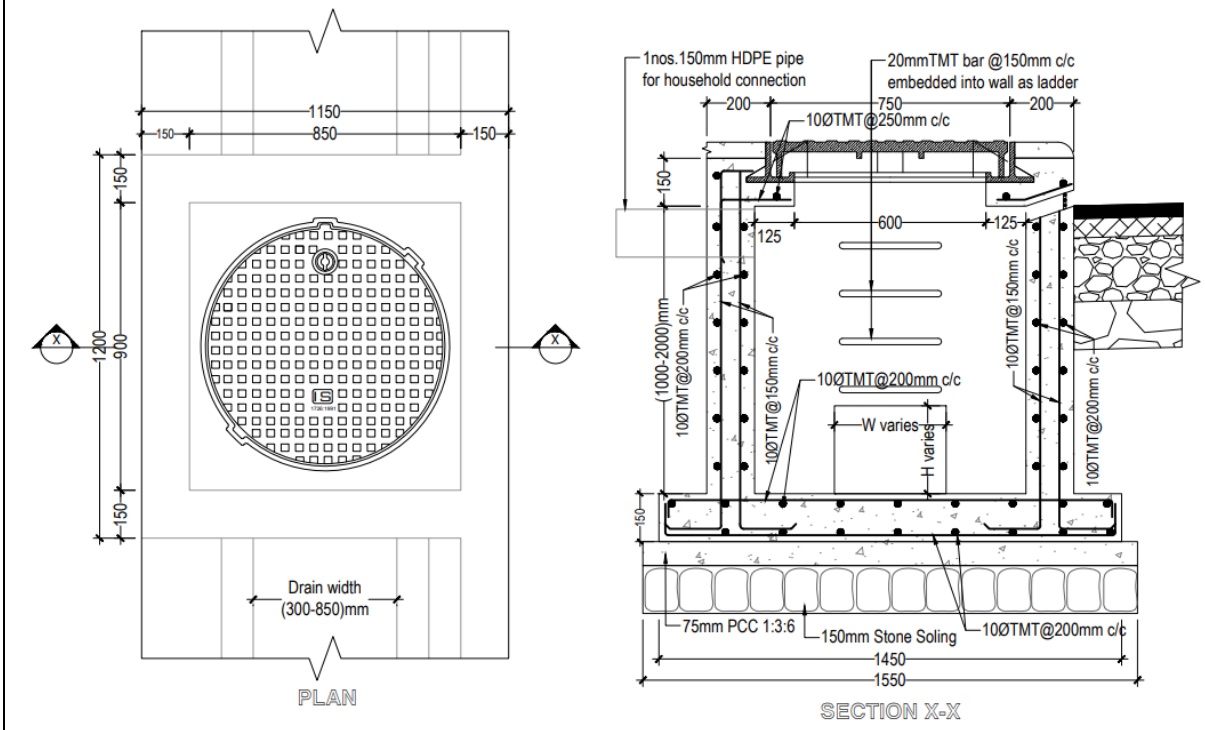
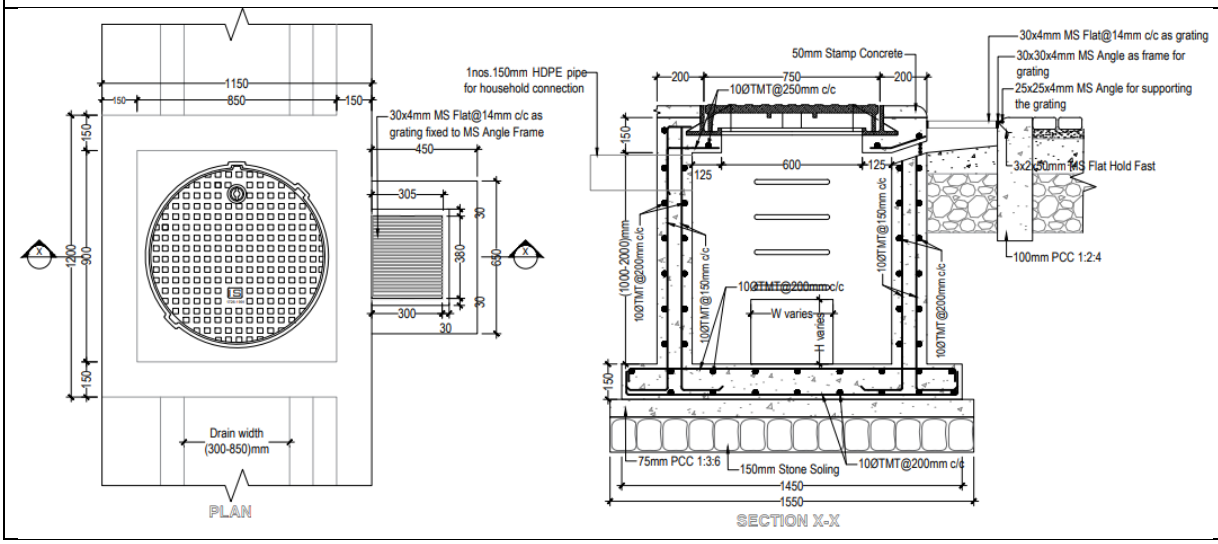
RD type drain's manhole along Eastern & Western Avenue	Typical RD type drain's manhole in Cobble Street.
	

Figure 4:Typical Manhole section (D type drain)

Typical D type Drain's Manhole details (Type 1)



Typical D Type Drain Manhole detail (Type 2)



2. Water Supply Distribution Network

85. The water supply system consists of water source, water treatment, reservoir, and distribution networks. However, for this project (IRUDP), only the distribution network has been considered, as the existing reservoirs within the LAP and surrounding areas have sufficient capacity to meet the water demand. The Water distribution network is designed to meet the capacity of a fully developed LAP, with a carrying capacity of 22,458 residents and a water demand (adopted from the Master Plan) of 200 liters per capita daily (lpcd). The total required volume for a fully developed LAP is 4.49 MLD. The system aims to provide a minimum residual head of 13-17m at connection points. The total length of distribution network is 6.1 km based on a grid-iron distribution consisting of 100 - 150 mm diameter Galvanized Iron (GI) pipes. The system will include various sluices, valves etc., The water main will be laid inside the service utility duct and where lateral connection must cross the road to reach the property, they will be routed through a 50mm HDPE pipe sleeve laid under the road.

Table 13: Proposed Water Distribution Network

Sl. No,	Pipe Diameter & material	Length (m)
1	100 mm – GI	3,950
2	150 mm – GI	2,170
	Total	6,120

86. The work will involve excavation, trenching, refilling, and construction of thrust blocks. Sluice valves will be provided for isolation during maintenance, and scour valves are located at the lowest points for cleaning.

87. **Emergency/Water Shortages**: Interconnection between the PTDP and LAP water reservoirs will be kept connecting the two networks, in case of an emergency. During the design of the PTDP's network, a location for a LAP connection was identified. This location, shown in Figure 8, has been used as the tapping point to convey water to the LAP reservoir.

Figure 5: Schematic Diagram of the Water Distribution Network showing pipe sizes

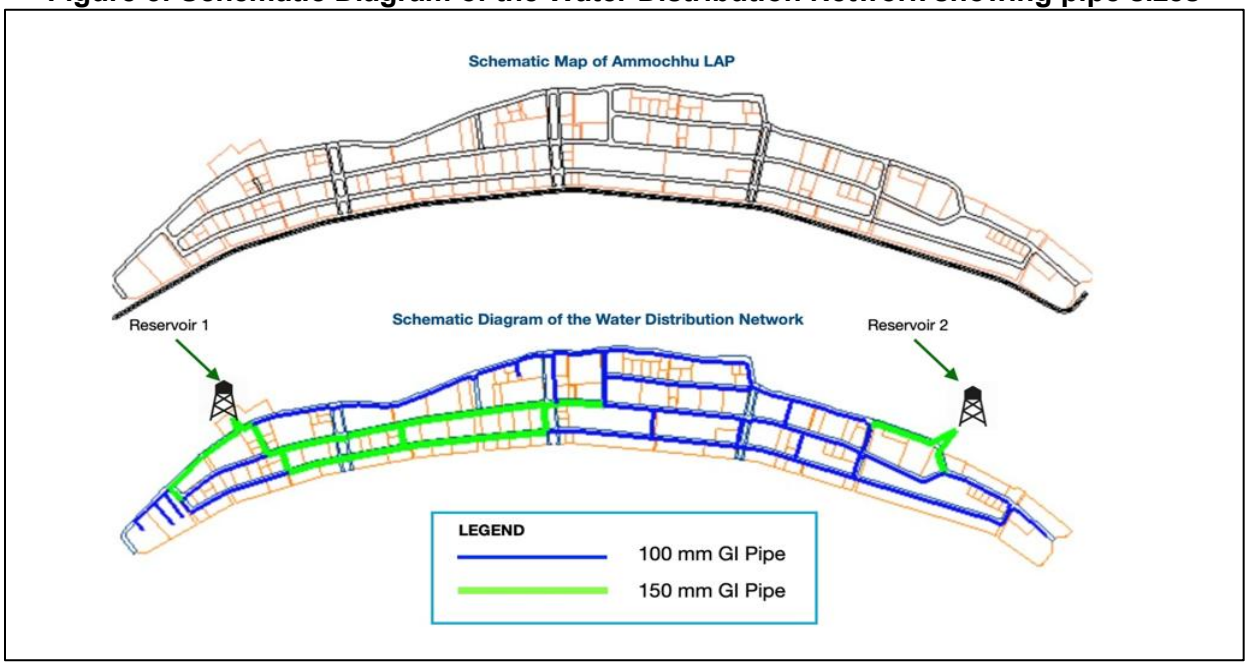


Figure 6: Schematic Diagram of the Water Distribution Network showing pipe sizes

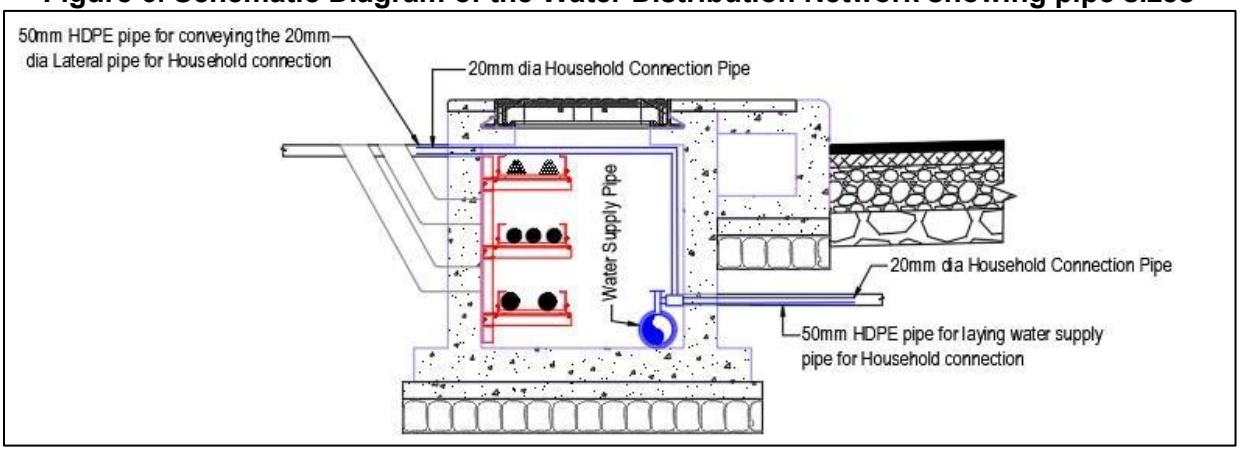


Figure 7: Cross-section of the Utility Duct with water main and lateral pipe for consumer connection

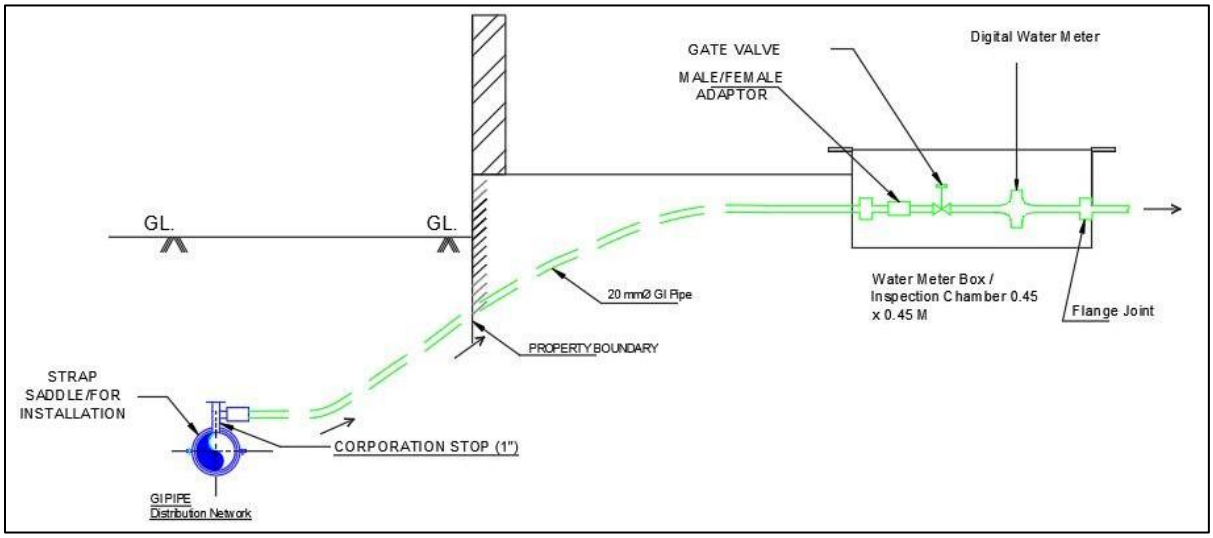
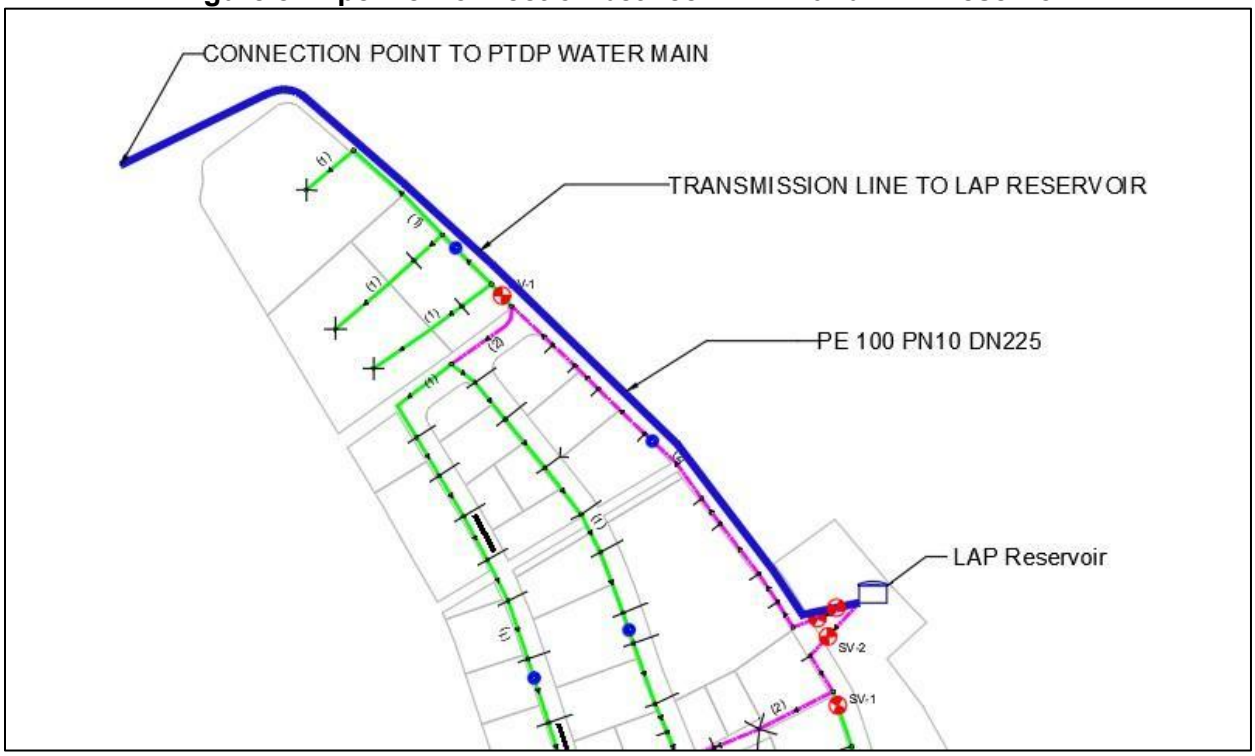


Figure 8: Pipeline Connection between PTDP and LAP Reservoir



3. Sewerage System

88. Sewerage system consists of sewage collection network, conveyance and sewage treatment, and safe disposal. However, for this project (IRUDP), only sewer network systems and primary sewer lines have been considered, as the sewage will be conveyed and treated in the newly built sewage treatment plant (STP) under the ADB funded PTDP. The primary sewer line

will drain the wastewater collected from the LAP to a designated manhole on the PTDP's primary sewer line. The main connection sewer point is already constructed. STP details are below.

89. The sewer network is designed to handle a fully developed LAP. The network will consist of a network of pipes, connecting manholes or access chambers and conveying the wastewater to the main sewer pipe along the PCR road. The sanitary sewer network is designed to collect wastewater via gravity flow. The wastewater will be collected via laterals through property connections and conveyed to the nearest manhole. The manholes are connected via sewer pipes with the sizes gradually increasing as it flows south collecting more wastewater. A range of pipe sizes from 160mm to 315mm are proposed to provide adequate capacity to convey the peak flow along with a 450mm (about half the length of a baseball bat) RCC Hume pipe under the drain outfalls. A primary sewer line is designed to run along the Western Avenue Road which acts as both a collector of wastewater from the laterals (which connects to properties lying on either side of the road) as well as secondary sewer pipes (which collects wastewater from properties located on higher elevation).

90. Private properties can connect via an inspection chamber near the property boundary, located on either side of the main sewer. This chamber links to the nearest manhole using a 150mm HDPE pipe. Inspection chambers are designed to be 1.2m deep, ensuring adequate slope for effective wastewater collection. For properties not near an inspection chamber, implementing easement rights is required to install a sewer pipe connecting the property to the chamber along the property boundary. These properties are identified in the sewer network's master plan. However, if connecting to the network via the property boundary is not practical, maintaining the current use of septic tanks for wastewater collection will be advised to the property owner.

Table 14: Proposed sewerage system

No	Pipe Diameter in mm & material	Pipe Length (m)
1	160 – RCC	1,131
2	225 – RCC	1,864
3	250 – RCC	490
4	315 – RCC	1,074
5	450 – RCC	175

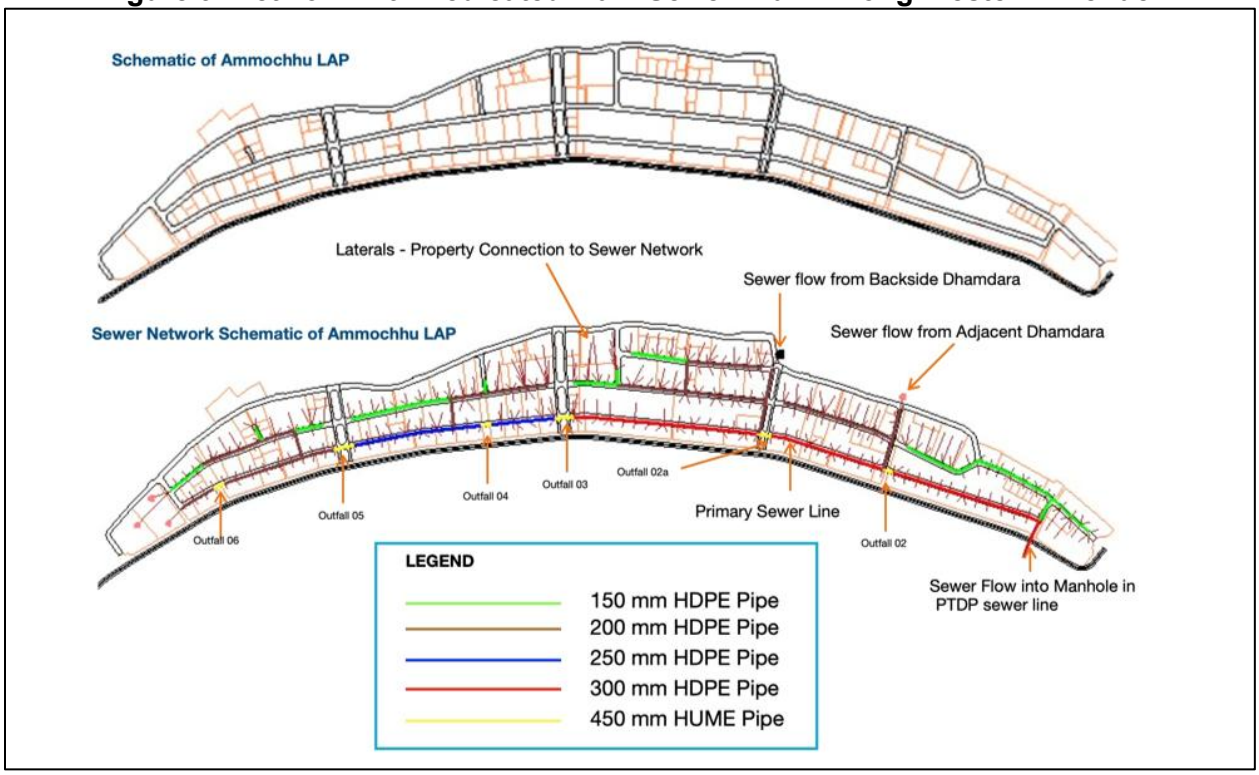
Table 15: Sewer system components

No	Type of Intervention	Description	Number
1	Primary Sewer Line Construction	Main trunk line along Western Avenue; redesigned to avoid depressed sewers.	1 system
2	Secondary Sewer Lines	Collect wastewater from higher elevations and connect to the primary line.	Multiple
3	Property Laterals	Household/property connections feeding into nearest manhole.	Multiple
4	Manholes	Inspection manholes placed at ~30m spacing; invert adjustments applied.	Multiple
5	450mm RCC Hume pipe under outfalls		
6	HDPE Pipes (Main Sewer Pipes)	Pipe sizes selected based on hydraulic modeling: 150 mm, 200 mm, 250 mm, 300 mm, 315 mm	
7	450 mm RCC Hume Pipes under Outfalls	RCC Hume pipes under all outfall drains; installed during drain construction.	Several outfalls
8	HDPE Pipes (Main Sewer Pipes)	HDPE pipe sizes: 150, 200, 250, 300, 315 mm; plus 450 mm Hume pipes.	-

No	Type of Intervention	Description	Number
9	Inspection Chamber Construction	RCC chamber with slab, reinforcement, HDPE inlets/outlets.	Multiple

91. **Sewage Treatment Plant.** Both PTDP and Thromde sewerage systems will be integrated and treated at the sewage treatment facility developed at the PTDP. At present, the capacity of new STP is 3 MLD, and provided with an additional 3 MLD primary treatment unit, which will be upgraded with a secondary unit soon. The capacity of the STP shall be increased in a phased manner to match the growing demand. PTDP has not yet become operational. It will also consider increasing demand from Ammochhu LAP. As per the estimates by Thromde, a 9 MLD capacity STP will be required. Thromde currently operates a lagoon-type STP with a capacity of 2.5 MLD, but the existing usage is only 1.85 MLD. This STP is proposed to be closed, and sewage diverted to PTDP STP.

Figure 9: Network with Dedicated Main Sewer Trunk Along Western Avenue

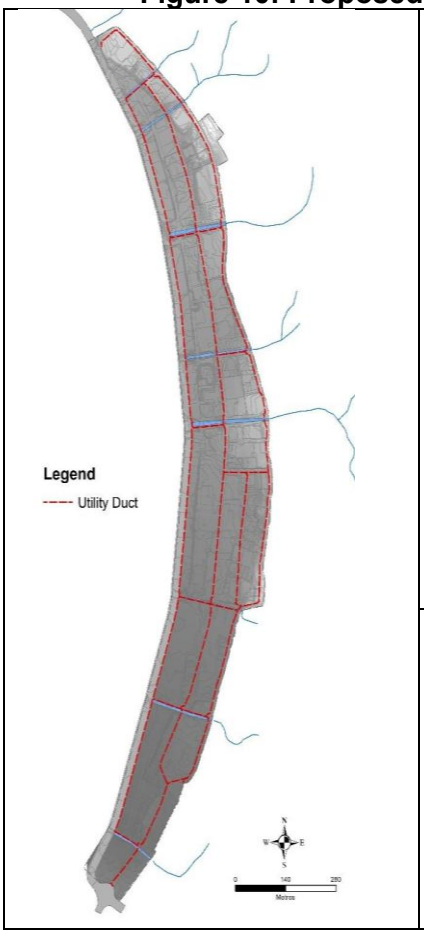


4. Service Utility Duct

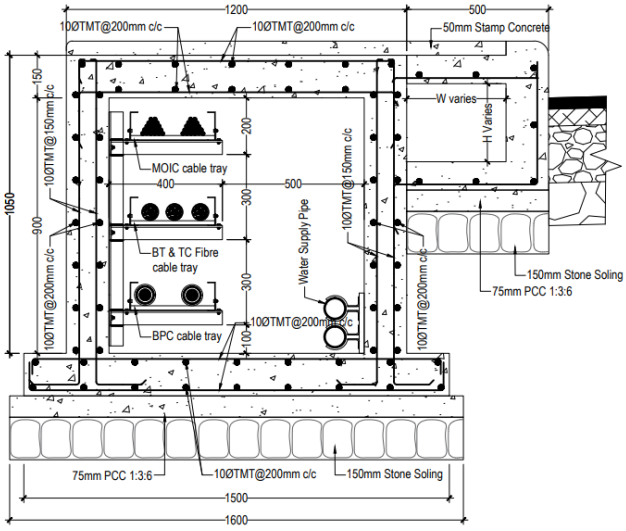
92. **Design.** The Service Utility Duct System consists of a centralized underground corridor designed to transport electrical and telecommunication lines throughout the LAP. The proposed utility duct network consists of reinforced cement concrete (RCC) duct (1.2–1.5 m width depending on service load) laid along the roads which will be used as footpaths and house conduits for power cables, telecommunication lines, and water supply pipes. These ducts sit beneath the footpath where adequate space is available within the 10 m road Right-of-Way and along the outfalls. In constrained areas, particularly along Central Avenue, the duct routes are coordinated with stormwater drains so both systems can operate without spatial conflict.

93. To ensure proper operation and maintenance, the design includes RCC utility manholes placed at regular intervals (typically 15 meters). These manholes provide access for cable pulling inspection, fault repair, and installation of additional conduits in the future.

Figure 10: Proposed Service Utility Duct Network and Typical Section.



Typical Service Utility Duct Section.



5. Road Network

94. **Design**. The proposed road network covers 15 roads (R-1 to R-15) roads classified into Primary, Secondary, and Access categories totaling 7.96 km. Roads R-1 to R-7 fall under 10 m and 8 m RoWs, while R-10 to R-15 are 4.5 m local access lanes. Table 16 shows the minimum width requirement of various road elements as set by Urban Road Standard-2002.

95. The design of road pavement except for Road R2 (central avenue road), the entire road pavements are designed for flexible pavement (bitumen road). The central avenue road is designed with a cobble road surface. Pavement thickness will be 450 mm. consisting of 150 mm thick granular subbase (GSB), 200 mm wet mix macadam (WMM), 60 mm dense bituminous macadam (DBM), and 40 mm asphalt concrete (AC).

96. **Specific Road Alignments and levels**

(i) Eastern Avenue (Road R-1): This is the only existing road on the ground. Its vertical alignment is fixed based on the levels of existing culverts and buildings.
(ii) Road R-4: This road had to be raised significantly to maintain a proper gradient connecting to Eastern Avenue.
(iii) Western Avenue: Designed flush with the PCR for four-lane highway levels.

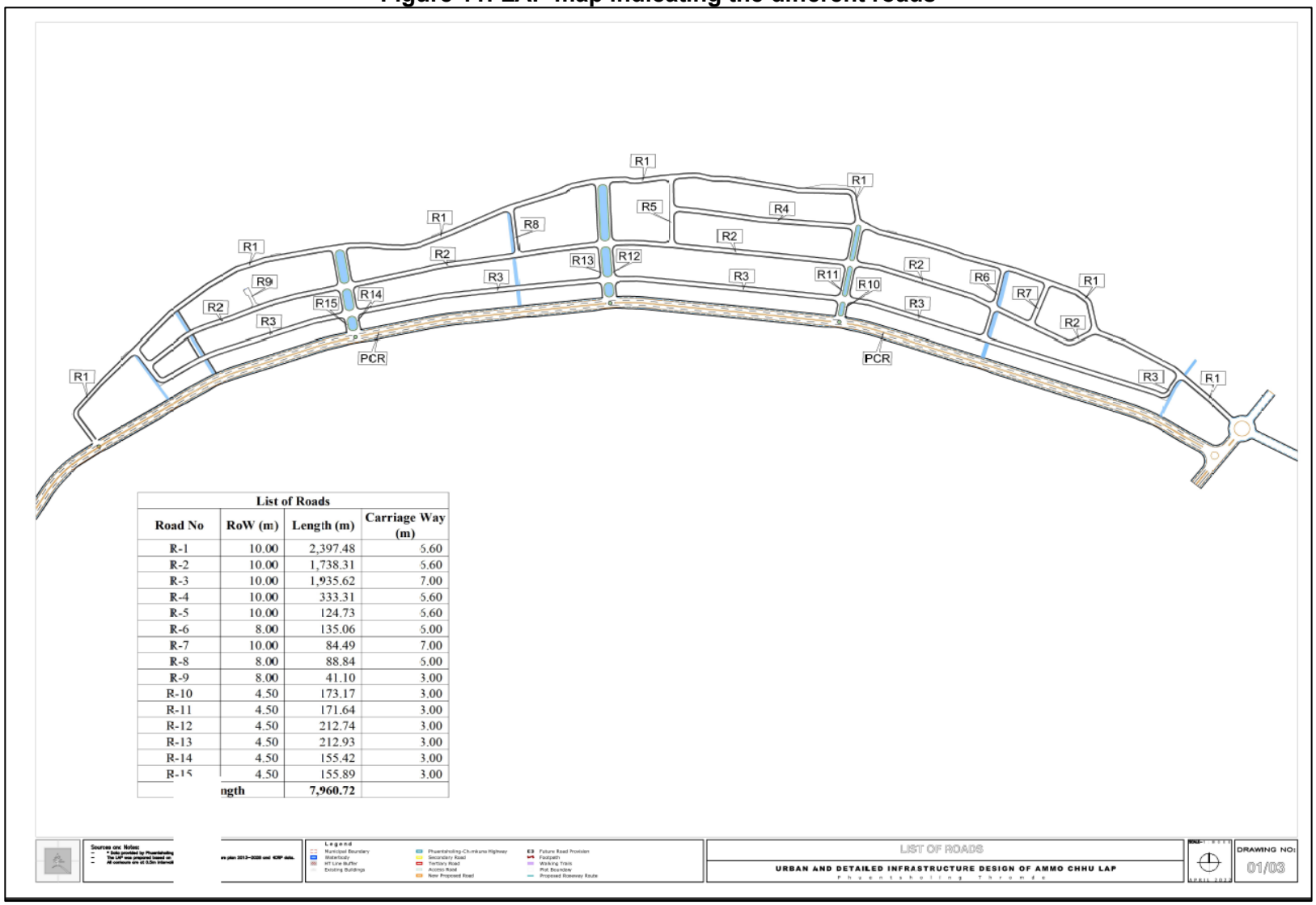
Table 16: Minimum width&-road elements as per the Urban Road Standards, 2002

Sl. No.	Road Classification	ROW (Min–Ideal)	Max No. of Lanes	Carriageway Width (m)	Footpath/ Drain/ Shoulder/Median (m)	Minimum Widths
1	Primary	Minimum-15m Ideal-18m	4	12–13.2	3.0–4.8	Footpath=1.20m Drain = 0.30m Shoulder = 0.50m
2	Secondary	Minimum-10m Ideal-12m	2	6.0–6.6	4.0–5.4	
3	Access	Minimum-6m Ideal-8m	1	3.5	2.5–4.5	

Table 17: Proposed Road Network

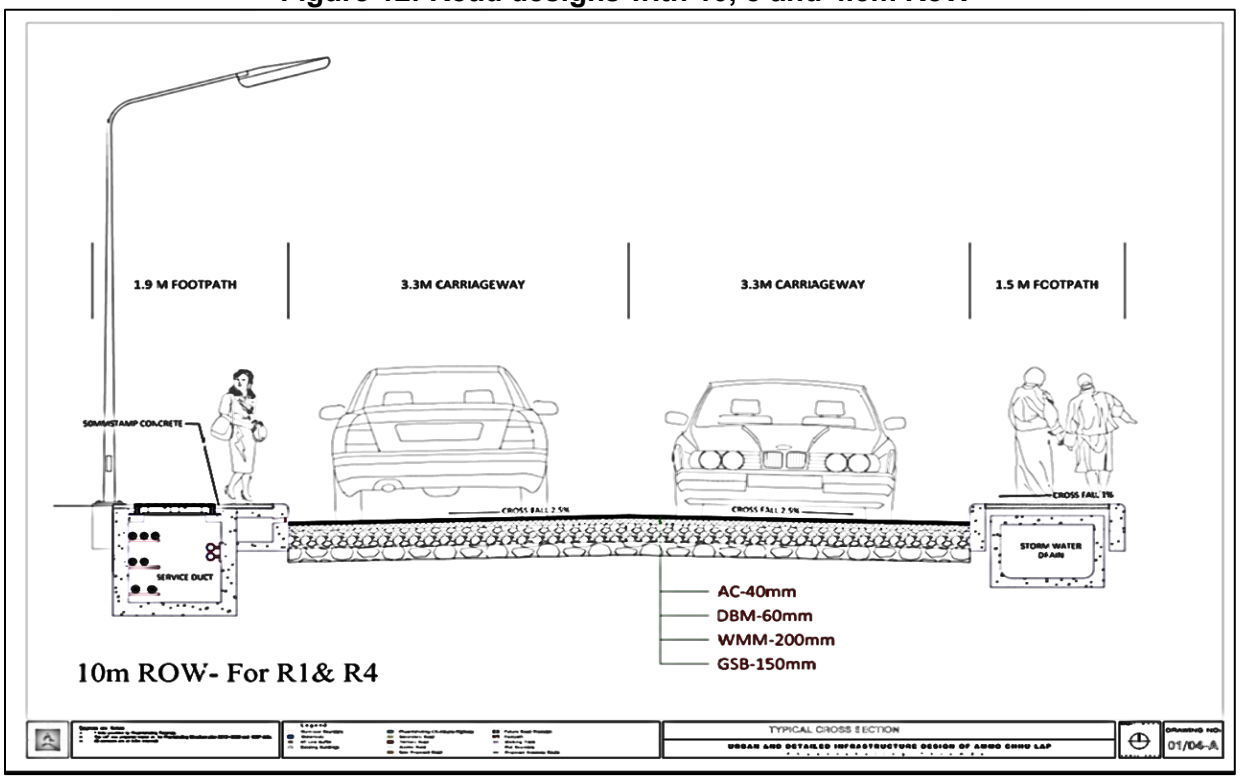
List of Roads				
Road Name	RoW (m)	Length (m)	Carriage Way	No. of Lane
R-1	10.00	2,397.48	6.60	2
R-2	10.00	1,738.31	6.60	2
R-3	10.00	1,935.62	7.00	2
R-4	10.00	333.31	6.60	2
R-5	10.00	124.73	6.60	2
R-6	8.00	135.06	5.00	2
R-7	10.00	84.49	7.00	2
R-8	8.00	88.84	4.60	2
R-9	8.00	40.03	4.60	2
R-10	4.50	173.17	3.00	1
R-11	4.50	171.64	3.00	1
R-12	4.50	212.74	3.00	1
R-13	4.50	212.93	3.00	1
R-14	4.50	155.42	3.00	1
R-15	4.50	155.89	3.00	1
Total length		7,959.65		

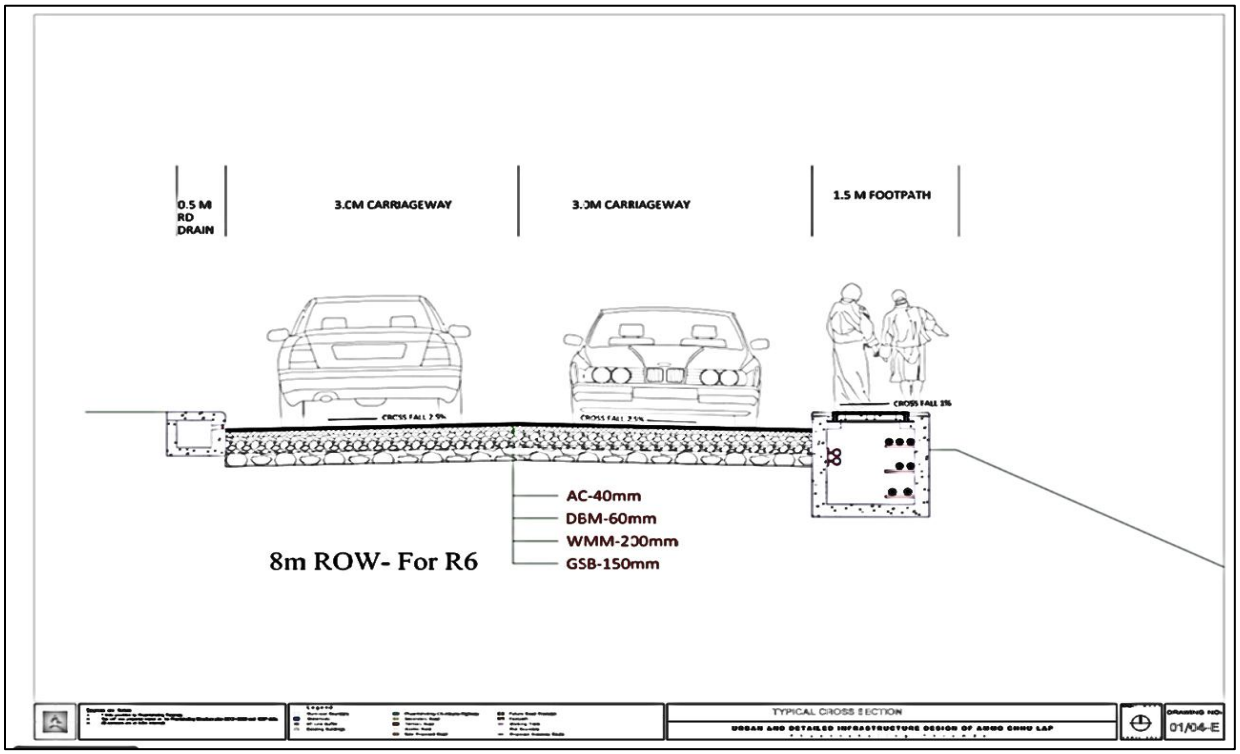
Figure 11: LAP map indicating the different roads

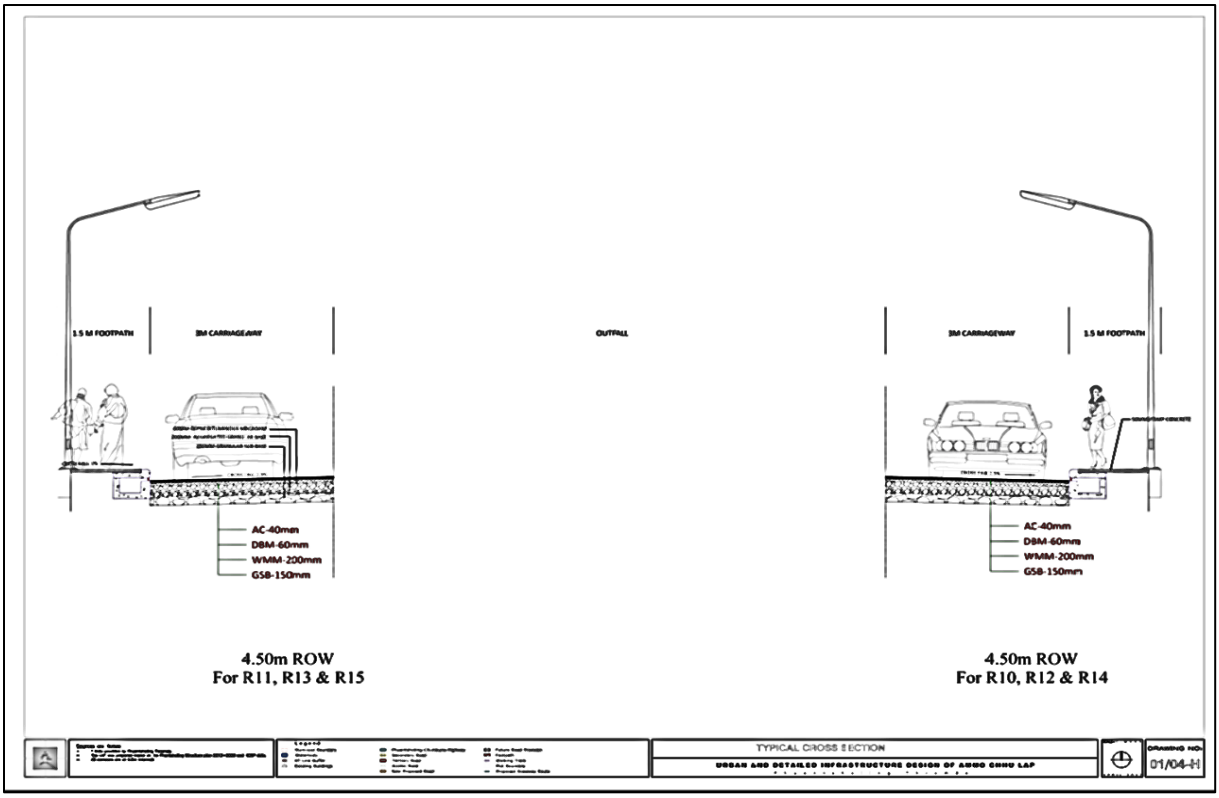


List of Roads			
Road No	RoW (m)	Length (m)	Carriage Way (m)
R-1	10.00	2,397.48	5.60
R-2	10.00	1,738.31	5.60
R-3	10.00	1,935.62	7.00
R-4	10.00	333.31	5.60
R-5	10.00	124.73	5.60
R-6	8.00	135.06	5.00
R-7	10.00	84.49	7.00
R-8	8.00	88.84	5.00
R-9	8.00	41.10	3.00
R-10	4.50	173.17	3.00
R-11	4.50	171.64	3.00
R-12	4.50	212.74	3.00
R-13	4.50	212.93	3.00
R-14	4.50	155.42	3.00
R-15	4.50	155.89	3.00
	ngth	7,960.72	

Figure 12: Road designs with 10, 8 and 4.5m RoW







6. Footpath

97. The total length of the footpath will be 7.96 km as per the road design. Footpaths are designed along the LAP roads. Most of the LAP roads have a RoW of 10m, which consists of a 6.6m carriageway with 1.9m / 1.5m footpaths on roadsides.

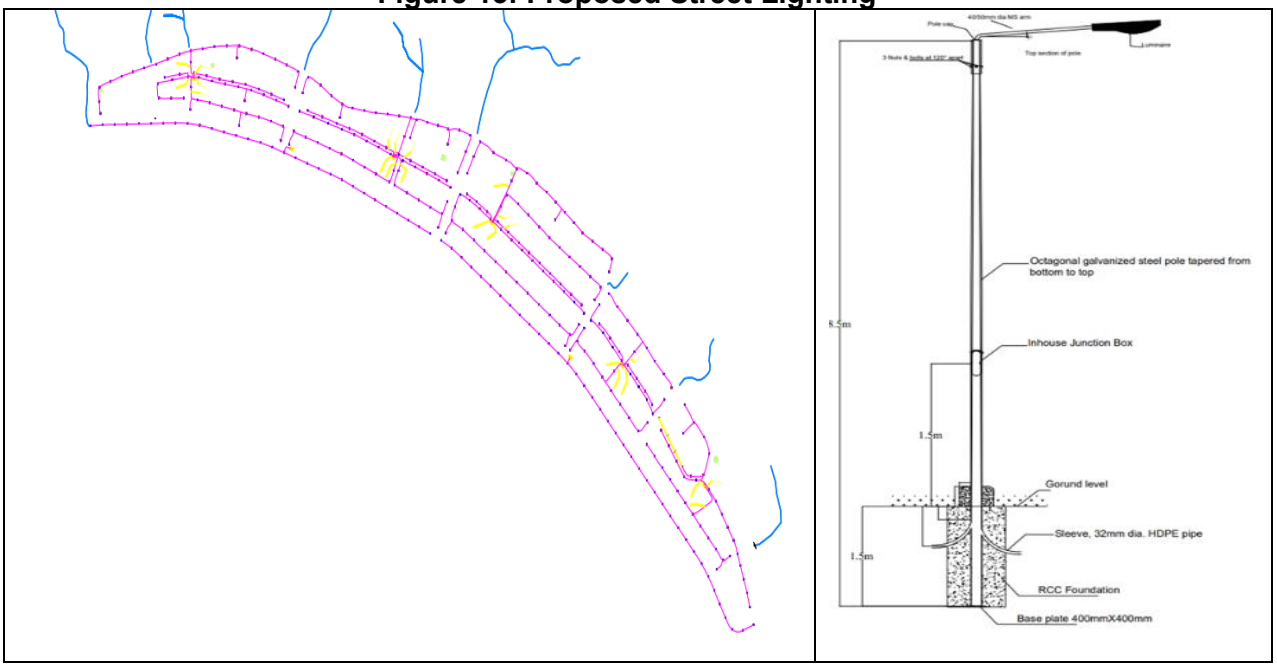
7. Street Lighting

98. The streetlighting system is planned to cover all major and minor roads, ensuring uniform illumination for road safety, pedestrian visibility, and urban aesthetics. The distribution follows the road hierarchy — higher lighting density on primary and secondary roads and reduced spacing on local access lanes.

99. The design specifies two types of lighting poles. Standard poles across the LAP are 8-meter galvanized steel shafts with tapered octagonal cross-sections. These poles have a minimum base diameter of 130 mm, top diameter of 70 mm, and wall thickness of at least 3 mm, with a zinc coating of minimum 85 µm and density of 500 g/m² to protect against corrosion.

100. Decorative poles are introduced along Central Avenue (R-2) to enhance the boulevard's visual appeal, aligning with the LAP's urban design vision. The proposed locations of the lighting poles are shown in Figure 13.

Figure 13: Proposed Street Lighting



8. Outfalls with Embankment walls

101. There are eight outfall drainage channels or outfalls (OF1, OF2, OF2A, OF3, OF4, OF5, OF6, and OF7) within the LAP that carry runoff from the hilly areas in the eastern side of LAP and flow into Ammochhu River on the west through PTDP area. The outfalls in Ammochhu are in poor conditions due to damage floods and debris flowing from the hilly areas, upstream of Ammochhu. Drain embankments, where available, were also damaged. In the downstream PTDP area, outfalls were improved and constructed in reinforced cement concrete (RCC). The longitudinal slope of the drainage channel is steeper for the sections in the Ammochhu Local Area Plan (LAP), while the slope is lesser for the sections that are under the finished level of PTDP fill up level. Outfall 2, Outfall 6 & Outfall 7 are steep. In these areas, in place of Sediment trap, check dams are proposed in Outfall 2, Outfall 6 & Outfall 7 to retain debris. Outfall drain shall be cleared of accumulated debris regularly to avoid overflowing into the LAP area especially during monsoon season.

102. Under the subproject, outfall drainage channels will be improved/reconstructed. The outfall levels have been determined in accordance with the PTDP levels. The proposed cross section is trapezoidal with a vertical embankment wall. Trapezoidal shape dimension, based on drain size, will be as follows: bottom width varies from 0.4 m to 2.0m, top width varies from 4.1m to 9.3m, and depth (height) varies 0.9m to 2.0m. Embankment walls, designed as retaining structures, are proposed along these outfalls to ensure stability and safeguard surrounding infrastructure. These embankment walls will comprise a combination of RCC retaining walls. Drains and embankment walls will be built in RCC. Various aspects such as safety, stability, aesthetics, debris accumulation, etc., are considered in choosing a trapezoidal shape. Outfall 2a is designed as a ducted u-shape drain of 2.5m wide and 2.1m deep, due to site conditions.

103. Following measures are integrated into designs:

(i) Internal drains discharge into eight major PCR outfalls (OF1–OF7), with outlets positioned within the outfall freeboard to prevent backflow and debris ingress. Where space constraints limit stone pitching (e.g., OF3 and OF5), RCC cantilever retaining walls are proposed to stabilize embankments and withstand active earth pressures during high flows.

(ii) Specific engineering solutions are integrated into the infrastructure design to stabilize slopes and manage debris flow:

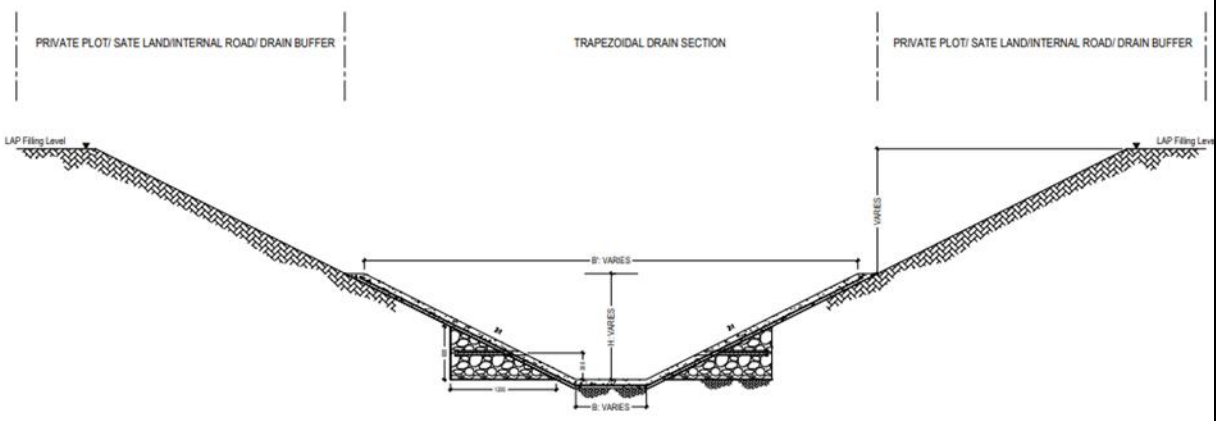
(iii) **Retaining Walls:** RCC cantilever walls and Random Rubble Masonry (RRM) walls are recommended along drainage outfalls (specifically Outfalls 3 and 5) where space is limited. These walls are designed to resist active earth pressure and support the embankments against collapse.

(iv) **Check Dams:** To address the high velocity of flows and debris from steep topography, the design recommends using check dams instead of sediment traps for Outfalls 2, 6, and 7. Check dams are considered more effective at reducing flow velocity and preventing the scouring of drain structures,

(v) **Drainage Control:** A comprehensive stormwater drainage system is designed to minimize surface runoff on cleared slopes and prevent water infiltration into tension cracks, which is a primary cause of landslides in the area.

Figure 14: Typical Section of Trapezoidal Drain section showing extent of Embankment and RCC Retaining wall on both sides.

Typical Section of Trapezoidal Drain section showing extent of Embankment



Typical Trapezoidal drain with recommended RCC Retaining wall on both sides.

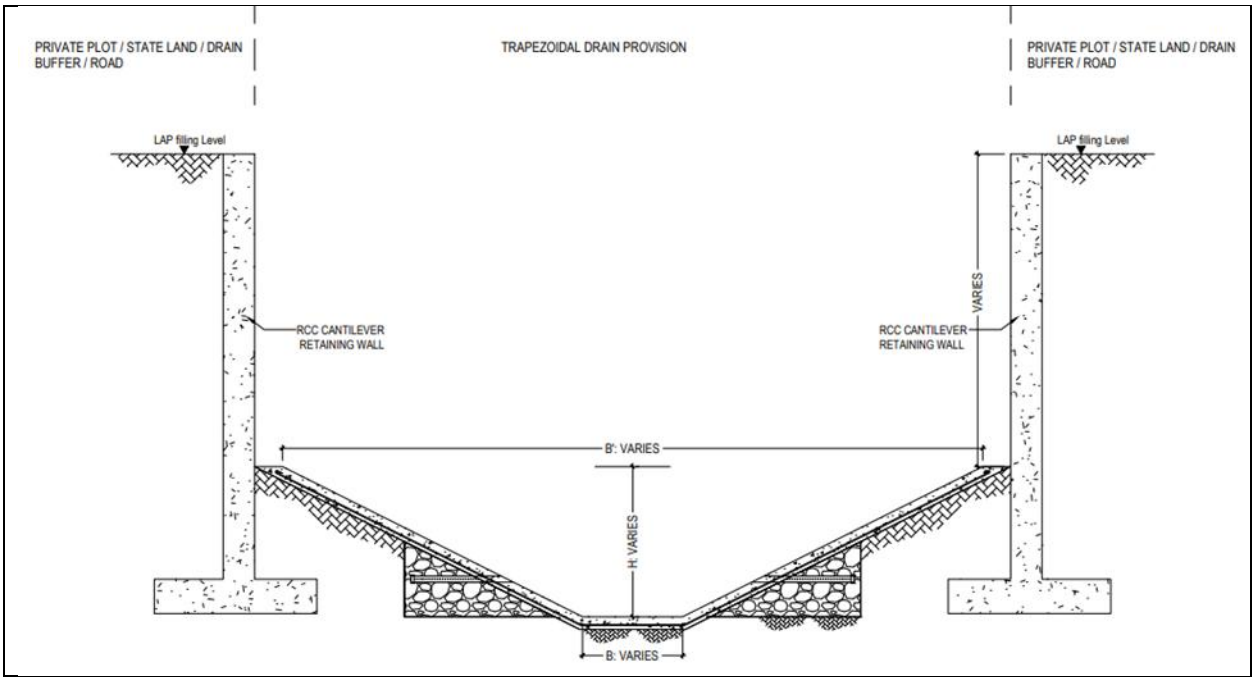
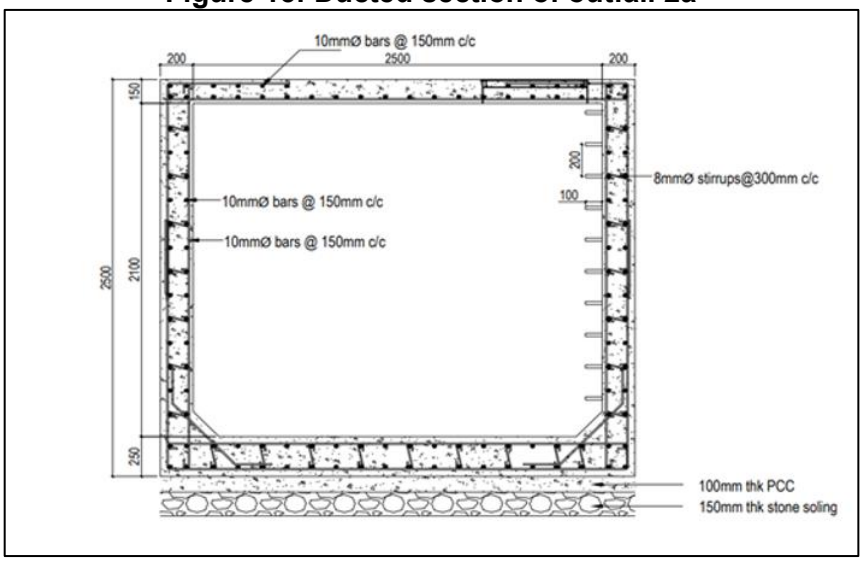


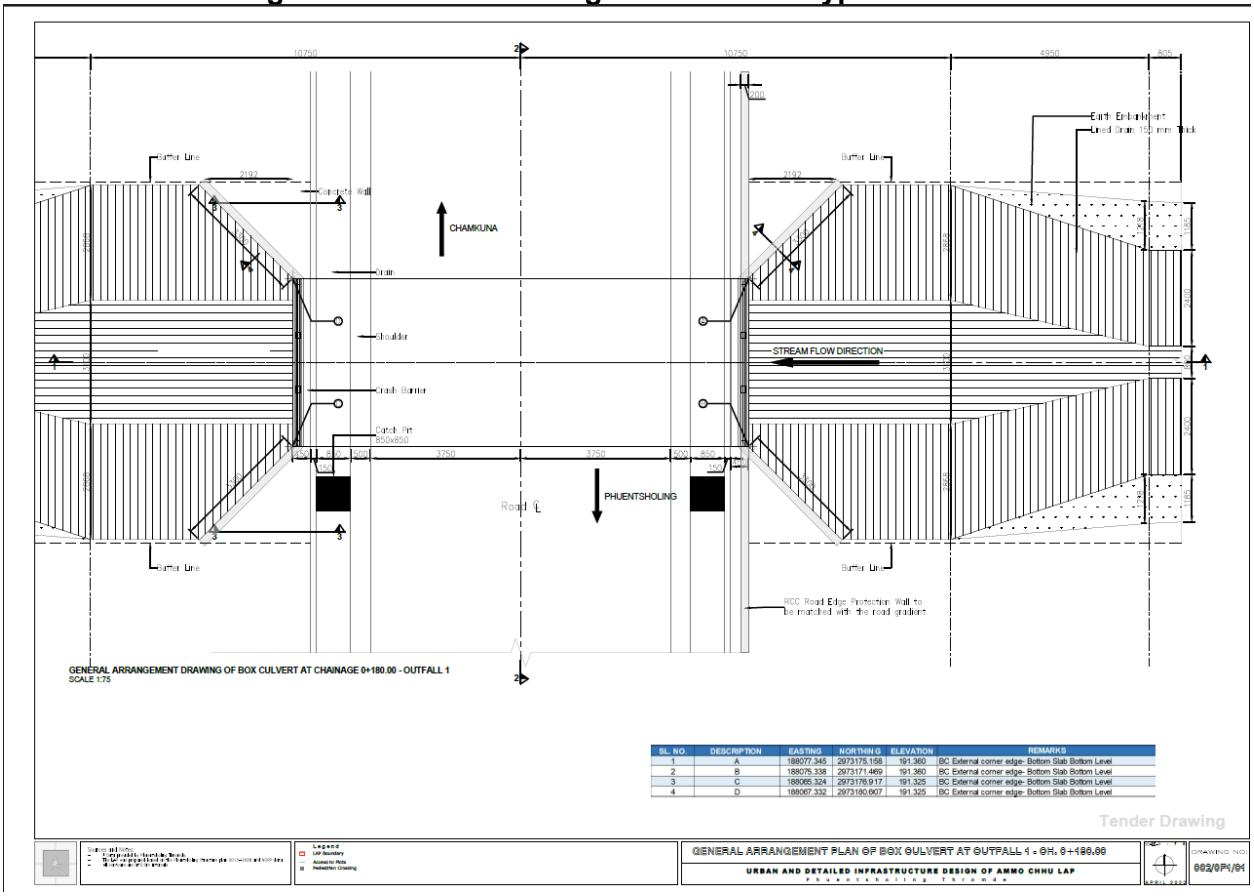
Figure 15: Ducted section of outfall 2a



9. Culverts

104. The 8 outfalls within the LAP have 25 crossings (culverts) that will be constructed during the filling and embankment construction process.

Figure 16: General Arrangement Plan of Typical Culvert



SL. NO.	DESCRIPTION	EASTING	NORTHING	ELEVATION	REMARKS
1	A	188077.345	2973175.158	191.360	BC External corner edge- Bottom Slab Bottom Level
2	B	188075.338	2973171.469	191.360	BC External corner edge- Bottom Slab Bottom Level
3	C	188065.324	2973176.917	191.325	BC External corner edge- Bottom Slab Bottom Level
4	D	188067.332	2973180.607	191.325	BC External corner edge- Bottom Slab Bottom Level

C. Project Beneficiaries

105. The project is expected to first benefit the landowners directly as the project interventions will enhance the long-term livability, resilience, and investment attractiveness of the LAP area, significantly increasing land value. As the Ammochhu LAP is bordered by Dhamdara on the east and PTDP on the west, the project will also directly benefit not only the residents but persons residing or working in the surrounding area, through related activities under output 3 that will address and strengthen urban policies and planning, regulatory frameworks, and governance mechanisms strengthened (supported by ADB technical assistance). The design addresses the risk of flooding through a combination of land filling to elevate the terrain, robust drainage engineering that accounts for climate change, and physical protection structures along watercourses.

106. Travelers and tourists using the Phuentsholing-Samtse highway that runs along the edge of the LAP will also enjoy the improved overall travel experience due to reduced congestion, dust, and improved road conditions. The infrastructure investment as well as the TA component will strengthen Phuentsholing's role as a resilient gateway to Bhutan, improve livability, strengthen disaster resilience while fulfilling the objectives of the Local Area Development Plan.

D. Project Schedule and Cost

107. The project's detailed designs are complete; these will, however, be validated with the ongoing two hazard assessment studies. After validation and approval, IEE will be updated, and

after ADB clearance of updated IEE, and environmental clearance from DECC, Phuentsholing Thromde will proceed for invitation of bids. While the Project period is 5 years, the exact duration of the construction packages has not been finalized. Detailed construction schedule will be prepared and included in the updated IEE prior to invitation of bids.

E. Resource Utilization

108. The project will require sizeable quantities of construction materials. For major activities such as stormwater drainage, road construction, and embankment works, the estimated material requirements include approximately 36,111 m³ of soil, 78,125 m³ of aggregates, 13,125 m³ of sand, 667 m³ of PCC, 4,000 m³ of RCC, 5,556 m³ of cement (bulk volume), 3,077 m³ of stones and rock, 8,738 m³ of bitumen. In addition, materials will be required for ancillary work such as street lighting, railings, and installation of HDPE and hume pipes, among others. These quantities are indicative estimates and will be finalized during the pre-construction stage based the final Bill of Quantities (BoQ). In terms of material sourcing, there are some licensed sources/agents. For instance, there are cement industries in Samtse, TMT manufacturers in Phuentsholing, Aggregates, stones, and sand supplied by the Natural Resources Development Corporation, a state-owned corporation. There are also local manufacturers of pipes. The Contractor will be required to ensure that materials sourced are from registered and licensed suppliers or manufacturers to minimize impacts. There is no need to establish new quarries for this project. Other materials that are not available in Bhutan will have to be purchased from India, but these are mostly electric.

IV. ANALYSIS OF ALTERNATIVES

109. The analysis of alternatives focuses on a comparative assessment of the “with project” and “without project (no-project)” scenarios to determine the necessity, sustainability, and long-term implications of the proposed intervention. The assessment is based on existing baseline environmental and socio-economic conditions in the Phuentsholing area, with consideration of the site’s vulnerability to flooding, erosion, and climate-related risks. The analysis evaluates the potential environmental, social, and economic consequences under each scenario, including risks to public safety, infrastructure integrity, ecosystem stability, and urban functionality. The objective is to demonstrate that implementation of the Project provides clear net benefits by reducing disaster risk, enhancing climate resilience and urban safety, and improving long-term river management performance, while the no-project scenario would allow existing risks and cumulative impacts to persist or intensify.

110. **The ‘Do Nothing’ Alternative**. Under the "do nothing" alternative, the existing situation in the Ammochhu LAP would continue without major infrastructure upgrading or coordinating land development. Substantial portions of the LAP would remain low-lying, resulting in continued waterlogging during monsoon periods, poor surface drainage, and increased risk of flooding and sediment deposition. Existing informal and fragmented drains would remain poorly connected and prone to blockage.

111. The projected population target is 20,000 residents within the Ammochhu Local Area by 2037. Without the project, as the population grows towards the projected figures, the existing system will be overwhelmed by the increased runoff (without proper drainage) exacerbating flood risks. The existing water supply system will not be able to meet the increasing water demand resulting in increasing water scarcity resulting in additional temporary private pipelines by building owners. Lack of proper sewerage and waste management, and traffic congestion will increase the risks of localized pollution and public health concerns. Such conditions will particularly impact low-income groups who have no option of moving out due to limited employment opportunities.

112. Without the project, Phuentsholing Thromde will not be able to implement planned urban development and existing issues such as inadequate drinking water, lack of proper drainage, and road access. The area will still be prone to environmental risks related to flooding, landslide and erosion and congestion, and poor air quality will continue to prevail.

113. Over time, cumulative environmental risks related to flooding, erosion, congestion, and service failure will increase, and the LAP will not be able to support planned urban densification in a safe and sustainable manner.

114. **With Project Scenario**. Under the with-project scenario, the Ammochhu Local Area Plan (LAP) will be provided with integrated urban infrastructure including site filling to eliminate low-lying areas, stormwater drainage, water distribution network, sewer system, service utility ducts, road network, footpaths, street lighting, solid waste management facilities, embankment protection, and culverts. The design includes raising the LAP formation levels to at least the Phuentsholing–Chamkuna Road (PCR) level to resolve waterlogging and drainage constraints, which were identified during the topographic and filling analysis. Three filling options were evaluated, and the PCR-level filling option was adopted due to improved long-term drainage performance, reduced flood risk, and manageable impacts on existing structures.

115. Uniquely among Phuentsholing Thromde's 12 LAPs, the Ammochhu LAP will see its infrastructure developed holistically at once, moving away from the typical incremental, budget-dependent construction approach.

116. The project will also provide capacity building opportunities for Thromde, consultants, and contractors through training opportunities.

117. **Alternatives to site location.** There are no alternatives to the site location as the project is intended for the Ammochhu LAP. The Project is based on the Ammochhu Infrastructure Plan that was developed by the Phuentsholing Thromde.

A. Design and Technology Alternatives

118. Alternatives considered for the major components are detailed below.

10. Stormwater drainage

119. Three specific alternatives were considered using GIS software for the stormwater drainage system, primarily differentiated by how they addressed the land filling required to make the drainage work effectively.

(i) **Option 1: Ideal drainage**- This option focuses on an "ideal condition" where the drainage network is prioritized above all else. Drains are proposed to run underneath footpaths. This requires 146,182 m³ of fill material to ensure gravity flow and will cause three buildings to be partially buried by the raised ground levels.

(ii) **Option 2: Minimum Filling**-This option explores a layout designed to minimize the amount of earthwork required. Drains will be routed parallel to the existing PCR outfalls and diverted through open spaces and footpaths between plots wherever possible. It requires 115,671 m³ of fill material and will and will impact 2 buildings.

(iii) **Option 3: Filling at PCR Level** -This option proposes filling the entire Local Area Plan (LAP) to match the elevation of the neighboring Phuentsholing-Chamkuna Road (PCR). This requires 197,904 m³ and will impact 4 buildings.

120. Final Selected Option: Although more expensive and socially most impactful, Option 3 (Filling at PCR Level) was eventually selected because it corrects the level disparity caused when previous projects raised their embankments. Leaving low-lying pockets (as in the other options) would create permanent ponding issues and flash flood risks, which would worsen climate change.

11. Water Distribution Network

121. The alternatives for the water distribution network focused on operational strategies regarding system pressure and pumping:

122. **Booster Station vs. Optimized Gravity Flow**. The design team considered incorporating a booster station into the network to universally increase the pressure in the system. This option was not pursued because this will add construction costs, increase operational complexity, and lead to higher water loss due to increased pressure in the pipes. The design instead optimized the network to provide a minimum residual head of 17m using gravity and the existing reservoir elevations, which was deemed adequate for the majority of the Local Area Plan (LAP).

123. **Municipal Pressure for High-Rises vs. Private Pumping**- The possibility of increasing the residual pressure in the entire system to accommodate future high-rise buildings (e.g., G+8 or G+9 structures) was evaluated. Sizing the public network to lift water to these heights was rejected and instead the system is designed to supply water up to the 5th floor (approx. 15m height). Increasing system pressure for a few potential high-rise buildings would increase operation costs and leakage risks for the entire network. For buildings higher than 6 stories, it is the standard engineering responsibility of the building owner to install their own pumping and storage facilities, rather than the municipality providing that pressure at the tap.

124. **Pipe Sizing Optimization**- Different pipe diameters were assessed to balance cost and hydraulic efficiency. A gridiron network was selected using primarily 100mm Galvanized Iron (GI) pipes, as this offered a good compromise between head loss and cost. 150mm pipes were selected only for sections with high flow requirements.

12. Sewer System

125. The design process for the sewer system evaluated alternatives for the network layout and the technical engineering of crossings.

126. **Network Layout Alternatives**- Two primary options were evaluated regarding how the Local Area Plan (LAP) sewer network will connect to the main trunk line of the neighboring Phuentsholing Township Development Project (PTDP).

(i) Option 1 proposed a network of pipelines connecting to the PTDP's primary sewer trunk line (located along the PCR road) at multiple different points.
(ii) Option 2 proposed sub-networks collecting into a primary trunk line within the LAP (specifically along the Western Avenue). This internal trunk will convey the wastewater to a single designated manhole in the PTDP's primary sewer trunk line.

127. Although Option 1 was initially preferred, consultation with PTDP officials revealed increasing the capacity of the primary line to accommodate loading from multiple sub-networks was not possible. Consequently, Option 2 was chosen to convey waste to a specific receiving manhole capable of accepting the flow.

128. **Outfall Crossing Alternatives**- Management of sewer lines crossing the large stormwater outfalls (specifically Outfall 05 and Outfall 06), where the invert elevation of manholes was initially higher than the drain invert elevation.

(i) Option 1 considered depressed sewers (pipes dropping below the hydraulic grade line) to pass under the outfalls. During the LAP consultations, the reliability of siphons and the high risk of blockage by grit was raised.
(ii) Option 2 - To maintain gravity flow without siphons, the main sewer trunk line along Western Avenue was dropped by 1.4 meters. This adjustment allows the sewer pipes to pass below the bottom of the outfall drains while maintaining sufficient slope to convey sewage to the PTDP network without requiring pumping or siphons.

129. Option 2 was selected as the preferred option as it does not require pumping of siphons.

13. Embankment along drainage outfalls

130. Three primary alternatives for managing the embankments along the drainage outfalls were considered.

131. **Option 1**. Stone Pitching- To create a stable slope using stone pitching, significant additional land will be required on both sides of the drains (Outfalls 1 & 2 require an additional 2.2m strip, Outfalls 3–7 an additional 6m strip and steeper slopes require an additional 4m strip. This option was deemed unfeasible because of the lack of required space to accommodate the strips needed.

132. **Option 2**. Raising the Invert Level by lifting the drain physically higher, the top of the trapezoidal drain would naturally sit at the same level as the proposed LAP filling, eliminating the need for high embankments. This was rejected because raising the outfall levels would disrupt the internal drainage of the LAP and this would require additional filling across the entire Local Area Plan to ensure gravity flow into the raised outfall.

133. **Option 3**. Construction of RCC (Reinforced Cement Concrete) cantilever walls along the outfalls due to limited space.

134. Option 3 was selected because vertical retaining walls require significantly less horizontal space than sloped stone pitching and are also more robust and can resist active earth pressure well given the height of the embankments.

14. Road works

135. The specific design choices and alternatives evaluated include:

(i) Roadside Drainage: V-Drains vs. Covered Box Drains- Covered box drain (Type RD) was selected to enable more space for the road carriageway within the constrained Right of Way.

(ii) Pavement Surface: The use of standard flexible pavement (bituminous) was selected for the majority of the roads (R-1, R-3 to R-15). For the Central Avenue Cobble Stone Surface was selected because this Avenue is designed as a boulevard with decorative elements (including specific decorative street lighting), distinguishing it from standard traffic routes.

(iii) Design Standards. For pavement thickness, three standards were considered (IRC-37 Indian Road Congress, DoR Pavement Chart (Department of Roads) and URS-2002 (Urban Roads Standard). The DoR and IRC recommendations (e.g., 200mm Wet Mix Macadam and 60mm Dense Bituminous Macadam) was selected as it aligns with national requirements

V. DESCRIPTION OF THE ENVIRONMENT

A. Project Location

136. **Phuentsholing Thromde**. Phuentsholing Thromde lies in the southwestern foothills of Bhutan, under Chhukha Dzongkhag, approximately 150 km from the capital, Thimphu. The Thromde spans 15.6 km² and has a population of 27,658 (15,052 males and 12,606 females) as per the 2017 housing census data.[24] It comprises six constituencies (Demkhongs), each represented by an elected Tshogpa (councilor). The Thromde extends from Ammochhu to Pasakha and includes 12 Local Area Plans (LAPs), with all under implementation except Chamkuna LAP. Phuentsholing is considered a major economic hub due to its proximity to the Indian border and caters to a large influx of transient population and Indian tourists. The project site is in Phuentsholing Thromde, in the Ammochhu LAP.

137. **Ammochhu LAP**. Situated within the floodplain of one of Bhutan's major rivers, the LAP extends from the foothills of Damdara in the east to the Phuentsholing–Samtse Highway in the west. It lies adjacent to the Phuentsholing Township Development Project (PTDP), occupying the flat floodplains reclaimed along the left bank of the Ammochhu. The Phuentsholing–Samtse Highway serves as a natural boundary separating the PTDP from the LAP. In 2017, the Ammochhu area recorded a population of 518 persons (PHCB, 2017). With an annual growth rate of 2.5%, this population is projected to reach approximately 915 persons by 2039. However, the allotment of 106 National Housing Development Corporation Limited (NHDCL) units in June 2018 led to a significant and immediate increase in resident numbers. With additional development anticipated under the Phuentsholing Township Development Project (PTDP), the population is expected to grow further in the coming years.

138. The LAP covers approximately 99 acres, of which 64% falls within the Urban Village 1 (UV-1) precinct, designated for high- and medium-density mixed-use development. Open spaces, including National Open Green Spaces (OS-1) and Green Space Systems (OS-2), comprise about 5% of the total area. An additional 1% is allocated for the Services Precinct (S-1). The remaining 31% of the land is occupied by roads, footpaths, and drainage infrastructure (footnote 6).

139. At present, only a limited number of new residential buildings are being constructed, in addition to existing NHDCL housing colonies. Most of the area, however, has been developed into heavy workshops and stockyards. Other land uses include commercial, industrial, and civic facilities, along with a small number of public-use areas or recreational reserves. These uses are interspersed without an overarching planning framework, resulting in a disorderly mix of functions. For instance, heavy machinery workshops and scrapyards are situated adjacent to residential buildings, and temporary restaurant structures operate within workshop compounds.

[24] NSB. 2025. Statistical Yearbook of Bhutan.

Figure 17: Geographical Diagram of LAPs in Phuentsholing Thromde

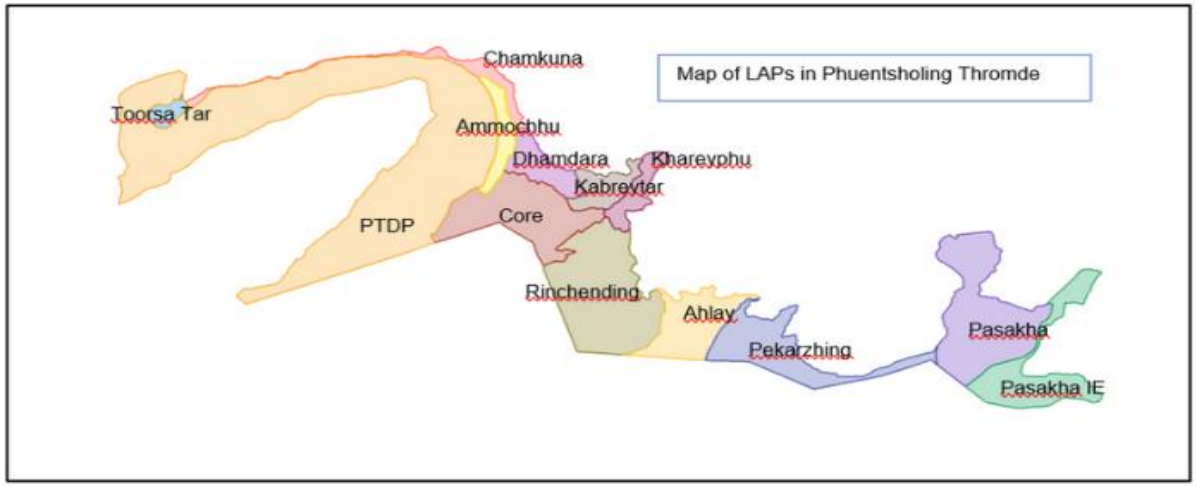
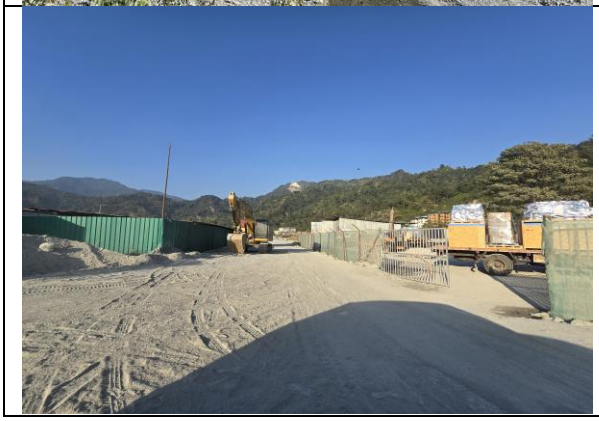


Photo 1-8: Photos of LAP Site Area



140. The Ammochhu LAP is bound by PTDP to the west, the core town to the south, and Damdara to the east. The LAP extends from the NHDCL housing colony in Bangay in the north to the newly constructed YDF bridge over the Omchhu. The Phuentsholing–Samtse Highway serves as a natural boundary between the PTDP and the Ammochhu LAP.

Figure 18: Map Showing Project Site

Photo 9 and 10: LAP Area

Source: Phuentsholing Thromde and Google Earth

141. **Project influence area.** The project area of influence (PAI) will include the direct area of impact where the project site is located. The site extends from the roundabout near the Omchhu bridge to Outfall 7 near the NHDCL residential building. The area has few residential and commercial buildings, and several workshops, material storage, waste scrapyards, wood packaging yards, and parking areas. Since last year, the Thromde has moved many workshops to an alternative location, although a few remain, which will also be moving to designated areas as there is as LAP is residential. The indirect area of influence includes the access and transportation routes to the site and communities and ecosystems that could be impacted due to increased traffic, congestion, air, dust, noise, water pollution, etc., on the eastern side project site is abutted by Dhamdara hill with dense vegetation. Immediate hilly area adjoining Ammochhu LAP is earmarked as Dhamdara LAP. None of these land falls in any forest area. Impacts are not likely to affect areas beyond 200m from the project site. Most of the sensitive receptors (schools, hospital, and religious sites) are beyond the project area (red polygon).

Figure 19: Receptors Located Outside the project Area of Influence

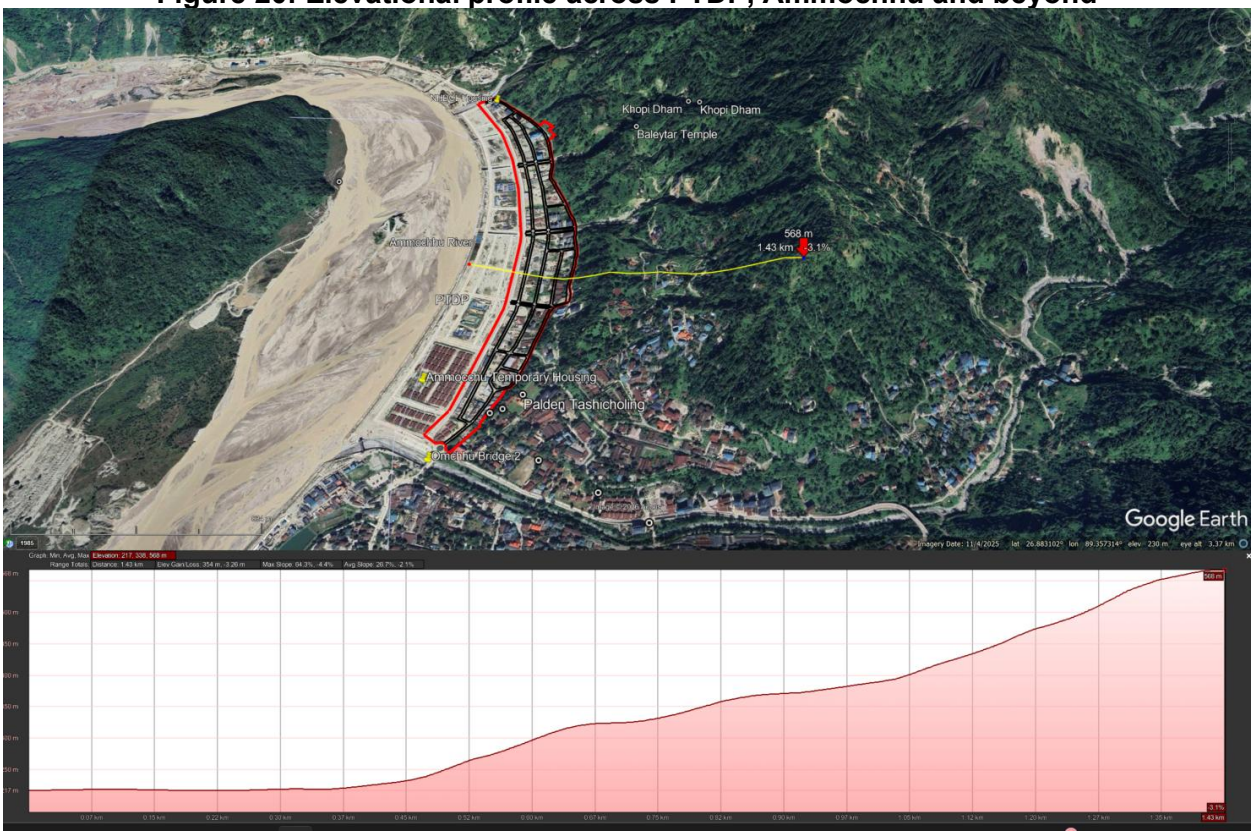
B. Physical Resources

1. Topography, geology, and soils

142. Bhutan has very rugged terrain with elevations ranging from 160 meters to more than 7,000 meters above sea level.[25] Phuentsholing Thromde occupies an area of 15.6 sq.km or 1560 hectares, which is mostly at elevations of less than 100-600 m within the wet subtropical agro ecological zone. A cross-sectional profile from the riverbanks to 1.4km shows the elevation profile ranging from 200-568 m.

[25] NSB. 2020. Statistical yearbook of Bhutan 2020. National Statistical Bureau.

Figure 20: Elevational profile across PTDP, Ammochhu and beyond



Source: Google earth.

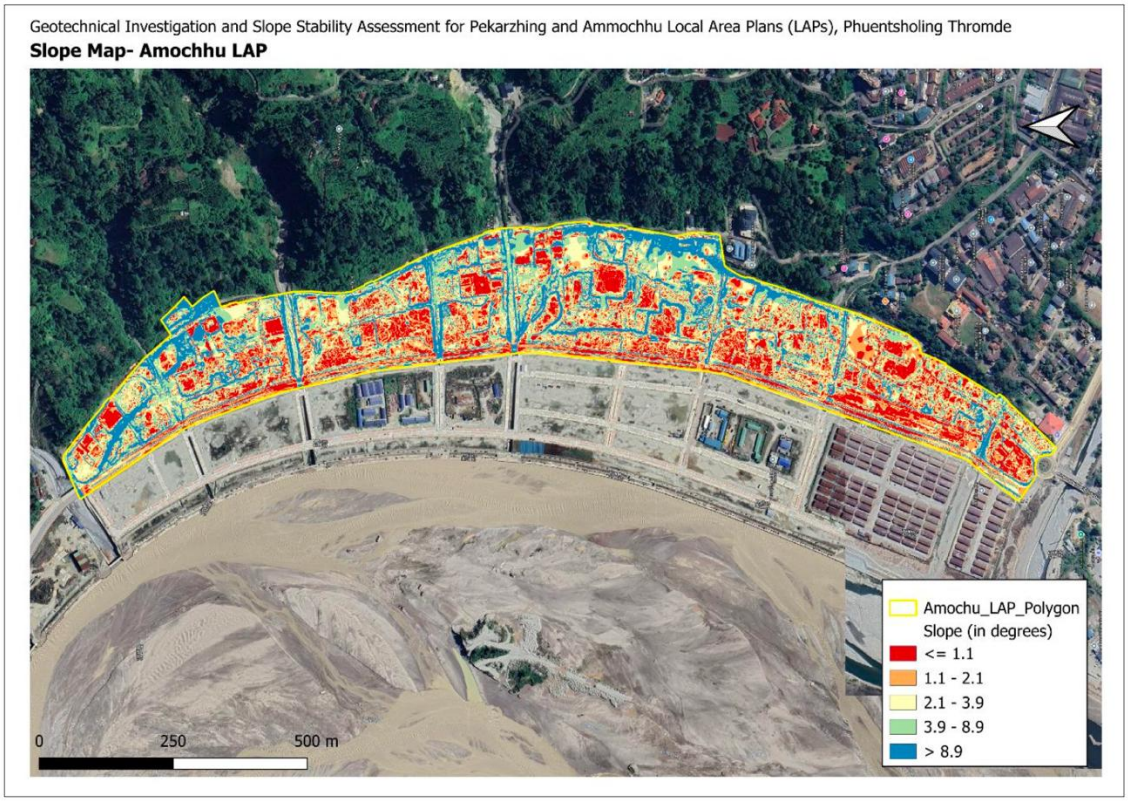
143. Phuentsholing occupies the river terraces of the Omchhu and Ammochhu rivers. Its terrain is bordered by steep hills to the north and east, the Ammochhu river to the west, and India to the south. The urban core has a gentle slope (1–4%) toward the Ammochhu, but adjacent hills are prone to landslides.[26] The high velocity of flow induced by the steep slopes results in a high sediment load including sand, gravels, cobbles, and boulders, leading to an unstable bed, and bank erosion. The Ammochhu LAP is situated behind and to the east of PTDP, that lies on the broad alluvial floodplain along the left bank of the Ammochhu River. The LAP is flanked by distinctly contrasting terrain. To the west, the area is bounded by the Ammochhu River, with low-lying floodplain lands that are highly dynamic and prone to erosion and inundation during the monsoon season. To the east and northeast, the terrain rises sharply into the foothills of Damdara and surrounding hill slopes, marking a transition from flat alluvial plains to steeper, more rugged slopes within a span of 1.5km. *The slope supports the natural flow of water. The cross-sectional profiles show gently undulating terrain (between 4-5 meters) at lower elevations, representing the active floodplain, followed by sharp increases in elevation that mark terrace risers or valley margins* [27]

[26] Phuentsholing Structure Plan 2013-2028. Ministry of Works & Human Settlement.

[27] Inception Report. *Geotechnical Investigation and Slope Stability Assessment for Pekarzhing and Ammochhu Local Area Plans (LAPs), Phuentsholing Thromde*. APECS Consultancy, Bhutan (January 2026)- The Inception Report of ongoing geohazard study of Phuentsholing, the topography of the LAP *"is generally mild and mountainous as per definition of cross slopes in the highway references. Majority of the area (over 50%) has a slope of less than 1 degrees, however, there is mild slope towards the valley side. The slope supports the natural flow of the water. The cross-sectional profiles show gently undulating terrain (between 4-5 meters) at lower elevations, representing the active floodplain, followed by sharp increases in elevation that mark terrace risers or valley margins. These elevated*

144. These slopes are composed of comparatively weak geological formations and are susceptible to slope instability, surface erosion, and landslides, particularly during periods of intense rainfall. To the south, the LAP merges into the core urban area of Phuentsholing, where the terrain remains flat but is increasingly modified by built infrastructure. The Phuentsholing–Samtse Highway runs along the western edge of the LAP, forming a strong linear boundary between the floodplain development and adjacent urban and township development areas. LAP site, a narrow strip of land parcel of about 200-250 m wide and 2.4km[28] long, gently slopes from east to west (from foothills of Damdara to Phuentsholing–Samtse Highway and PTDP). Areas close to Damadara are comparatively steeper.

Figure 21: Terrian of Ammochhu LAP

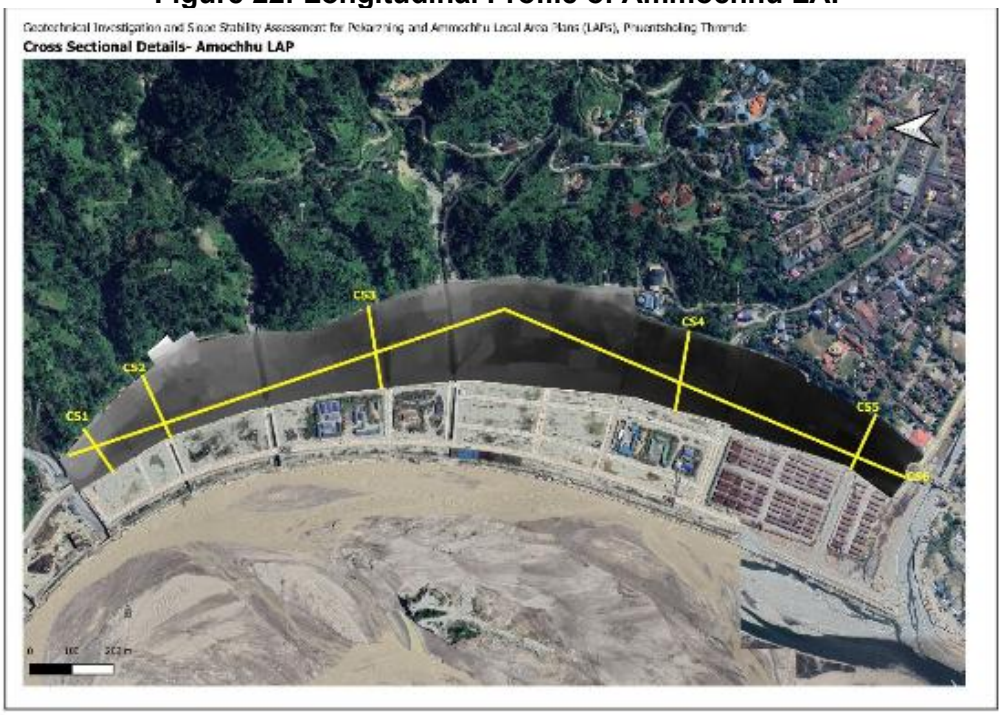


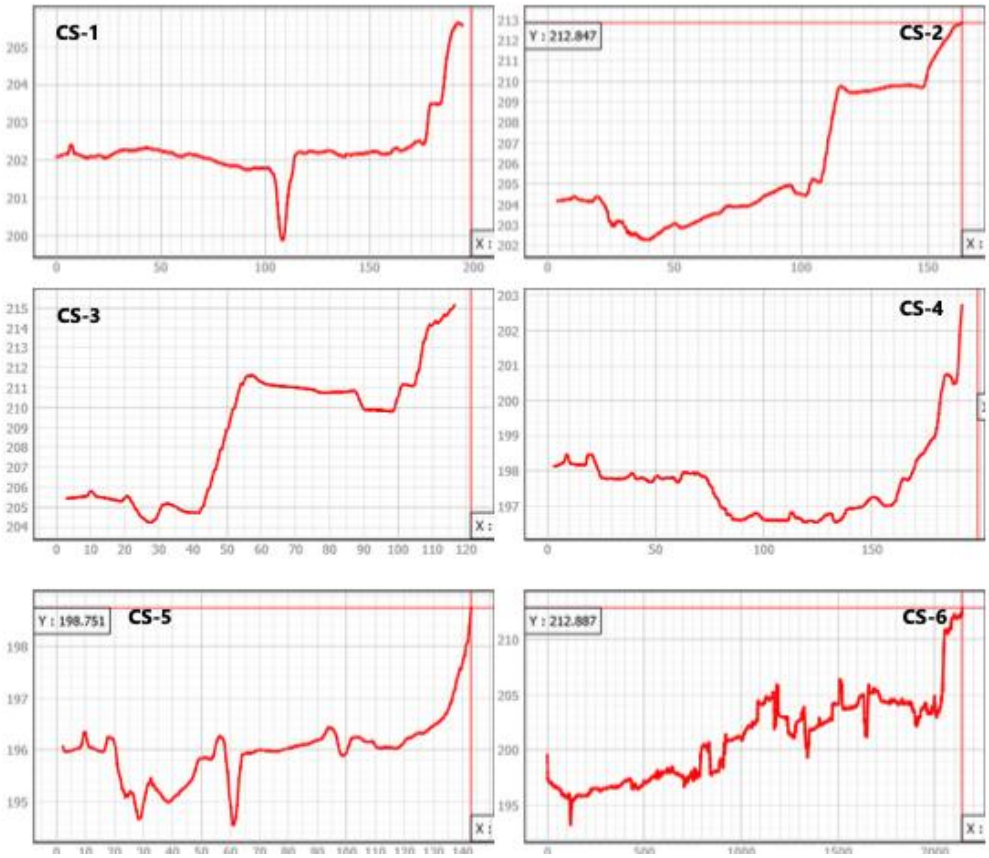
Source: Inception report (footnote 29).

sections form flat surfaces extending laterally before rising again toward steeper hillslopes. In places, narrow incised depressions are observed, indicating active channels or localized incision within the valley floor."

[28] 2.4km is the length of the Eastern Avenue Road, the longest road in the LAP.

Figure 22: Longitudinal Profile of Ammochhu LAP

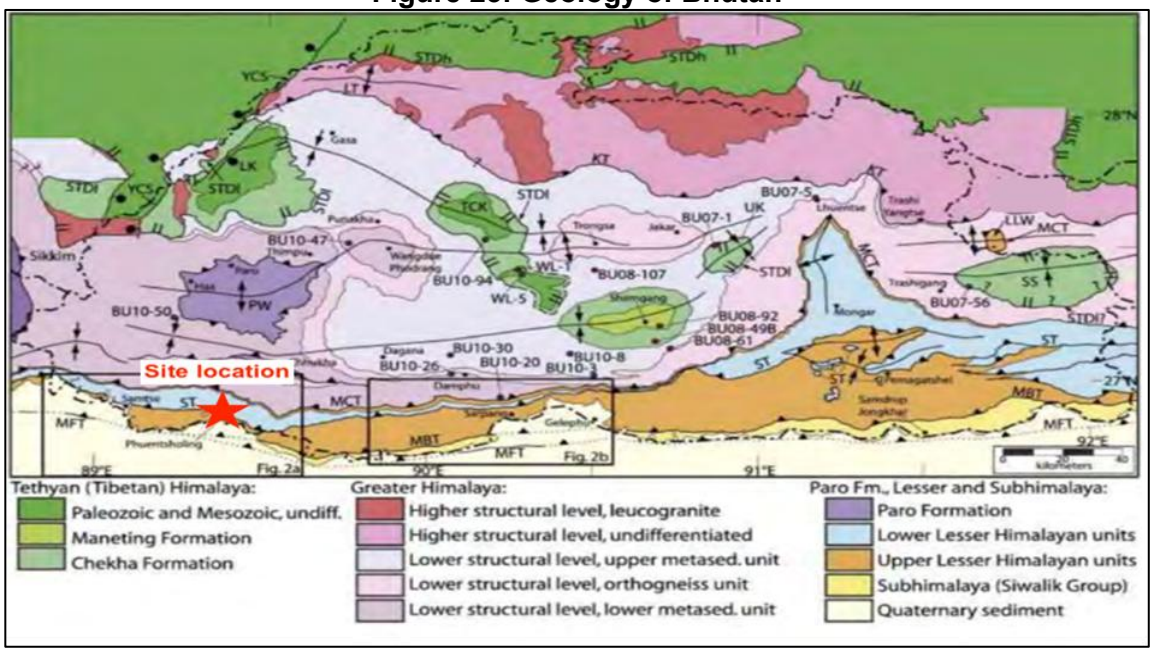




Source: Inception report (footnote 29)

145. The geological map shows the geological formations and fault zones passing through Bhutan. It is in the eastern Himalaya formed due to the subduction of the Indian Plate beneath the Eurasian Plate and spans from the low-lying Brahmaputra Plain to the high Plateau. Most of the land area of Bhutan is underlain by the Main Himalayan Thrust (MHT), which runs along the entire length of the Himalayan arc. The continuity of seismic activities in Bhutan is attributed to the presence of major shear zones such as the MHT, Main Boundary Thrust (MBT) and Main Central Thrust (MCT). The project site falls under the Lower and Upper Lesser Himalayan Units/Group as shown in Figure 23.

Figure 23: Geology of Bhutan



Source[29]

146. Bhutan has three geological zones and Phuentsholing lies in the Frontal Belt that makes up the foothills and parts of the Lesser or Lower Himalaya. This Frontal Belt consists of recent deposits of sand, gravel, and boulders on the foothill terraces. The geology in the Phuentsholing area, called the Phuentsholing Formation of Baxa Group of rocks, consists of variegated phyllite (which is highly weathered, fractured and at places decomposed to residual soil. It also comprises talcose phyllite with thin bands of grayish white quartzite, limonitic quartzite, dolomite bands, and basic rocks. Major tectonic and neo-tectonic activities have resulted in landslides at different structural levels along the slopes in Phuentsholing.[30]

147. The geology of the area falls into the Phuentsholing Formation belonging to Baxa Group of Rocks which comprises quartzite, greenish grey, variegated and carbonaceous phyllilite. The formation falls over the Main Boundary Thrust, and signs of active faulting within the formation itself have been reported.[31] The soil map of the world prepared by FAO and ISRIC was used to

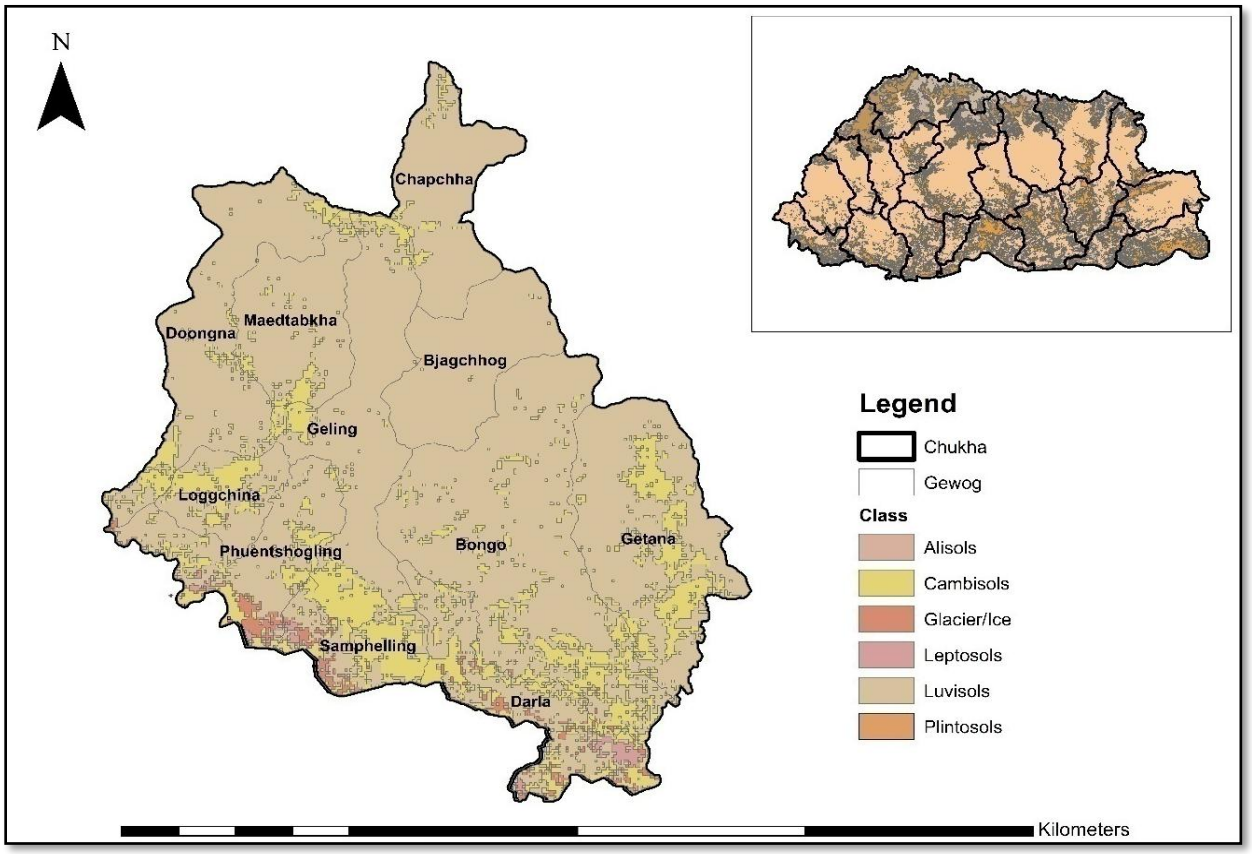
[29] Tempa, K., Aryal, K., Chettri, N., Forte, G., Gautam, D. 2022. Sensitivity analysis of input ground motion on surface motion parameters in high seismic regions: a case of Bhutan Himalaya. Natural Hazards and Earth System Sciences. 22. 1893-1909. 10.5194/nhess-22-1893-2022.

[30] UNDP/GEF. 2014. Addressing the risk of climate induced disasters through enhanced National and Local capacity for effective actions.

[31] Department of Geology and Mines, 2013. Report on the technical feasibility of four critical landslides within the extended township of Phuentsholing. Annex 4.1

extract the soil information for Bhutan. The scale of the latest available soil map is 250 meters grid; therefore, it is the best available data to extract the soil information for the project areas. The figure below shows the types of soil and their coverage.[32]

Figure 24: Soil Map of Chukha Dzogkhag



Source: FAO and ISRIC (International Soil Reference and Information Centre)

148. Chukha Dzongkhag has 5 types of soil excluding the glacier/ice. Luvisols soil type[33] is found covering about 80.36% of the total area of the district. Cambisols soil type covers an area of 326.88 km^2 (17.44%) while Leptosols cover only about 13.43 km^2 (0.72%). Soil testing is being carried out as part of the Geohazard study.[34] As per the inception report of the study, "the Ammochhu Local Area Plan (LAP) covers an area of approximately 99 acres located on the western bank of the Ammochhu River, directly adjacent to Phuentsholing's existing urban core. The Ammochhu River forms the principal drainage boundary of the LAP. River-training and embankment works implemented under the ADB financed Phuentsholing Township Development Project (PTDP) are designed to stabilize the floodplain and protect reclaimed land from monsoon

[32] FAO and ISRIC (International Soil Reference and Information Centre)

[33] Luvisols are technically characterized by a surface accumulation of humus overlying an extensively leached layer that is almost devoid of clay and iron-bearing minerals. Cambisols are soils at an early stage of soil formation and are categorized by the absence of a layer of accumulated clay, humus, soluble salts, or iron and aluminum oxides. The texture of the subsurface horizons is sandy loam or finer, with at least 8 percent clay by mass and a thickness of 15 cm (6 inches) or more. Leptosols are soils with a very shallow profile depth and they often contain large amounts of gravel. They typically remain under natural vegetation, being especially susceptible to erosion, desiccation, or waterlogging, depending on climate and topography.

[34] Inception Report. *Geotechnical Investigation and Slope Stability Assessment for Pekarzhing and Ammochhu Local Area Plans (LAPs), Phuentsholing Thromde*. APECS Consultancy, Bhutan (January 2026).

inundation. The area is traversed by drainage outfalls and engineered channels that collect runoff from the upstream slopes. The underlying deposits are composed of recent alluvium, sand, silt, and gravel layers derived from the Ammochhu's fluvial activity, with a high groundwater table during the monsoon season. These soils exhibit variable bearing capacities and are sensitive to water-table fluctuations, which the Ammochhu Development Control Regulations (DCR) notes must be accounted for in foundation design through proper geotechnical evaluation and compaction control.

2. Climate

149. Bhutan's climate is highly varied, shaped by its dramatic altitudinal range and complex Himalayan topography. The country experiences three broad climatic zones: subtropical conditions in the southern foothills, temperate conditions in the central valleys, and alpine conditions in the northern highlands. This variation results in significant differences in temperature and precipitation across short distances. Located in Bhutan's sub-tropical zone, Phuentsholing experiences hot and humid summers and warm, dry winters. Figures 25 and 26 show Phuentsholing's monthly maximum and minimum temperatures for the years 2023 and 2024.

150. The monthly average maximum temperature for the years 2023 and 2024 was recorded in July (38.5°C), and May (39.5°C), respectively. The monthly average minimum temperature for the years 2023 and 2024 was recorded in January & October (both 8.0°C), and February (7.0°C), respectively.

Figure 25: Phuentsholing's Monthly Maximum and Minimum Temperatures, 2023

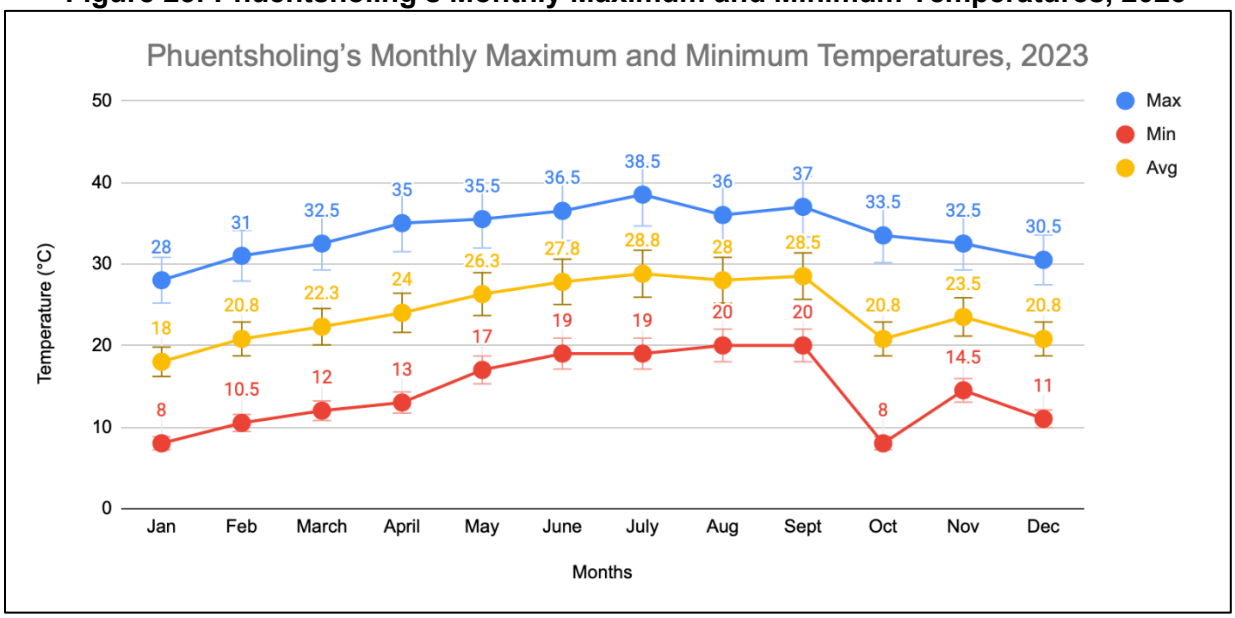
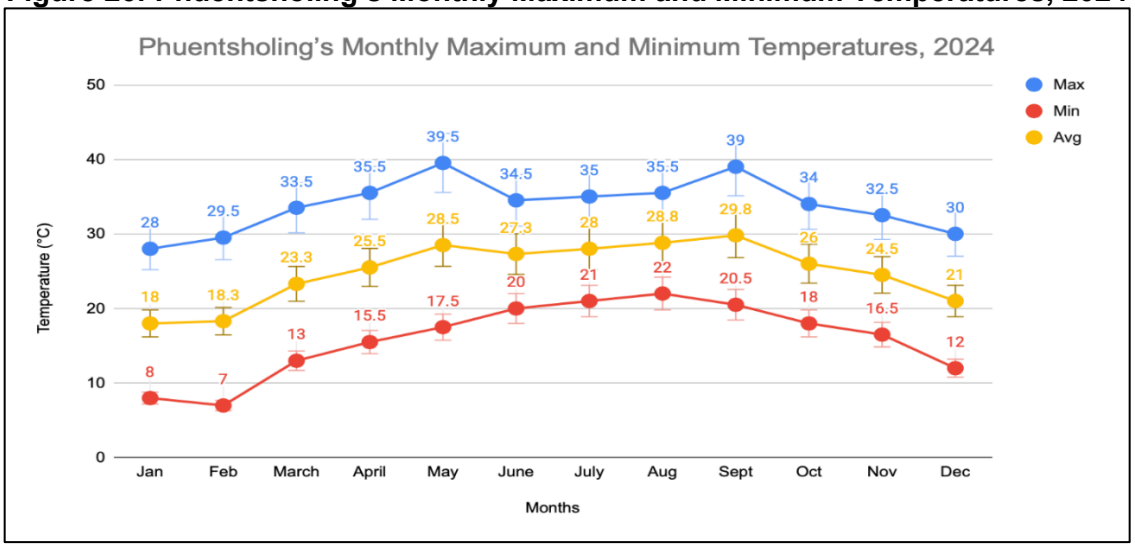
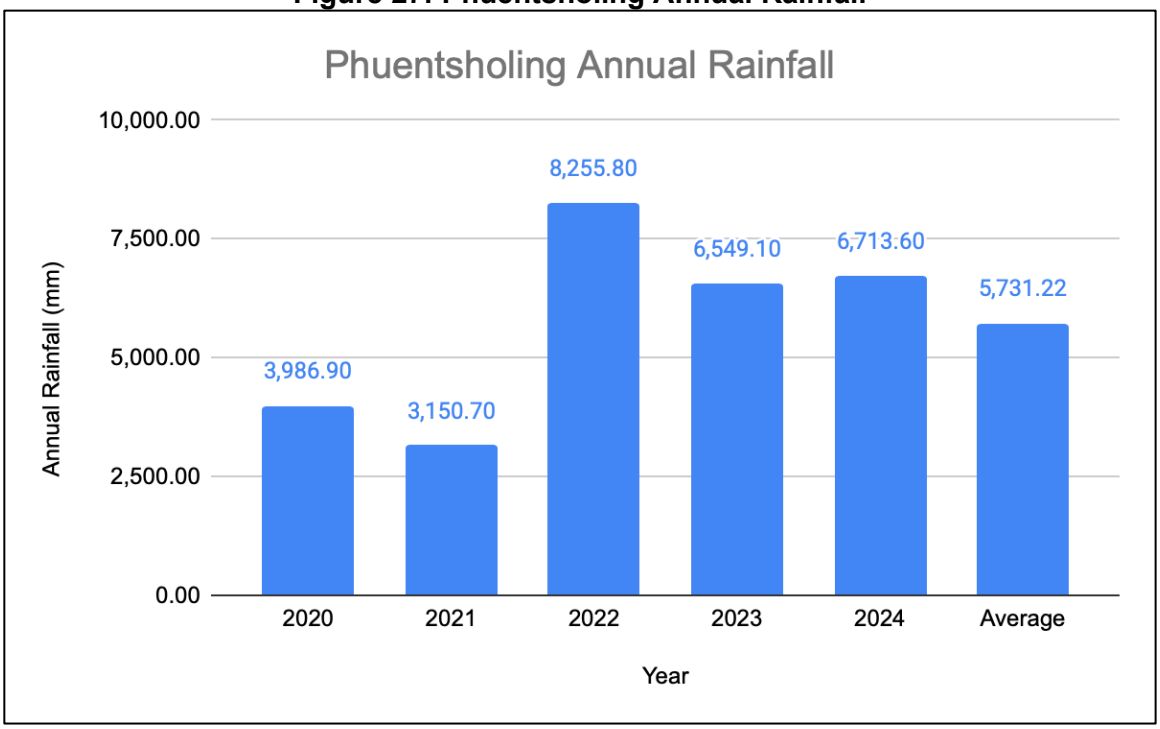


Figure 26: Phuentsholing's Monthly Maximum and Minimum Temperatures, 2024



151. **Rainfall**. Phuentsholing has four distinct seasons, with a pronounced monsoon from June to September bringing intense rainfall. Monsoons characteristically give rise to highly intense rainfall which as a result cause the rivers to swell and flood waves to pass in a matter of hours. It is vulnerable to landslides and flooding during heavy rainfall due to its fragile topography. Based on data from 2020-2024, the average annual rainfall is approximately 5,731.22 mm.[35]

Figure 27: Phuentsholing Annual Rainfall



Source: NSB, Statistical Yearbook of Bhutan 2025.

[35] National Statistics Bureau. Statistical Yearbook of Bhutan 2025.

3. Ambient Air Quality and Noise

152. Three locations were chosen to assess the project area's ambient air quality. The date of sampling was from November 3-5, 2025, for a total of 24 hours at each location. Figure 28 depicts the location of the air quality and noise level measurement stations. All the monitored parameters, except particulate matter (PM), are well within the national standards WHO 2021 guideline values. PM2.5 and PM10 at AQ02 exceeded WHO guidelines, but still within the national standard. During the dry season, vehicular congestion on PCR and dust is a concern, because of the numerous trucks that ply the Phuentsholing–Samtse Highway carrying boulders and sand India and Bangladesh. Many of the vacant sites in Ammochhu LAP along the Phuentsholing–Samtse Highway are used for temporary parking for loaded trucks. Thromde has identified a separate area outside the LAP for parking facility, and a separate fuel station will also be installed at the sites. Henceforth, the Thromde will then restrict trucks from parking along the main highway along the LAP. This will minimize congestion and damage to roads and reduce dust.

Figure 28: Location of Air Quality (AQ) and Noise Levels (NL) measurement stations

Source: Google earth

Table 18: 24 Hour Average Air Quality Data

Sl. No.	Parameters	UOM	Sampling Location			NECS Std (2020)	WHO Guideline value (2021)
			AQ01	AQ02	AQ03		
1	Carbon Monoxide (CO)	mg/m³	0.428	0.456	0.357	2 (8-hr avg)	4 (24-hr avg)
2	Nitrogen Dioxide (NO_2)	µg/m³	6.728	11.52	6.713	80 (24-hr avg)	25 (24-hr avg)
3	Nitric Oxide (NO)	µg/m³	6.75	17.93	6.728		
3	Ozone (O_3)	µg/m³	28.034	69.72	17.56	100 (8-hr avg)	100 (8-hr avg)
4	Sulphur Dioxide (SO_2)	µg/m³	21.323	6.9	23.3	80 (24-hr avg)	40 (24-hr avg)
5	PM_1	µg/m³	9.654	11.14	6.126	-	-
	$PM_{2.5}$	µg/m³	13.34	19.42	12.655	60 (24-hr avg)	15 (24-hr avg)
6	PM_{10}	µg/m³	44.4	85.09	44.4	100 (24-hr avg)	45 (24-hr avg)
7	TSP (PM100)	µg/m³	64.135	140.64	117.63	200 (24-hr avg)	-

Sampling Locations and Coordinates:
AQ01 and NL01-NHDCL housing (26.884623, 89.377009)
AQ02 and NL02- Near Karma Scrap yard (26.8777966, 89.3790049)
AQ03 and NL03-Near perfect builder store office (26.8670252, 89.3775807)

Source: Field monitoring survey, November 2025

Table 19: Basic Meteorological Record of Air Quality Data

Parameters	Unit	Sampling location		
		AQ01	AQ02	AQ03
Atmospheric Pressure	hPa	985.34	984.36	986.88
UV Index	Index	1.345	1.85	1.86
Humidity	%	88.12	72.512	84.28
Temperature	°C	23.9	27.72	25.86
Light Intensity	Lux	7,936	12,128	13,538
Wind Speed	m/s	1.059	1.137	0.835
Rainfall	Mm	0	0	0

Source: Field monitoring survey, November 2025.

Figure 29: Location of the new truck parking

Source: Google Earth

4. Water Resources

153. Bhutan is characterized by an extensive river network, with the principal rivers flowing from north to south, and their tributaries running in an east–west direction. The four major river systems are the Ammochhu, Wangchhu, Punatsangchhu, and Manas. The latter covers about half the country and is made up of Mangdechhu and Drangmechhu. These two large rivers converge into one river just before crossing the Indian border. The Ammochhu originates in the People's Republic of China (PRC) and traverses the western districts of Ha and Samtse before draining through Chhukha into the plains of India. Its upper catchment lies at high elevations with steep terrain, and its source is Mount Pauhunri (7,128 meters above mean sea level) located on the border shared with India and the PRC. The total catchment area extending down to Phuentsholing covers approximately 3,785 square kilometers.[36]

154. Ammochhu and Omchhu are the two main rivers passing through the settlements in Phuentsholing Municipality. The Omchhu River, which flows through the city, joins the Ammochhu river system just upstream of Bhutan's border with India. During the winter months, reduced discharge makes the river more accessible, contributing to increased pollution. In contrast, during the summer monsoon, both rivers swell significantly, causing serious risks to life and property.

155. The project site is close to the Ammochhu River. There are several streams that flow into the Ammochhu river from the hillside through Ammochhu LAP as can be seen in figure 33 There are total of 8 outfall drainage channels that traverse LAP, cross the highway, and enter PTDP area before its discharge into Ammochhu River. In PTDP, the outfalls are remodeled and constructed in concrete to facilitate smooth flow, while in Ammochhu LAP, these drains are in

[36] ADB. 2024. Environmental Monitoring Report. Phuentsholing Township Development Project. Project No. 50165-002

poor condition, impacted by both floods, and debris flow from upstream areas. Improvement of these drains with channelization and embankment walls are proposed under this subproject.

156. **Surface water quality.** Both ground and surface water quality monitoring in ten locations along both the Ammochhu and its tributaries has been ongoing under the PTDP project since its commencement. The location of these sites is depicted in Figure 30. Of interest for the LAP project are sampling sites SW 06 (above the project site) and SW07 (below the project site). The latest data available is the July 2025 environmental monitoring report. The data was collected in April 2025 and the results from the report are presented in the table below. The Results indicate that most parameters fall under Very Good category. Three parameters were within the 'Good' category. This included Iron content (0.32 and 0.34 mg/l) and coliform (total coliform was 1200mpn/100ml) and Fecal coliform (70 MPN/100 ml).

Figure 30: Location of surface and groundwater quality monitoring locations, PTDP

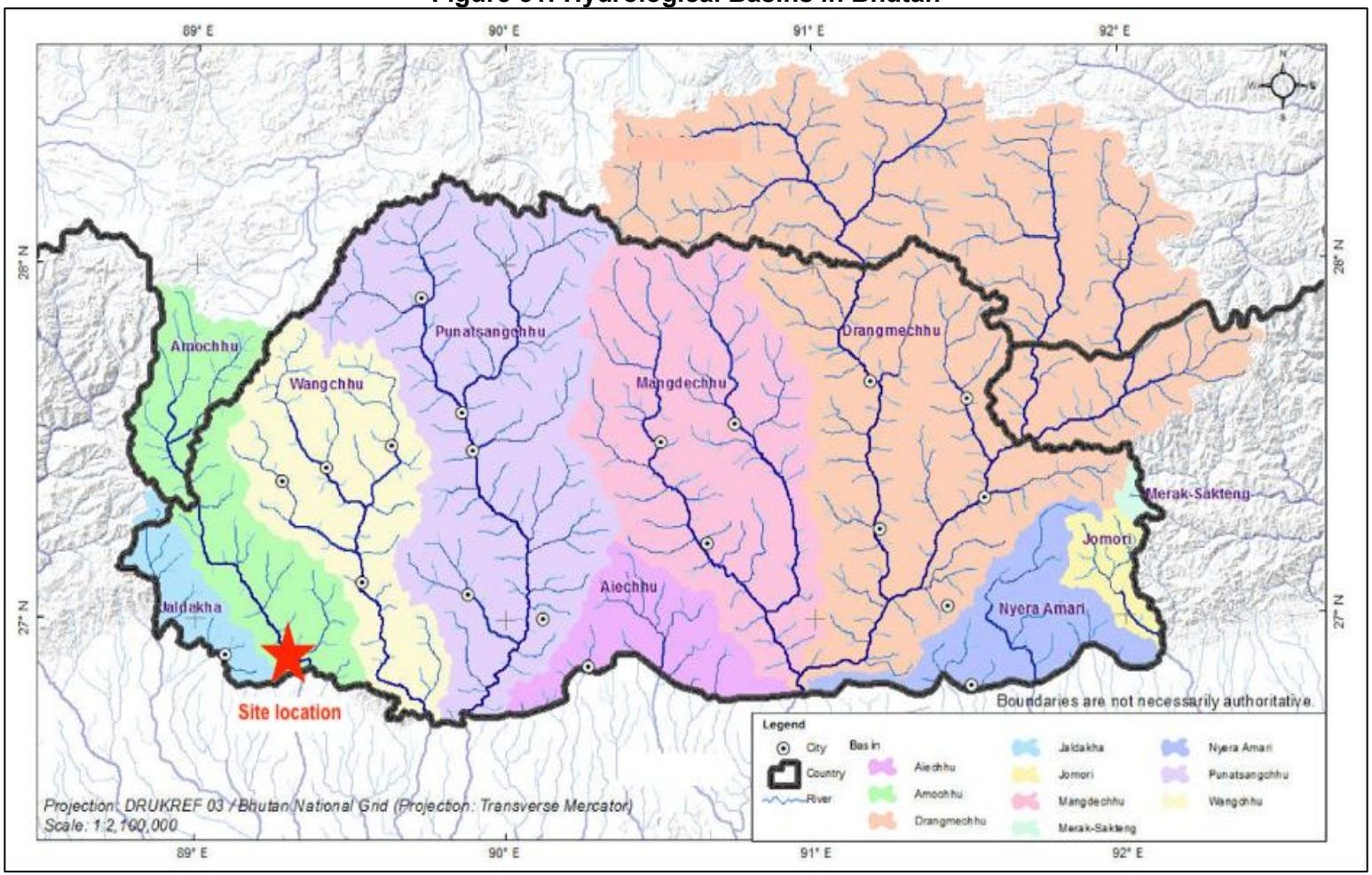
Source: Phuentsholing Township Development Project (PTDP), SEMR, January- June 2025.

Table 20: Surface Water Quality Monitoring Results

SN	Parameter	Unit	NEC (A) Very Good	NEC (B) Good	NEC (C) Moderate	SW06	SW07
1	**pH**	**-**	**6.5–8.5**			**7.52**	**7.36**
2	Color	Hz	5	50	-	1	1
3	Electrical Conductivity	µS/cm	800	1000	2000	184.4	174.1
4	Total Dissolved Solids (TDS)	mg/l	500	1500	2100	117	112
5	Turbidity	NTU	5	-	-	1.16	<1.0
6	Ammonical Nitrogen	mg/l	-	-	-	<0.01	<0.01
7	Ca Hardness	mg/l	200	-	-	26	22
8	Mg Hardness	mg/l	200	-	-	17	12
9	Calcium (as Ca)	mg/l	200	-	-	10.42	8.82
10	Magnesium	mg/l	200	-	-	4.08	2.88
11	Sodium	mg/l	-	-	26	0.39	0.30
12	Potassium	mg/l	-	-	-	-	-
13	Salinity	ppt	-	-	-	-	-
14	Chemical Oxygen Demand (COD)	mg/l	5	-	-	-	-

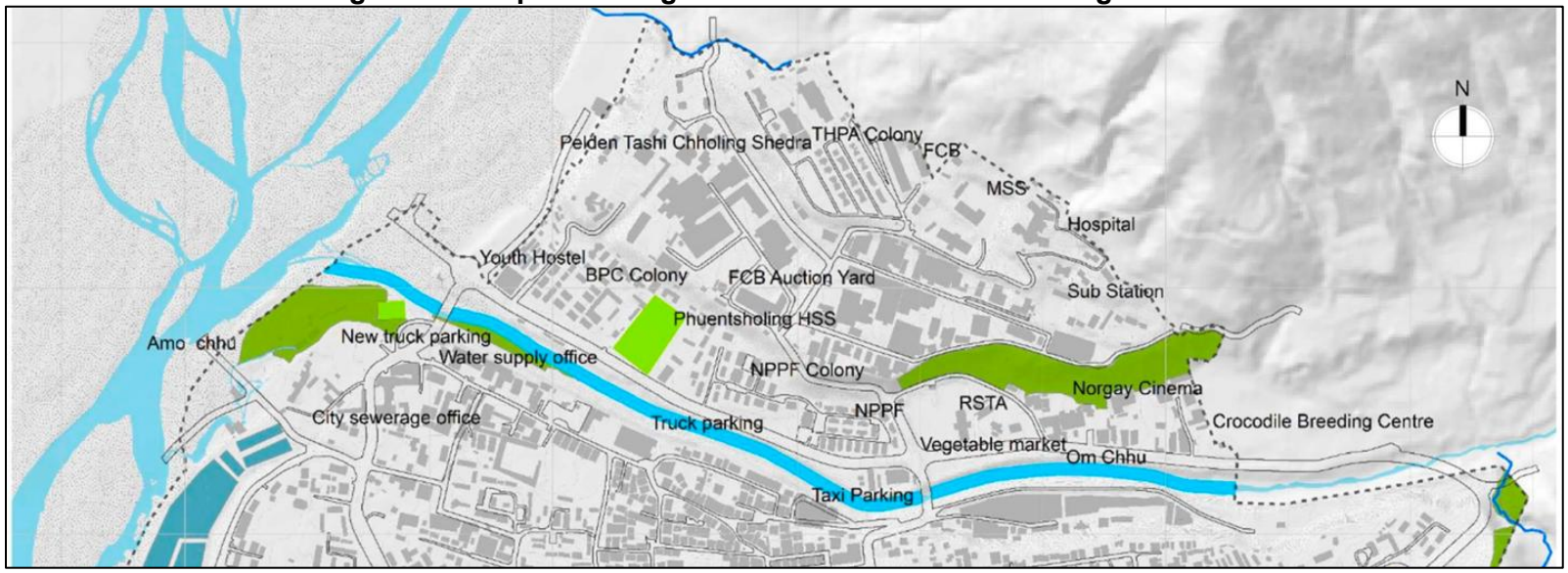
SN	Parameter	Unit	NEC (A) Very Good	NEC (B) Good	NEC (C) Moderate	SW06	SW07
15	Biochemical Oxygen Demand (BOD)	mg/l	2	5	50	<2.0	<2.0
16	Chloride	mg/l	50	200	-	-	-
17	Phenol	mg/l	0.001	0.002	-	<0.01	<0.01
18	Sulphates	mg/l	25	-	-	-	-
19	Nitrate	mg/l	10	50	-	-	-
20	Fluoride	mg/l	1	2	-	<0.1	<0.1
21	Total Nitrogen	mg/l	-	-	-	-	-
22	Total Phosphorus	mg/l	-	-	-	<0.1	<0.1
23	Dissolved Oxygen (DO)	mg/l	6	4	-	-	-
24	SAR	-	-	-	26	-	-
25	Total Suspended Solids (TSS)	mg/l	25	100	-	<10.0	<10.0
26	Surfactants	mg/l	0.1	0.2	-	<0.01	<0.01
27	Cyanide	mg/l	0.05	0.05	-	<0.01	<0.01
28	Arsenic	mg/l	0.01	0.05	-	<0.01	<0.01
29	Cadmium (Cd)	mg/l	0.003	0.003	-	<0.002	<0.002
30	Chromium (Cr)	mg/l	-	-	-	<0.02	<0.02
31	Copper (Cu)	mg/l	0.05	0.1	-	<0.04	<0.04
32	Iron	mg/l	0.2	0.5	-	0.32	0.34
33	Lead	mg/l	0.02	0.02	-	<0.05	<0.05
34	Mercury (Hg)	mg/l	0.0005	0.0005	-	<0.001	<0.001
35	Zinc (Zn)	mg/l	0.2	0.5	-	0.04	0.06
36	Boron (B)	mg/l	-	-	1	<0.1	<0.1
37	Total Coliform	MPN/100 ml	50	5000	10000	1200	1200
38	Fecal Coliform	MPN/100 ml	20	2000	5000	70	70

Figure 31: Hydrological Basins in Bhutan



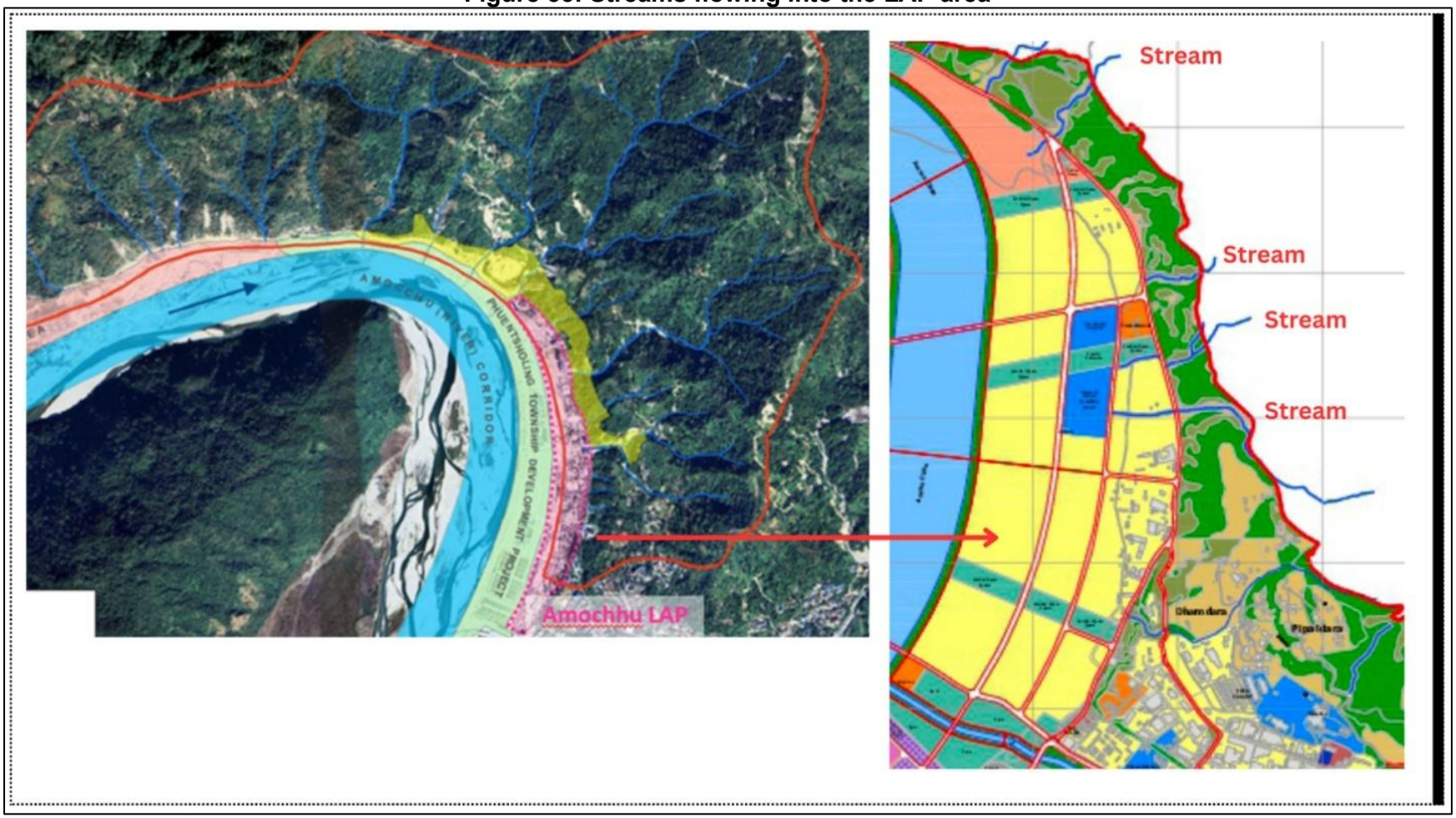
Source: National Environmental Commission (NEC), National Integrated Water Resources Management (IWRM) Plan 2016.

Figure 32: Map indicating the two rivers in Phuentsholing Thromde



MoWHS, 2019. Phuentsholing Core LAP

Figure 33: Streams flowing into the LAP area



Source: consultant

157. **Groundwater Quality.** Groundwater sample was taken from the tap near the water tank on in LAP 1 December 2025 and was analyzed at the Qualissure Laboratory Services in India. The results are presented in Appendix 2. In summary, the water test report indicates that the tap water meets the drinking water quality standards as set by the National Standards 2020. The analysis confirms the sample is free from bacterial contamination, with both E. coli and Fecal Streptococci below detectable limits. Physically, the water is clear and neutral, featuring a pH of 7.12, very low turbidity (<1.0 NTU), and a Total Dissolved Solids (TDS) count of 234 mg/l. Chemical assessments show healthy oxygenation with a Dissolved Oxygen level of 6.7 mg/l and minimal organic pollution, while toxic substances—including heavy metals like arsenic and lead, as well as pesticides and cyanides—were not detected, ensuring the water is chemically safe and free of objectionable odors or colors.

C. Ecological Information

158. **Forest Cover and Vegetation**. Within the 15.6 km^2 area of the demarcated Thromde area, only 28% is classified as green areas. This includes forest, parks, and open areas in the EI –E4 and G1-G2 Land use areas.

159. Broadly, the country can be divided into three distinct Eco floristic zones (alpine zone, temperate zone, and subtropical zone). According to the Department of Forest and Park Services (DoFPS), 81%[37] of Chukha district is covered with forest. The primary forest types are broadleaf forest, mixed conifer with blue pine and fir at higher altitudes. Much of Phuentsholing falls under the subtropical zone that comprises broadleaf forests. Species types vary with the level of rainfall and soil type- from deciduous on exposed dry slopes to almost evergreen in the moist valleys. In general, forests are multi- storied and have high species diversity. Within the Ammochhu LAP itself, which was originally part of Ammochhu floodplain, there is no forest, and the area is highly modified and used for various urban development purposes. The native vegetation has been altered or removed over time due to repeated flooding, river channel shifts, infrastructure development, and urban expansion. Moreover, vegetation is sparse and fragmented, consisting of secondary growth, grasses, shrubs, and scattered trees.

160. Ecologically, the Ammochhu LAP functions more as a transitional and highly disturbed landscape rather than a natural habitat. Faunal presence within the LAP is limited and restricted to common bird species, small reptiles, and insects adapted to urban and semi-urban environments. Larger wildlife species are absent from the LAP due to human activity, noise, and lack of continuous habitat, though they may occur in the surrounding vegetated areas further away from the urban core. The surrounding slopes of Dhamdara and adjacent hill areas, which form the eastern and northeastern backdrop of the LAP, retain dense tree cover as can been seen in photo 11. This is not a designated forest land, and the part of wooded hill area, immediately above the Ammochhu LAP, is part of the Dhamdara LAP and earmarked for future development.

[37] DOFPS, 2019. Forest Facts and Figures 2019.

Photo 11: Vegetated hillside located eastern edge of LAP

161. An inventory of the tree cover along the hillside was carried out in December 2025 as part of the IEE preparation process. The tree canopy is dominated by native broadleaf tree species, including *Alangium chinense, Albizia procera, Alstonia scholaris, Bombax ceiba, Chukrasia tabularis, Dalbergia sissoo, Daubanga grandiflora, Tetrameles nudiflora,* and *Oroxylum indicum*. These species are characteristic of riverine and mixed deciduous forests of southern Bhutan. Most recorded tree species are classified as Least Concern (LC) under the IUCN Red List.

162. The shrub layer includes species such as *Vitex negundo, Woodfordia fruticosa, Leea asiatica*, and *Buddleja asiatica*. The herbaceous and climber layers are heavily dominated by invasive species, along with grasses such as *Saccharum spontaneum* and *Thysanolaena latifolia*, and ferns including *Pteris vittata* and *Pityrogramma calomelanos*. This vegetation structure is multi-layered but because of its proximity to settlement and disturbance is infested with invasive species such as *Chromolaena odorata, Lantana camara, Mikania micrantha, Parthenium hysterophorus*, *Eupatorium adenophorum* etc., (almost 50% of the species).

Table 21: Floral Species recorded during the site visit

S. No.	Scientific name	Common name	Habit	IUCN Status	National legislation
1	*Alangium chinense*	Chinese Cornelian cherry	*Tree*	LC	
2	*Albizia Procera*	White siris	Tree	LC	
3	*Alstonia scholaris*	Devils tree	*Tree*	LC	
4	*Bombax ceiba*	Silk cotton tree	*Tree*	LC	*Schedule-III*
5	*Chukrasia tabularis*	Indian mahogany	*Tree*	LC	
6	*Dalbergia sissoo*	Indian rosewood	*Tree*	LC	*Schedule-II*
7	*Daubanga grandiflora*	Thora	*Tree*	LC	*Schedule-II*
8	*Leucaena leucocephala*	River tamrind	*Tree*	LC	
9	*Moringa oleifera*	Drumstick tree	Tree	LC	
10	*Tetrameles nudiflora*	False hemp tree	*Tree*	LC	
11	*Oroxylum indicum*	Indian trumpet tree	*Tree*	LC	
12	*Buddleja asiatica*	Buddlejaceae	Shrub	LC	
13	*Calotropis gigantea*	Crown flower	*Shrub*	LC	
14	*Cerntrosema pubescens*	Butterfly pea	*Shrub*	LC	
15	*Ficus hispida*	Opposite leaf fig	*Shrub*	LC	*Schedule-III*
16	*Ficus semicordata*	Drooping fig	*Shrub*	LC	
17	*Holmskioldia sanguinea*	Chinese hat plant	*Shrub*	LC	

S. No.	Scientific name	Common name	Habit	IUCN Status	National legislation
18	*Leea asiatica*	Leeaceae	*Shrub*	LC	
19	*Mimosa pudica*	Humble plant	*Shrub*	LC	
20	*Trema politoria*	Charcoal tree	*Shrub*	LC	
21	*Vitex negundo*	Five leaved chaste	*Shrub*	LC	
22	*Woodfordia fructicosa*	Fire-flame bush	*Shrub*	LC	
23	*Alternanthera sessilis*		Herb	LC	Invasive
24	*Barleria cristata*		Herb	LC	Invasive
25	*Bidens pilosa*	Blackjack	Herb	LC	Invasive
26	*Boehmeria nivea*		Herb	LC	Invasive
27	*Chromolaena odarata*	Jack in the bush	Herb	LC	Invasive
28	*Colocasia esculenta*	Elephant ear	Herb	LC	Invasive
29	*Crassocephalum crepidioides*	Fireweed	Herb	LC	Invasive
30	*Crotolaria pallida*		Herb	LC	Invasive
31	*Cyanthillium cinereum*		Herb	LC	Invasive
32	*Eupatorium adenophorum*		Herb	LC	Invasive
33	*Lantana camara*	Tick berry	Herb	LC	Invasive
34	*Mesospaerum suaveolens*		Herb	LC	Invasive
35	*Musa balbisiana*		perennial herb	LC	
36	*Perthenium hysterophorus*	Famine weed	Herb	LC	Invasive
37	*Sida acuta*		Herb	LC	Invasive
38	*Solanum torvum*		Herb	LC	Invasive
39	*Solanum viarum*		Herb	LC	Invasive
40	*Synedrella nodiflora*	Node weed	Herb	LC	Invasive
41	*Triumfetta rhomboidea*	Woody Herb	Herb	LC	Invasive
42	*Vigna spp*		Herb	LC	Invasive
43	*Coccinia grandis*	Ivy gourd	*Climber*	LC	Invasive
44	*Ippomoea hederifolia*		Climber	LC	Invasive
45	*Argyreia nervosa*	Morning glory	*Climber*	LC	Invasive
46	*Mikania micrantha*	Bittervine	*Climber*	LC	Invasive
47	*Paederia foetida*	Skunkvine	*Climber*	LC	Invasive
48	*Pityrogramma calomelanos*		Fern	LC	Invasive
49	*Pteris vittata*		Fern	LC	Invasive
50	*Saccharum spontaneum*	Kans grass	Grass	LC	Invasive
51	*Thysanolaena latifolia*	Tiger grass	*Grass*	LC	

163. **Mammal species**. During field site surveys in December, only two species were recorded; Assamese macaque (*Macaca assamensis*) a Near Threatened species and Red-bellied squirrel (Least Concern). Given the project site's central urban location and surrounding settlements, the presence of diverse or critically endangered species is unlikely. Although the *Macaca assamensis* is near threatened, it is widely distributed in Bhutan.

Table 22: Mammal Species recorded at the project site

Sl No	Scientific name	Common name	IUCN Status	National legislation
1	*Macaca assamensis*	Assamese macaque	NT	Schedule-III
2	*Callosciurus pygerythrus*	Red bellied squirrel	LC	

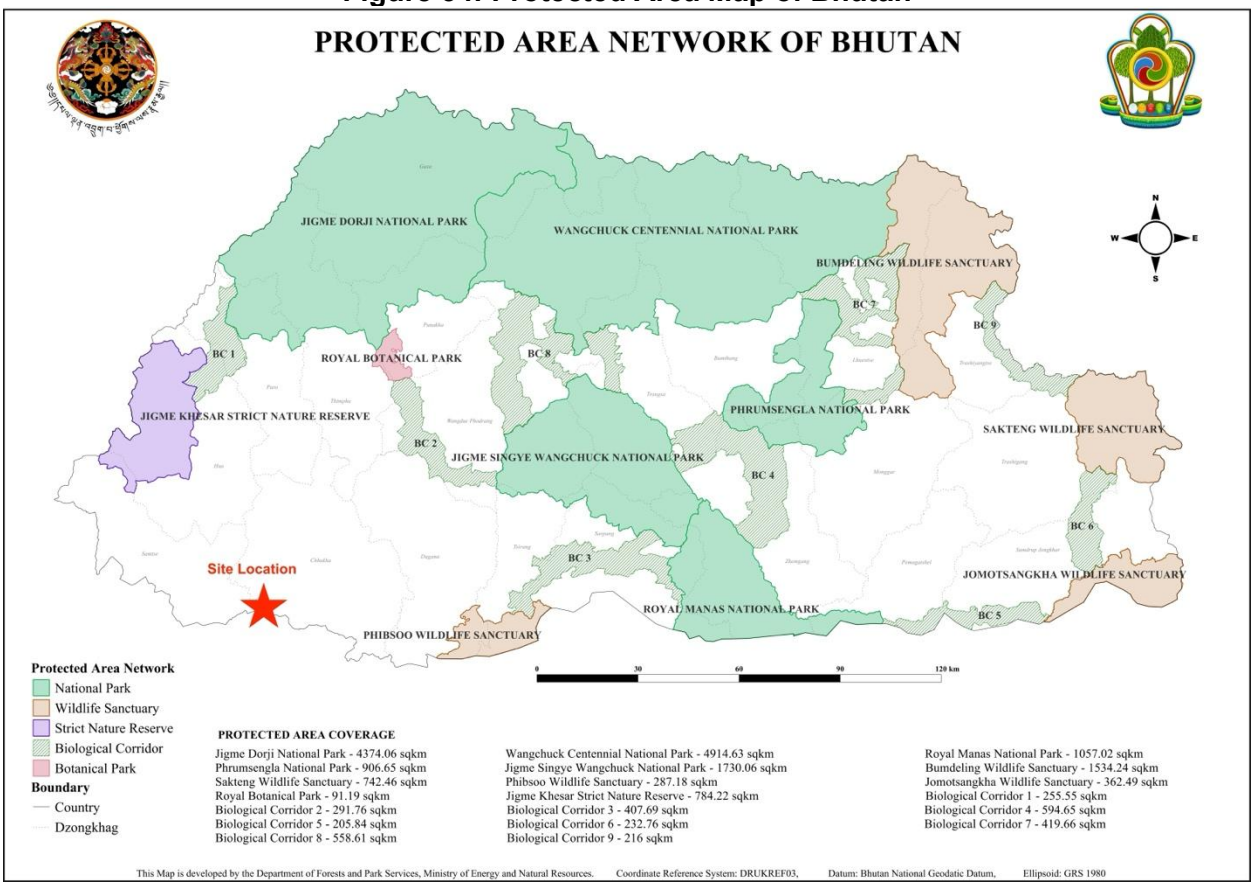
Table 23: Bird Species recorded at the project site

Sl. No	Scientific name	Common name	IUCN Status
1	*Acridotheres grandis*	Great Myna	LC
2	*Acridotheres tristis*	Common Myna	LC
3	*Actitis hypoleucos*	Common Sandpiper	LC
4	*Aegithina tiphia*	Common Iora	LC
5	*Chaimorrornis leucocephalus*	White-capped Redstart	LC
6	*Columba livia*	Common Pigeon	LC
7	*Copsychus saularis*	Oriental Magpie Robin	LC
8	*Corvus splendens*	House Crow	LC
9	*Dendrocitta vagabunda*	Rufous Treepie	LC
10	*Dicrurus aeneus*	Bronzed Drongo	LC
11	*Egretta garzetta*	Little Egret	LC
12	*Elanus caeruleus*	Black-winged Kite	LC
13	*Gracula religiosa*	Common Hill Myna	LC
14	*Gracupica contra*	Asian Pied Starling	LC
15	*Lanius cristatus*	Brown Shrike	LC
16	*Lonchura maja*	White -rumped Munia	LC
17	*Motacilla alba*	White Wagtail	LC
18	*Motacilla citreola*	Citrine Wagtail	LC
19	*Orthotomus sutorius*	Common Tailorbird	LC
20	*Passer domesticus*	House Sparrow	LC
21	*Passer montanus*	Eurasian Tree Sparrow	LC
22	*Phoenicurus hodgsoni*	Hodgson's Redstart	LC
23	*Psilopogon lineatus*	Lineated Barbet	LC
24	*Pycnona cafer*	Red-vented Bubul	LC
25	*Pycnonotus jocosus*	Red-whiskered Bulbul	LC
26	*Pycnonotus leucogenys*	Himalayan Bulbul	LC
27	*Spilopelia chinensis*	Spotted Dove	LC
28	*Sturnia malabarica*	Chestnut-tailed Starling	LC

164. **Protected Areas**. There are no legally protected areas, biological corridors of protected areas or buffer zones in the vicinity of the project site. The nearest protected area is the Jigme Khesar Strict Nature Reserve, located within a 50 km buffer. This Reserve is located in Ha district. There are also no wetlands within the subproject area of influence. Of the five KBAs within a 50 km radius within Bhutan, only Kamji is within a 10 km radius, while Toorsa Strict Nature Reserve falls within the wider 50 km buffer.

165. IBAT mapping indicates the apparent proximity of three additional KBAs; however, these sites are located across the international border in India and not within Bhutan. Jaldapara Wildlife Sanctuary is about 10 km from the project site is located in India across the international border. Given that Phuentsholing is a border town, this visual proximity reflects map scale rather than actual spatial or ecological relevance. The project area is geographically separated from these Indian KBAs by intervening settlements and infrastructure, and there is no direct ecological connectivity or plausible transboundary impact pathway between the project and these sites.

Figure 34: Protected Area Map of Bhutan



Source: Department of Forest and Park Services.

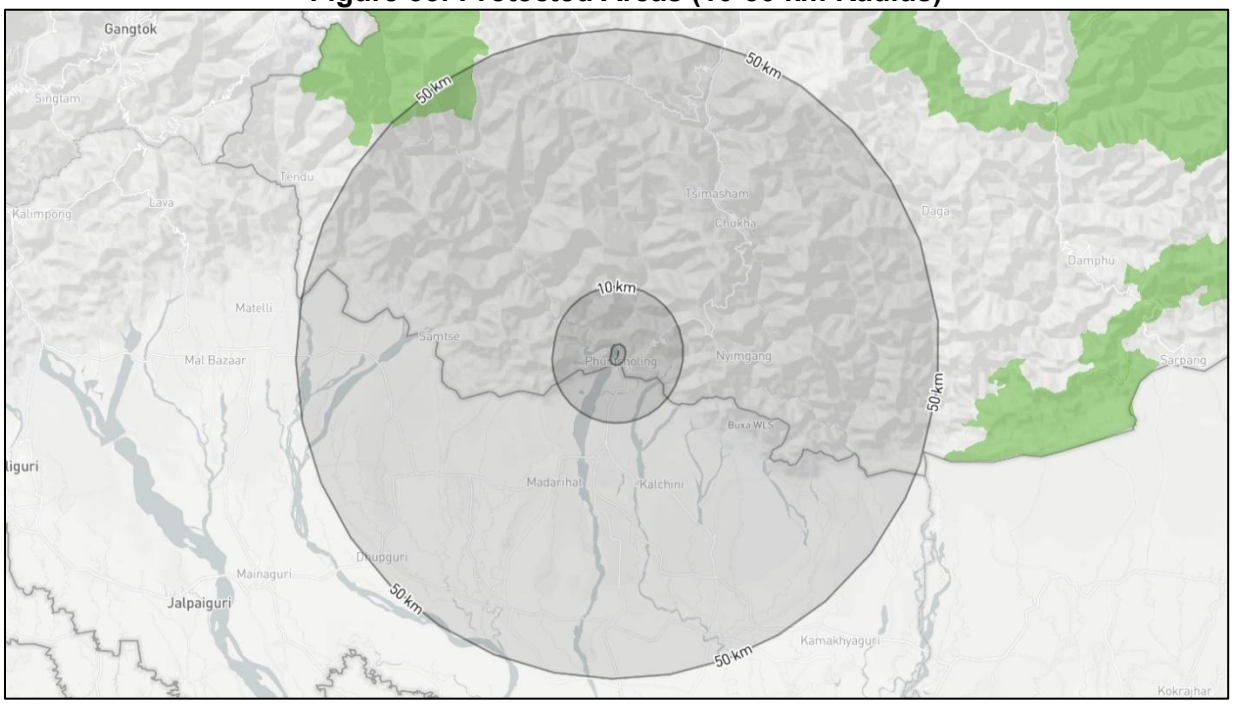
166. **Critical Habitats**. The Integrated Biodiversity Assessment Tool (IBAT)[38] was used to screen and assess potential risks on the protected areas or critical habitat that may exist around the project site (10-50km radius). Screening results show there is one protected area— Jigme Khesar Strict Nature Reserve located within a 50 km radius of the proposed site. Of the five KBAs within a 50 km radius within Bhutan, only Kamji is within a 10 km radius, while Toorsa Strict Nature Reserve is within 50 km. and three are 1-50 km. Three of the KBAs are in India.

Table 24: KBAs within 1-50 km radius of the proposed site

	WDPA Id	Name	Country	Distance (km)
1	15210	Kamji	Bhutan	10km
2	18458	Jaldapara Wildlife Sanctuary	India	10km
3	15196	Toorsa Strict Nature Reserve	Bhutan	50km
4	15215	Samtse	Bhutan	50km
5	18457	Gorumara National Park	India	50km

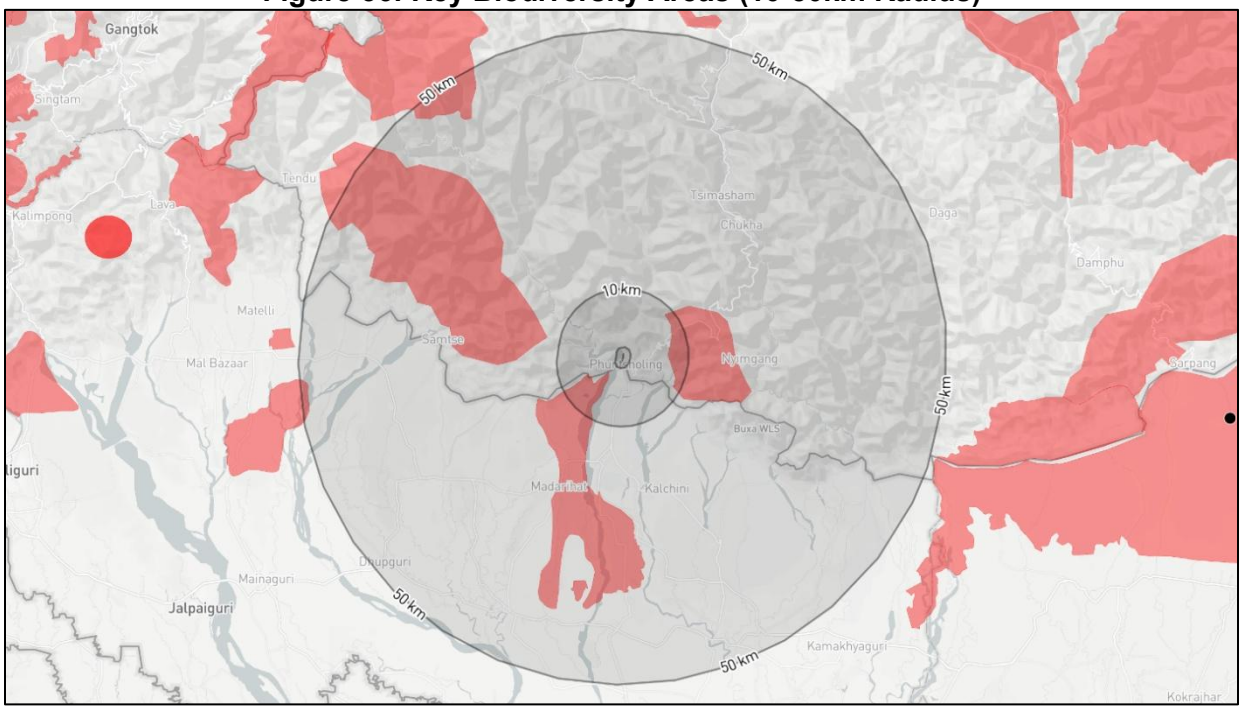
[38] IBAT PS6 & ESS6 Report. Generated under license 26117-98139 from the Integrated Biodiversity Assessment Tool on 14 December 2025 (GMT). www.ibat-alliance.org.

Figure 35: Protected Areas (10-50 km Radius)



Source: IBAT site location and buffer, generated on 14 December 2025.

Figure 36: Key Biodiversity Areas (10-50km Radius)



Source: IBAT site location and buffer from KBA, generated on 14 December 2025.

167. **IUCN Red List Species**. The IBAT list contains 823 species including 4 CR, 13EN, 29 VU and 39 NT species, as can be seen in the table below. Consultations with the local Forest Office indicate that 9 species are known to inhabit forest areas within 1km of the project site. These include the Asian Elephant (EN), Steppe Eagle (EN), Asian small-clawed Otter (VU), King cobra

(VU), Burmese Python (VU), Mountain Hawk Eagle (NT), Indian Roller (NT), River Lapwing (NT) and Assamese Macaque (NT), Species such as the Elephant have been reported to move towards the forested areas in the Kaileshwar hills, which on the left bank of the Amochhu River. [39] This area is outside the project area as it is beyond the PTDP, which is also not part of the project. The LAP area is not forested, and field surveys conducted along the eastern Avenue Road only confirmed the presence of Assamese Macaque (Near Threatened) in Damodara hilly area.

Table 25: Total Number of Species Listed in the IBAT Report.

Phylum (Class)	CR	EN	VU	NT	LC	DD	Total
Mammalia	1	3	10	10	75	0	99
Arthropoda (Makacostraca)	0	0	0	0	1	0	1
Arthropoda (insecta)	0	0	0	0	82	4	86
Arthropoda (arachnida)	0	0	0	0	3	0	3
Chordata (reptilia)	0	3	4	3	60	1	71
Chordata (amphibia)	0	1	0	0	21	0	22
Chordata (Aves)	2	4	12	25	439	0	482
Fungi	0	0	0	0	2	0	2
Plantae	1	2	3	1	44	6	57
Total	4	13	29	39	727	11	823

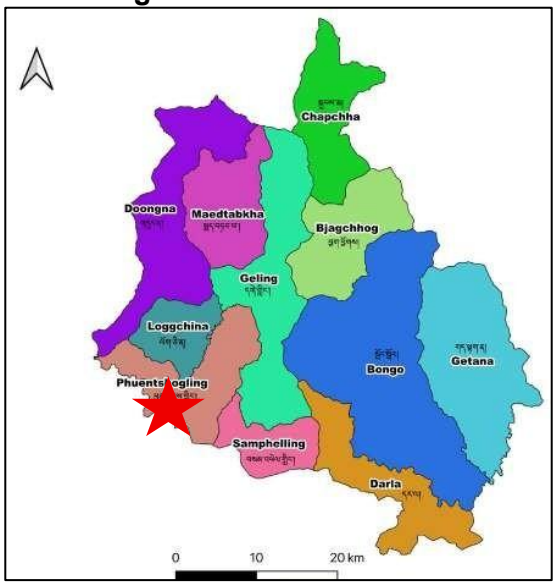
D. Socio-economic Environment

168. **Demography**. Based on the NSB Statistical Yearbook 2025, the latest population data is from 2017. As of 2017, Chhukha Dzongkhag had a total population of 68,966, comprising 36,041 males and 32,925 females. Within this, Phuentsholing Thromde accounted for 27,658 people (15,052 males and 12,606 females) (footnote 36). However, the Ministry of Works and Human Settlements estimates the figure to be closer to 30,000 when including the floating population. The Thromde contains 6,817 households within an area of 15.6 km².[40] In 2017, the Ammochhu area recorded a population of 518 persons (PHCB, 2017). With an annual growth rate of 2.5%, this population is projected to reach approximately 915 persons by 2039. However, the allotment of 106 National Housing Development Corporation Limited (NHDCL) units in June 2018 led to an immediate increase in resident numbers by 500. The NHDCL Housing fall within the Ammochhu LAP.

169. **Literacy & workers profile.** Phuentsholing's workforce has a mixed literacy profile. While most workers have some formal education, 16.7% have no schooling, mainly in daily wage and unskilled labor. Over half have middle (28.0%) or higher secondary (19.4%) education. Tertiary qualifications are held by a smaller group: 14.2% with bachelor's and 2.3% with master's degrees. Educational attainment is higher among skilled, administrative, and technical workers, and lower among semi-skilled and unskilled laborers.[41]

[39] ADB, 2017. Bhutan: Amochhu Land Development and Township Project. Environmental Impact Assessment Report.
[40] GNHC, 2017. 12th-FYP_Vol-III_Phuentsholing-Thromde.
[41] Royal Institute for Governance and Strategic Studies (RIGSS). 2021. Comprehensive Household Census of Phuentsholing Thromde and Peri-urban Areas. Phuentsholing, Bhutan.

Figure 37: Map indicating Chukha District and Figure 38: location of Phuentsholing



Source: Chukha Dzongkhag https://chhukha.gov.bt/

170. **Educational and health facilities**. Within the Thromde, educational facilities include four private Early Childhood Care and Development (ECCD) centers, one Lower Secondary School, one Middle Secondary School, three Higher Secondary Schools (two privately owned), and three autonomous schools spanning the primary, middle, and secondary levels. These institutions collectively serve 4,749 students (2,359 male and 2,390 female). Healthcare services are provided by a single general hospital staffed with 12 doctors, 39 nurses, and 7 health assistants.

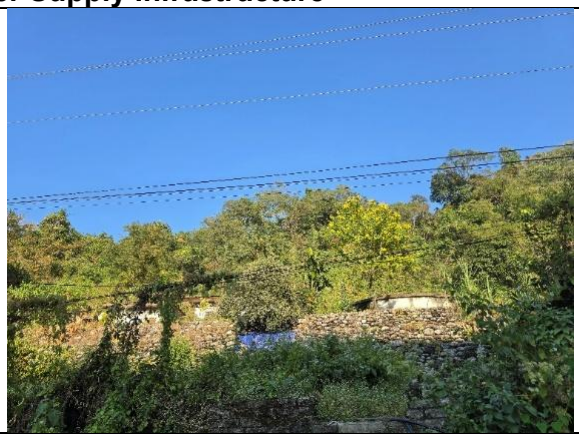
171. **Municipal Services and Amenities – Water supply**. Phuentsholing Thromde provides water supply services in Thromde area. In Phuentsholing, a total of 1,410 buildings and houses have access to safe drinking water supplied in the premises. The existing water supply system is both based on ground and surface water, and comprises operational borewells, four raw water streams, three water treatment plants (WTPs), ten reservoirs, and one break-pressure tank. Capacity of the three WTPs are: the South Treatment Plant (2,000 m³ or 2 million liter per day MLD), the North Treatment Plant (2,000 m³ / 2 MLD), and the Kharbandi (Rinchending) Treatment Plant (500 m³ / 0.5 MLD). Eight LAPs, including Ammochhu LAP, is serviced from designated reservoir tanks established for each of the eight (LAPs).

172. Within the Ammochhu LAP, water is supplied from two bore wells, one pump house, and two reservoir tanks located near the roundabout and near outfall 6. Groundwater is pumped to an elevated storage tank above the LAP, from which it is distributed to the area. The water undergoes a disinfection treatment process to render it safe for consumption. In terms of storage capacity, reservoir 1 has a capacity of 250 m3/ 0.25 ML within the LAP area located at an elevation of 223 m above mean sea level (amsl). Another reservoir capacity of 300 m3 /0.3MLD outside the LAP area at an elevation of 216 m amsl. Treated water is stored in reservoirs and pumped to various storage tanks, from which it is distributed to residents by gravity flow. At present, there is no proper water distribution network. Water is provided twice a day; however, the water supply is inadequate for buildings with many apartments, and residents resort to informal private connections that draw water directly from nearby streams. [42] These pipes are often suspended overhead or laid along road surfaces (footnote 6).

[42] Interview with local resident/restaurant owner near reservoir 1 on November 2025.

173. Currently water from reservoir 2 is supplied to the Ammochhu temporary shelters in PTDP area which housed approximately 5,000 persons. This temporary shelter was developed during the COVID19 crisis to accommodate the Bhutanese citizens returned to Phuentsholing from India and other countries. This is one of the primary reasons for the water shortage in the LAP. The temporary shelter is expected to be vacated soon, so the water being supplied there will be distributed to the Ammochhu LAP. Also, the ADB funded PTDP, which is in completion stage, has recently completed the construction of a water supply system including a WTP of capacity 3.1 MLD and an elevated surface reservoir. In future, both Ammochhu LAP and PTDP systems will be integrated, and have adequate capacity to supply both areas. For a fully developed Ammochhu LAP with 22,458 residents and a water demand of 200 liters per capita per day (lpcd), the total volume of water required is 4.49 MLD. The distribution network was sized to have adequate capacity to convey the 4.49 MLD to different areas in the network. These developments are part of Phuentsholing Structure Plan Phuentsholing Thromde will augment the water supply sources and treatment capacities in future in modular manner to meet the growing demand from Ammochhu LAP and PTDP as these areas start to be developed and occupied by inhabitants.

Photo 12-14: Existing Water Supply Infrastructure

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Water reservoir near Omchu Roundabout</td><td>Water reservoir near Outfall 6</td></tr>
<tr><td>  </td><td></td></tr>
<tr><td>New PTDP Reservoir</td><td></td></tr>
</table>

174. **Sewerage.** More than half of the households (3,506 out of 6,817)[43] in the Thromde are to the sewerage network. The capacity of the existing lagoon-type sewerage treatment plant (STP)

[43] GNHC, 2017. 12th-FYP_Vol-III_Phuentsholing-Thromde

is 2.5 MLD and is located on the bank of the Ammochhu occupying an area of around 13 acres.[44] However, this does not cater to the Ammochhu LAP, and currently there is no sewerage system in the LAP. Therefore, individual households and buildings depend on individual on-site sanitation systems. Sewage or black water is discharged into septic tanks, while grey water from kitchens and bathrooms is discharged into roadside drains.

175. During the detailed infrastructure design phase of the PTDP, bilateral meetings were held to integrate the Thromde and PTDP sewer systems. Consequently, the full carrying capacity of the Ammochhu LAP was incorporated in PTDP. Accordingly, a total provision of 9 MLD, including scope for future expansion, has been integrated into the new STP at PTDP to accommodate sewage flows from both the existing lagoon-type STP and the Ammochhu LAP. At present 3 MLD STP, based on sequential batch reactor (SBR) process has been constructed and ready for operation. Additionally, a primary treatment unit of 3 MLD is also constructed. Secondary treatment unit will be added in near future to this to increase the overall STP capacity to 6 MLD.

176. This advanced SBR process will treat the sewage and produce better quality treated water than what is required under discharge standards. For example, the effluent discharge standard for biochemical oxygen demand (BOD) is 30 milligram per liter (mg/l), while the BOD of SBR STP treated effluent as per design is less than 10 mg/l.

177. Therefore, under this subproject, nho STP is proposed. Sewer network will be developed, and a sewer main will be laid from Ammochu LAP to PTDP sewer main, to convey the collected sewage to the PTDP STP for treatment and safe disposal.

Figure 39: Location of Sewerage Treatment Plant

Photo 15: Newly constructed PTDP STP

[44] MoWHS. 2019. Phuentsholing Core Local Area Plan.

178. **Storm Water Drains**. Within the Ammochhu LAP, there is an absence of a proper drainage infrastructure, which results in frequent flooding during the monsoon season, posing a significant concern for the area. Outfall drainage channels follow natural stream alignments. Existing buildings rely on small drains to channel runoff into nearby streams or into the larger drainage systems that are still being developed (footnote 6).

179. **Solid Waste Management.** Phuentsholing Thromde is responsible for solid waste management (SWM) in Phuentsholing. Waste collection services are provided by a registered private collector, and the collected waste is transported to the landfill site at Toribari. Commissioned in 2005, the landfill spans 3.01 acres (including the access road), of which less than 2 acres are currently in use. Within the city, waste is collected twice daily, while in peripheral areas the frequency drops to once a week due to a shortage of collection vehicles. On average, 8–9 tonnes of waste are collected from the Thromde each day.[45] The Toribari disposal site is located at about 8 km from the LAP. For construction waste, currently the Thromde has identified an area close to Ammochhu LAP, situated north of the Surface water treatment plant. Within the Ammochhu LAP, although door-to-door waste collection is carried out by garbage trucks and communal bins are placed near residential areas. improper waste disposal remains prevalent throughout the LAP. There is no segregation of waste (dry, wet, hazardous). Individuals/scrap dealers segregate waste brought from other parts of the country and store them at the LAP site, prior to selling them to factories or recyclers.

180. A new solid waste processing unit is developed in the ongoing ADB funded PTDP under a Design–Build–Operate contract model. The facility is located close to the new STP and is spread over 6,790 sq. m area. The plant includes facilities for waste segregation, material recovery (recyclables), and wet waste composting. It is proposed to establish a facility of 30 tons per day capacity at this site, the current design capacity of the plant is 15 tpd, and it will be increased to 30 tpd as the demand grows. Waste from the Thromde will be transported to this yard for segregation and processing. Only non-recyclable and reject waste will be sent to the landfill. This will be the common facility for Phuentsholing Thromde including for PTDP and Ammochhu LAP. Estimated solid waste generation from Ammochhu LAP, for the design population, is 3.4 tpd wet waste and 3.4 t dry waste. Phuentsholing Thromde will collect waste from households and transported to the waste processing facility.

Photo 16 and 17: Construction of waste disposal site

[45] MOWHS 2019, Annual information bulletin -material source -Phuentsholing Thromde.

Figure 40: Site for Disposal of Construction Waste and the Landfill site at Toribari

Source: Google Earth

181. **Road network.** The Thromde has a total road network of 57.15 km, encompassing all road types.[46] Public transport facilities include one bus terminal, two city bus stops, and two additional bus stops. A new multilevel car parking facility has recently been constructed in the city center. A network of mostly earthen roads exists within the LAP area, developed largely according to user convenience due to the flat terrain and diversions created by ongoing projects. The primary circulation route is the Phuentsholing–Samtse Highway, which generally aligns with the planned road layout. Within the LAP, various internal roads of differing rights-of-way provide connectivity across the area. These are not surfaced and many diversions arise from these to individual plots. Ongoing drainage maintenance works and recurring monsoon-related flooding have disrupted and, in several locations, disconnected the road network (footnote 6). As a result, the existing network does not fully align with the planned layout and requires systematic improvement to ensure reliable access and connectivity.

182. **Pedestrian Access.** There is currently no proper pedestrian footpath in the Ammochhu LAP area. Residents and visitors walk along rough roads and informal spaces between buildings. Given that many establishments operate heavy machinery workshops and a significant number of heavy vehicles move through the locality, pedestrians face considerable safety risks, including

[46] Phuentsholing Thromde, 2017. Annual performance reporting for the year 2017.

a heightened likelihood of accidents. These workshop and warehouses/stockyards are being relocated to other areas.

183. **Open spaces.** Within the Ammochhu LAP, there are small pockets of open space located near the residential buildings within the NHDCL housing colony; however, these areas are limited in scope and primarily serve the immediate residents. Beyond these pockets, there are no formally designed open spaces or public parks within the LAP.

E. Physical Cultural Resources

184. Culturally, Phuentsholing reflects a rich blend of Bhutanese traditions and diverse influences arising from its border-town character. While Bhutanese values, customs, and governance structures remain central, the town is home to a multi-ethnic population and exhibits a cosmopolitan social fabric. In regard to physical cultural resources, Phuentsholing Thromde has three government-owned lhakhangs: Zangdopelri Lhakhang in the town center, Palden Tashi Chholing Shedra overlooking the Ammochhu river, and Rinchending monastery, also known as Kharpandi Lhakang, in Rinchending overlooking the town. Other temples are farther away in Pasakha, such as Ugyen Dorji Chorkhorling monastery or Pasakha Goenpa. Figure 41 presents the distance of the site area to the three PCRS.

185. **Tourism.** Phuentsholing is not regarded as a primary tourist destination for international visitors; rather, it functions mainly as a transit point and a short-stay location for Indian tourists, particularly during holidays and vacation periods in India. In 2023 and 2024, Bhutan recorded a total of 103,066 and 145,065 tourist arrivals respectively. In 2024, 65%, or 94,280, of tourist arrivals were Indians.[47] Of these, most tourists entered Bhutan by road through Phuentsholing.[48] In 2025, from January to August, a total of 43,468 tourists entered Bhutan via Phuentsholing. In terms of accommodation, Chhukha district, including Phuentsholing, offers 28 total hotels - 15 three-star hotels, 8 two-star hotels and 5 Village Home Stays (VHS).[49] Within the project area, there are about 2-3 hotels only.

[47] The Bhutanese. 2025. Bhutan gets 145,065 tourists in 2024.
[48] Department of Tourism. 2025. Monthly Tourism Bulletin of Bhutan.
[49] Department of Tourism. May 2025. Monthly tourism Bulletin of Bhutan.

Figure 41: Distance of site area to PCRs

Source: Google Earth

F. Hazards and Disaster Risks

186. According to the INFORM 2019 Risk Index, Bhutan ranks 115th out of 191 countries, indicating a comparatively lower overall disaster risk. However, its location along the Himalayan Mountain belt makes it highly susceptible to earthquakes, the country's most prominent natural hazard.[50] The primary seismic threat arises from the Main Himalayan Thrust (MHT), along with oblique strike-slip faults that intersect the Himalayas both at the surface and subsurface levels. Additional risk is posed by extensional grabens along Bhutan's northern border. The southern region faces the greatest vulnerability due to the shallow depth of the MHT and site conditions that amplify ground shaking. This combination, together with the structural susceptibility of common local building types, contributes to a significantly elevated earthquake risk. Additional earthquake related dangers include landslides in mountainous terrain and soil liquefaction in low-lying flatlands.[51]

187. **Earthquakes.** Although a detailed seismic microzonation study of Bhutan has not yet been conducted, the ongoing continent-to-continent collision and associated stress accumulation in the Himalayas suggest that the country falls within Seismic Zone IV or V, consistent with the classification of northeastern India under the Bureau of Indian Standards. According to Bhutan's seismic hazard map (see Figure 42), Phuentsholing is located at the boundary of a high-hazard zone, rated on a four-point scale ranging from low to very high.[52]

188. Historical records indicate that four major earthquakes exceeding magnitude 8 on the Richter scale occurred in 1897, 1905, 1934, and 1950, while an additional ten earthquakes of magnitude greater than 7.5 have struck the Himalayan belt over the past century. In recent decades, Thimphu, Paro, and Phuentsholing have experienced the impacts of three significant seismic events. The 1980 earthquake (magnitude 6.1), with its epicenter in Sikkim, caused cracks in buildings across Thimphu, Phuentsholing, Gelephu, Samdrup Jongkhar, and Trashigang, along with damage to village houses, and triggered landslides that blocked the Phuentsholing–Thimphu national highway. Subsequent earthquakes in 1988 (magnitude 6.6, epicenter along the Indo–

[50] Climate Risk Country Profile: Bhutan (2021): The World Bank Group and the Asian Development Bank.
[51] Stevens et al. Seismic hazard and risk in Bhutan. *Natural Hazards*, 104, 2339–2367. http://10.1007/s11069-020-04275-3
[52] PTDP. 2018. Disaster and Climate Risk and Vulnerability Assessment.

Nepal border) and 2003 (magnitude 5.5, epicenter in Bhutan) produced similar impacts, damaging human settlements, institutional buildings, including schools, hospitals, and dzongs, as well as sections of the national highway network.[53]

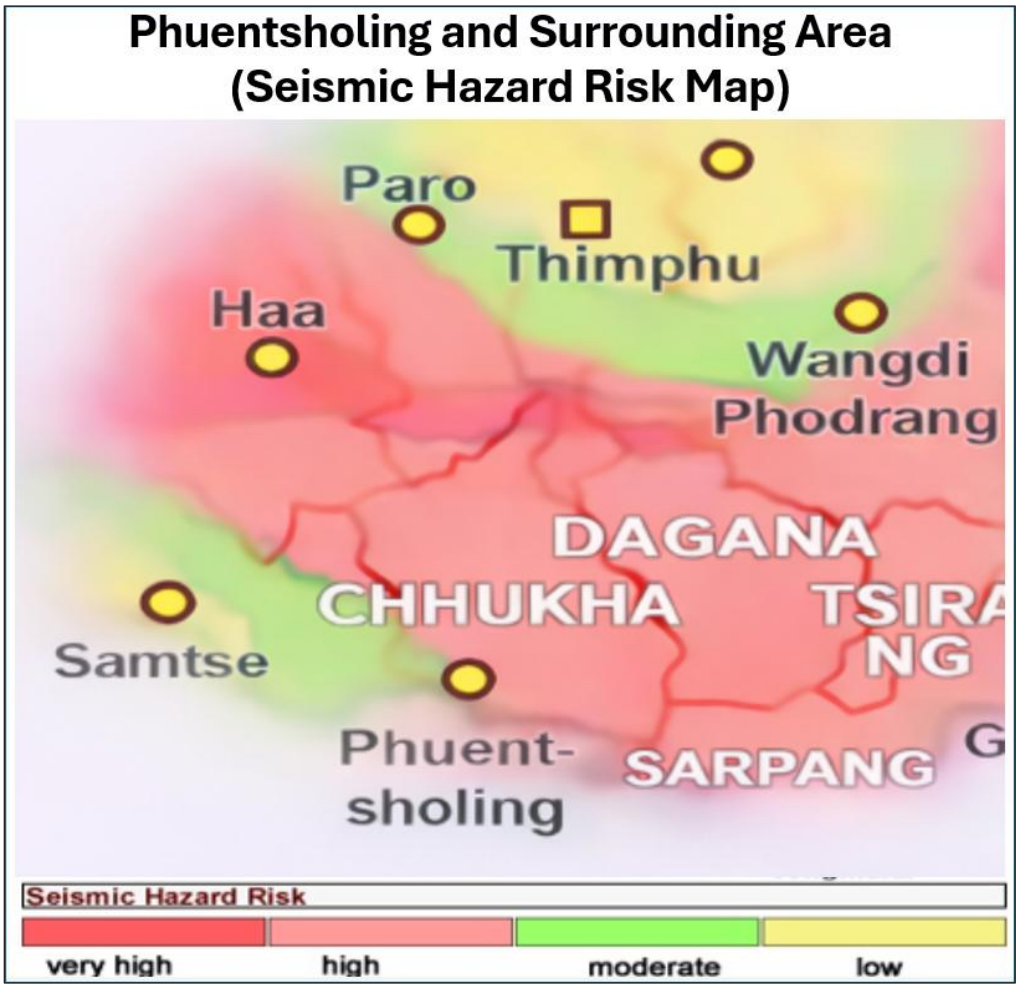
189. The most recent seismic events affecting the district occurred in 2009, when an earthquake impacted multiple Dzongkhags, including Chhukha, damaging rural households, schools, lhakhangs, and government infrastructure.[54] Further damage was reported in September 2011 during the Sikkim earthquake (magnitude 6.7), which caused widespread destruction to rural homes and public facilities, followed by another notable event in 2015.[55]

190. **Slope failure and landslides.** Phuentsholing is vulnerable to landslides due to the unstable/young geology, steep topography, high precipitation, and formal and informal development on, and at the toe of, hillslopes in and around the existing town. Disaster risk associated with landslides for the existing town is therefore considered to be high, in a qualitative sense.[56]

191. **Flood risks.** The Ammochhu river has flooded and eroded vast areas of land in the past.[57] Although the LAP was originally situated at a higher elevation compared to the adjacent Phuentsholing Township Development Project (PTDP) area, due to design modifications, the embankment levels of the Phuentsholing-Chamkuna Road (PCR) project rose, resulting in extensive low-lying areas within the LAP. In case of an extreme flood event, these levels are at risk of being flooded. The Master Plan for the Ammochhu Land Development and Township Project (ALDTP)[58] and the PTDP project (both ADB financed) include infrastructural measures for flood protection. The NCHM prepared a Standard Operating Procedure for interim community-based flood warning system for Ammochhu settlement, [59] despite this during the recent Ammochhu flood caused by incessant rains in October 2025, several families residing in temporary Quarantine housing and Workforce Management Centre were impacted.[60] There is no report of people residing in the Ammochhu LAP being affected.

Figure 42: Seismic Hazard Map of Bhutan

[53] PTDP. 2018. Disaster and Climate Risk and Vulnerability Assessment.
[54] Chhukha Dzongkhag 2018. Disaster Management and Contingency Plan 2018
[55] Phuentsholing Thromde 2018. Thromde Disaster Management and Contingency Plan 2018
[56] Phuentsholing Township Development Project,2018. Disaster and Climate Risk and Vulnerability Assessment. PTDP Project.RRPBHU50165-002
[57] In 2016, the swollen Ammochhu river washed away land, leading the government to spend over Nu 2 million (M) in compensation (NCHM, Compendium of extreme events V2,)
[58] ADB, 2017. Bhutan: Ammochhu Land Development and Township Project
[59] NCHM, 2020.
[60] The Bhutanese, October 5, 2025, and Press Release from the Ministry of Home Affairs, 2025 (MOHA/DLGDM/DPMD(Media)310 dated 5 October 2025.



Source: Indian Institute of Technology. Roorkee, India

192. The natural topography of the area slopes from the hillside (East) towards the Ammochhu (West) so which means that the steeper sections of the drainage channel of the Outfalls are located in Ammochhu LAP. There are 8 streams / outfall drainage channels that through the LAP and join Ammochhu River downstream, after crossing PCR and traversing PTDP. During the monsoons, the high intensity of rainfall, coupled with a huge amount of sediment that flows down from the hillsides areas poses a great flash flood and sedimentation risk in the LAP.

193. **Flood and landslide risks.** Flood risks depend on the distance of the site from the nearest river which is Ammochhu (Toorsa). Ammochhu and Omchhu (also known as Dhoti Khola) are the two main rivers passing through the settlements in Phuentsholing Municipality. Table 26 portrays the flood events in the Omchu (which lies towards the south of the Ammochhu LAP) and Ammochhu (which is separated from the Ammochhu LAP by the PTDP).

Photo 18-19: Landslides near Outfall 7

Figure 43: Landslide areas near outfall 7,5, and 3

Table 26: Flood events in Dhoti Khola and Ammochhu Rivers

Year	Date	River/Basin	Impact	Area
1990	2 June	Omchhu/ Dhoti Khola	The incident damaged agricultural fields, residential houses, water supply lines, one bridge, two temporary shacks, and the boundary wall of the fuel depot, and also washed away the gabion wall.	South of the LAP
1991	2,3,5 July	Omchhu/ Dhoti Khola	The water supply pipelines and several small huts surrounding the colony were completely swept away.	South of the LAP

Year	Date	River/Basin	Impact	Area
2000	August	Omchhu/ Dhoti Khola	Seventeen huts in the vegetable market were washed away, while the BOD fuel station, a private sawmill, and the City Corporation's water supply office were submerged. In addition, an automobile workshop and the staff quarters of the City Corporation sustained severe damage.	South of the LAP
2005	May	Ammochhu	A dozen makeshift shops and adjacent dry land were damaged.	Towards the west, near PTDP
2008	September	Ammochhu	Part of the Gabion wall was washed away	Towards the west, near PTDP
2015	30 June	Ammochhu	In Bangay, seven families lost their makeshift homes and shops. A brick factory and workshop were flooded, while two excavators and three school buses were submerged.	Towards the west, near PTDP
2016	23 July	Ammochhu	Workshops and warehouses located along the riverbanks were flooded.	Towards the west, near PTDP
2023	13 July	Omchhu/ Dhoti Khola	Torrential rainfall causes flash flood wreaking havoc and damaging roads and walls of Phuentsholing thromde.[61]	Not Within LAP
2025	4-5 October	Ammochhu	The recent flood in the Ammochhu River caused extensive damage across Phuentsholing, affecting homes, offices, businesses, and essential services. Over 30 families residing in temporary quarantine housing, 30 police households, and multiple government and private offices were severely impacted.[62]	Towards the west, near PTDP

Source: National Centre for Hydrology and Meteorology. The Compendium of climate and hydrological extremes in Bhutan.

194. The flood hazard assessment for Chhukha Dzongkhag highlighted that monsoon flows in the district's rivers deposit significant sediment within Phuentsholing, causing shifts in river courses. The primary flood risk arises from the reduced elevational difference between the Ammochhu riverbed and adjacent settlements. The site is classified as high flood risk due to its proximity to the Ammochhu river. The Omchhu (Dotikhola) is of particular concern as it threatens the lower parts of Phuentsholing town. To mitigate this risk, approximately 2 km of retaining and embankment walls were constructed along the Omchhu between 2000 and 2001 with Asian Development Bank (ADB) funding.[63]

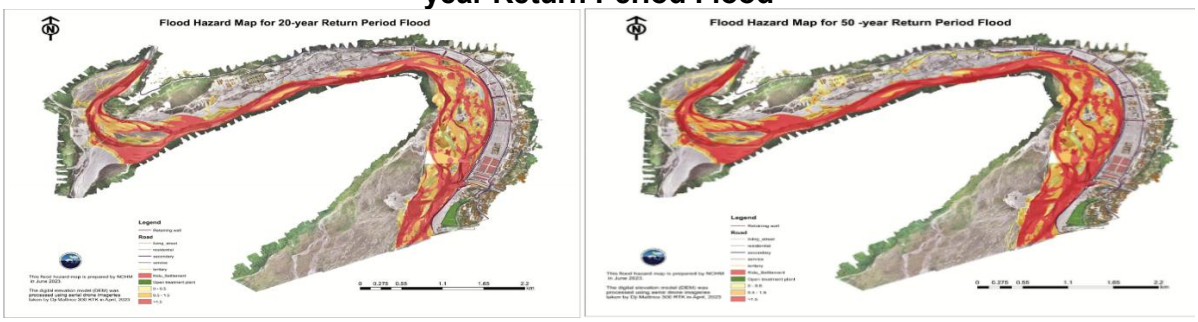
195. Landslides in Bhutan are recurrent and closely associated with flooding events, with susceptibility peaking during the monsoon season. In Phuentsholing, the primary causes of landslides are monsoon rainfall, geological conditions, and human activities. The eastern and southern foothill belts are particularly vulnerable due to steep terrain and highly fractured rock

[61] The Bhutanese. 2023. Devastating flash floods wreak havoc in Gelephu and Phuentsholing.
[62] The Bhutanese. 2025. Ammochhu flood leaves families struggling to rebuild lives.
[63] ADB. 2025. Bhutan Green and Resilient Affordable Housing Sector Project – Ammochhu, Phuentsholing.

formations that allow rapid water infiltration. Contributing factors include the undercutting of slopes by high-energy rivers and streams during periods of intense rainfall. Seismic activity also plays a role, as evidenced by earthquake-induced landslides following the 1980, 1988, and 2003 events. In urban areas, landslides often create secondary impacts by disrupting road networks essential for the transport of goods, while in rural regions, farmers cultivating steep slopes in the south and east face recurring losses from this hazard.[64] The site hazard assessment in the Ammochhu area is rated as high for flood, earthquake, and landslides.[65]

196. In April 2020, the National Centre for Hydrology and Meteorology (NCHM) conducted a detailed hydrological survey, modeling, and hazard mapping, which informed the installation of an early warning system and the development of Standard Operating Procedures for the Ammochhu.[66] Figures below depict the Ammochhu flood hazard map prepared by NCHM in June 2023.

Figure 44: and Figure 45: Ammochhu Flood Hazard Map for 20 year and For 50 (right) year Return Period Flood



Source: NCHM, 2025. Bhutan Flood Hazard Atlas

197. As per the Climate change assessment (CCA) conducted for the IRUDP, the overall risk for the IRUDP project is assessed as “high”. As per CCA, “there is an Increased risk of landslides and flooding may affect the planned urban infrastructures in the Ammochhu LAP. Phuentsholing is prone to landslides and localized flooding or flash floods.”. Hydrological modelling undertaken previously to support the preparation of the RGoB’s National Adaptation Plan (NAP) served as reference for the CCA.

198. There are eight outfall drainage channels that traverse Ammochu LAP carrying runoff / flood water from Damdara hilly area on the east to Ammochu River on the west. Phuentsholing hills are prone to landslides, due to which flood water sometimes carry large volumes of sediment / debris from upper hills. There is also a risk of landslide dam outburst floods (LDOFs) arising from a chain of events beginning with extreme rainfall and/or seismic activity which triggers a landslide that blocks a narrow stream /river gorge and then eventually breaches. Such episodes can have significant socio-economic consequences for downstream communities.

[64] PTDP. 2018. Disaster and Climate Risk and Vulnerability Assessment.
[65] ADB. 2021. Climate and Disaster Risk Assessment. Kingdom of Bhutan: Green and Resilient Affordable Housing Sector Project
[66] National Centre for Hydrology and Meteorology, 2020. Report on Installation of Community Based Flood Early Warning System at Ammochhu, Phuentsholing.

199. Various flood risk mitigation measures are implemented under the other ongoing projects such as ADB-funded Phuentsholing Town Development Project and South Asia Subregional Economic Cooperation Transport, Trade Facilitation, and Logistics Project. Measures are also integrated into Ammochhu LAP design under the current project. At present, two studies are in progress in Phuentsholing to further assess the potential risks of slope instability and weak geological conditions, landslides, debris flows etc. and recommend measures to increase the resilience and mitigate any residual risks to Ammochhu LAP. Risk mitigation measures are further discussed in the next section on impacts and mitigation measures.

VI. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

A. Impacts Assessment methodology

200. ADB SPS requires that all project activities need to be carefully assessed and considered to avoid and/or minimize negative social, religious, and cultural, and environmental impacts. The approach for the environmental assessment of this project involved the following steps:

(i) Compilation of baseline information on the project area and site location including information on physical, ecological, demographic and social characteristics of the project;
(ii) Baseline data on air, water and noise parameters along three sections of the LAP were also analyzed;
(iii) Use of the environmental screening using ADB's Rapid Environmental Assessment checklist (Appendix 1) to determine possible sensitive receptors within the project area and its buffer of 250m LAP;
(iv) Consultation with the Thromde on the proposed infrastructure design, alternatives and implementation plan;
(v) Site visit to collect information on the terrestrial biodiversity;
(vi) Consultation with experts involved in aquatic surveys regarding aquatic species;
(vii) Feedback from the Department of Forest to confirm the presence of species within the project area based on the IBAT report; and
(viii) Discussions between Thromde and Thromde community during the public consultations.

201. Several criteria were used for assessment. These include:

(i) Type/nature of activities proposed;
(ii) Project footprint/spatial scale of the proposed infrastructure work/magnitude of impact;
(iii) Likelihood of the impacts from occurrence;
(iv) Existing baseline conditions at the project site and within the project zone of influence, which in this case is up to 250m;
(v) Duration of the proposed activities and period of impact (short, medium, or long term); and
(vi) Requirements for compliance with national acts, rules and regulations and compliance with ADB policies.

Table 27: Likelihood of Impacts from Occurrence

Likelihood	Definition
Certain	Occurs under typical operating or construction conditions.
Likely	Occurs under worst case (negative impact) or best case (positive impact) operating conditions.
Occasional	Occurs under abnormal, exceptional or emergency conditions.
Unlikely	Unlikely to occur.

Table 28: Parameters for Determining Magnitude

Parameter	Major	Medium/ Moderate	Minor	Negligible
Duration of potential impact	Long term (more than 35 years)	Medium Term Lifespan of the project (5 to 15 years	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of potential impact	Widespread far beyond project boundaries	Beyond immediate Project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries with no detectable potential impact
Reversibility of potential impact	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	Baseline requires a year or so with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant
Legal requirements	Breaches national standards and or international guidelines/obligations	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	Not applicable
Likelihood of potential impacts occurring	Certain	Likely	Occasional	Unlikely

202. **Sensitivity of Receptor**. The sensitivity of a receptor has been determined based on review of the population (including proximity/numbers/vulnerability) and presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity in relation to the topic. The criteria for determining receptor sensitivity of the project's potential impacts are outlined in the following table.

Table 29: Parameters for Determining Significance

Sensitivity Determination	Definition
Very severe	Vulnerable receptor with little or no capacity to absorb proposed changes
Severe	Vulnerable receptor with little or no capacity to absorb proposed changes or limited opportunities for mitigation
Mild	Vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation
Low	Vulnerable receptor with good capacity to absorb proposed changes or/and good opportunities for mitigation

203. **Assigning Significance**. Following the determination of impact magnitude and sensitivity of the receiving environment or potential receptors, the significance of each potential impact has been established using the impact significance matrix shown below in the table.

Table 30: Significance of Impact Criteria

Magnitude of Potential Impact	Sensitivity of Receptors			
	Very severe	Severe	Mild	Low
Major	Critical	High	Moderate	Negligible
Medium	High	High	Moderate	Negligible
Minor	Moderate	Moderate	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

B. Summary of Impacts

204. The project's potential impacts on the key environmental parameters have been assessed and their significance determined using the methodology described above. A summary of the potential impacts of the project on the key environmental parameters and significance of these impacts is presented in the following table.

Table 31: Summary of Rating of Potential Impacts

Activity/ Impact	Duration of Impact	Spatial Extent	Reversible	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Design and Pre-Construction phase								
Land Acquisition – Change in land use	Long term	Local	Yes	Unlikely	Medium	Mild	Moderate	Low
Disruption of utilities and services	Short term	Local	Yes	Certain	Medium	Mild	Low	Negligible
Tree Removal	Long term	Local	No	Certain	Medium	Mild	Low	Negligible
Consents, Permits and Clearances	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Natural Hazards and Disasters (floods, earthquake)	Long term	Local	Yes	Certain	Major	Severe	Moderate to high	Low
Climate Change	Long term	Local	Yes	Certain	Major	Severe	Moderate	Low
Community Awareness	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Construction Phase								
Worker recruitment -Occupational Health and Safety	Short term	Local	Yes	Certain	Medium[67]	Mild	Moderate	Negligible
Construction of site office, worker camps and storage sheds, stockpile areas	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Excavation	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Water supply	Will be provided through municipal water supply							
Electrical connections	Substation will be installed by BPC							
Mobilization of construction equipment and material transportation-traffic and congestion	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Air pollution	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Dust generation	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible

[67] 24-30 months

Activity/ Impact	Duration of Impact	Spatial Extent	Reversible	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Noise Pollution	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Soil erosion and Sediment mobilization	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Ground water quality	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Drainage congestion	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact on critical habitat	Short term	Local	No	Unlikely	Minor	Mild	Low	Negligible
Impact on endangered species	Short term	Local	No	Unlikely	Minor	Mild	Low	Negligible
Impact on Physical Cultural Resources	Short term	Local	No	Unlikely	Minor	Mild	Low	Negligible
Socio-economic status/livelihood	Short term	Local	Yes	Certain	Minor	Mild	Positive	Positive
Community Health and Safety	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Aesthetic impacts	Short term	Local	Yes	Unlikely	Minor	Mild	Low	Negligible
Operation Phase								
Maintenance and operation	Long term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Disaster and natural hazards	Long term	Local	Yes	Likely[a]	Minor	Mild	Low	Negligible
Community health and safety	Long term	Local	Yes	Certain	Minor	Mild	Low	Negligible

[a] Natural hazards/extreme events are likely to occur, but not predictable as to when these will occur.

C. Anticipated Impacts and Mitigation Measures

1. Location and Design Anticipated Impacts

205. **Impact on Protected areas, critical habitats and endangered species.** The site is located within Phuentsholing Thromde boundary. There are no legally protected areas or key biodiversity areas in the vicinity of any of the sites. The closest protected area is Phipsoo wildlife sanctuary which is more than 80 km away and separated by the Sunkosh River. There are also no wetlands within the project area of influence. The Ammochhu LAP is approved, and designated land use is for urban development. Therefore, the subproject will not impact any critical habitat, endangered or vulnerable species. Based on the site visit, there is one mammal (Assamese Macaque) listed as “near threatened” found in the nearby hill area, Dhamdara . The species is not hunted in Bhutan (hunting of any wildlife species is banned). Aside from the road widening works in the Avenue, there will be no other work requiring vegetation clearance, as all infrastructure work will be located within the settlement area.

206. **Mitigation.** To avoid any impacts on these species, following measure will be implemented:

(i) During orientation, Contractors must be instructed to ensure only marked trees are felled and removed as marked. Also require contractors to inform all workers on hunting restrictions and to inform the PMU immediately upon encountering injured wildlife so that the animals can be rescued and relocated.

207. **Impact on Physical Cultural Resources.** The closest physical cultural resource (PCR) to the Ammochhu Local Area Plan (LAP) is the Palden Tashi Choeling Shedra (see orange box), which can be accessed via the Eastern Avenue and is located behind the Outfall-1 area. The Shedra lies outside the Ammochhu LAP boundary, and no project components or development activities are proposed within its premises. Accordingly, no direct physical impacts on the Shedra are anticipated.

Figure 46: Location of the Palden Tashi Choeling Shedra (outside the LAP)

Source: Google Earth

208. **Mitigation**. No mitigation required as the project site is not located at a distance that could impact any PCR. As a precautionary measure, all works in the vicinity will be undertaken in accordance with site-specific environmental management measures to minimize impacts of construction activities.

209. **Risk of natural hazards such as earthquakes and climate change considerations.** The project site was assessed in terms of earthquake, flooding, and landslide risks. Due to its location, terrain, and climatic conditions, the project site is at notable risk of earthquakes, landslides, and floods. Being in the floodplain of the Ammochhu River and crossed by many drainage channels originating from the upstream hill, the project site is vulnerable to flash floods. There are potential zones affected by landslides, particularly close to Ammochhu LAP (especially near outfall 7 above the NHDCL housing colony, and outfalls 3 and 5). Thus, the site is susceptible to the impacts of landslides and debris flows originating from the eastern hill slopes adjacent to the project site. The debris flows can be triggered by intense rainfall or seismic activity, leading to the rapid movement of soil, rocks, and other materials downslope, which may threaten both existing infrastructure and new development within the area. The accumulation of debris at outfall locations could further exacerbate flooding and drainage issues, while also posing a direct hazard to nearby settlements and construction activities.

210. **Risk mitigation measures implemented under other projects that support Ammochu LAP.** The ADB-funded Phuentsholing Town Development Project[68] developed 460 hectares of riparian land along the Ammochhu, incorporating measures for flood and erosion control. The design accounts for river velocity, maximum flood levels, and scour depth associated with a 100-year Probable Maximum Flood (PMF). To protect the riverbed, a reinforced concrete (RCC) diaphragm wall has been constructed, extending below the normal scour depth and reinforced with “dead man anchors” and “anchor slab” techniques. The retaining wall along the river serves to significantly reduce the site’s flood risk.

211. Under the ADB-funded South Asia Subregional Economic Cooperation Transport, Trade Facilitation, and Logistics Project,[69] the 3 km, four-lane Phuentsholing–Chamkuna Road (PCR) was designed with three integrated erosion and flood control systems. These measures include armoring and stabilizing the embankment, implementing river training works to maintain a safe separation between the main Ammochhu channel and the road, managing sediment- and boulder-laden surface runoff from the hillside east of the road, and constructing adequate conveyance structures to ensure the safe passage of water toward the Ammochhu River.

212. **Mitigation measures integrated into the Ammochu LAP design under IRUDP.** IRUDP will apply a risk-informed approach to planning, design and implementation to avoid increasing existing vulnerabilities, creating new risks through maladaptation, or locking-in development in high-risk areas. This will include integrating climate change allowances and appropriate safety margins into relevant infrastructure designs, and strengthening non-structural measures (e.g., land-use controls and development sequencing under the Ammochhu LAP, risk communication, and preparedness and response arrangements, to manage residual risk over the asset life. The Ammochu LAP project design incorporates several engineering and management strategies specifically designed to reduce the risk and impact of disasters and natural hazards, particularly those related to flooding, and sediment or debris flow in outfalls. The Ammochhu Urban Design

[68] ADB. 2017. Environmental Impact Assessment. Ammochhu Land Development and Township Project (Phuentsholing Town Development Project. Project Number:50165-002.

[69] ADB, Initial Environment Examination Report. BHU: South Asia Sub regional Economic Cooperation Transport, Trade Facilitation and Logistics Project. April 2020.

and Detailed Infrastructure Design report integrates design measures for risks due to climate change, particularly the potential flooding in the area. These design measures consider findings and recommendation of various other studies, such as:

(i) A hydrological modelling that was undertaken previously to support the preparation of the government's National Adaptation Plan;
(ii) Ammochhu LAP Urban Design and Detailed Infrastructure Design Report, prepared by Phuentsholing Thromde, integrated a climate change assessment and the technical review of the existing mitigating measures.
(iii) The design of the drainage systems (including outfalls) in the Ammochhu LAP is aligned with PTDP, which makes use of the 100-year flood model. As per the analysis in the CRA, the PTDP design discharge of 7100 m^3/s exceeds all observed flood peaks, flood frequency analysis, and synthetic hydrographs.
(i) LAP Filling for flood mitigation. The chosen final fill option involves filling the Ammochhu LAP to the level of the Phuentsholing Chamkuna Road (PCR). This action removes pockets of low-lying area, eliminating the ponding issue in the future;
(ii) Comprehensive management of stormwater runoff, addressing the existing problems of low-lying areas, water clogging, and high flood risk. This includes design of drainage structures based on historical data and modeling;
(iii) Retaining walls (RCC cantilever and Random Rubble Masonry) are recommended along outfalls and roads to prevent embankment collapse and manage active earth pressure
(iv) The drainage system is along internal service roads underneath the footpaths and designed to ensure self-cleaning, maintaining a minimum velocity of 1.5 m/sec to prevent deposition of particles and to ensure that sediment is flushed through the system rather than settling and causing blockages that lead to overflow.
(v) The design uses rainfall data from 2008–2018 as a baseline but acknowledges that climate change will lead to erratic patterns and higher temperatures (projected +2.5°C by 2050)
(vi) Under Output 3 (Urban policies and planning, regulatory frameworks, and governance mechanisms strengthened) ADB will support Phuentsholing Thromde in reviewing and updating its inclusive urban policies and land-use-based planning framework. This will include the integration of land use provisions, development control regulations and design guidelines aimed at improving resilience in landslide- and flood-prone areas, such as requirements for elevated ground floors, restrictions on basement use, allocation of lower floors for temporary or non-residential purposes, and the adoption of climate adaptation measures. These will be undertaken in close consultation with the Ministry of Infrastructure and Transport, as well as local communities within the Ammochhu LAP.
(vii) Measures to manage residual risks to residents and assets from failure of flood and other hazard defenses such as strict land use zoning, development controls and enforcement, extended range hazard early warning systems (HEWS), raised public awareness of risks and responses through drills and emergency preparedness, and evacuation routes to shelters and training will be incorporated into Ammochchu LAP.

213. **Ongoing risk assessment and mitigation studies.** To further assess the potential risks of slope instability and weak geological conditions, landslides, debris flows and potential LDOFs originating from the site's eastern hills, and to further increase the resilience and mitigate any residual risks to Ammochhu LAP, two studies are currently in progress in Phuentsholing. One

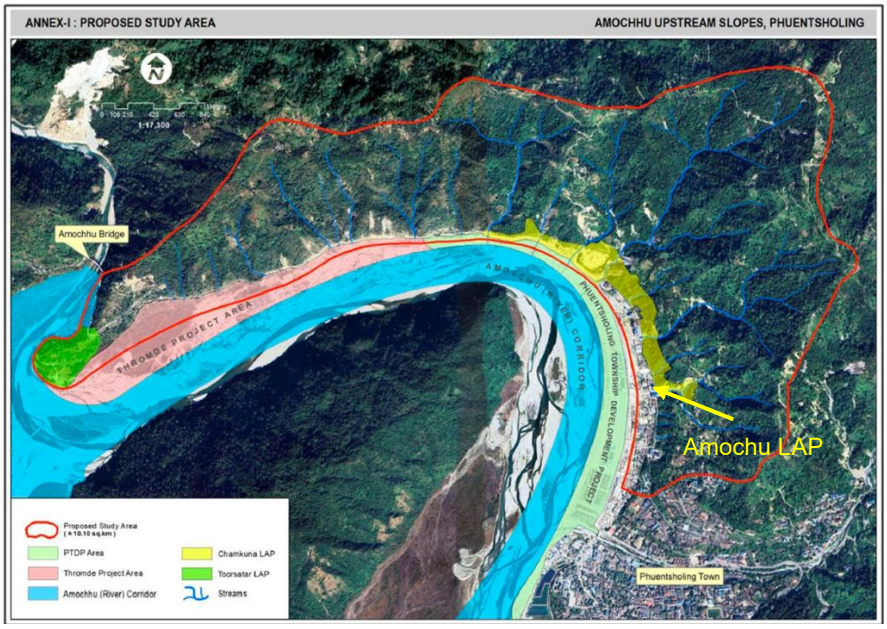
study initiated by Phuentsholing Thromde focuses on Ammochhu LAP, and the other study funded by an ADB technical assistance (ADB TA) focuses on a larger Phuentsholing area that will benefit both PTDP and Ammochhu LAP. Details of the studies are provided below.

(i) Phuentsholing Thromde is currently conducting a geohazard study (Geotechnical Investigation and Slope Stability Assessment for Pekarzhing and Ammochhu LAPs in Phuentsholing).[70] This study is being conducted with the funding support from the Coalition of Disaster Resilience Infrastructure's (CRDI) Infrastructure Resilience Accelerator Fund (IRAF). This is part of United Nations Development Program (UNDP) support to RGOB though a project titled "Enhanced risk informed planning, data-driven decision making and early warning system for disaster resilient urban infrastructure in major cities of Bhutan with the funding support from CRDI IRAF. The objectives of this study are: (i) determine the geotechnical feasibility and hazard levels of the two LAPs, (ii) Identify areas vulnerable to slope instability and erosion hazards, (iii) assess adverse geotechnical impacts of development, (iv) recommend suitable land-use zones and foundation design parameters, and (v) propose site-specific and area-wide mitigation measures for unstable slopes. The "study aligns with the policy intent and spatial vision established under the Phuentsholing Structure Plan 2013-2028. The Structure Plan serves as the statutory framework guiding urban expansion, environmental protection, and hazard-sensitive development within the Thromde boundary". This study is scheduled to be completed in May 2026.

(ii) Another study supported by ADB technical assistance for the Building Adaptation and Resilience in the Hindu Kush Himalayas – Bhutan and Nepal (BARHKH), "Phuentsholing Slope Hazard Mitigation Conceptual Design" is being carried out by a consultant BGC Engineering USA Inc. (BGC). A key objective of the study is to provide recommendations to strengthen the risk management measures for PTDP (e.g., structural and non-structural options), which could be integrated in the proposal for PTDP savings utilization. This study covers PTDP, Ammochhu LAP, and some parts of the Dungkhag (see figure 47). The study is being conducted in two phases: The goal of Phase 1 is to determine the problem, constraints, possible solutions, and priority of creeks in terms of risk posed from debris flows. The goal of the phase 2 (conceptual design phase) is to select preferred risk reduction options at each creek and demonstrate that the selected options are feasible, cost-effective, and technically effective. The project budget, effort, and schedule estimate assume that BGC's team will develop conceptual mitigation plans at 10 creeks, including outflow drainage channel traversing Ammochhu LAP and PTDP. This study is scheduled for completion in June 2026. The measures suggested by the study could be integrated into the PTDP, which would also benefit IRUDP.

[70] Inception Report. *Geotechnical Investigation and Slope Stability Assessment for Pekarzhing and Ammochhu Local Area Plans (LAPs), Phuentsholing Thromde*. APECS Consultancy, Bhutan (January 2026).

Figure 47: Proposed BARHKH Study Area in Phuentsholing



214. **Mitigation**. To address potential residual risks, if any, of flooding resulting mainly from the debris flows in outflow drainage channels, blocking and LDOFs, the following measures shall be implemented by Phuentsholing Thromde:

(i) The final detailed design needs to incorporate recommendations of the two studies. Upon completion of the two ongoing risk assessment and mitigation studies,[71] the planning and design of Ammochhu LAP infrastructure, including the proposed risk mitigation measures (both structural and non-structural) shall be reviewed, revised, updated and/or validated as required. This shall include review, validation, and update as needed of climate change allowances and safety margins.

(ii) Ensure to apply a risk-informed approach to planning, design and implementation to avoid increasing existing vulnerabilities, creating new risks through maladaptation, or locking-in development in high-risk areas.

(iii) Identify additional risk mitigation measures that are not included in the IRUDP or PTDP, and secure financial resources for implementation of the same. It must be ensured that the funding for additional measures and implementation plan is firmed up prior to invitation of bids for Ammochhu LAP under IRUDP.

(iv) Coordinate with the two study teams and ensure Ammochhu LAP designs are risk informed.

(v) Conduct / continue public consultations with Ammochhu LAP and wider stakeholders on Ammochhu LAP design, risk mitigation studies and measures

(vi) Raise public awareness of risks and responses through drills and emergency preparedness, and evacuation routes to shelters and training in Ammochchu LAP.

[71] (1) Geotechnical Investigation and Slope Stability Assessment for Pekarzhing and Ammochhu Local Area Plans (LAPs), Phuentsholing Thromde, and (2) "Phuentsholing Slope Hazard Mitigation Conceptual Design" under the ADB TA for the Building Adaptation and Resilience in the Hindu Kush Himalayas – Bhutan and Nepal (BARHKH).

215. **Disruption to existing structures, utilities, and services.** Within the Ammochhu LAP area, project activities—particularly excavation for road widening, construction of pipelines, sewers, ducts, culverts, drainage systems, and embankment works—may disrupt existing utilities and services. This risk is heightened by the presence of privately installed water pipelines supplying individual buildings in addition to Thromde-managed networks, as well as electricity poles located near proposed outfall and embankment works, which may be susceptible to displacement or damage during construction. In addition, two existing electrical substations (BO30H119 and PHE30T23) are located within the proposed road centerline or on private plots and may be affected.

Photos 20-22: Electrical lines along the outfall

Photo 23-25: Scattered water pipelines

216. **Mitigation.** Prior to commencement of construction works, all identified utilities within work sites / LAP roads must be clearly mapped, marked, and, where necessary, safely relocated outside the work area. The PMU shall coordinate with the Thromde, Bhutan Power Corporation and relevant service providers, and affected building owners to prepare and implement a utility relocation plan. The PMU and Contractor will provide timely and prior notice to LAP residents and property owners about the nature, location, and duration of any anticipated service disruptions. If disruption is unavoidable, this must be communicated in advance and kept to the shortest practicable duration. In case of damage, the Contractor will be fully liable to pay for the repair and compensate for the loss of service delivery as determined by the contract.

217. Information dissemination will not be limited to public consultations but will include as well as public announcements through the Thromde's official website, television, and social media platforms to ensure broad outreach, especially for buildings and landowners or residents who may be living or traveling elsewhere.

218. **Tree removal.** There are no notable trees within the LAP, except along the eastern edge abutting Damdara hill. Much of this area mostly comprises shrubs and bushes. As per preliminary estimates, 12 trees need to be cut, which will be further confirmed during the road alignment marking on the ground. Details are provided below:

Table 32: List of species to be cut along eastern Avenue

S. No	Scientific name	Common name	Local name	Trees need to be cut	IUCN Status
1	*Alangium chinense*	Chinese Cornelian cherry	Luma shing (Dz), Benthong shoing(Sh), Okane (Lh)	2	-
2	*Alstonia scholaris*	Devils tree	Dungthung shing (Dz),Chatiwan(Lh)	1	LC
3	*Bombax ceiba*	Silk cotton tree	Pema geyser shing (Dz), Simal (Lh)	1	LC
4	*Oroxylum indicum*	Indian trumpet tree	Tsampa-kayee meto(Dz), Namkaling meto(Sh)	1	LC
5	*Moringa oleifera*	Drumstick tree	Pemageyser Dzuima (Sh)	5	LC
6	*Leucaena leucocephala*	River tamrind	Tsa shing (Dz), Tsee Shing (Sh)	1	LC
7	*Daubanga grandiflora*	Thora	Patang shing (Dz), Lampatey (Lh)	1	LC
			Total	**12**	

LC = least concern

219. **Mitigation**. During the alignment marking, efforts will be made to minimize tree cutting. For removal of trees, since the project site is within the Thromde, Thromde will conduct site visits with the Forest Range office to identify which trees need to be removed and accordingly seek consent. The PMU must ensure that only trees that are within the road alignment are removed. To compensate for the loss of trees, trees will be planted during landscaping and beautification upon completion of infrastructure work. To ensure slope stability and enhance aesthetics, the Thromde should take measures to mitigate erosion and plant suitable trees where land is available.

220. As part of the beautification, it is anticipated that Thromde will carry out tree plantation (2 times the number of trees cut). The fund for this is under their annual maintenance budget. No additional mitigation is required.

2. Pre-Construction Stage Anticipated Impacts

221. **Consents, Permits and Clearances**. Since Local Development Plans are categorized as 'Red', Phuentsholing Thromde is required to conduct an environmental impact assessment (EIA) for the development of the Ammochhu Local Area Plan (LAP) under the Phuentsholing Thromde as per the Environmental Assessment Act 2000 and its Regulation for Environmental Clearance of Project (RECoP) 2016.

222. **Mitigation**. Phuentsholing Thromde will submit an EIA report to the Department of Environment and Climate Change (DECC) for review and issuance of environmental clearance for the project. Ammochhu LAP EC must be obtained prior to invitation of bids for the subproject.

223. The Thromde is responsible for the provision of facilities such as drinking water, sewerage, and waste disposal within the *Thromde*. Therefore, once the procurement process is complete, the selected contractor must process the following permits.

(i) Land lease for contractor facilities, water supply for drinking and construction and waste disposal – Thromde;
(ii) For electrical connections for work sites and worker camps- Bhutan Power Corporation;
(iii) For tree marking – Environment Office, Thromde;
(iv) For recruitment of foreign workers- Department of Labor; and
(v) Disposal of Construction Waste - Environment Office, Thromde.

224. **Impacts due to recruitment and management of workers.** While the contractor should be encouraged to provide local employment, due to the lack of skilled national workers, it is generally still necessary to import foreign skilled workers. Key risks with hiring of workers include discrimination in employment and pay, unfair terms and conditions of employment, lack of contracts, excessive overtimes, delayed, irregular or non-payments, risk of child labor or forced labor, Gender-based violence, Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH), inadequate or unsafe working conditions and issues related to worker accommodation and welfare.

225. **Mitigation**. The Contractor will be required to follow the rules and regulations for foreign and local worker recruitment, such as the "Handbook on Recruitment and Employment of Foreign Workers in Bhutan"[72] and prohibit the recruitment of workers below the age of 18. The Contractor will strive to be gender sensitive by ensuring equal pay for equal work for female worker, brief workers on gender discrimination and sexual harassment. All foreign workers will be screened at their point of entry for the more virulent and contagious diseases, including HIV/AIDS, TB, Malaria, etc.

226. The contractor will prepare a labor management plan (LMP) that will include terms and conditions of employment, including hours of work, wages, overtime, compensation and benefits, holidays, leaves, and so on. The procedures will set out measures to ensure equitable treatment of all workers, uphold non-discrimination irrespective of gender, age, ethnicity, religion, disability,

[72] RGOB. Regulations on Working Conditions, 2012.

or other characteristics and address harassment, and/or exploitation and gender-based violence. The LMP will also include a provision for dealing with worker grievances. The contractor will ensure safe living and working conditions as indicated in the paragraphs below. The Contractor will comply with the requirements of the Regulation on Occupational Health and Safety for the Construction Industry 2022 along with the relevant provisions in the Regulation on Occupational Health, Safety and Welfare, 2022 as applicable to construction sites.

227. **Impacts due to site selection, preparation and construction of site office, worker camps and material storage sheds.**: Establishing construction camps and site facilities will require dedicated space for site offices, worker accommodation, material storage, machinery parking, and utility connections. The influx of workers will increase demand for temporary housing, drinking water, electricity, and sanitation services. Poorly sites, planned or inadequately managed construction camps may result in overcrowding and sub-standard worker accommodation with unsanitary conditions posing increased risks of communicable diseases, including for vulnerable groups such as female workers, pollution of soil and water bodies from untreated wastewater, greywater, and solid waste and cause environmental degradation due to improper material storage.

228. Once the contract is awarded, the site will be handed over to the Contractor by the Thromde. Without proper facilities, the implementation of the activities may not proceed smoothly and may delay the project timeline. Placing these sites near sensitive areas like schools, religious sites, the river and its tributaries could lead to negative social impacts (noise, disturbance, risk of conflicts, sexual harassment/abuse) and environmental impacts (water quality and aquatic habitats). While their specific locations are yet to be determined, it may be located within the LAP area, which includes vacant lands. Within LAP there are residential houses and a couple of hotels, however there are no sensitive areas like schools, hospitals or cultural places. Establishing construction camps close to residential houses may have negative impacts. There are outflow drainage channels, and wastewater, discharge or spillage may enter outfalls and join Ammochhu River.

229. **Mitigation:** The contractor will ensure the following measures are implemented;

(i) Obtain prior approval from the Thromde for siting of worker camps. Camps shall be located at least 30 m from rivers and 15 m from streams, avoid flood-prone areas, and require minimal vegetation clearance, with no tree felling;
(ii) Maintain at least 50 m from the nearest residential house, in case camps are established within the LAP.
(iii) Fulfil land lease requirements with the Thromde for use of government land and execute written agreements where private land is utilized;
(iv) Establish camps or accommodations following international best practices such as the standards for workers accommodation pertaining to *"Workers' accommodation: processes and standards. A guidance note by IFC and the EBRD" 2009*;[73] and the International Labor Organization's Workers' Housing Standards,[74] which requires that a workers' camp should ensure structural safety and reasonable levels of decency, hygiene and comfort;
(v) Comply with the Regulation on Occupational Health and Safety for the Construction Industry, 2022, and the Bhutan Schedule of Rates (2024) standards

[73] Workers' Accommodation: Processes and Standards.
[74] Workers' housing

for temporary living accommodation, including requirements for room size, flooring, roofing, walls, lighting, ventilation, health, hygiene, and safety;

(vi) Provide gender-segregated and gender-friendly accommodation, with adequate space (minimum one room per four workers), sufficient headroom and ventilation, and protection from weather conditions (heat, rain, wind, and cold). Given the hot summer conditions in Phuentsholing, rooms shall be equipped with fans and mosquito nets;

(vii) Since Phuentsholing is one of the hottest places in Bhutan, with long hot summers and short winters, appropriate facilities should be provided to cope with the weather conditions.

(viii) Ensure the provision of safe and adequate drinking water with sufficient storage capacity. Where water is sourced from non-municipal supplies, it shall be tested regularly to ensure compliance with national drinking water quality standards;

(ix) Provide sanitation facilities at a minimum ratio of one pour-flush toilet per six workers, with separate facilities for males and females. Toilets shall be connected to septic tanks with soak-away pits located at least 30 m from rivers, streams, and groundwater sources, and shall include bathing and washing facilities;

(x) If workers are provided with meals, provide a common dining room away from the sleeping areas. Water from the kitchen or dining areas must be channeled away from streams and onto soak pits.

(xi) Where workers prepare their own meals, provide a separate kitchen area. Where meals are provided, establish a common dining area away from sleeping quarters. Wastewater from kitchens and dining areas shall be discharged to soak pits and not into nearby streams or drains;

(xii) Ensure camps are equipped with electricity, fire extinguishers, and adequate lighting. Camps shall be secure, barricaded, self-contained, regularly cleaned, and well organized, with segregated waste bins for general, biodegradable, and hazardous waste;

(xiii) Obtain all required approvals from the Thromde and Bhutan Power Corporation for water supply and electricity connections; and

(xiv) Where feasible, explore the option of renting existing buildings for offices or accommodation to minimize the project footprint and associated environmental disturbance.

230. **Lack of budget for mitigation measures – Bid process and Cost estimation.** Standard bidding documents include provisions for Occupational Health and Safety (OHS) measures at construction sites,[75] and provision of temporary living accommodation, there is the risk that mitigation measures such as cost of compensation for work related injuries or waste disposal are not budgeted in the contractors cost.

231. **Mitigation**. During the procurement process the following must be undertaken:

(i) Ensure compliance with the prevailing Bhutan Schedule of Rates (BSR) for OHS and worker accommodation;

[75] including Insurance, Personal Protective Equipment (PPE), First Aid kits, Boundary Fencing, Scaffolding, Safety nets, Traffic management, signage calculated as per the "Guideline for Occupational Health and Safety Cost" and provision of temporary living accommodation (bed room, kitchen, and toilet cum bathroom including proper water supply and electricity as per the drawing and temporary living accommodation standards) are calculated as per the "Guideline for Estimating Cost of Temporary Living Accommodation."

(ii) Include the EMP into the contract documents and include a clause to make contractors liable for non-compliance to the ADB safeguards, national regulations and standards and the EMP;
(iii) Incorporate the cost of waste transportation from the construction sites to the waste dump site in the Bill of Quantities (BOQ) to avoid supplementary claim and ensure proper waste disposal; and
(iv) The Contractor must review the EMP and prepare a site-specific Contractor EMP, incorporating and budgeting for all measures to avoid lapses and non-compliance during implementation. This will be reviewed and approved by Thromde.

232. **Non-compliance with ADB Loan Agreement, and SPS, 2009** Despite the Project Management Unit's (PMU) general familiarity with the ADB Safeguard Policy Statement (SPS) and loan and national regulatory requirements, a significant risk to compliance may arise due to staff capacity, potential staff transfers and competing priorities, which can lead to gaps in meeting obligations under the ADB loan agreement, SPS 2009, and the Department of Environment and Climate Change (DECC) environmental clearance conditions.

233. For the PMU, the following are mandatory requirements:

(i) Seek prior clearance of the IEE report from ADB before disclosure;
(ii) Staffing commitments for environmental and social safeguards and capacity building;
(iii) Ensure that sufficient funds are available to properly implement all agreed measures in the EMP;
(iv) Disclosure of the approved IEE, updated IEEs and EMRs;
(v) Incorporate EMP, GRM and EMOP and relevant provisions of the loan agreement into bidding documents only after approval from ADB;
(vi) During pre-bid meetings, brief contractors on their responsibilities in EMP implementation, and the need to comply with all ADB loan covenants, national legislation and clearances;
(vii) Upon selection, conduct contractor training on the EMP requirements, documentation and reporting procedures;
(viii) Prepare and submit semi-annual EMRs for ADB review and approval; and
(ix) Report any accidents, fatalities to ADB within 48 hours as well as any unanticipated incidents along with corrective actions taken within one week.
(x) Prepare updated IEEs or amendments in case of changes in project scope and design during implementation.

234. **Poor Supervision and Monitoring of EMP.** The project activities will require constant supervision and guidance on environmentally safe construction practices and therefore require safeguard staff to ensure that EMP requirements are followed, reported and that corrective actions are undertaken in case of unanticipated impacts. With Thromde implementing multiple projects, including the Omchhu Project, it is likely that the existing staff may be overwhelmed with competing tasks.

235. **Mitigation.** The PMU and Contractor must incorporate adequate budget to ensure adequate staffing and capacity building measures from pre-construction to construction phases. The Thromde must ensure that the Environment Officer in the PMU is supported by assistants who will be involved in the monitoring of the environmental related aspects of the project.

236. Contractors EHS staff/focal should provide updated monthly information on EMP compliance for incorporation into the monitoring reports.

237. **Lack of community awareness and project disclosure**. Public consultation was carried out on 22nd December 2025, by Thromde wherein 29 participants were present. The Minutes of the Meeting are in Appendix 4. As there are more than 100 landowners, many living outside of Phuentsholing, it is possible that not all property owners and residents are aware of the project. Because of the nature of the infrastructure work, it is important to ensure transparency, community engagement and information sharing about project activities, schedules and the GRM process, especially as there were concerns regarding land filling, and project impact on ongoing and future construction.

238. **Mitigation**. To strengthen transparency, community engagement and safeguard compliance, the project must adopt a structured and proactive disclosure and awareness strategy:

(i) Disclose the approved IEE and GRM on Thromde website and make printed summaries available at the site office;
(ii) Disseminate information about project activities and schedules (television, newspaper, social media and local representatives).This advance notification will enable residents to plan accordingly, mitigating potential disruptions, congestion on work areas, or access restrictions or temporary closures of roads;
(iii) Share SMS alerts for activities that may cause temporary disturbances (e.g. road diversions, closures);
(iv) Institute the Grievance Redress Mechanism prior to the construction phase and notify and disseminate information to the public on the GRM process;
(v) Ensure that the contractors install project signboards (according to national design standards and specification) so that passersby, travelers and the community are aware of the project site, work timing, access restrictions. Signboards should have project contact numbers. These must be updated as focal persons change; and
(vi) Ensure that any updated IEE and addendums are approved by ADB and disclosed.

3. Construction Stage Anticipated Impacts and Mitigation Measures

239. **Socio-economic Impacts.** The subproject will generate employment and business opportunities for local suppliers of construction materials as well as material transporters and machine operators. The socio-economic benefits of obtaining temporary employment in construction workforces can be significant for low-income people within and outside Thimphu.

240. **Socio-economic Impacts.** The project is expected to deliver significant socio-economic benefits, particularly for low-income populations in and around Phuentsholing, by creating temporary employment opportunities in construction workforces. Furthermore, it will stimulate local economic activity by generating business for material transporters, machine operators, and local suppliers of construction materials. At the same time, it will also create temporary disruptions due to construction activities.

241. **Occupational health and safety Impacts.** The construction industry entails working in confined spaces like trenches, excavation, use of machinery, and constant exposure to noise, dust, and equipment. Construction noise such as welding and use of excavators will cause more disruption to the machine operators or workers in close proximity to the machine. There is also the risk of workplace injury due to (i) lack of personal protective equipment (PPE), (ii) unsafe acts/carelessness or ignorance by supervisors, workers, etc., (iii) use of unskilled or untrained

workers, (iv) working long hours with inadequate facilities, and (v) lack of dedicated personnel to monitor and ensure worker health and safety and lack of general safety awareness. LAP is located on foothills, crossed by several outflow drainage channels, and is vulnerable to seasonal floods, therefore presents risks to workers and supervision staff during the works. Flash floods in drainage channels during the works pose a serious risk. Working with asphaplt, concrete and other material also potentially pose health and safety risks to workers

242. **Mitigation.** To ensure the health and safety of worker, the contractor will be required to abide by the international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning Activities;[76] Good International Practice (GIP) and by Regulation on Occupational Health, Safety and Welfare, 2022, and undertake the following measures:

(i) The contractor must prepare a project-specific Health and Safety Management Plan that is based on identified potential hazards, outlines preventive measures, incorporates worker training, documentation and reporting and outline emergency response arrangements.
(ii) For works scheduling, Phuentsholing Thromde and contractor shall coordinate with the RGOB agencies on disaster risks, seasonal floods, extreme weather, landslide etc., temporary warning systems (at least manual) shall be put in place, with coordination of agencies, households in upper hills. This especially critical for works in drainage outfalls or on the eastern avenue adjacent to Damdara hill. Flashfloods, and debris flow may pose risks to project staff and workers, and may also lead to loss of equipment, material in the flood, and may have adverse impacts on receiving water bodies.
(iii) As required by the regulation, the contractor will establish an OHS committee and employ a certified Health and Safety Focal Person who will have the overall responsibility to ensure safe working conditions and environment for all workers.
(iv) To prevent accidents during electrical, excavation, machine operation etc. hire only trained and certified workers, licensed drivers and machine operators
(v) Prepare and implement accident and emergency response procedures, including evacuation, first response, transportation to hospital, root-cause investigation, and corrective actions.
(vi) Ensure all foreign workers are screened at their point of entry for virulent and contagious diseases, including HIV/AIDS, TB, Malaria, etc.
(vii) Provide required PPE (safety boots, helmets, gloves, goggles, reflective clothing, dust masks, ear protection) at no cost to workers, maintain a PPE register, and enforce usage
(viii) ensure safe working conditions (fall protection, safety from emissions, hot substance like asphalt, electrical safety, excavation safety, fire safety, first-aid),
(ix) Conduct regular OHS training and toolbox talks covering hazards, safe work practices, PPE, code of conduct, emergency procedures, and site-specific risk
(x) institute protocols to carry out periodic inspections and corrective actions
(xi) Provide first aid kit, fire extinguisher, and adequate supply of safe drinking water at a workplace
(xii) Install safety signage at critical and risky/precarious areas.
(xiii) The Thromde must report any fatality, major incident, or significant injury to ADB "as soon as possible" after becoming aware of it. The initial report must be followed

[76] IFC World Bank Group. 2007. Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Construction and Decommissioning.

by a detailed report outlining the root cause analysis and future preventive measures.

(xiv) The Contractor must compensate the worker (s) for any fatality or major incident resulting in injury or ill-health caused by project activities as per the national regulation.

(xv) During the summer, the contractor must establish a schedule for work and rest periods during hot days. Similar to PTDP, the contractor should provide designated areas where workers can rest away from the heat and the rain.

(xvi) Institute a protocol to deal with grievances at the worksite and communicate this to all workers.

(xvii) If workers are required to work overtime, then the contractor must submit a night work plan based on assessment of all risks and hazards. The plan must include appropriate provisions to ensure a safe and healthy work environment with standard operating protocols, equipment, facilities and training. Provide adequate lighting, fair compensation, and safe working conditions for overtime and extended work hours.

(xviii) Install safety signage at critical and risky/precarious areas.

243. **Impacts due to excavation works.** Excavation work will be carried out for drains, sewer lines, utility ducts, roads, embankments, and culverts and will generate soil. This may lead to soil erosion, particularly during monsoon periods. The increased sediment load may enter the Ammochhu River through outfalls if construction runoff is not properly controlled. On the other hand, excavation during dry months will create dust piles on windy days. There is also the possibility that buried waterlines may be disrupted during excavation work.

244. **Mitigation**. Most of the excavated material will be reused for filling in depressions in the LAP area. To reduce runoff, all excavation work should be planned during the drier months. To mitigate for dust piles, the newly excavated area must be sprinkled with water frequently to main the soils in damp condition. Measures must be undertaken to prevent the disruption of utilities and services. Prior to commencement of construction works, all identified utilities within or the construction site must be clearly mapped, marked, and, where necessary, safely relocated outside the work area. The PMU shall coordinate with Bhutan Power Corporation, other service providers, and affected building owners to prepare and implement a utility relocation plan. PMU must provide advance notification to affected users and sequence the work to minimize service interruptions. If disruption is unavoidable, this must be communicated in advance and kept to the shortest practicable duration. In case of damage, the Contractor will be fully liable to pay for the repair and compensate for the loss of service delivery as determined by the BPC.

245. **Impacts due to sourcing of raw materials and storage.** The infrastructure development works include various types of construction - roads, embankments, culverts, stormwater drainage, sewer system, water distribution network and drains. Construction activities will require raw materials for various structures. These materials will need to be sourced from primary suppliers. The most prominent of these include sand, cement, aggregates, steel, bitumen, waterproofing materials, HDPE pipes, galvanized iron pipes, electrical fixtures, cables and chemicals. Inadequate planning of material sourcing, handling, and storage could result in implementation delays, material losses, and inefficient use of resources. The project must ensure the efficient use of raw materials to minimize environmental impacts, as well as ensure that primary suppliers are certified/legal and not causing significant adverse impacts on natural habitats, critical habitats or protected areas. Improper handling, storage, transport and or disposal of hazardous materials like fuel, oils, paints and other chemicals used in construction may have adverse impacts on environment, workers and local community living or working near the work sites.

246. **Mitigation**. The Contractor will ensure the following:

(i) Avoid creation of new quarries or borrow areas for sourcing materials. As far as possible used existing government licensed material sources in the vicinity of project area
(ii) Use locally available construction materials wherever feasible to reduce transportation impacts and support local suppliers. Sand and stones etc. must be sourced from existing legally approved quarries
(iii) All suppliers must be licensed, have necessary RGOB permits and clearances for quarrying or borrow materials, and should not be extracting materials from protected areas or critical habitats.
(iv) Predetermine quantities of construction materials during planning to avoid wastage and minimize storage
(v) Follow an inventory management system to track material usage and prevent shortages or overstocking.
(vi) Construct adequate on-site storage facilities, including covered storage sheds, to protect materials from weather damage and deterioration
(vii) Minimize the material requirement, wherever possible reuse and recycle materials
(viii) For construction materials that will need to be imported, ensure that these are purchased through licensed agents.
(ix) Valuable or sensitive materials will be securely stored, and appropriate security measures, such as security personnel or installation of surveillance systems, will be implemented to reduce the risk of theft.
(x) Provide material specific storage for hazardous materials and ensure chemical containers are labelled
(xi) Do not allow any fuel storage at site.
(xii) Designate areas to store hazardous materials in covered sheds with impermeable lining and bunded to 110% capacity.
(xiii) Provide spill response kit with sufficient absorbent materials (e.g., sorbents, dry sand, sandbags) on-site to immediately soak up any accidental spills and leaks.
(xiv) Workers who are required to handle corrosive, oxidizing, or reactive chemicals should be provided with specialized training on the risks and usage of these substances and provided with appropriate PPE (gloves, apron, splash suits, face shield or goggles etc.).
(xv) Immediately evacuate employees/workers to the hospital in case of accidental exposure.
(xvi) Do not retain hazardous waste at site for more than 2 weeks, and ensure these are disposed of, as per Thromde's guidance.

247. **Construction water requirements.** The construction work and the presence of a sizable workforce is expected to create an additional demand for water for drinking, cooking, washing as well as construction and its associated activities (sprinkling/spraying and cleaning). Water will be also required for construction especially for concrete mixing and curing works, especially for construction of RCC structures, footpath etc.

248. **Mitigation**. The Contractor will be required to ensure adequate water for domestic (drinking, cooking, washing and sanitation) and construction purpose. In case of shortage of water for construction, the contractor will install adequate water tanks to store water. All water supply pipes will be checked, repaired and maintained to prevent leakages or blockages. For construction purpose, as the site is close to the Ammochhu river, the water from the river and the

streams (in summer) can be tapped for ongoing construction works, with the prior permission of Thromde.

249. **Power supply requirements.** Electricity will be required for lighting and cooking in the worker camps, site office and use of construction tools, equipment and machinery. Without electrical power supply will delay project implementation at the site.

250. **Mitigation.** During the construction period, the required electrical supply will be utilized sought from Bhutan Power Company (BPC), transmission and distribution lines are already available in the area.

251. **Impacts mobilization and operation of construction equipment and vehicles.** The operation of vehicles and mobile construction equipment at the construction site are risky if adequate precautions are not followed, especially as the site is very vast and it is not possible to cordon off the entire site to the public. Hazards include risk of being struck or crushed by moving equipment or its load when being lifted or moved or due to mechanical failure or when machines tip over. Mobilization of machines and trucks for material transportation will also contribute to congestion and reduced air quality through air emissions and dust generation.

252. **Mitigation.** To minimize the risk to workers working nearby, the machine operators must be trained and competent and use the horn when backing, be assigned a signal person to guide when reversing and workers must be restricted from working in close proximity during this period, unless it is essential for assisting the use of the machine or for the intended work. In such cases, a supervisor should alert the worker of potential risks. The public must be warned to keep away from primary work areas through installation of clearly visible warning signs. Air pollution prevention measures will be followed. To minimize dust, material transporters must cover dust-generating materials such as sand and fine aggregates to prevent dust and spillage during transport.

253. **Impacts due to wastewater generation and management.** Wastewater will be generated from both domestic sources (workers' camps) and construction activities. Uncontrolled discharge of greywater and blackwater from construction sites and workers' camps could pollute nearby surface and groundwater. Additionally, construction-related wastewater, particularly from concreting and equipment washing, will cause contaminate streams (and the Ammochhu river into which they drain) due to the presence of suspended solids, and cement residues that can be harmful to aquatic life.

254. **Mitigation**. All temporary workers' camps and construction-site sanitation facilities must be provided with adequate wastewater management systems. Domestic wastewater (greywater and blackwater) generated from workers' camps must be managed through properly designed septic tanks and soak pits, to be used for the duration of the construction period. Upon completion of construction, all temporary sanitation facilities shall be safely decommissioned, with septic tanks desludged and backfilled with soil. Similar to PTDP project, the Contractor may alternatively deploy portable toilets with sealed holding tanks, which shall be regularly serviced and desludged by Thromde upon payment of the required fees. The Contractor must avoid the discharge of construction or concreting wastewater directly into the outfall by using impermeable bunds.

255. **Impacts due to solid waste generation and poor management.** The major source of the waste will be from the site offices, worker camps and construction sites. The wastes will include mostly polyethylene terephthalate (PET) bottles, paper, plastics, glass, organic food and construction waste. From the construction sites, various types of waste will be generated, from metallic waste (iron and steel), plastics (pipes, cement bags, packaging), electrical waste,

chemicals, unused construction materials. Inadequate waste disposal can lead to land and water contamination, attract rodents (in the case of organic materials), and negatively affect the local community through unpleasant smell and unsanitary environments.

256. **Mitigation.** The contractor must be fully responsible for all waste generated within the construction site, site office and worker camps. First and foremost, the contractor must ensure compliance with the Waste Prevention and Management Act of Bhutan, 2009 and ensure adequate budget is allocated for waste management. The following measures are proposed for different sites.

257. **Waste management at site offices and worker camps**

(i) Provide appropriate color-coded and labelled bins to segregate waste into organic/biodegradable and general waste. General waste should further be segregated into plastics, bottles and paper and e-waste.
(ii) Conduct employee and worker awareness to promote waste segregation, reduction, recycling and good housekeeping
(iii) Prohibit burning of waste
(iv) Maintain cleanliness of the respective premises or surroundings through weekly cleanup campaigns
(v) Follow the Thromde waste collection schedule timings and ensure that waste does not pile up

258. **Waste management at the construction site**

(i) Ensure compliance with the Waste Prevention and Management Act of Bhutan, 2009
(ii) Designate areas to store construction waste, chemical waste and hazardous waste, ensuring that the latter two are stored in containers in covered sheds with impermeable lining and bunded to 110% capacity
(iii) Prohibit burning of waste
(iv) Conduct employee and worker awareness to waste reduction and illegal waste dumping.
(v) Maintain cleanliness of the work site through weekly cleanup campaigns
(vi) Secure disposal permits to dispose construction waste at designated/approved disposal sites.
(vii) Cover all construction waste during transportation, secure and label waste containers (hazardous waste), and transport these to a designated site without spillage along the transportation route.
(viii) Maintain documentation and record of all types of waste generated and disposed.

259. **Measures for Thromde**

(i) Conduct awareness for contractors and their workers on waste management protocols and requirements prior to construction.

260. **Natural hazards and disasters – land slide, flood and other risks.** The monsoon months are the periods of heavy rainfall between June and September end and early October, when the risk of landslide and floods are the highest. During the monsoon season, the Ammochhu River experiences significantly increased flows, while the hillsides can become highly susceptible to erosion, landslides. The increase flow of water at the outfalls can create localized flooding.

Ongoing construction activities—such as excavation for drains, sewer lines, utility ducts, roads, embankments, and culverts—may exacerbate these risks especially in newly excavated areas. The risk of earthquakes is also considerable, given the location of Phuentsholing town but this is unpredictable. Other risks include windstorms during the dry season and accidental fires. Other emergencies that could occur may be due to accidents at the work sites or worker camps. All natural hazards and accidents will require emergency measures.

261. **Mitigation**. As much as possible, the excavation works should be completed before the onset of the heavy monsoons. To minimize the loss of soil and reduce landslide risks, temporary site drainage will be planned to ensure that rainwater from excavated areas, worker camps and material storage areas do not cause erosion and sedimentation. The contractor will prepare an Emergency Preparedness and Response Plan taking into consideration the work site as well as the location of worker camps. Measures for emergencies will include the following;

(i) For works scheduling, Phuentsholing Thromde and contractor shall coordinate with the RGOB agencies on disaster risks, seasonal floods, extreme weather, landslide etc., temporary warning systems (at least manual) shall be put in place, with coordination of agencies, households in upper hills. This especially critical for works in drainage outfalls or on the eastern avenue adjacent to Damdara hill. Flashfloods, and debris flow may pose risks to project staff and workers, and may also lead to loss of equipment, material in the flood, and may have adverse impacts on receiving water bodies.
(ii) Contractors must prepare an emergency preparedness plan that is aimed at ensuring the safety of all employees and workers in case of an emergency and to minimize work disruption as much as possible;
(iii) Display and maintain suitable warning signs at conspicuous places in Dzongkha and English.
(iv) Identify an Emergency Response Focal Person who will coordinate Emergency operations with the Thromde in case of natural hazards and disasters;
(v) Establish a clear protocol for communication between Thromde and Contractors and their focal persons;
(vi) Designate a meeting point at work sites and worker accommodation areas and establish protocols for evacuation, response and relief actions;
(vii) Brief workers on emergency response procedures to be followed and conduct mock drill for employees and worker;
(viii) Keep abreast on extreme weather forecasts and avoid working in such condition;
(ix) In the case of accidents immediately evacuate injured persons to the hospital;
(x) Ensure that transportation is available for emergencies at all times;
(xi) Maintain fire extinguishers at site offices and worker camps and ensure these are regularly checked; and
(xii) Post emergency numbers (police, ambulance, Thromde, fire, Contractor’s emergency personnel) at visible places and update this if personnel have left or been replaced.

262. **Soil erosion and siltation of water bodies.** The monsoon months are the periods of heavy rainfall between June and September. If excavation work is carried during rainy days, the heavy downpour will wash away the loose soil from exposed surfaces could lead to heavy erosion and siltation of water channels and streams/rivers.

263. **Mitigation.** Measures to reduce erosion and siltation include:

(i) As far as practicable, all major excavation works shall be completed prior to the onset of the monsoon season (June–September) to minimize exposure of bare soil to intense rainfall and surface runoff.
(ii) Design and construct temporary drainage systems to intercept and divert stormwater away from excavated and soil-exposed areas.
(iii) Install silt traps to prevent sediment-laden runoff from entering drains and outfalls

264. **Dust and air emissions from construction activities.** Ambient air quality monitored at the site shown particulate matter exceeding the WHO guidelines while within national air quality standards. These are mainly to due to movement of large number of trucks transporting construction material for export across the international border, and being border town, sharing its urban border with Jaigaon town, also has effect of transboundary pollution. Project construction works - site preparation, excavation work and construction activities and material loading and unloading (e.g. sand) will generate dust, especially during the dry season. Although dust generation and air pollution impacts are short-term and limited to the project site and along transportation routes, these will impact neighboring communities through diminished air quality. Mixing and application of asphalt, and from processing equipment, air emissions are anticipated.

265. **Mitigation.** The Contractor will ensure that that the following measures are undertaken to reduce impacts on air quality.

(i) All construction equipment and vehicles will be maintained in good condition and must pass the required emission test. A maintenance log will be kept for each equipment and vehicle.
(ii) Contractor will ensure that transporters avoid vehicle idling and prevent smoke belching and enforce speed limit
(iii) Material transporters will cover dust-generating materials such as sand and fine aggregates to prevent dust and spillage during transport.
(iv) Undercarriage and wheels of trucks will be cleaned after unloading and before leaving the site
(v) Dust suppression will be carried out through sprinkling of water during excavation work, especially on windy days.
(vi) Stockpiles of soil, sand and other construction materials will be covered to prevent it from being carried off on windy days.
(vii) Burning of waste will be prohibited and enforced strictly.

266. **Impact on biodiversity**. In the process of clearing vegetation, there is a risk that wildlife and reptile may be disturbed or harmed. Though there is no notable wildlife, chance encounters cannot be ruled out.

267. **Mitigation.** The contractor should create awareness among the staff and workers on do's and don'ts and safety of wildlife and humans in case of such chance encounters. A pre survey of the site shall be conducted prior to clearance of vegetation in coordination with the Forest office. If any wild animal is spotted, it shall not be disturbed or harmed, and activities shall be halted until it is moved out. Ecological surveys of trees shall be conducted of trees prior to cutting, for any bird's nests. If any active nests, ensure that trees are not disturbed until young birds fly away from the nests; do not cut trees during the breeding season. Contractor will be required to contact the Environment Officer or nearest Forest Office in case any wildlife is injured during construction, so that the species can be rehabilitated and returned to the wild.

268. **Noise and Disturbance to the Neighboring Community.** During the construction period, the main sources of noise will be from construction activities such as use of excavators and movement of vehicles and trucks. The impacts from construction work will be most disturbing to the neighboring community if these activities are carried on during early morning hours or late into the night. Another source of disturbance especially in the evenings is from the workers camps when workers play loud music, engage in brawls or drunken behavior. All these impacts are centered on work sites and camps and last only until the end of the construction period.

269. **Mitigation**. Measures to minimize disturbance to the community include restricting construction work between 9PM -8AM,[77] briefing workers on their obligations regarding proper management of work and behavior with sanctions for inappropriate behavior or repeated complaints from the residents. Vehicle owners will be encouraged to develop and implement a preventive maintenance schedule for all heavy construction equipment and machinery to minimize noise and vibration.

270. **Impacts due to night work and overtime work.** Night work refers to the activities or tasks performed outside regular daylight hours, specifically between 22:00 hours to 06:00 hours, as defined by the Environmental Standard 2020. The contractors may require workers to work overtime after 6PM to expedite the construction work. Night work risks differ from daytime operations, because of reduced visibility, altered human alertness, and greater vulnerability to environmental hazards. Additionally, it can strain workers' physical and mental health, posing long-term risks if not properly managed. Night work can also significantly impact the surrounding community, causing disturbance.

271. **Mitigation.** To mitigate risks and impacts from night construction works, contractors and the PMU should prepare a comprehensive night work plan outlining working hours, illumination requirements, and safety measures. This plan should include training for workers on safe night operations and provision of appropriate PPE, including reflective vests to enhance visibility and reduce accident risks. Construction activities at night should be limited, and when necessary, scheduled in consultation with the community to avoid disturbance, particularly restricting noisy activities and heavy vehicle movement after 22:00 hours. Adequate lighting must be provided at sites during night works. Toolbox talks should cover risks of night work and mitigation measures, ensuring workers are aware and equipped. Emergency preparedness plans must be active during night works, with first aid and emergency vehicles available on-site. PMU and contractor EHS officers should monitor safety, noise, and lighting levels throughout night activities. All overtime wages for night work must comply with applicable labor acts and regulations to ensure workers' rights and welfare are protected.

272. **Community health and safety impacts.** There are residential, commercial and other establishments in Ammochhu LAP. There are people, including children and elders, living or people working in business or other establishments. Members of the public will be exposed to safety risks and hazards if they inadvertently enter active work areas or are walking along the roads, near moving equipment and vehicles. This is highly possible as the work area includes a number of private buildings, and works will be extended to all the roads in LAP. Risks to community health and safety may arise from presence of construction workers camps. There is risk potential transmission of communicable diseases by construction workers (both national and foreign) through interaction with nearby residents and the general public. Movement of construction trucks and equipment along the public roads, outside or within LAP, may also pose safety risks to community.

[77] As per Development Control Regulations 2016.

273. **Mitigation**. The Contractor will undertake the following measures to minimize risks to community health and safety:

(i) Cordon the specific work site to restrict public access; separate the work sites and public movement areas by provide barricades and demarcate areas;
(ii) Install signboards to notify passers-by of ongoing work, and place warning signs near access road and entry points, and hazard prone areas;
(iii) Provide safe alternative pedestrian pathways for nearby residents where existing roads/paths need to be closed temporarily;
(iv) Install barricades around active construction areas;
(v) Maintain adequate lighting around work sites at night to prevent accidental entry;
(vi) Ensure all project vehicles comply with speed limits;
(vii) Publicize the GRM to the community to allow community members to report safety concerns or accidents promptly;
(viii) Ensure that workers follow a mandatory code of conduct (CoC)that covers respectful behavior toward community members, prohibition on sexual harassment, substance abuse and compliance with national laws and respect for cultural norms. All workers must sign the CoC;
(ix) Establish a clear chain of command and accountability structure for dealing with incidents, grievances and reporting; and
(x) Display contact details of these personnel on the site notice board to improve accessibility and rapid and immediate action.
(xi) Ensure drivers are trained defensive and safe driving, and traffic rules and regulations. Ensure that construction vehicles and equipment are not operated in public areas without reversing sensor/alarms, a driver's assistant to guide the driver when required, e.g. in reversing the vehicles.
(xii) Conduct regular and random alcohol detection tests to drivers and vehicle operators and put in place strict measures to deal with any violations.

274. **Impact due to increase road traffic and congestion.** The project area currently faces truck traffic and congestion issues, primarily driven by its location as near the international border and because of the lack of proper parking space and a separate fuel depot. Trucks with loaded mineral products bound for India and Bangladesh line up along the Phuentsholing-Chamkuna Road (PCR) / Phuentsholing-Samtse highway, creating multiple issues – from congestion, highway damage, dust pollution and safety issues and inconvenience to travelers. To address this issue, Phuentsholing Thromde has allocated a new 15-acre site, about 1 km from the LAP, to serve as a designated truck parking area. A separate fuel station is proposed to be installed at the new parking site to further reduce the need for trucks to enter the main urban area. Once operational, no trucks will be allowed to park on the highway or in near the LAP and PTDP. Phuentsholing Thromde shall ensure that the alternative location is made operational. Proposed subproject is also likely to generate notable traffic carrying construction materials, which will increase the traffic and congestion on the road, inconveniencing the road users and local community. Construction traffic may also pose safety risks to road users and nearby community, both in LAP area and outside.

275. **Mitigation**. To manage congestion and safety during the construction period, the following mitigation measures are proposed:

(ii) The Contractor will prepare a construction traffic management plan and submit this to PMU for approval. Once approved, the plan will be followed and any changes to the plan will be discussed with and approved by the PMU;
(iii) Material drop-off by trucks will be restricted during peak traffic hours.(8:00–9:30 AM and 4:00–6:00 PM;
(iv) Contractors must enforce speed limits for trucks near the construction site to reduce accident risk; and
(v) Advance notice will be provided to the community regarding any temporary road closures, diversions, or access restrictions.
(vi) Ensure drivers are trained defensive and safe driving, and traffic rules and regulations. Conduct regular and random alcohol detection tests to drivers and vehicle operators and put in place strict measures to deal with any violations.
(vii) Ensure that construction vehicles and equipment are not operated in public areas without reversing sensor/alarms, a driver's assistant to guide the driver when required, e.g. in reversing the vehicles.

276. **Aesthetics.** The project site is located along the Highway, where travelers to Samtse and local Indian tourists frequently pass and there are also residential buildings including the NHDCL colonies. Haphazard construction activities, such as disorderly material storage, vehicle parking, and waste disposal, are expected to adversely affect the visual amenity and the overall experience of travelers, tourists and residents. Excavation during dry months can create dust piles contributing to visual pollution.

277. **Mitigation**. The design includes a Service Utility Duct (SUD) to house electrical and telecom cables underground. This eliminates unsightly overhead lines and repeated road digging for future repairs. During the construction, the Contractor must undertake the following measures

(i) Prepare a detailed layout for all vehicle and machine parking, material storage, and worker camps to avoid haphazard living and work sites;
(ii) Unwanted construction materials and waste must be properly stored and managed to prevent these being blown by the wind; and
(iii) Upon completion, a camp and site closure plan must be implemented. This includes dismantling worker camps, removing debris and machinery, and restoring the site to its pre-construction state to restore aesthetics.

278. **Chance finds.** Already a lot of excavation work has been ongoing in Ammochhu LAP and the adjoining PTDP area, and there has been no discovery of artefacts to date. As a result of this, the possibility of chance finds may be remote. Nevertheless, there is still a possibility that underground assets or archaeological artifacts may be discovered at the site, requiring precautionary measures and procedures to be followed.

279. **Mitigation**. In case of discovery of a chance find, (archaeological, historical, cultural religious objects, or graves) during the excavation, the following steps must be undertaken by the contractor and PMU:

(i) Upon detection of any chance find, the contractor must immediately stop all activity within 30m of the find and immediately notify the supervisor onsite and the Thromde. No construction is to be carried out by the Contractor until notified by the Thromde;

(ii) The Thromde in turn will document the chance finds and inform the Department of Department of Culture and Dzongkhag Development, Ministry of Home Affairs of the discovery immediately to avoid delay in the construction work;
(iii) The Department of Culture and Dzongkhag Development (DoCDD) may provide their assessment from the photo documentation or conduct in-person site assessment to assess the chance find in detail and relay appropriate instruction to Thromde;
(iv) The Thromde must ensure that there are no delays in the verification process or in notifying the contractor of the procedures to be followed based on the assessment by the DoCDD; and
(v) Thromde must monitor to ensure that the instruction given by the DoCDD is carried out correctly.

280. **Unanticipated Impacts.** There is a risk that there may be unanticipated environmental and social impacts that may occur during the construction phase, either due to natural causes or caused by project activities.

281. **Mitigation:**

(i) Should there be any unanticipated impacts, the IEE and the EMP will need to be updated to account for any additional or new environmental impacts and relevant corrective actions;
(ii) For impacts caused by the project, the Contractor/ material transporters will be fully liable for repair and restoration of any private or government property damaged during construction and material transportation; and
(iii) All accidents must be reported. In case of fatalities, this must be reported to ADB within the 48 hours, and corrective actions following the incident must be documented.

282. **Impacts due to improper site clearance and closure of works.** Completion of infrastructure work entails a number of critical steps that must be undertaken to ensure proper closure and handing over of worksites and repatriation of foreign workers. There is a risk that sites are not cleaned up and waste remains at site, plantations are damaged or eaten by animals, and foreign workers do not depart from the site.

283. **Mitigation:** Once the construction is over, the Contractor will be responsible for ensuring decommissioning all temporary worker camps. All temporary structures will be dismantled/demolished, temporary septic tanks are cleared and disposed of its contents safely and soak pits covered with an adequate amount of soil and construction materials, cleaning the site of debris before handing it back to PMU. Any damaged property (government or private) will be repaired and/compensated before final leaving the site. The site will then be replanted with appropriate species. For more specific actions on the decommissioning activities, the Contractor shall follow international best practices such as those in World Bank Environmental Health and Safety (EHS) Guidelines on Construction and Decommissioning Activities (footnote 83).

284. **Work sites**

(i) Upon completion of all work, remove all chemicals, construction materials, debris and dispose these at an approved site;

(ii) Dismantle all offices, storage sheds, worker camps;
(iii) Seek Thromde approval and empty all septic tanks, cover soak pits with soil and compact it;
(iv) Ensure the entire site is cleaned up, and all barricades removed and restore the site to its pre-construction state;
(v) If private land was leased, obtain a handing over certificate from the land owner; and
(vi) Repair and handover any damaged property whether government or private before handing over the site to Thromde. Evidence of repairs must be included in closure report.

285. **Worker repatriation**

(i) Ensure that all foreign workers are repatriated upon completion of work as required by the Labor Regulation**.**

4. Anticipated Impacts and Mitigation Measures during Operation Phase

286. **Socio-economic Impact.** Currently there are several warehouses, small businesses, storage structures, workshops along with residential buildings. The Thromde allowed businesses to run temporarily in the LAP to encourage business and stimulate economic activity. However, once the project is complete, these ongoing businesses cannot continue as the land use must be compliant with the Development control regulations and the precinct designation which is urban village -1 (UV-1).[78]

287. **Mitigation**. Land and business owners are aware of the LAP land use, and Thromde already informed them to shift to other designated places as per the Phuentsholing structure plan. Thromde shall ensure that LAP development is in compliance with Phuentsholing Thromde's development control regulations, ensuring appropriate land use and sustained service uptake.

288. **Impacts due to operation and maintenance of the LAP infrastructure.** Improper operation and maintenance of the infrastructure developed under the subproject, may lead to lower realization of intended benefits, and may also have adverse impacts on environment and people. For example, improper maintenance of sewers may lead to blockage of sewers, resulting into overflowing of sewage into public throughfares and private premises inconveniencing people and putting them at risk of contamination. The Thromde project is expected to ensure that the newly provided infrastructure is resilient and sustainable in the long run.

289. **Mitigation:** To ensure that newly constructed infrastructure is resilient, and sustainable, Thromde will ensure that annual budget is allocated, necessary human resources and equipment, tools and consumable etc., is made available for maintenance of infrastructure. Thromde will incorporate an operation and maintenance regime, that includes: designating personnel to carry out regular check and maintenance work, instituting formal reporting mechanism and maintenances schedules. Water and sewage quality monitoring – both raw and treated, shall be conducted regularly to ensure compliance with drinking water standards and sewage discharge standards.

[78] A urban village -1 is a high-density mixed-use precinct where apartments and group housing are permitted, residential, local level retail shops and services, household economic activity and cottage industries not involving use of, or installation of, a machinery driven by more than 10 KW power and which do not create noise, vibrations, fumes, dust, etc. only in independent dwelling units (not in tenement dwellings or flats). Here the permissible structure is G+5. Therefore, with a stand floor height of 3 m, the average height of the highest floor in the LAP is 15m.

290. **Occupational health and safety risks.** Maintenance will require workers to work with electrical machinery, in the outfalls, harmful conditions (e.g., sewer maintenance and waste management) and in congested areas along traffic routes. If not provided with adequate training, personnel protection equipment, safety harness or other appropriate equipment or instructions, or signage, the workers will face safety risks.

291. **Mitigation**: To ensure that worker safety is given top priority.

(i) Maintain annual budget for worker trainings, briefings and PPE;
(ii) Ensure that operators of machines are certified and well trained;
(iii) Ensure that repair and maintenance workers are provided with adequate benefits, appropriate PPE; and
(iv) Develop proper standard procedures, and ensure workers are regularly guided and supervised.

292. **Natural hazards and disasters:** Due to existing geological, seismic, landslide and flooding risks in the site, residents will continue to be at risk unless measures are not in place. Under Output 3—Urban policies and planning, regulatory frameworks, and governance mechanisms strengthened, an ADB technical assistance (TA) will support Phuentsholing Thromde in reviewing and updating its inclusive urban policies and land-use-based planning framework. This will include the integration of land use provisions, development control regulations and design guidelines aimed at improving resilience in landslide- and flood-prone areas, such as requirements for elevated ground floors, restrictions on basement use, allocation of lower floors for temporary or non-residential purposes, and the adoption of climate adaptation measures. These will be undertaken in close consultation with the Ministry of Infrastructure and Transport, as well as local communities within the Ammochhu LAP.

293. **Mitigation.** Thromde will seek additional funding and implement the recommendations of the ongoing geological and hazard assessment study. In the meantime, the following measures are proposed to be prepared, respond to and mitigate such disasters.

(i) Strengthen collaboration with National Centre for Hydrology and Meteorology to ensure that timely warning of flood events;
(ii) Strengthen dissemination of early and timely warning for people to evacuate in case of a flood event;
(iii) Conduct training for residents to on disaster preparedness and response mechanisms;
(iv) Monitor active landslide areas to detect changes in slope movements and potential risks;
(v) Restrict future infrastructure work in areas where landslides may be triggered; and
(vi) Promote community awareness, mobilization, volunteerism and cooperation for such emergencies.

294. **Risk of damage to infrastructure due to private constructions in LAP.** The risk of damage to infrastructure arising from private construction is a concern identified by both the public and the Thromde during the public consultation. Use of local roads for heavy construction trucks, for example, for private construction may damage the newly built roads.

295. **Mitigation**: The Thromde will prepare and implement guidelines and development controls that will safeguard the newly constructed infrastructure.

5. Cumulative Impact Assessment

296. The cumulative impacts of the Ammochhu Local Area Plan (LAP) project have been assessed in the context of Phuentsholing's rapid urban growth, limited developable land, and multiple ongoing and planned infrastructure developments. The project will contribute to the overall demand generated by concurrent developments, including the Phuentsholing Township Development Project (PTDP), the Phuentsholing–Chamkuna Road Project, the Pasakha Dry Port and the workshop area just below the Round About.

297. ADB is a significant donor to Phuentsholing, financing a number of project over the last decade. The Phuentsholing Township Development Project (PTDP) is nearing completion soon. Under the Green and Resilient Affordable Housing Sector Project, the new housing buildings in Ammochhu and at the city core are under construction and an additional new JFPR building at Rabten is under preparation under this IRUDP project. Also, the Climate-Resilient Omchhu River Basin Project (CRORBP) commenced in 2025.

298. Of these, the housing colony at Ammochhu and the construction activities in Omchhu are the closet to the project site. Construction activities under these projects are expected to generate impacts related to air quality, noise, health and safety, and other environmental aspects. During construction, the project will increase demand for water, timber, and construction materials.

299. Phuentsholing already experiences heavy traffic volumes, with approximately 10,000 vehicles moving daily between the city and the border town Jaigaon in India and also functions as a transit corridor for mining and industrial transport. The project will add incremental traffic pressure, particularly along the Phuentsholing–Chamkuna Road (PCR), which currently carries a high volume of boulder and construction material trucks. Dust generation and congestion are already observed along this corridor due to vehicle movement and roadside workshops. Construction activities under the project will temporarily intensify these conditions and may cause short-term inconvenience to nearby residents. To reduce this cumulative impact, the Thromde has identified a new truck parking site outside the LAP area to relocate stationary trucks away from the highway.

300. Because of the presence of various construction activities in the vicinity, it will be difficult to separate out impacts to air quality between this project and other ongoing activities and projects. Project specific impacts will however be avoided, minimized, and/or mitigated through the measures included in this subproject EMP, which will also minimize the overall impacts. Moreover, other ongoing projects (PTDP, CRORBP and GRAHSP) are also implementing the EMPs of respective subprojects to minimize the construction related impacts. These projects are also funded by ADB.

301. Once completed these projects are expected to generate positive cumulative effects and synergies. Together, these initiatives support integrated serviced land development, affordable housing delivery, and institutional capacity strengthening. The cumulative outcome is improved urban resilience, enhanced service coverage, and improved living conditions for residents of Ammochhu LAP as well as neighboring LAPs, while supporting sustainable urban growth over the longer term. This will contribute to more orderly urban expansion and improved functionality of Phuentsholing as a regional commercial and service center.

302. Expansion of the LAP will also increase the load on municipal services, particularly water, sewer and solid waste collection and disposal systems. However, as presented in project

description section, existing systems along with the newly developed infrastructure under PTDP, will be adequate to meet the demand for the services. Since these developments are part of Phuentsholing structure plan, the Thromde will expand the services and increased the capacities gradually as the demand grows. Phuentsholing Thromde shall formulate and implement infrastructure augmentation and investment plans, especially for water supply, sewerage and solid waste management, comprehensively considering overall developments envisaged in Phuentsholing as per the structure plan, and projected spatial and population growth.

6. Environmental Benefits and Enhancement Measures

303. Bhutan's urbanization rate has increased from 23% in 1998 to 43.6% in 2022 and is projected to exceed 56% by 2047, with growth concentrated in Thimphu and Phuentsholing. This rapid transition has outpaced municipal infrastructure capacity, resulting in inadequate drainage, water supply constraints, sanitation challenges, unmanaged solid waste, surface water pollution, and encroachment into hazard-prone areas. Weak enforcement of land-use controls and outdated spatial plans have contributed to urban sprawl, environmental degradation, and increased exposure to climate risks. The project will strengthen municipal environmental performance through integrated stormwater management, improved wastewater collection, controlled utility corridors, safer road networks, and enhanced public spaces, thereby reducing pollution loads, flood exposure, and long-term maintenance burdens.

304. Phuentsholing, Bhutan's second-largest city and primary commercial gateway, faces intense urbanization pressure driven by cross-border trade, employment opportunities, and housing demand. The Ammochhu Local Area Plan (LAP), covering approximately 99 acres, represents a strategic growth zone adjacent to the Phuentsholing Township Development Project (PTDP). While PTDP has reduced exposure to major river flooding through floodplain reclamation and embankment protection, localized risks persist, including inadequate surface drainage, slope instability, and limited-service capacity. Rapid population growth and planned land allocations are expected to increase development density, with the Ammochhu LAP projected to accommodate approximately 20,000 residents as part of Phuentsholing's growth toward over 80,000 residents by 2037. The project will upgrade stormwater drainage, roads, utility corridors, water supply, sewerage, solid waste systems, and embankment protection, improving environmental quality, reducing flood and erosion risks, and strengthening the area's capacity to safely absorb urban growth in a climate-resilient manner.

305. The proposed project builds on ADB's long-standing support to Phuentsholing under earlier urban infrastructure and township development initiatives, which improved basic services, flood protection, and public amenities. These investments demonstrated the effectiveness of integrated planning and resilient infrastructure in reducing disaster risks and improving urban livability. The current project scales these principles by embedding climate adaptation, resource efficiency, environmental protection, and inclusive design into the next phase of urban expansion at Ammochhu LAP, ensuring continuity of resilient development outcomes.

VII. INFORMATION, DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Consultation and Participation

306. Consultation, participation, and disclosure are essential and form an integral part of planning, designing and implementation processes in a project. Such consultations are continuous two-way processes which will help in better design and implementation of a project. Key stakeholders consulted or those that participated in the consultation meetings during the project planning process are as follows:

(i) Current residents in LAP, businesspersons, landowners
(ii) Phuentsholing Thromde
(iii) Bhutan Telecom Limited
(iv) Bhutan Power Corporation
(v) Public representatives

B. Consultation and Disclosure Conducted till date

307. Local community and residents were consulted during the site visit to the LAP in October 2025. As required under the ADB SPS, Phuentsholing Thromde (PT) conducted consultation with the public on 22 December 2025. Prior to this adequate notification was provided regarding the consultation through the national newspaper as well as on the Thromde website. A total of 29 persons (23 male, 6 female) participated in the stakeholder consultation meeting.

308. The public consultation commenced with a brief address by the Executive Secretary, who conveyed deep appreciation to the ADB for its unwavering support to Thromde in executing various projects to date, and also expressed gratitude to the public for their participation in the meeting. Attendees were apprised of the initiation and approval process of the project, which entailed thorough examination and deliberation. It was underlined that the execution of such endeavors poses significant challenges. Participants were urged to engage actively, seek clarifications, and extend their support to ensure the realization of the project.

309. The presentation, conducted by Phuentsholing Thromde, outlined the scope of the project and anticipated advantages. The public was briefed about the allocated budget and the various components slated for implementation. Additionally, the current status of the project and proposed activities were thoroughly discussed, including provisions for grievance redress both prior to and throughout the project's execution.

310. The ADB social safeguard consultant delivered a brief presentation outlining the safeguard policies in place to ensure the smooth implementation of the project. It was emphasized that the project is well planned and adopts a holistic approach, covering multiple infrastructure components without causing adverse impacts, thereby indicating a highly positive overall outcome. The public was also presented with examples of best practices demonstrating how social welfare is integrated into projects of a similar scale. In addition, the consultant commended the meeting, noting that it was a meaningful public consultation in line with ADB’s expectations.

311. The environmental safeguard consultant delivered a presentation on the project’s environmental aspects, highlighting that such assessments are a mandatory requirement for all ADB-funded projects. The presentation emphasized the importance of addressing community health and safety, natural hazards, and related risks during the project implementation phase.

312. While the consultation meeting was engaging, the Mayor (elected public representative and the head of the Thromde / municipality) expressed concerns regarding the relatively low levels of public participation in such gatherings and underscored the significance of collaboration and active involvement. Thromde asserted that it has consistently acted in the public's interest and solicited the community's support in these matters, as securing and executing a project of this magnitude entails considerable challenges and extensive scrutiny. Among the 12 Local Area Plans (LAPs) under Phuentsholing Thromde, the Ammochhu LAP stands out as the sole plan wherein its infrastructure will be developed holistically at one go, diverging from the typical approach of incremental construction based on governmental budgets. Consequently, Thromde urged the plot owners of the Ammochhu LAP to actively support and collaborate to ensure the project is completed timely without any complications.

313. During the discussion, the concerns from the participants ranged from individual plot concerns, construction and projects related clarifications to concerns beyond the LAP area such as PTDP and the upper hillsides. These are summarized below.

314. Individual concerns:

(i) Compensation for structures approved under previous administration and request for time extensions to relocate.

315. Concerns regarding the project and LAP:

(i) Ongoing filling activities and who is responsible for filling works;
(ii) The adequacy of provisions for drainage, flood and landslide protection;
(iii) How the project might affect ongoing construction activities, given that these works are already underway before the project;
(iv) Noise, dust, and road deterioration caused by the high volume of trucks;
(v) How to manage construction on private plots after the project is complete, to avoid damaging the newly constructed infrastructure; and
(vi) Provisions for landscaping and plantation works.

316. Concerns beyond the project footprint and Ammochhu LAP:

(i) Anticipated timeline of developing zone C,D, E of PTDP
(ii) Requests to restrict construction on fragile hillsides.

317. The Responses from the Thromde are detailed in Table 33. The relevant concerns have been incorporated into the impact mitigation chapters and the ESMP.

Table 33: Summary of Discussion during Consultation

Topic	Comment / Suggestion from Participants	Response from Thromde	Follow-up Action / Next Steps
LAP Filling and Development Levels	Concerns were raised about ongoing land filling activities and how they may affect future development.	All filling must follow the approved Urban Design levels and receive development approval from Thromde. Plot owners are responsible for filling their own plots based on their development needs, while Thromde will construct	Thromde to continue providing approved formation levels and enforce compliance through development approvals. Plot owners to coordinate filling

Topic	Comment / Suggestion from Participants	Response from Thromde	Follow-up Action / Next Steps
	Clarification was sought on who will be responsible for filling works.	essential infrastructure and provide reference filling levels. Full-area filling by Thromde is difficult due to existing structures.	based on approved design levels. development approvals. Plot owners to coordinate filling based on approved design levels.
Impact on Ongoing Private Construction	Concerns were raised on whether upcoming project works would affect ongoing construction activities.	Thromde clarified that ongoing construction should not face issues as approvals are aligned with the infrastructure design.	Continue coordination with plot owners and contractors during implementation.
Drainage, Flood and Landslide Protection	Participants emphasized the need for strong drainage and disaster protection measures, as current systems are insufficient.	Thromde confirmed that flood and landslide resilience is a key project priority. Major components include stormwater drainage and embankment walls along outfalls.	Ensure drainage and embankment designs are implemented as planned
Development of PTDP Zones C, D and E	Queries were raised regarding the timeline for development of PTDP zones.	PTDP is implemented by DHI and located in Samtse Dzongkhag; Thromde has limited control. The matter requires separate engagement with DHI.	Not applicable- Outside the project area
Highway Truck Traffic (Noise, Dust, Road Damage)	Participants expressed concern about increasing truck traffic causing dust, noise, livelihood impacts, and road deterioration.	Thromde acknowledged the concern but noted that highway trucking is regulated by central agencies and that ADB has also raised concerns. The issue has been communicated to higher authorities.	Relocation of truck parking outside LAP already initiated. Measures by the Boulder Association to mitigate dust must be monitored. Dust suppression measures are included in the EMP
Compensation and time extension	compensation for existing structures that had been approved by Dungkhag and request for time extension to relocate and request for continued use for industrial purposes on state land provided by the Thromde.	The plot owner was requested to provide any proof or documentation of approval to be considered for compensation. the public was informed that notifications were issued by the Thromde one and a half years ago, providing sufficient time to property owners to relocate. State land within the vicinity cannot be allocated as industrial activity is not compatible with the proposed LAP plan.	Thromde will work with individual land owners to resolve issues.

Topic	Comment / Suggestion from Participants	Response from Thromde	Follow-up Action / Next Steps
Encroachment Between Private Plots	A private owner reported encroachment by an adjoining plot and requested intervention.	Thromde generally handles encroachment only on state land but will review this case and explore possible resolution.	Thromde to review the case
Hazardous area in the hillside	Concerns and request to Thromde not to allow further construction on the hillside due to the fragile nature of the area	Thromde emphasized that they cannot prevent construction by individual landowners. However, there are construction limitations based on the high hazard levels in the precinct.	Recommendations from the BARHKH project will be adopted by Thromde
Post construction greening	provisions for landscaping and plantation works	Thromde always keeps a separate budget provision for 'landscaping & beautification' along with the budget for upkeeping of infrastructures in the annual budget	Landscaping will be part of O & M budget
Post construction infrastructure	Concerns were expressed regarding damage to LAP infrastructure from new construction on individual plots	While it is preferable to have simultaneous development on private plot, Once the project is complete, all developers will have to comply with restrictions to maintain the quality infrastructures.	Guidelines to minimize damage to newly constructed infrastructure will be included in EMP

C. Future Consultations and Disclosure

318. Consultation will be a continuous process. Once the ongoing hazard assessment studies are completed, during the review and validation process of the detailed design of the LAP infrastructure, Phuentsholing Thromde will prepare a brief and disclose the same through the conduct of meaningful consultations with the stakeholders. Upon completion and submission of draft reports of ongoing risk mitigation studies, consultations with Ammochhu LAP, and other stakeholders from PTDP, Phuentsholing core town and other LAPs shall be conducted feedback if any shall be considered in finalizing the designs and implementation. Follow-up consultations will also be undertaken prior to construction activities and will continue throughout the subproject implementation. Formal disclosure of completed project reports will also be made by making copies available at the LAP site office and Phuentsholing Thromde head office, informing the public of their availability, and providing a mechanism through which comments can be made.

319. Prior to construction and upon finalization of the GRM process, the public must be informed about the GRM procedure and sensitized on how to submit grievances. Also, the neighboring communities around the immediate work site and worker camps must be consulted during project execution, to inform them about ongoing activities and offer opportunities for communities to articulate perspectives and concerns pertaining to ongoing activities. During the consultation, the community will be informed about community health and safety measures, emergency preparedness, code of conduct required to be followed by contractors and the GRM process.

320. **Information Disclosure**. Information will be disclosed through public consultation and more formally by making documents and other materials available in a form and at a location in

which stakeholders can easily access. This will involve making reports available at public locations within the vicinity of the sites and providing a mechanism for the receipt of comments and making documents available more widely by lodging them on the ADB and Phuentsholing Thromde websites. The subproject contact details will also be posted on the signboard installed at the construction site, so that any person can call the PMU for subproject related information.

321. PMU will disclose the following documents on the project website, and endorse these same documents to ADB for disclosure on ADB website:

(ii) draft IEE report;
(iii) new or updated IEE reports and corrective action plan prepared during project implementation, if any; and
(iv) environmental monitoring reports.

322. PMU will provide relevant environmental information, including information from the relevant documents in a timely manner, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. For illiterate people, other suitable communication methods will be used. For the benefit of the community, the summary of the IEE will be translated into the local language (Dzongkha) and made available at: (i) offices of PMU; and (ii) offices of the supervising/implementing unit or office.

323. Hard copies of the IEE will be available in the PMU, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from these offices. Electronic version of the IEE reports will be placed in the project website after approval of the documents by the government and clearance from ADB. PMU will issue notification on the disclosure mechanism in local or national newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates, etc. This will create awareness of the project implementation among the public. PMU will consider other additional means of information disclosure depending on practicability, such as the distribution of posters to community billboards within the vicinity of the subproject sites.

VIII. GRIEVANCE REDRESS MECHANISM

A. Institutional Arrangement

324. The PMU will institutionalize a GRM to effectively address any grievances that may arise during project preparation, implementation and operation. The project will adopt a three tier GRM for implementation in the project. The GRM will receive, evaluate, and facilitate the resolution of social, environmental, or other project-related grievances. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

325. The grievance redress process and timeframe involved in the GRM is described below:

326. **Process and Timeframe:** The grievance redress process and timeframe involved in the

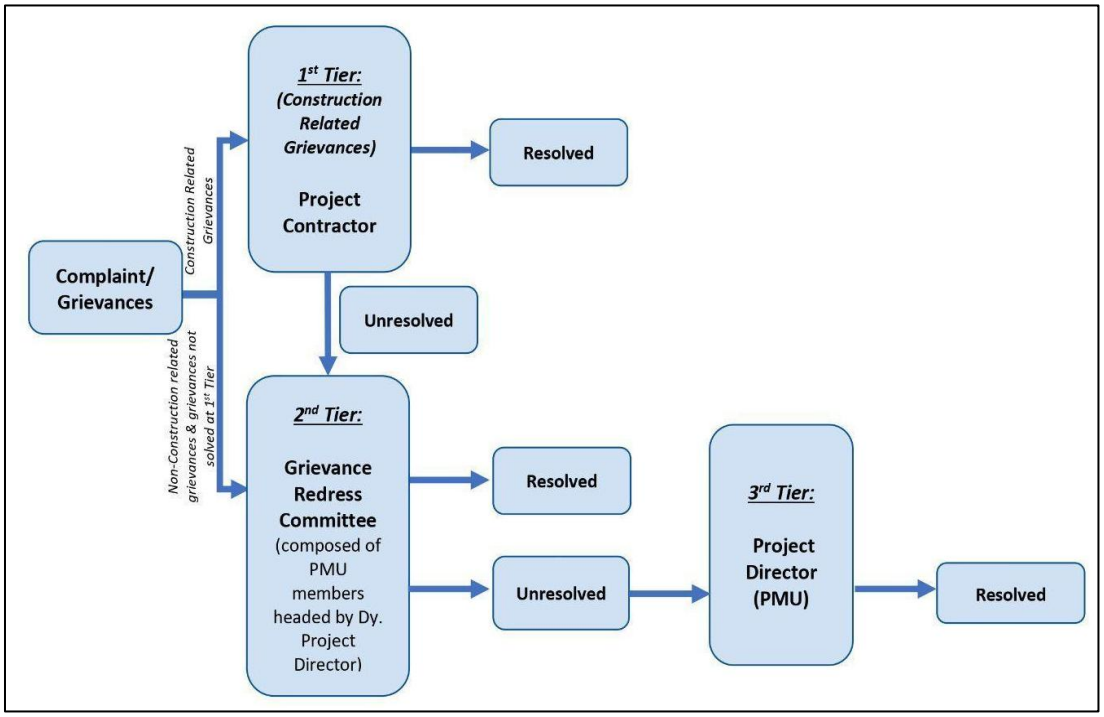
327. GRM is described below:

(i) **First-tier:** The Environment Officer of PMU will receive and resolve within 7 working days if there are complaints before commencement of the construction. If any grievances before the start of the construction are not resolved by the Environment Officer, the grievances shall be submitted to GRC for deliberation. The project contractor will receive and resolve within 7 working days for any construction related grievances. If grievances are not related to the construction activities, the complainant(s) can submit the grievance to the PT Environment Officer, who will submit this to the PMU.

(ii) **Second-tier:** If the complainant(s) is not satisfied with the decision or response he/she receives from the Contractor within 7 days of submitting the grievance, the complainant can submit his appeal to the PT Environment Officer, who will be the member secretary for the GRC committee at the PMU. The Deputy Project Director will be responsible for receiving complaints, reviewing them in coordination with the Grievance Redress Committee and ensuring their resolution within a maximum of 15 working days.

(iii) **Third tier:** For grievances that remain unresolved and require intervention at a higher level, the matter will be escalated to the Project Director at the third level and the resolution will take a maximum of 10 working days**.**

Figure 48: GRM Process



PMU =project management unit, PSC= project steering committee

328. Aside from the project's GRM, an aggrieved person shall have access to the country's legal system at any stage. This access can run parallel to the GRM process and is not dependent on its outcome.

329. **Composition.** The Grievance Redress Committee (GRC) will be established at the PMU Office in Phuentsholing Thromde, comprising selected members from the PMU. The Deputy Project Director of PMU will serve as the Chairperson of the GRC, with the PT Environment Officer acting as the Member Secretary.

330. The GRC, as detailed in Table 34, will be responsible for reviewing and recording all grievances related to the project. Each submission will be documented both in logbook and in excel database with the complainant's name, contacts (except in anonymous cases), the date of submission, GRM level, the nature or subject of grievance, safeguard classification (social or environmental), status of the complaint (under the review, open/pending, closed etc.), outcome (accepted, partially accepted, rejected), resolution date. Only project-related complaints will be accepted and reviewed, including anonymous complaints.

331. The GRC will convene regular quarterly meetings with all members and may call special meetings as needed when grievances are received. It will review each case, identify appropriate resolutions, and engage relevant parties (including experts focused on specialized spheres) in the resolution process. Meetings addressing specific grievances must include the individual who submitted the complaint, except in cases of anonymous complaints. Grievances will be addressed within a maximum of 15 working days, although more complex cases may require additional time depending on their nature and severity. Depending on the degree of the case, an additional time

may be agreed with the complainant submitting the written notification to her/his about the extended timeline in advance to resolve the grievances.

332. Any affected person may use the ADB Accountability Mechanism by directly contacting ADB's Complaint Receiving Officer (CRO). Before submitting a complaint to the Accountability Mechanism, affected people must first make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the Bhutan Resident Mission, BHRM). If after following this process, the affected person/parties are still dissatisfied with the grievance resolution, only then will their complaint be taken up by the ADB Accountability Mechanism. The ADB BHRM contact information and the Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

Table 34: Composition of Grievance Redress Committee

Position	Name	Remarks
Deputy Project Director (PMU)		Chairperson
Environment Officer (PMU)		Member Secretary
Project Manager (PMU)		Member
Admin Officer (PMU)		Member
Project Engineer (PMU)		Member
Legal Officer (PMU)		Member
Contractor (Project Manager)		Member
Local Government Leader (Tshogpa / Councilor)		Members are on a call basis based on the nature of grievance representing the relevant agency. This concerned agency will nominate the officials to represent their office during the time of grievances.
Representative from reputable community-based organization		

B. GRC Mechanism and Flow of Information

333. The broad outline of the GRC mechanism and flow of information is given below:

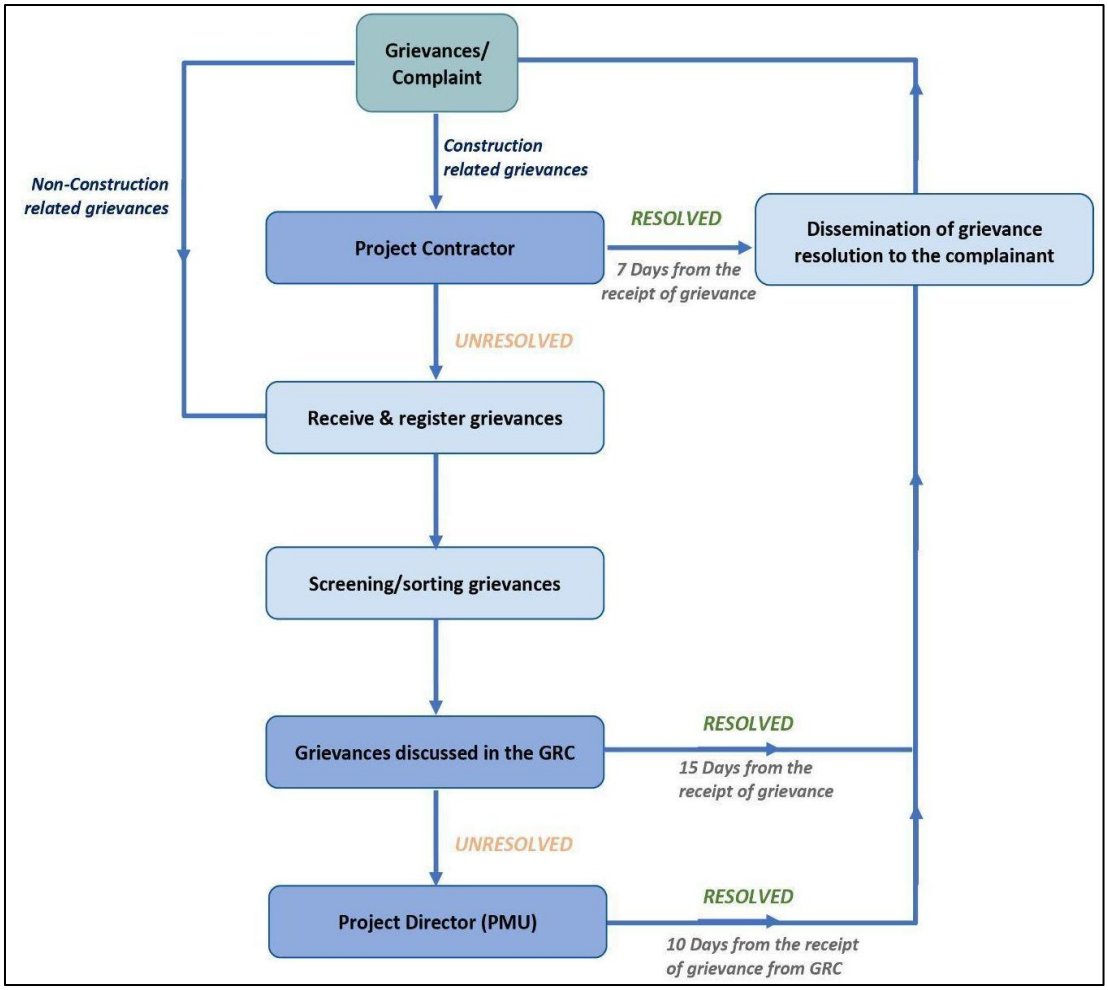
(i) The PT Environment Officer will check the grievance redress boxes weekly and communicate any received grievance to the GRC.
(ii) Each complaint/grievance will be issued a reference number. The PT Environment Officer will issue each aggrieved person acknowledging that the grievance has been complaint and details on the process to follow.
(iii) The GRC will work with aggrieved persons to resolve the complaint/grievance. On settlement of the complaint, the PT Environment Officer will verify that the complaint is addressed (through consultation with the affected parties) and issue a letter to the aggrieved person citing the findings of the GRM investigation and any action taken regarding the complaint.
(iv) The decision on the grievance must be communicated to the aggrieved person by the GRC within a maximum timeframe of 15 days with appropriate action taken for resolution of the issue.
(v) All grievances will be documented and indexed. The meeting proceedings and actions against each of the grievances will be documented by the Environment Officer.

(vi) If grievance requires a policy decision or remains unresolved at GRC level chaired by the Deputy Project Director, the case will be forwarded to Project Director for further resolution which will be resolved within 10 days.

(vii) All complaints lodged with the GRC will be recorded in a proper GRC register at the Phuentsholing Thromde office. All details of the grievance and the complaint should be captured in the register. This shall also be reported to ADB within the annual safeguard report. Details of the nature of complaint, status of complaint, and outcome will be included within the safeguard report. ADB's Independent Environmental Specialist will undertake routine inspections of the GRM to ensure that the GRM is functioning.

(viii) The identity of the aggrieved parties will be maintained in full confidentiality as necessary. The information provided in the GRM box will be made accessible only to the GRC focal person.

Figure 49: GRM standard operating procedure for the Project



C. Cost and Budget

334. All costs involved in resolving the complaints (meetings, consultations, involvement of the required experts, communication and reporting/information dissemination) will be borne by the

PMU through provisional sum of the contract document. However, the cost of implementation of the resolutions provided by the GRM shall be borne by the contractor if it is their fault and responsibility. If the issues are beyond the contractor's responsibility, the matter shall be decided by the PMU.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Institutional Arrangement

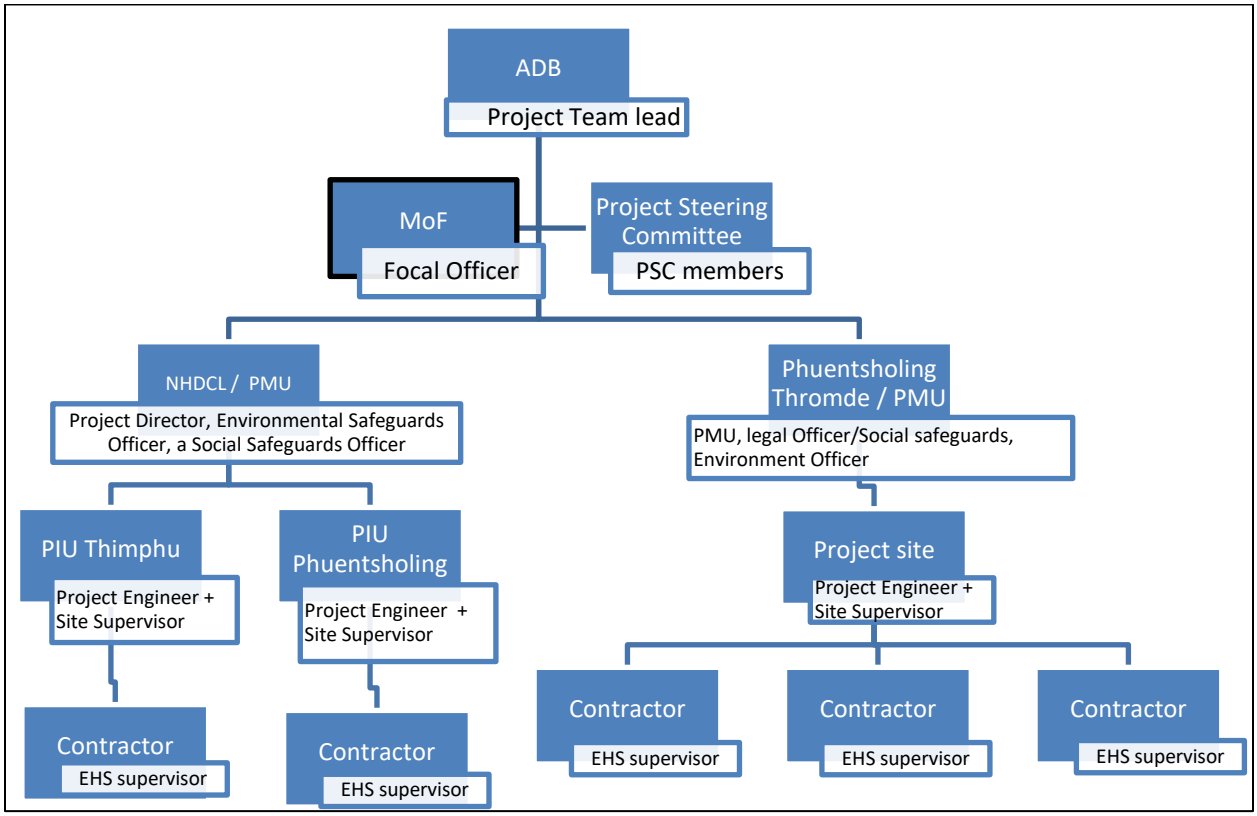
335. The Ministry of Finance (MOF) will be the executing agency and Phuentsholing Thromde will be the implementing agency for the project output 1(Inclusive and resilient urban infrastructure in Ammochhu Local Area Plan**)**. National Housing Development Corporation Limited (NHDCL) will be the implementing agency Project's output 2: Adequate, affordable and resilient housing units constructed and allotted for low-income households

336. **Project Steering Committee**: A central project steering committee (PSC) set up under the Project will provide Project Oversight. It will comprise of the MOF, Ministry of Infrastructure and Transport (MIOT), National Land Commission (NLC), Phuentsholing Thromde, Phuentsholing Dungkhag, NHDCL, Department of Tourism of Ministry of Industry, Commerce and Employment (MOICE), National Commission for Women and Children (members). The PSC will facilitate and ensure adequate coordination among relevant stakeholders and provide guidance for implementation of all outputs for this proposed Project.

337. **Phuentsholing Thromde (PT)** will be responsible for management, coordination and execution of all activities and will establish a project management unit (PMU) at PT for implementing the Project. The PMU will comprise of the Project Director and Project Manager, with the Urban Planner, Administration, Environment Officer and the Legal Officer. Project design, supervision and implementation will be undertaken by the PMU with the support of all relevant Divisions who will oversee the design and implementation as per the relevant mandates of each Division/section (water, sewerage, land and road) within the Thromde. The Environment Unit will be responsible for all environment safeguard related activities while the legal officer will be responsible for social safeguard component (planning, implementation, monitoring and reporting).

338. At the field level, the Thromde Project Engineer and a Site Supervisor, will act as the focal persons for environmental, social, and gender aspects, guided by the legal and environmental officers at the PMU. The Project Engineer and a Site Supervisor will report regularly to the PMU on safeguard compliance and progress. Site engineer or site supervisor will be designated as safety officer, responsible construction safety.

Figure 50: Overall Project Implementation Arrangement



339. **Environmental Safeguards Tasks of PMU.** The PMU will be responsible for ensuring effective coordination, supervision, and reporting of all environmental, safeguard activities. PMU environmental safeguards officers will oversee safeguard compliance across all project sites, and the details tasks will include:

(i) Ensure subprojects comply with the national and local statutory and legal environmental requirements, ADB SPS 2009, ADB loan covenants, and environmental safeguards provisions of the subproject IEEs and EMPs;
(ii) coordinate with design engineers, to consider and integrate EMP measures into the project to avoid potential environmental impacts;
(iii) Ensure that draft IEEs prepared based on feasibility / preliminary designs are updated to reflect the final subproject detailed designs, and are approved by ADB and disclosed before invitation of bids (works type contracts) or prior to commencement of works (design-build type contracts);
(iv) Include IEEs with EMPs in bidding and contract documents of civil works contracts;
(v) Ensure bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the subproject site;
(vi) Ensure that the requirement for contractors to prepare their respective Health and Safety (H&S) Plans is included in bidding documents and contracts;

(vii) Ensure that the IEEs including EMPs are promptly updated in case of changes prior to commencement of works;
(viii) Review and approve site-specific EMPs (SEMPs) of contractors;
(ix) Provide oversight on environmental management aspects of the Project, and ensure EMPs and SEMPs are implemented by contractors; conduct regular site visits; provide support and guidance to PMUs in SEMP implementation and monitoring;
(x) Ensure that contractors and their subcontractors comply with labour legislations and ADB's SPS Prohibited list requirements; ensure that workers are paid and treated according to the labor legislations;
(xi) Establish overall project's health and safety procedures, work permit methods and ensure safety culture at project sites;
(xii) ensure all workers are provided with occupational healthy and safety (OHS) training before the start of work and regularly during the works;
(xiii) ensure strict implementation of OHS requirements including but not limited to contractors' no personal protective equipment (PPE), no work policy;
(xiv) Review monthly reports from contractors;
(xv) Support PMUs in preparing quarterly reports on all aspects concerning environmental assessment, management, and monitoring;
(xvi) Establish a system to monitor environmental safeguards of the Project including monitoring the indicators set out in the monitoring plan of the IEE;
(xvii) Facilitate timely and ensure overall compliance with all national and local government rules and regulations regarding site and environmental permits/clearances/approvals as well as any other environmental requirements as relevant;
(xviii) Review, monitor and evaluate effectiveness with which the EMPs, SEMPs, and Health and Safety Plans are implemented, and recommend necessary corrective actions to be taken;
(xix) Consolidate quarterly monitoring reports from the PMUs and submit semi-annual environmental monitoring reports (SEMRs) to ADB;
(xx) Ensure availability of budget for safeguards activities;
(xxi) Ensure adequate awareness campaigns, information disclosure among affected communities and timely disclosure of final IEEs/EMPs and SEMRs, including corrective action plans, if any, in project website and in a form accessible to the public;
(xxii) assist in setting up of grievance redress mechanism (GRM), identifying grievance redressal committee (GRC) members, and developing the capacity of GRC members, PMUs, and contractors in addressing environmental safeguards-related issues/concerns/complaints;
(xxiii) Undertake regular review of safeguards-related loan covenants, and the compliance during project implementation; and
(xxiv) Organize periodic capacity building and training programs on safeguards for stakeholders, PMU, PMUs and contractors.

340. **Environment and Social Specialist Consultants**. Considering the limited scope of the project, general nature of construction works, and previous experience with ADB funded projects, PMU and PMUs will implement the project, and no specific consulting support is proposed. The PMU and PMUs will, however, be strengthened with adequate staff to implement the project. However, if need be, PMUs will recruit specialist consultants in environmental and social safeguards to assist and train PMU and PMUs in implementing the EMPs and/or social

safeguards measures and ensuring compliance with ADB SPS and national and local laws and regulations.

341. **Civil Works Contract and Contractor.** The PMU will include the IEE with EMP along with DDR/Resettlement Plan in bidding and contract documents. The Contractor will be required to appoint an environment, health and safety (EHS) supervisor to ensure implementation of EMP during civil works. Contractor will carry out all environmental and social mitigation and monitoring measures outlined in their contract. The Contractor will be required to submit to PMU, for review and approval, a SEMP including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program per EMP; and (iv) budget for SEMP and EMP implementation. No works can commence until SEMP is approved by PMU.

342. Specifically, the Contractor will have the following responsibilities, among others that will be included in the bid and contract documents:

(i) Ensure that the infrastructure development works are carried out in an environmentally friendly manner, minimizing environmental impacts while ensuring the health and safety of all its workers and the minimizing disturbance to the surrounding environment and communities;
(ii) Consideration of ADB SPS, national regulations and the EMP requirements during bid preparation and cost estimation;
(iii) Appoint a full time, on-site, EHS supervisor responsible for compliance to ADB SPS requirements, national regulations and the EMP. The officer/staff must have a clear term of reference and responsibilities to ensure that all environmental and social concerns are properly managed;
(iv) Prepare and implement a SEMP, including health and safety plan, covering both occupational and community health and safety, ensuring job-specific hazard identification and risk assessment
(v) Ensure regular reporting to the PMU on work progress and alert management on any potential issues or delays;
(vi) Obtain the necessary permits and clearances as required to implement the Project;
(vii) Ensure that all worker recruitment and OHS requirements are compiled;
(viii) Take necessary corrective action to rectify any non-conformance, including actions related to grievances;
(ix) Institute an emergency plan for natural calamities/disasters and accidents at the site; and
(x) Following chance finds procedures to discovery of any physical cultural artifact.

343. A copy of the EMP/approved SEMP/approved DDR or resettlement plan will be kept on-site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP/SEMP/DDR/RP constitutes a failure in compliance and will require corrective actions.

344. PMU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually

transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the proposed project infrastructure sites.

B. Environmental Management Plan Matrices

345. Table below summarizes the potential impacts and mitigation and management measures to be taken during pre-construction, construction and operation phases to avoid, reduce, mitigate, or compensate for adverse environmental impacts.

Table 35: Environmental Management Plan

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Design / Pre- construction phase					
Project site selection	Impact on protected area, critical habitats and endangered species	• None required as the project site is located within the city limit. The project site does not overlap with any KBA or Protected Area	NA	PMU	PMU
	Natural Hazards and Disasters	• Ensure to apply a risk-informed approach to planning, design and implementation to avoid increasing existing vulnerabilities, creating new risks through maladaptation, or locking-in development in high-risk areas. • Incorporate in the design engineering and management strategies that reduce the risk and impact of disasters and natural hazards, particularly the potential of flooding due to overflow or flash floods from the Ammochhu river and other tributaries in the project area. • Coordinate with the two study teams and ensure Ammochhu LAP designs are risk informed • The final detailed design needs to incorporate recommendations of the two studies. Upon completion of the two ongoing PT and BARKHK hazard assessment and mitigation studies[79], the planning and design of Ammochhu LAP infrastructure, including the proposed risk mitigation measures (both structural and non-structural) shall be reviewed, revised, updated and/or validated as required; this shall include review, validation, and update as needed of climate change allowances and safety margins. • No bidding process shall be initiated until the detailed design is finalized based on the recommendations of the studies. • Identify additional risk mitigation measures that are not included in the IRUDP or PTDP, and secure financial resources for implementation of the same. It must be ensured that the funding for additional measures and implementation plan are firmed up prior to invitation of bids for Ammochhu LAP under IRUDP.	Included in Project design cost	PMU	PMU

[79] (1) Geotechnical Investigation and Slope Stability Assessment for Pekarzhing and Ammochhu Local Area Plans (LAPs), Phuentsholing Thromde, and (2) "Phuentsholing Slope Hazard Mitigation Conceptual Design" under the ADB TA for the Building Adaptation and Resilience in the Hindu Kush Himalayas – Bhutan and Nepal (BARHKH).

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Conduct / continue public consultations with Ammochhu LAP and wider stakeholders on Ammochhu LAP design, risk mitigation studies and measures • Raise public awareness of risks and responses through drills and emergency preparedness, and evacuation routes to shelters and training in Ammochchu LAP.			
	Impact on biodiversity, tree cutting Road construction will entail removal of trees and vegetation along the bottom of the hillside	• During orientation Contractors must be instructed to ensure only marked trees are felled and removed as marked. • Contractors will brief all workers on hunting restrictions • Contractor will inform the PMU immediately upon encountering injured wildlife so that the local Forest Office can rescue and relocate these species. • ensure that only trees that are within the Road alignment are removed. To compensate for the loss of trees, trees will be planted during landscaping and beautification upon completion of infrastructure work. To ensure slope stability and enhance aesthetics, the Thromde will plant suitable trees during landscaping. • During orientation Contractors must be instructed to ensure only marked trees are felled and removed as marked. Also require contractors to inform all workers on hunting restrictions and to inform the PMU immediately upon encountering injured wildlife so that the animals can be rescued and relocated. • Ecological surveys of trees shall be conducted of trees prior to cutting, for any bird's nests. If any active nests, ensure that trees are not disturbed until young birds fly away from the nests; do not cut trees during the breeding season	NA	PMU	PMU
	Physical Cultural Resources	All works in the vicinity will be undertaken in accordance with site-specific environmental management measures to minimize impacts of construction activities.	NA	PMU	PMU
	Disruption to existing structures, utilities and services	• Coordinate with Bhutan Power Corporation (BPC) for relocation planning • Provide timely and prior notice to LAP residents and property owners about the nature, location, and duration of any anticipated service disruptions, to allow households and businesses to make alternative arrangements (for water and electricity) as required.	PMU Operating Cost; Contractor Cost	PMU	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Consents, permits and clearances	Failure to comply with national regulation and procedures can delay project progress	• Land lease for contractor facilities, water supply for drinking and construction and waste disposal - Thromde • For electrical connections for work sites and worker camps- Bhutan Power Corporation • For tree marking – Range Office and Thromde • For recruitment of foreign workers- Department of Labor • Disposal of Construction Waste - Environment Office, Thromde	PMU Operating Cost; Contractor Cost	PMU	PMU
Removal of trees	Road construction will entail removal of trees and vegetation along the bottom of the hillside	• ensure that only trees that are within the Road alignment are removed. To compensate for the loss of trees, trees will be planted during landscaping and beautification upon completion of infrastructure work. To ensure slope stability and enhance aesthetics, the Thromde will plant suitable trees during landscaping.	NA	PMU	PMU
Site preparation and Construction of site office, worker camps and material storage sheds	Establishing construction camps and site facilities will require dedicated space for site offices, worker accommodation, material storage, machinery parking, and utility connections. The influx of workers will increase demand for temporary housing, drinking water, electricity, and sanitation services. Poorly planned or inadequately managed construction camps may result in overcrowding and sub-standard worker accommodation with unsanitary conditions posing increased risks of communicable diseases, including for vulnerable groups such as female workers, pollution of soil and water	• Establish camps or accommodations following international best practices such as the standards for workers accommodation pertaining to *"Workers' accommodation: processes and standards. A guidance note by IFC and the EBRD" 2009*;[80] and the International Labor Organization's Workers' Housing Standards (footnote 81), which requires that a workers' camp should ensure structural safety and reasonable levels of decency, hygiene and comfort. • Obtain prior permission from Thromde for locating worker camps. • Select sites at least 30m from rivers and 15m from streams, minimizing vegetation clearance (no tree felling). • Fulfill land lease requirements with Thromde for government land; sign agreements for private land use. Accommodation Standards: • Provide good-quality, gender-friendly temporary housing that meets Bhutan Schedule of Rates (2024) standards. • Ensure rooms are well-ventilated, with protection from elements (wind, heat, rain, etc.).	Contractor's cost	Contractor	PMU

[80] *Workers' Accommodation: Processes and Standards*.

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	bodies from untreated wastewater, greywater, and solid waste and cause environmental degradation due to improper material storage.	• Maintain minimum one room for every 4 employees with adequate space and headroom. • Provide separate kitchen if workers choose to cook themselves. Sanitation & Hygiene: • One pour-flush toilet per 6 persons, with separate facilities for males and females. • Include bathrooms, washing areas, septic tanks, and soak-away pits located 30m away from water bodies. • Ensure regular cleaning, hygiene, and organized waste management using separate bins for general, biodegradable, and hazardous waste. Water Supply: • Provide ample and safe drinking water that meets national standards. • Include adequate storage tanks. • Test water quality if not sourced from municipal supply. Cooling & Health Provisions: • Due to high summer temperatures in Phuentsholing, equip rooms with cooling facilities (e.g. fans) and mosquito nets to reduce malaria risk. Dining Facilities: • Where meals are provided, establish a common dining room away from sleeping areas. • Channel kitchen and dining wastewater to soak pits, away from streams. Utilities & Safety: • Ensure access to electricity and install fire extinguishers. • Camps must be self-contained, barricaded, and comply with occupational health and safety regulations (2022). • Secure necessary approvals for water and electrical connections from Thromde and Bhutan Power Corporation. Alternative Options: • Consider renting offices instead of constructing them to reduce the project footprint.			

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Incorporation of EMP costs in the bidding process	Standard bidding documents include provisions for Occupational Health and Safety measures at construction sites, and provision of temporary living accommodation, there is the risk that mitigation measures such as cost of compensation for work related injuries or waste disposal are not budgeted in the contractors cost.	• Ensure compliance with the prevailing Bhutan Schedule of Rates (BSR) for OHS and worker accommodation • Include the EMP into the contract documents and include a clause to make contractors liable for non-compliance to the ADB safeguards, national regulations and standards and the EMP. • Incorporate the cost of waste transportation from the construction sites to the waste dump site in the Bill of Quantities (BOQ) to avoid supplementary claim and ensure proper waste disposal. • Require contractor to review the EMP and prepare a site-specific Contractor EMP, incorporating and budgeting for all measures to avoid lapses and non-compliance during implementation. This will be reviewed and approved by the Thromde	NA	PMU	PMU
Creation of Project Supervision team	The project activities will require constant supervision and guidance on environmentally safe construction practices and therefore require safeguard staff to ensure that EMP requirements are followed, reported and that corrective actions are undertaken in case of unanticipated impacts. With Thromde implementing multiple projects, including the Omchhu Project, it is likely that the existing staff may be overwhelmed with competing tasks.	• PMU and Contractor must incorporate adequate budget to ensure adequate staffing and capacity building measures from pre-construction to construction phases • Ensure that the Environment Officer in the PMU is supported by assistants who will be involved in the monitoring of the environmental related aspects of the project. • Contractors EHS staff/focal should provide updated monthly information on EMP compliance for incorporation into the monitoring reports.	Project overhead cost	PMU / PMU	PMU
Compliance with ADB Loan Agreement and Safeguard Policy Statement and EC conditions	Despite the Project Management Unit's (PMU) general familiarity with the ADB Safeguard Policy Statement (SPS) and loan and national regulatory requirements, a significant risk to compliance may arise due to staff capacity, potential staff	• Seek prior approval of the IEE report from ADB before disclosure • Staffing commitments for environmental and social safeguards and capacity building • Ensure that sufficient funds are available to properly implement all agreed measures in the EMP • Disclosure of the approved IEE, updated IEEs and EMRs	Project overhead cost	PMU / PMU	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	transfers and competing priorities, which can lead to gaps in meeting obligations under the ADB loan agreement, SPS 2009, and the Department of Environment and Climate Change (DECC) environmental clearance conditions. Without consultants or a PMU, Thromde staff will be overwhelmed with ensuring oversight of the EMP implementation, timely submission of SEMRs and proper functioning of the GRM.	• Incorporate EMP, GRM and EMOP and relevant provisions of the loan agreement into bidding documents only after approval from ADB • During pre-bid meetings, brief contractors on their responsibilities in EMP implementation, and the need to comply with all ADB loan covenants, national legislation and clearances. • Upon selection, conduct contractor training on the EMP requirements, documentation and reporting procedures, • Prepare and submit semi-annual EMRs for ADB review and approval • Report any accidents, fatalities to ADB within 48 hours as well as any unanticipated incidents along with corrective actions taken within one week			
Project Disclosure and Community Awareness	Public consultation was carried out on 22nd December, 2025, by Thromde wherein 29 participants were present. The Minutes of the Meeting are in Appendix 4. As there are more than 100 land owners, many living outside of Phuentsholing, it is possible that not all property owners and residents are aware of the project/ y not get out to those who missed the meeting for various reasons. Because of the nature of the infrastructure work, it is important to ensure transparency, community engagement and information sharing about project activities, schedules and the GRM process, especially as there were a number of concerns regarding land filling, and project impact on ongoing and future. Construction.	• Disclose the approved IEE and GRM on Thromde website and make printed summaries available at the site office. • Disseminate information about project activities and schedules (television, newspaper, social media and local representatives).This advance notification will enable residents to plan accordingly, mitigating potential disruptions, congestion on work areas, or access restrictions or temporary closures of roads. • Share SMS alerts for activities that may cause temporary disturbances (e.g. road diversions, closures). • Institute the Grievance Redress Mechanism prior to the construction phase and notify and disseminate information to the public on the GRM process • Ensure that the contractors install project signboards (according to national design standards and specification) so that passersby, travelers and the community are aware of the project site, work timing, access restrictions. Signboards should have project contact numbers. These must be updated as focal persons change. • Ensure that any updated IEE and addendums are approved by ADB and disclosed	Project overhead cost	PMU / PMU	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Construction phase					
Recruitment and management of workers	While the contractor should be encouraged to provide local employment, due to the lack of skilled national workers, it is generally still necessary to import foreign skilled workers. Key risks with hiring of workers include discrimination in employment and pay, unfair terms and conditions of employment, lack of contracts, excessive overtimes, delayed, irregular or non-payments, risk of child labor or forced labor, Gender-based violence, Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH), inadequate or unsafe working conditions and issues related to worker accommodation and welfare.	• Contractor will prepare a labor management plan that will include preparation of worker contracts with terms and conditions of employment, including hours of work, wages, overtime, minimum age of employment, compensation and benefits, holidays, leave, equitable treatment of all workers, worker exploitation and gender-based violence. • The LMP will also include a provision for dealing with worker grievances.	Contractor's cost	Contractor	PMU
Occupational Health and Safety	The project will require laborers to working in the outfall areas, carry out excavation, use machinery and be constantly exposed to noise, dust, and equipment. Use of machines will cause more disruption to the machine operators or workers in close proximity to the machine. There is also the risk of workplace injury due to (i) lack of personal protective equipment (PPE), (ii) unsafe acts/carelessness or ignorance by workers, (iii) use of unskilled workers, (iv) working long hours with inadequate facilities, and (v) lack of dedicated personnel to	• The contractor must prepare a project-specific Health and Safety Management Plan that is based on identified potential hazards, outlines preventive measures, incorporates worker training, documentation and reporting and outline emergency response arrangements. • For works scheduling, Phuentsholing Thromde and contractor shall coordinate with the RGOB agencies on disaster risks, seasonal floods, extreme weather, landslide etc., temporary warning systems (at least manual) shall be put in place, with coordination of agencies, households in upper hills. This especially critical for works in drainage outfalls or on the eastern avenue adjacent to Damdara hill. Flashfloods, and debris flow may pose risks to project staff and workers, and may also lead to loss of equipment, material in the flood, and may have adverse impacts on receiving water bodies. • Establish an OHS committee, and employ a certified Health and Safety Focal Person			

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	ensure worker health and safety and lack of general safety awareness.	• Hire only trained and certified workers, licensed drivers, machine operators and electricians • Prepare and implement accident and emergency response procedures, • Ensure all foreign workers are screened at their point of entry for virulent and contagious diseases, including HIV/AIDS, TB, Malaria, etc. • Provide required PPE at no cost to workers, maintain a PPE register, and enforce usage • Ensure safe working conditions (fall protection, electrical safety, excavation safety, fire safety, first-aid), • Conduct regular OHS training and toolbox talks covering hazards, safe work practices, PPE, code of conduct, emergency procedures, and site-specific risk • Institute protocols to carry out periodic inspections and corrective actions • Provide first aid kit, fire extinguisher, and adequate supply of safe drinking water at a workplace • Install safety signage at critical and risky/precarious areas. • The Thromde must report any fatality, major incident, or significant injury to ADB "as soon as possible" after becoming aware of it (not more than 48hrs). The initial report must be followed by a detailed report outlining the root cause analysis and future preventive measures. • The Contractor must compensate the worker (s) for any fatality or major incident resulting in injury or ill-health caused by project activities as per the national regulation. • During the summer, the contractor must establish a schedule for work and rest periods during hot days • Provide designated areas where workers can rest away from the heat and the rain. • Institute a protocol to deal with grievances at the worksite and communicate this to all workers. • If workers are required to work overtime, then the contractor must submit a night work plan based on assessment of all risks and hazards. The plan must include appropriate provisions to ensure a safe and			

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		healthy work environment with standard operating protocols, equipment, facilities and training.			
Excavation work	Excavation work will be carried out for drains, sewer lines, utility ducts, roads, embankments, and culverts and will generate soil. This may lead to soil erosion, particularly during monsoon periods. The increased sediment load may enter the Ammochhu River through outfalls if construction runoff is not properly controlled. On the other hand, excavation during dry months will create dust piles on windy days. There is also the possibility that buried waterlines may be disrupted during excavation work.	• To reduce runoff, all excavation work should be planned during the drier months • Reuse excavated soil for filling depressions within the LAP area. • Scheduled excavation work during drier months to minimize surface runoff. • Suppress dust by sprinkling water at least twice daily during dry and windy conditions. • Avoid disruption of utilities and services through advance planning and coordination. • Map, mark and relocate existing utilities prior to construction based on a relocation plan prepared in consultation with Bhutan Power Corporation, other service providers, and affected building owners • Where service disruption is unavoidable, provide prior notice to affected persons/households and limit the disruption to the shortest practicable duration. • The Contractor will pay for any damage to utilities as determined by the relevant authority (BPC/ Bhutan Telecom, Thromde)			
Material sourcing and Storage	The infrastructure development works include various types of construction from construction of embankments, culverts, stormwater drainage, sewer system, water distribution network to road works. Construction activities will require raw materials for various structures. These materials will need to be sourced from primary suppliers. The most prominent of these include reinforced cement concrete (RCC), sand, cement, aggregates, bitumen, waterproofing materials, HDPE pipes, Galvanized iron pipes, electrical fixtures, cables and	• Avoid creation of new quarries or borrow areas for sourcing materials. As far as possible used existing government licensed material sources in the vicinity of project area • Use locally available construction materials wherever feasible to reduce transportation impacts and support local suppliers. Sand and stones etc. must be sourced from existing legally approved quarries • Predetermine quantities of construction materials during planning to avoid wastage and minimize storage • Follow an inventory management system to track material usage and prevent shortages or overstocking. • Construct adequate on-site storage facilities, including covered storage sheds, to protect materials from weather damage and deterioration • Wherever possible reuse and recycle materials	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	chemicals. Inadequate planning of material sourcing, handling, and storage could result in implementation delays, material losses, and inefficient use of resources. The project must ensure the efficient use of raw materials to minimize environmental impacts, as well as ensure that primary suppliers are certified/legal and not causing significant adverse impacts on natural habitats, critical habitats or protected areas.	• However, all suppliers must be licensed and should not be extracting materials from protected areas or critical habitats. • For construction materials that will need to be imported, ensure that these are purchased through licensed agents. • Valuable or sensitive materials will be securely stored, and appropriate security measures, such as security personnel or installation of surveillance systems, will be implemented to reduce the risk of theft.			
Water requirements	The construction work and the presence of a sizable workforce is expected to create an additional demand for water for drinking, cooking, washing as well as construction and its associated activities (sprinkling/spraying and cleaning). Water will be also required for construction especially for concrete mixing and curing works, especially for construction of RCC walls, footpath etc.	• Ensure adequate water for domestic (drinking, cooking, washing and sanitation) and construction purpose. • In case of shortage of water install adequate water tanks to store water. • All water supply pipes must be checked, repaired and maintained to prevent leakages or blockages. • For construction purpose, the water from the river can be tapped for ongoing construction works, with the prior permission of Thromde.			
Use of water	Generation of Wastewater	• Prevent direct discharge of concreting wastewater into the river. • Implement on-site collection of all concreting wastewater using impermeable bunds, sedimentation ponds, or lined pits to facilitate sedimentation. • Prior to disposal, treat collected wastewater by neutralizing acids to adjust the pH, filtering to remove fine particles and debris. • Use of soak pits at worker camps	Contractor's cost	Contractor	PMU
Requirement of Electricity	Electricity will be required for lighting and cooking in the worker camps, site office and	• Seek BPC permission to tap the required electrical supply	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	use of construction tools and equipment				
Mobilization of Vehicles and Construction Equipment	The operation of vehicles and mobile construction equipment at the construction site are risky if adequate precautions are not followed, especially as the site is very vast and it is not possible to cordon off the entire site to the public. Hazards include risk of being struck or crushed by moving equipment or its load when being lifted or moved or due to mechanical failure or when machines tip over. Mobilization of machines and trucks for material transportation will also contribute to congestion and reduced air quality through air emissions and dust generation.	• Machine operators shall be properly trained and competent to minimize risks to nearby workers. • Operators must use audible horns/reversing sensor and alarms when reversing or maneuvering equipment. • A designated signal person shall guide machinery during reversing operations. • Workers shall be restricted from working in close proximity to operating machinery unless essential for the task. • Where close proximity work is unavoidable, a supervisor shall warn workers of potential hazards and ensure safety controls are in place. • The public shall be warned to stay away from primary work areas through installation of clearly visible warning signs. • Follow air pollution prevention measures • Material transporters must cover dust-generating materials such as sand and fine aggregates to prevent dust and spillage during transport.	Contractor's cost	Contractor	PMU
Material transportation and machinery use	Congestion and blockages/obstructions	• Contractor must coordinate with material transporters to schedule materials drop times and avoid peak traffic hours (e.g. 8.00-9.30AM and 4-6PM). • Ensure loading and unloading of materials are carried out quickly and efficiently, without causing congestion • Restrict parking of vehicles along the road unnecessarily • Install signs to inform travelers of ongoing work to that they can opt to use alternative routes • Transport vehicles must have back sirens to alert workers or the public when moving.	Contractor's cost	Contractor	PMU
Natural hazard and disaster	Landslide and flood risks	• For works scheduling, Phuentsholing Thromde and contractor shall coordinate with the RGOB agencies on disaster risks, seasonal floods, extreme weather, landslide etc., temporary warning systems (at least manual) shall be put in place, with coordination of agencies, households in upper hills. This especially critical for works in drainage outfalls or on the eastern avenue adjacent to Damdara hill. Flashfloods, and	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		debris flow may pose risks to project staff and workers, and may also lead to loss of equipment, material in the flood, and may have adverse impacts on receiving water bodies. • Contractors must prepare an emergency preparedness plan that is aimed at ensuring the safety of all employees and workers in case of an emergency and to minimize work disruption as much as possible; • Display and maintain suitable warning signs at conspicuous places in Dzongkha and English. • Identify an Emergency Response Focal Person who will coordinate Emergency operations with the Thromde in case of natural hazards and disasters; • Establish a clear protocol for communication between Thromde and Contractors and their focal persons; • Designate a meeting point at work sites and worker accommodation areas and establish protocols for evacuation, response and relief actions; • Brief workers on emergency response procedures to be followed and conduct mock drill for employees and worker; • Keep abreast on extreme weather forecasts and avoid working in such condition; • In the case of accidents immediately evacuate injured persons to the hospital; • Ensure that transportation is available for emergencies at all times; • Maintain fire extinguishers at site offices and worker camps and ensure these are regularly checked; and • Post emergency numbers (police, ambulance, Thromde, fire, Contractor's emergency personnel) at visible places and update this if personnel have left or been replaced.			
Soil Erosion and sedimentation	Heavy rains will cause soil erosion and sedimentation	• Identify areas at risk of soil erosion and sedimentation • As far as practicable, all major excavation works shall be completed prior to the onset of the monsoon season (June–September) to minimize exposure of bare soil to intense rainfall and surface runoff.	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Design and construct temporary drainage systems to intercept and divert stormwater away from excavated and soil-exposed areas. • Install silt traps to prevent sediment-laden runoff from entering drains and outfalls			
Air quality	Reduced air quality due to project activities	• All construction equipment and vehicles will be maintained in good condition and must pass the required emission test. A maintenance log will be kept for each equipment and vehicle. • Contractor will advise transporters to avoid vehicle idling and prevent smoke belching and enforce speed limit • Material transporters will cover dust-generating materials such as sand and fine aggregates to prevent dust and spillage during transport. • Dust suppression will be carried out through sprinkling of water during excavation work, especially on windy days. • Stockpiles of soil, sand and other construction materials will be covered to prevent it from being carried off on windy days. • Burning of waste will be restricted and enforced strictly • Carry out Air quality monitoring to determine trends	Contractor's cost	Contractor	PMU
Biodiversity	Risk of injury and harm to mammals and reptiles during vegetation clearances	• Create awareness among the staff and workers on do's and don'ts and safety of wildlife and humans in case of such chance encounters. • A pre survey of the site shall be conducted prior to clearance of vegetation in coordination with the Forest office. If any wild animal is spotted, it shall not be disturbed or harmed, and activities shall be halted until it is moved out. • Ecological surveys of trees shall be conducted of trees prior to cutting, for any bird's nests. If any active nests, ensure that trees are not disturbed until young birds fly away from the nests; do not cut trees during the breeding season. • Contractor shall contact the Environment Officer or nearest Forest Office in case any wildlife is injured during construction, so that the species can be rescues, rehabilitated and returned to the wild.	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Night Work and Overtime	Often, the contractors will require workers to work overtime after 6PM to expedite the construction work. Night work risks differ from daytime operations, because of reduced visibility, altered human alertness, and greater vulnerability to environmental hazards. Additionally, it can strain workers' physical and mental health, posing long-term risks if not properly managed. Night work can also significantly impact the surrounding community, causing disturbance.	• The contractors will prepare a comprehensive night work plan outlining working hours, illumination requirements, and safety measures and facilities for workers, and emergency procedures.	Contractor's cost	Contractor	PMU
Construction activities	Noise and Disturbance to the Neighboring Community Noise from use of large machines and loud/noisy equipment and worker sites and from worker camps	• restrict construction work between 9PM -8AM, • brief workers on their obligations regarding proper management of work and behavior with sanctions for inappropriate behavior or repeated complaints from the residents. • Encourage vehicle owners to develop and implement a preventive maintenance schedule for all heavy construction equipment and machinery to minimize noise and vibration. • Ensure that noise levels do not exceed Environmental Standards 2020. • Measures at the work site • For renovation works at the Thromde site, instruct workers on the need to minimize disturbance during working hours. • Schedule noisy work for before or after office-hours • Ensure all vehicles and machinery are checked and maintained in good conditions to avoid noise • Install noise buffers or station noise machinery away from residential, offices and institutional areas • Carry out noise monitoring at adjacent properties at risk of noise level exceedance for the duration of such work and ensure that noise levels do not exceed national standards, 2020.	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Instruct workers not to blast music from their camps, especially during early hours and evening			
	Disruption of utilities and services	• Caution machine operators and transporters to avoid impacting utilities and services during excavation, and material delivery. • In the event of damage, the transporter or contractor will be held fully responsible for repair costs and compensation for any service delivery losses as determined by the Thromde or Grievance Committee.	Contractor's cost	Contractor	PMU
Community safety and health risks	Risk to Community health and safety due to influx of workers, ongoing construction work, waste generation, open access to public and unsafe work areas	• Cordon the specific work site to restrict public access; separate the work sites and public movement areas by provide barricades and demarcate areas; • Install signboards to notify passers-by of ongoing work, and place warning signs near access road and entry points, and hazard prone areas; • Provide safe alternative pedestrian pathways for nearby residents where existing roads/paths need to be closed temporarily; • Install barricades around active construction areas; • Maintain adequate lighting around work sites at night to prevent accidental entry; • Ensure all project vehicles comply with speed limits; • Publicize the GRM to the community to allow community members to report safety concerns or accidents promptly; • Ensure that workers follow a mandatory code of conduct (CoC)that covers respectful behavior toward community members, prohibition on sexual harassment, substance abuse and compliance with national laws and respect for cultural norms. All workers must sign the CoC; • Establish a clear chain of command and accountability structure for dealing with incidents, grievances and reporting; and • Display contact details of these personnel on the site notice board to improve accessibility and rapid and immediate action. • Ensure drivers are trained defensive and safe driving, and traffic rules and regulations. Ensure that construction vehicles and equipment are not operated	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		in public areas without reversing sensor/alarms, a driver's assistant to guide the driver when required, e.g. in reversing the vehicles. • Conduct regular and random alcohol detection tests to drivers and vehicle operators and put in place strict measures to deal with any violations.			
Hazardous materials usage, storage and disposal	Risk of inadequate storage, usage, spillage and disposal	• Provide material specific storage for hazardous materials and ensure chemical containers are labelled • Do not allow any fuel storage at site. • Designate areas to store hazardous materials in covered sheds with impermeable lining and bunded to 110% capacity. • Provide spill response kit with sufficient absorbent materials (e.g., sorbents, dry sand, sandbags) on-site to immediately soak up any accidental spills and leaks. • Workers who are required to handle corrosive, oxidizing, or reactive chemicals should be provided with specialized training on the risks and usage of these substances and provided with appropriate PPE (gloves, apron, splash suits, face shield or goggles etc.). • Immediately evacuate employees/workers to the hospital in case of accidental exposure. • Do not retain hazardous waste at site for more than 2 weeks, and ensure these are disposed of, as per Thromde's guidance.	Contractor's cost	Contractor	PMU
Waste generation and management	Improper waste management and disposal	Overall • Ensure compliance with the Waste Prevention and Management Act of Bhutan, 2009 Waste management at site offices and worker camps • Provide appropriate color-coded and labelled bins to segregate waste into organic/biodegradable and general waste. General waste should further be segregated into plastics, bottles and paper and e-waste. • Conduct employee and worker awareness to promote waste segregation, reduction, recycling and good housekeeping • Prohibit burning of waste	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Maintain cleanliness of the respective premises or surroundings through weekly cleanup campaigns • Follow the Thromde waste collection schedule timings and ensure that waste does not pile up. Waste management at the construction site • Designate areas to store construction waste, chemical waste and hazardous waste, ensuring that the latter two are stored in containers in covered sheds with impermeable lining and bunded to 110% capacity. • Prohibit burning of waste • Conduct employee and worker awareness to waste reduction and illegal waste dumping. • Maintain cleanliness of the work site through weekly cleanup campaigns • Secure disposal permits to dispose construction waste at designated/approved disposal sites. • Cover all construction waste during transportation, secure and label waste containers (hazardous waste), and transport these to a designated site without spillage along the transportation route. • Maintain documentation and record of all types of waste generated and disposed. • Thromde - Conduct awareness for contractors and their workers on waste management protocols and requirements prior to construction.			
Wastewater generation	Wastewater will be generated from both domestic sources (workers' camps) and construction activities. In the absence of an adequate sewerage system, uncontrolled discharge of greywater and blackwater from construction sites and workers' camps could pollute nearby surface and groundwater. Additionally, construction-related wastewater, particularly from concreting and equipment washing, will	• All temporary workers' camps and construction-site sanitation facilities shall be provided with adequate wastewater management systems. • Domestic wastewater (greywater and blackwater) from workers' camps shall be managed using properly designed septic tanks and soak pits throughout the construction period. • Upon completion of construction, all temporary sanitation facilities shall be safely decommissioned, with septic tanks desludged and backfilled with soil. • Alternatively, portable toilets with sealed holding tanks may be deployed, to be regularly serviced and desludged by Thromde upon payment of required fees (similar to PTDP practice).	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	cause contaminate streams (and the Ammochhu river into which they drain) due to the presence of suspended solids, and cement residues that can be harmful to aquatic life.	• Discharge of construction or concreting wastewater directly into drains or outfalls shall be strictly avoided. • Impermeable bunds shall be used to contain wastewater and prevent direct releases into the river.			
Community health and safety	Safety risk to public safety during transport of materials. Safety risk to pedestrians.	• Cordon the specific work site to restrict public access, especially in areas where excavation and electrification work is ongoing. • Install signboards to notify passers-by of ongoing work, and place warning signs near access road and entry points, and hazard prone areas. • Provide safe alternative pedestrian pathways for nearby residents where existing roads/paths need to be closed temporarily, • Install barricades around active construction areas • Maintain adequate lighting around work sites at night to prevent accidental entry • Ensure all project vehicles comply with speed limits • Publicize the GRM to the community to allow community members to report safety concerns or accidents promptly • Ensure that workers follow a mandatory code of conduct (CoC) that covers respectful behavior toward community members, prohibition on sexual harassment, substance abuse and compliance with national laws and respect for cultural norms. All workers must sign the CoC • Establish a clear chain of command and accountability structure for dealing with incidents, grievances and reporting. • Display contact details of these personnel on the site notice board to improve accessibility and rapid and immediate action.	Contractor's cost	Contractor	PMU
Traffic Management	Congestion along the highway and internal roads	• Prepare a construction traffic management plan and submit this to PMU for approval. Once approved, the plan will be followed. • Any changes to the plan will be discussed with and approved by the PMU.	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Material drop-off by trucks will be restricted during peak traffic hours.(8:00–9:30 AM and 4:00–6:00 PM • Contractors must enforce speed limits for trucks near the construction site to reduce accident risk • Advance notice will be provided to the community regarding any temporary road closures, diversions, or access restrictions. • Ensure drivers are trained defensive and safe driving, and traffic rules and regulations. Conduct regular and random alcohol detection tests to drivers and vehicle operators and put in place strict measures to deal with any violations. • Ensure that construction vehicles and equipment are not operated in public areas without reversing sensor/alarms, a driver's assistant to guide the driver when required, e.g. in reversing the vehicles.			
Aesthetics	The project site is located along the Highway, where travelers to Samtse and local Indian tourists frequently pass and there are also residential buildings including the NHDCL colonies. Haphazard construction activities, such as disorderly material storage, vehicle parking, and waste disposal, are expected to adversely affect the visual amenity and the overall experience of travelers, tourists and residents. Excavation during dry months can create dust piles contributing to visual pollution.	• Prepare a detailed layout for all vehicle and machine parking, material storage, and worker camps to avoid haphazard living and work sites. • Unwanted construction materials and waste must be properly stored and managed to prevent these being blown by the wind • Upon completion, a camp and site closure plan must be implemented. This includes dismantling worker camps, removing debris and machinery, and restoring the site to its pre-construction state to restore aesthetics	Contractor's cost	Contractor	PMU
Chance finds	Potential damage to Physical Cultural Resources (chance finds) that may be encountered underground during excavation activities	• In case of discovery of a chance find, (archaeological, historical, cultural, religious objects, or graves) during the excavation or construction, the following steps must be undertaken by the contractor, PMU and PMU: • Upon detection of any chance find, the contractor must immediately stop all activity within 30m of the find and immediately notify the supervisor onsite and	PMU contingency budget	Contractor, PMU	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		the Thromde. No construction is to be carried out by the Contractor until notified by the Thromde • The Thromde in turn will document the chance finds and inform the Department of Department of Culture and Dzongkhag Development, Ministry of Home Affairs of the discovery immediately to avoid delay in the construction work. • The Department of Culture and Dzongkhag Development (DoCDD) may provide their assessment from the photo documentation or conduct in-person site assessment to assess the chance find in detail and relay appropriate instruction to Thromde. • The Thromde must ensure that there are no delays in the verification process or in notifying the contractor of the procedures to be followed based on the assessment by the DoCDD • Thromde must monitor to ensure that the instruction given by the DoCDD is carried out correctly.			
Construction activities	Damage to infrastructure or injury to workers due to natural hazards and disasters	• For works scheduling, Phuentsholing Thromde and contractor shall coordinate with the RGOB agencies on disaster risks, seasonal floods, extreme weather, landslide etc., (such as National Centre for Hydrology and Meteorology) temporary warning protocols shall be put in place, with coordination of agencies, households in upper hills. This especially critical for works in drainage outfalls or on the eastern avenue adjacent to Damdara hill. Flashfloods, and debris flow may pose risks to project staff and workers, and may also lead to loss of equipment, material in the flood, and may have adverse impacts on receiving water bodies. • Contractors must prepare an emergency preparedness plan that is aimed at ensuring the safety of all employees and workers in case of an emergency and to minimize work disruption as much as possible. • Identify an Emergency Response Focal Person who will coordinate Emergency operations with the Thromde in case of natural hazards and disasters, • Establish a clear protocol for communication between Thromde and Contractors and their focal persons	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Designate a meeting point at work sites and worker accommodation areas and establish protocols for evacuation, response and relief actions • Brief workers on emergency response procedures to be followed and conduct mock drill for employees and workers • Keep abreast on extreme weather forecasts and avoid working in such conditions • In the case of accidents immediately evacuate injured persons to the hospital • Ensure that transportation is available for emergencies at all times • Maintain fire extinguishers at site offices and worker camps and ensure these are regularly checked • Post emergency numbers (police, ambulance, Thromde, fire, Contractor's emergency personnel) at visible places and update this if personnel have left or been replaced.			
Construction activities	Unanticipated impacts	• Should there be any unanticipated impacts, the IEE and the EMP will need to be updated to account for any additional or new environmental impacts and relevant corrective actions. • For impacts caused by the project, the Contractor/ material transporters will be fully liable for repair and restoration of any private or government property damaged during construction and material transportation. • All accidents must be reported. In case of fatalities, this must be reported to ADB within the 48 hours, and corrective actions following the incident must be documented	Contractor's cost	Contractor	PMU
Completion of Construction work	Risk that sites are not cleaned up and waste remains at site, plantations are damaged or eaten by animals, and foreign workers do not depart from the site	**Work sites** • Upon completion of all work, remove all chemicals, construction materials, debris and dispose these at an approved site • Dismantle all offices, storage sheds, worker camps • Seek Thromde approval and empty all septic tanks and dispose contents safely at e, cover soak pits with soil and compact it.	Contractor's cost	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Ensure the entire site is cleaned up, and all barricades removed and restore the site to its pre-construction state. • If private land was leased, obtain a handing over certificate from the land owner. • Repair and handover any damaged property whether government or private before handing over the site to Thromde. Evidence of repairs must be included in closure report. **Worker repatriation** Ensure that all foreign workers are repatriated upon completion of work as required by the labor Regulation.			
Operation phase					
Operation and maintenance (O&M) of infrastructure	Infrastructure may not be resilient, sturdy and sustainable	Thromde will incorporate an operation and maintenance regime, that includes; • Allocate annual budget for maintenance work • Designate personnel to carry out regular check and maintenance work	Thromde operating budget	Thromde	-
	Impacts on public health and environment due to poor treatment, supply of water not meeting drinking water standards	• Prepare water security plan for Ammochu LAP separately or part of Phuentsholing water security plan • Immediately after completion of construction works, conduct comprehensive testing of water supply, before supplying to the consumers; ensure that water supply meets drinking water standards of Bhutan; all essential physical, chemical and biological parameters must be tested • Establish a water surveillance program to monitor raw and treated (disinfected) water quality periodically at source, water reservoirs and at consumer end.	Thromde operating budget	Thromde	-
	Increased demand for services and impact on sustainability	• formulate and implement infrastructure augmentation and investment plans, especially for water supply, sewerage and solid waste management, comprehensively considering overall developments envisaged in Phuentsholing as per the structure plan, and projected spatial and population growth.	Capital budget from Thromde, RGOB and supported by financing partners as needed	Thromde	MOF, RGOB
	Risk to the health and safety of O&M staff	• Maintain annual budget for worker trainings, briefings and PPE • Ensure that operators of machines are certified and well trained	Thromde operating budget	Thromde	-

Project Activities	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Ensure that repair and maintenance workers are provided with adequate benefits, appropriate PPE, • Develop proper standard procedures, and ensure workers are regularly guided and supervised.			
	Damage to infrastructure and impacts on community health and safety due to natural hazards and disasters	• Strengthen collaboration with National Centre for Hydrology and Meteorology to ensure that timely warning of flood events • Strengthen dissemination of early and timely warning for people to evacuate in case of a flood event. • Conduct training for communities living along the banks of the river and adjacent to it on • Strengthen Thromde's disaster preparedness and response mechanisms • Monitor active landslide areas to detect changes in slope movements and potential risks • Restrict future infrastructure work in areas where landslides may be triggered • Promote community awareness, mobilization, volunteerism and cooperation for such emergencies	Thromde operating budget	Thromde	-
	Damage to infrastructure due to private construction work	• The project design provisions for water supply, sewerage, power and telecommunications connections from private property in the future. The integrated service utility duct will be underground so it will be protected. • The Thromde will prepare guidelines and development controls that will safeguard the newly constructed infrastructure.	Thromde operating budget	Thromde	-

C. Monitoring and Reporting

346. The Environmental Monitoring Plan is linked to the Environmental Management Plan. Therefore, the environmental performance of the project will be measured against the following criteria:

(i) Air emission and dust- measures to contain air emission and dust during construction;
(ii) Water supply –The provision of facilities to ensure safe and adequate water supply for construction as well as domestic needs of staff and workers;
(iii) Waste disposal- Receipt of waste disposal permit and the number of truckloads of excavated materials and waste segregated, reused, recycled and disposed;
(iv) Traffic congestion – Number of accidents due to material transportation and drop off;
(v) Worker Health and Safety- The number of accidents and emergencies must be recorded with actions taken to prevent repeat of the same mistakes in the future; and
(vi) Community health and safety- The number of grievances and complaints received by the community during project construction and operation.

347. Environmental monitoring is an obligatory aspect of project implementation. The ADB SPS requires that the borrower/client monitor and measure the progress of implementation of the EMP. The extent of monitoring activities will be commensurate with the project's risks and impacts. In addition to recording information to track performance, the borrower/client will undertake inspections to verify compliance with the EMP and progress toward the expected outcomes.

348. More specifically, environmental monitoring during project implementation is required to:

(i) assess project performance against agreed criteria;
(ii) identify any environmental harm and non-compliance issues;
(iii) provide data to support compliance;
(iv) prepare corrective action plans is required; and
(v) meet government approval/ permit conditions and ADB requirements.

349. The PMU, will monitor the progress of EMP implementation and compliance with ADB SPS requirements and national rules and regulations/guidelines. The PMU will coordinate and monitor project activities contractor to ensure timely implementation of project activities.

350. The contractor will submit monthly reports to the PPMU with jurisdiction over the project. The monthly reports will include compilation of copies of monitoring sheets accomplished and duly signed by the contractor's EHS supervisor (or equivalent) on a daily basis. A sample daily monitoring sheet which can be used by the contractor is in Appendix 7. This monitoring sheet is indicative which can be further enhanced depending on the actual situations at project construction site.

351. PMU shall consolidate contractor's monthly reports, and reports from the PMU on its independent monitoring or inspection activities. PMU shall accomplish semi-annual environmental monitoring report (SEMRs), which shall be submitted to ADB for review and disclosure on ADB website. Submission of SEMR will continue until ADB issues a project completion report (PCR).

352. Monitoring and reporting will be undertaken during project implementation to ensure that the procedures are being adequately implemented and to identify any modifications or corrective action that may be required to improve the efficiency of the EMP throughout the project implementation process. The environmental reporting will cover developments that have taken place in relation to the loan recipient project during the reporting period, report any changes in the design or procedures, management or site-specific situations.

Table 36: Environmental Monitoring Plan

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
Pre-Construction					
1	Process for EC • Environmental clearance	PMU		EO	PMU
2	Finalization of LAP design with risk mitigation study recommendations and implementation plan for risk mitigation measures	• Final infrastructure design • Ris mitigation measures	One time	EO	PMU
3	Roles and responsibilities and awareness of project site supervision team	• Office order • TOR for Site supervision team • Training materials • Participant list	One time	EO	PMU
4	Awareness and training of Contractor	• Pre-bid meeting to inform contractors • No. of trainings and dates • Contractor's attendance sheet	One time	EO	PMU
5	Incorporating of EMP into bid documents	• EMP included in bid document	One time	EO	PMU
6	Incorporating of OHS requirements into contract	• OHS component included in Contract	One time	EO	PMU
7	Project disclosure and information	• Project information/brief on Thromde website, • Project contact number on signboards • Minutes of Meeting/Consultation with Affected people and community	One time	EO	PMU
Construction phase					
8	Consents and Permits	• Valid tree removal permit • Waste disposal permits • Labour permit for workers	One time	Contractor	PMU
9	Recruitment of workers	• No. of workers (nationals/foreign- by gender) • No. of skilled and unskilled workers • No. of workers below age 18	During recruitment	Contractor	PMU
10	Workers' welfare (health and safety)	• No. of worker camps • Availability of safe drinking water, electricity and sanitation facilities	Monthly	Contractor	PMU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
		(with separate toilets for males and females) • PPE distribution list/records • Ocular inspection of the cleanliness of worker camps • safety structure installed • Overtime facilities provided • Emergency Contact numbers displayed • Assembly points identified • Emergency protocols • First aid kid • Warning signs at risky/hazardous areas • Records in accident register with incidents and actions taken. • No of fire extinguishers installed at site • Type and no. of trainings (training record)			
11	Temporary land use/lease	• Land lease agreement between Contractor and landowner/government	One time	Contractor	PMU
12	Air quality	• Ambient air quality measurement • Ocular observation of vehicles and site conditions • Use of reconditioned machines and vehicles. • Maintenance of machines • Ocular observation of dust and dust suppression measures undertaken as per EMP	Semi-annually (ambient air quality measurement) Monthly or as necessary (ocular)	Contractor	PMU
13	Noise levels	• Ambient noise level measurement • Number of noise complaints from the community.	Semi-annually (ambient air	Contractor	PMU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
			quality measurement) Monthly or as necessary (ocular)		
14	Water supply and conservation	• No. of water storage tanks. • Measures taken during periods of shortage. • No. of water supply repair and maintenance works	Monthly or as necessary	Contractor	PMU
15	Waste management of worker camps, construction sites	• No. and types of waste bins installed • No. of truckloads of construction waste disposed • Types of solid waste segregated and reused • Ocular inspection of camps and construction site • Segregation, storage of hazardous waste	Monthly or as necessary	Contractor	PMU
16	Generation of excavated soil	• % soil reused for construction • % soil disposed • Ocular observation of soil pileup at site	One time	Contractor	PMU
17	Site drainage	• Site drainage • Connection to storm water drainage • Repair and maintenance of drains • Ocular observation of site drainage	Monthly or as necessary	Contractor	PMU
18	Damage to private property	• No. of complaints received from community and private owners	Semi-annually	Contractor	PMU
19	Congestion and blockages/obstructions	• No. of complaints on congestion caused by Construction traffic • Ocular observation of road conditions (spillage of construction material	Monthly	Contractor	PMU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
		along access road, blockage of drains and footpaths)			
20	Material storage	• No. of material storage sheds • Ocular observation on material storage at site • Material inventory	Monthly	Contractor	PMU
21	Community health and safety	• Consultation with community (minutes of meeting, participant list) • No. of safety signs • Installation of barricades • Obstruction of access routes/paths • No. of accidents occurred • No. of complaints received	Monthly	Contractor	PMU
22	Camp closure	• Ocular observation of site conditions and compliance to EMP	One time	Contractor	PMU
Operation phase					
23	Land use in LAP	• Development and land use in the LAP	Annually	PMU	PMU
24	Maintenance of Infrastructure	• O & M budget, schedule and reports	Annually	PMU	PMU
25	Worker OHS	• O& M staffing and qualification • POE and OHS SOP	Annually	PMU	PMU
26	Natural Hazards and Disaster	• # of disasters related trainings • Monitoring reports	Annually	PMU	PMU
27	Infrastructure resilience/sustainability	• Guidelines and development control • #damage to infrastructure	Annually	PMU	PMU

D. Capacity Building

353. The PMU with the support of ADB will facilitate the implementation of capacity building program for the PMU and contractors, with specific topics on environmental safeguards such as but not limited to the list below. The capacity building program will be participatory to the extent possible and will employ a variety of approaches to be more effective (such as learning by doing, role playing, group exercises, on-the-job training, etc.). A pre and post training assessment will be undertaken to measure the effectiveness of the ram. The contractors will be responsible for conducting site-specific/work-specific orientation on environmental safeguards for their workers**.**

Table 37: Training Modules for Environmental Management

Module	Frequency of Sessions	Target participants	Source of funds
1. Introduction and Sensitization to Environmental Issues (One-day workshop): • ADB Safeguards Policy Statement; • Government of Bhutan applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHS, etc.; • Sensitization on Project environmental concerns, environmental impacts of urban infrastructure improvement projects. \ • Incorporation of EMP into the project design and contracts, IEE update and revision and amendment, EMP implementation • Monitoring, reporting (including unanticipated events and fatalities) and corrective action planning • Dealing with unanticipated incidents and ADB incident reporting procedures	Once during Pre-construction	PMU staff and Contractor engineers	PMU
Preparing and implementing SEMP (1/2 day - once at the beginning and at a frequency of once in six months during implementation	Once during Pre-construction	PMU staff and Contractor engineers	PMU
Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction (health and safety, core labor laws, spoils management, emergency preparedness and response) -	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work All workers (including unskilled laborers)	PMU staff and Contractor engineers	Contractor

Module	Frequency of Sessions	Target participants	Source of funds
3. Community Health and Safety (1/2 day) • Roles and responsibilities; • Managing worker behavior and community relations • Construction traffic management plan • Waste management plan • Site clean-up and restoration	Once before and during construction	PMU staff and Contractor engineers	Contractor

E. Cost of EMP Implementation and Monitoring

354. Implementation of the EMP and monitoring of environmental conditions at the site will entail costs that will be borne by the Contractor. Such costs shall be included in the bidding and contract documents to ensure that all environmental measures are implemented and monitored without any budget constraints or impediments. These costs have been estimated as far reasonably as possible, and therefore indicative.

Table 38: Indicative Cost of EMP Implementation and Monitoring

	Activities or Items	Unit of Measure	No. of Units	Unit Cost ($)	Total ($)
A	EMP Implementation				
A.1	Providing barricade around work sites	Lump Sum			6,000.00
A.2	Providing project sign board, safety signage boards, caution tapes, pamphlets	Lump Sum (LS)			3000.00
A.3	Providing water sprinkling three times a day during construction works at site	LS			3000.00
A.5	Trainings and awareness programs to Contractor's labors at least in the project period.(Induction training, types of job specific training should be mentioned clearly and training plan should be submitted by Contractor).	no.	3	500.00	1500.00
A.6	Provide personal protective equipment, first aid kits, fire extinguishers. (PPE extra stock of minimum 10% of total workers should be available with stock and issue register should be available for inspection.	LS			5000.00
A.7	Hire of dedicated Environment, Health and Safety Officer throughout contract period to ensure compliance with national EC and EMP safeguard compliances with one standby emergency vehicle.	months	18	1,000.00	18,000.00
B	**EMP MONITORING** (Note: For environmental quality monitoring, reports should be submitted along with the signature of witness/consultant on the conduct of sampling).				
B.1	Monitoring of Air Quality at the site (PM10, PM2.5, TSP, CO, NOx, Sox)	Site	every 3 months	150	1800
B.2	Monitoring of Noise Level at the site (Leq day and night)	Site	every 3 months	150	1800

	Activities or Items	Unit of Measure	No. of Units	Unit Cost ($)	Total ($)
B.3	Monitoring of Surface Water Quality at 1 location	Samples	every 6 months	150	900
C.	Enhancement Measures				
C.1	Landscaping after the construction period	m2	Cost included in Contractor's BOQ cost.		
F.	Contingency (10%)	3,200			
	Total	35,200.00			

X. CONCLUSION AND RECOMMENDATION

355. The IEE process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed in Ammochhu Local Planning Area (LAP) under the proposed ADB funded IRUDP. Potential negative impacts were identified in relation to design, construction, and operation of the proposed infrastructure. The proposed project builds on ADB's long-standing support to Phuentsholing under earlier urban infrastructure and township development initiatives, which improved basic services, flood protection, and public amenities.

356. Phuentsholing, Bhutan's second-largest city and primary commercial gateway, faces intense urbanization pressure driven by cross-border trade, employment opportunities, and housing demand. The Ammochhu LAP, covering approximately 99 acres, represents a strategic growth zone adjacent to the ADB funded Phuentsholing Township Development Project (PTDP). PTDP has reduced exposure to major river flooding through floodplain reclamation and embankment protection. Rapid population growth and planned land allocations are expected to increase development density, with the Ammochhu LAP projected to accommodate approximately 20,000 residents as part of Phuentsholing's growth toward over 80,000 residents by 2037. This subproject will develop essential urban infrastructure in Ammochhu LAP, including roads, stormwater drainage and embankment protection, utility corridors, water supply, sewerage, solid waste collection, street lighting, footpaths, etc., The water, sewer network, and solid waste systems will be connected to existing city and newly developed infrastructure in PTDP. Therefore, provision in subproject is limited to distribution and collection systems, and does not include source, treatment or disposal related infrastructure.

357. Phuentsholing Thromde planned Ammochhu LAP in 2014 and it was approved by the National Commission on Human Settlements in 2019. This LAP forms part of the Phuentsholing structure plan (2013-28), and about 64% of LAP falls within the Urban Village 1 (UV-1) precinct, designated for high- and medium-density mixed-use development, and about 5% in green and open spaces. Ammochhu LAP is part of Phuentsholing structure plan of Phuentsholing town, which includes 12 LAPs and Thromde core area. The project once completed will benefit the people of Phuentsholing and will contribute to improved living conditions in the town. Besides, Output 3 of the IRDUP will support Phuentsholing Thromde in reviewing and updating its urban policies and land-use-based planning framework, including integration of land use provisions, development control regulations and design guidelines aimed at improving resilience in landslide- and flood-prone areas, such as requirements for elevated ground floors, restrictions on basement use, allocation of lower floors for temporary or non-residential purposes, and the adoption of climate adaptation measures. These will be undertaken in close consultation with the Ministry of Infrastructure and Transport, as well as local communities.

358. Project site, Ammochhu LAP, is spread over an area of 99 acre (~40 hectares) in the northern part of the Town, with Damdara hill to its east and Phuentsholing–Chamkuna Road on the west. Site is gently sloping from east to west, towards Ammochhu River. Slope is comparatively steeper toward the hillside. PTDP site abuts Ammochhu River and PCR separated PTDP and Ammochhu LAP. Land use of the site is predominantly urban. There are no environmentally or culturally sensitive areas within or adjacent to the project site. Damdara hill is covered with thick vegetation and trees; however, this is not a forest area, and wildlife is limited. The project does not encroach into the hilly area. Though there are no proper infrastructure like roads, there are few residential and commercial buildings. A number of engineering and repair workshops, material stockyards, operating temporarily, which will be shifted out to designated areas as there is no industrial land use in the LAP. Tree cover is sparse and will require removal of few trees along the eastern edge for the proposed road.

359. Phuentsholing is prone to landslides and flooding. The planned development incorporates protective measures (e.g., PTDP embankment and river training works for fluvial flooding from the Ammochhu River), Phuentsholing will continue to face a range of hazards under present and future climatic conditions. Ammochhu LAP situated in the foothills of Damdara hill is also vulnerable, especially to flooding, debris flow induced by landslides in the upper hills. There are various outflow drainage channels that traverse Ammochhu LAP, and the PTDP and discharge into Amcochhu River. Outfalls carry debris and sediment and pose risk to drainage channels and flooding of the surrounding areas. Accordingly, IRUDP will apply a risk-informed approach to planning, design and implementation to avoid increasing existing vulnerabilities, creating new risks through maladaptation, or locking-in development in high-risk areas. This will include integrating climate change allowances and appropriate safety margins into relevant infrastructure designs, and strengthening non-structural measures (e.g., land-use controls and development sequencing under the Ammochhu LAP, risk communication, and preparedness and response arrangements, to manage residual risk over the asset life. Flood risk considerations have been incorporated into the land preparation and infrastructure development plans for the LAP. Under the subproject, the outfall channels have been designed with improved sections, sediment or debris traps, supported by retaining walls to withstand the anticipated flows.

360. Therefore, the subproject is unlikely to have any notable negative impacts due to the subproject design or location. Appropriate measures are already integrated into subproject designs. To comprehensively address Phuentsholing vulnerabilities and risks posed by slope instability, landslides, floods, debris flows, and LDOFs, two studies (geohazard study part of a UNDP program, and BARHKH study under an ADB TA) are underway in Phuentsholing, which also cover vulnerable areas above the Ammochhu LAP. To address any residual risks, it is important that findings and recommendations of these studies are duly considered, integrated into Ammochhu LAP development and implemented. Detailed designs shall be reviewed, including climate change allowances and safety margins, validated, and/or updated accordingly. Phuentsholing Thromde shall ensure that any recommendations and additional works in the studies to improve the slope stability and minimize debris flow, which are beyond the scope of the subproject, shall be carefully identified, and an implementation plan drawn up with funding sources. This shall be firmed up prior to bidding for Ammochhu LAP infrastructure. Consultations with Ammochhu LAP, and other stakeholders from PTDP, Phuentsholing core town and other LAPs shall be continued, feedback if any shall be considered in finalizing the designs and implementation. Measures to manage residual risks to residents and assets from failure of flood and other hazard defenses such as strict land use zoning, development controls and enforcement, extended range hazard early warning systems (HEWS), raised public awareness of risks and responses through drills and emergency preparedness, and evacuation routes to shelters and training shall be incorporated into Ammochchu LAP.

361. Negative impacts are anticipated during the construction, resulting from the conduct of works, such as dust, noise, waste generation, water pollution, traffic, and associated occupational and community health and safety risks. Since the works will be conducted within partially developed neighborhoods, excavations and works may pose risks to nearby buildings and structures. These impacts are common impacts of works in urban areas and can be readily controlled and brought to acceptable levels through effective engineering design and by implementing the recommended mitigation measures outlined in the EMP. Operational phase will focus on standard maintenance of infrastructure, meaning that any effects will be primarily localized.

362. The operation phase impacts are not notable. Mitigation measures have been developed for all identified impacts and incorporated in the EMP. Provision of infrastructure in LAP will lead to increase in population and increase the load on municipal services. The existing systems, together with PTDP infrastructure, will be adequate to meet the demand. Ammochhu LAP is part of Phuentsholing structure plan, therefore this is envisaged development, and Thromde will expand the services and increase the capacities gradually as the demand grows. Phuentsholing Thromde shall formulate and implement infrastructure augmentation plans, especially for water supply, sewerage and solid waste management, considering overall population growth, demand for services and available supply levels, as per Phuentsholing structure plan.

363. Mitigation measures will be assured by a program of environmental monitoring conducted during the construction phase to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off- site, environmental quality monitoring, document checks, and interviews with workers and the community. Regular supervision, monitoring and reporting at all levels - by the Contractor, PMU and PMU, must be adhered to so that the Environmental Monitoring Reports can accurately reflect work progress and site conditions as well as compliance with the environmental safeguard's conditions in the loan agreement, ADB SPS, national environmental regulations and the EMP.

364. Stakeholders were involved in developing the IEE through face-to-face discussions and on-site meetings, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the Phuentsholing Thromde and ADB websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

365. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009). To comply with the national regulations, Phuentsholing Thromde will submit the IEE/EIA to DECC and obtain environmental clearance prior to invitation of bids. Phuentsholing Thromde must obtain all other necessary statutory clearances, permits and approvals, prior to bidding or start of construction as applicable.

366. **Recommendation.** (i) review, validate, and/or update the subproject designs with the findings and recommendations of the UNDP and BARHKH studies upon completion, (ii) plan for implementation of additional measures, if any, beyond the scope of IRUDP, recommended by the studies to improve slope stability, reduce risks of landslides, debris flows, and LDOFs incidents affecting Ammochhu LAP, (iii) prepare implementation plan including identifying funding sources, and (iv) conduct / continue public consultations with Ammochhu LAP and wider stakeholders on Ammochhu LAP design, risk mitigation studies and measures

367. Update IEE to reflect final updated / validated designs and submit to ADB for review and disclosure, prior to invitation of bids; the approved updated IEE shall be attached to the bid and contract documents (v) Obtain environmental clearance from DECC for Ammochhu LAP, prior to invitation of bids, (v) No work can commence until (a) updated IEE, if needed, is approved by ADB is provided to the Contractor, and (b) the SEMP prepared by the Contractor is approved by PMU or PMU. In the event of any design change during subproject implementation period, the IEE shall be updated to include assessment of impacts due to the design change, any corrective actions, associated cost, and revised schedule.

Appendix 1: Rapid Environmental Assessment Checklist

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 (SDSS) for endorsement by the Director, SDSS 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: IRUDP

Sector Division: Urban Development

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area			
Densely populated?		✓	Currently the LAP area comprises of scattered residential buildings. Much of the land issued for industrial, automotive/workshops and as storage areas for sand, bitumen and construction material. Over the last few years, in preparation of the LAP development, the Thromde has relocated workshops out of the site. The current population of the LAP and PTDP is only 4,171[81]
Heavy with development activities?	✓		Phuentsholing Thromde is the second largest Thromde in the country. The site is along the Phuentsholing- Chamkuna Highway which is quite congested with boulder carrying trucks traveling along the highway. The site is also located close to the PTDP project .
Adjacent to or within any environmentally sensitive areas?		✓	No
Cultural heritage site		✓	The closest heritage site is outside the LAP boundary so there will be no direct impact on the Shedra.

[81] *CHCPT 2021. Comprehensive Household Census of Phuentsholing Thromde & Peri-urban Areas (RIGSS in collaboration with Chhukha Dzongkhag & Phuentsholing Thromde)*

Screening Questions	Yes	No	Remarks
Protected Area		ü	The nearest protected area is the Jigme Khesar Strict Nature Reserve, located within a 50 km buffer. Of the five KBAs within a 50 km radius within Bhutan, only Kamji is within a 10 km radius, while Toorsa Strict Nature Reserve is within 50km. and three are 1-50km. As Phuentsholing is the border town, the IBAT indicates the proximity of the site to 3 KBAs are in India. The project area is separated from these by settlements in India.
Wetland		✓	There is no wetland in and around the area.
Mangrove		✓	There are no coastal areas in Bhutan.
Estuarine		✓	There are no Estuarine areas in Bhutan.
Buffer zone of protected area		✓	The closest protected area (Jigme Khesar Strict Nature Reserve) is within the 50km buffer.
Special area for protecting biodiversity		✓	There is no special area for protecting biodiversity in and around the area.
Bay		✓	There are no coastal areas in Bhutan.
B. Potential Environmental Impacts Will the Project cause…			
impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.	✓		The Thromde is set to operate the newly constructed Solid Waste Treatment Yard, so all waste from the Ammochhu LAP will be transported and processed here.
deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?		✓	The current baseline conditions of the LAP consist mostly of temporary settlements, except the NHDCL colony and few private buildings. The project aims to improve water supply, sewerage and waste management in the LAP. LAP is planned as mixed precinct with predominantly commercial use, which will in turn decongest the city core
degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?		✓	The project site is far from these types of ecosystems.
dislocation or involuntary resettlement of people?		✓	The project will not require resettlement of persons.
disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable group?		✓	The project will improve living conditions for all persons. All infrastructure work will be carried out on land collectively taken from land owners as part of land pooling- so no poor, vulnerable persons are impacted. There are no indigenous people in the project area.
degradation of cultural property, and loss of cultural heritage and tourism revenues?		✓	No, there are no cultural site or tourist destinations that will be impacted by the project.

Screening Questions	Yes	No	Remarks
occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		✓	The project will not impact squatters and low-income groups as land was pooled from property owners.
water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters?		✓	The site is already connected by the municipal water supply line. The Ammochhu river lies towards the west. The project aims to improve sewerage system in the LAP as currently half of the households and buildings are unconnected to t he sewerage network.
air pollution due to urban emissions?	✓		This is anticipated during construction phase. The LAP is already facing dust pollution issues. Actions are underway to minimize dust pollution through provision of a dedicated parking space and dust suppression. The project will also include measures to minimize air pollution and dust in the environmental management plan (EMP).
risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation?	✓		This is anticipated during construction phase. Occupational health and safety hazards from construction works will be mitigated through the OHS measures, many of which are mandatory by regulation. The environmental management plan (EMP) of the project will provide measures to mitigate this impact.
road blocking and temporary flooding due to land excavation during rainy season?		✓	Land excavation activities will be planned and executed so as not to obstruct any existing roads or access routes. Potential localized flooding will be prevented through the provision of temporary drainage systems to safely convey runoff away from excavated areas and prevent water accumulation at the site.
noise and dust from construction activities?	✓		This is anticipated during the construction phase. The LAP is already facing dust pollution issues. Actions are underway to minimize dust pollution through the provision of a dedicated parking space and dust suppression. The project will also include measures to minimize air pollution and dust in the environmental management plan (EMP).
traffic disturbances due to construction material transport and wastes?	✓		It is anticipated that an increase in traffic will be caused by material transporting vehicles, especially as the main highway passes through the site. The project will require the contractor to prepare a traffic management plan to reduce congestion.

Screening Questions	Yes	No	Remarks
temporary silt runoff due to construction?	✓		This is anticipated if excavation works are undertaken during the rainy season. The EMP of the project will provide measures to avoid or minimize runoff, such as for example, avoiding or minimizing heavy excavation works during monsoon season and providing silt traps
hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		✓	Ammochhu LAP is an open river valley with good natural ventilation but is already facing issues of dust pollution. Existing dust issues are mainly related to unpaved surfaces, vehicle movement, and open sand piles. Mitigation measures are in the pipeline by the Thromde. The project will also include dust suppression measures in the EMP to reduce pollution.
water depletion and/or degradation?		✓	During construction phase, there will be an increase in demand for water use for construction activities as well as for domestic purposes, but this will be temporary. Through the project, a comprehensive water supply system for the LAP is being planned in line with the Thromde Water and Wastewater Master Plan.
overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?	✓		Ground water has been tapped to supply water to the city for over a decade. Water extraction is controlled by the Thromde. Water for the project will be tapped from the Ammochhu river wherever possible.
contamination of surface and ground waters due to improper waste disposal?	✓		The contractor will be required to follow Thromde's waste disposal system.
pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?		✓	This is not anticipated. The Ammochhu river is not used for livelihood activities or drinking water supply.
large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	✓		The project will recruit both foreign and local workers but it is not anticipated that this will burden the infrastructure as the water supply storage tanks and sanitation facilities are the responsibility of the contractor
social conflicts if workers from other regions or countries are hired?	✓		This could happen due to differences between workers but the issue is only during the construction period and appropriate measures will be undertaken to minimize social conflicts. Workers will be required to follow the code of conduct and provided with briefings during induction.
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?	✓		Fuel, paints and other chemicals normally will be used during construction phase, but not explosives. The EMP of the project will provide measures to avoid potential impact of fuel or chemical spills during construction phase.

Screening Questions	Yes	No	Remarks
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?	✓		The EMP of the project will provide measures to avoid potential impacts to communities, such as for example, work areas to be clearly demarcated with signages and provided with safety barriers, and access by public will be restricted. Only workers and project concerned members will be allowed to visit the operational site.

Appendix 2: Groundwater quality monitoring data

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DOC NO : QLS/SAMP/08-D/00

TEST REPORT

Name & Address Of the Customer:	Report No.	: QLS/P-68/25-26/C/26
	Date	: 12.12.2025
Deki. P. Yonten, Consultant	Sample No.	: QLS/P-68/25-26/26
	Sample Description	: Drinking Water
	Location Code & Name	: DW-1
	Sampling Method	: APHA 24th Edition 2023; 1060B
	Date of Performance	: 27.11.2025-03.12.2025
	Sample Drawn On	: 22.11.2025
	Ref No. Date	: Work Order Dated. 26.03.2025

Analysis Result

(A) Microbiological Analysis

Sl.No.	Characteristic	Ambient Water Quality Standard as per National Environment Commission, Royal Government of Bhutan, June 2020			Test Method	Result
		A	B	C		
1.	Faecal Streptococci MPN/100ml	20	1000	1000	IS 1622-1981 (RA 2019)	<2
2.	E. coli MPN/100ml	--	--	--	IS 1622-1981 (RA 2019)	<2

Detection Limit:

1. Faecal Streptococci – 2 MPN/100 ml
2. E. coli MPN/100ml - 2 MPN/100 ml

(B) Chemical Analysis

Sl. No.	Test Parameter	Test Method	Ambient Water Quality Standard as per National Environment Commission, Royal Government of Bhutan, June 2020			Result
			A	B	C	
1.	pH Value at 25°C	IS 3025 (Part 11): 2022	6.5-8.5	6.0-9.0	6.0-9.0	7.12
2.	Colour in Hazen Units	IS 3025 (Part 4): 2021	5	50	---	<5
3.	Total Suspended Solid (as TSS) in mg/l	APHA 24th Edition-2023, 2540D	25	100	---	<2.5
4.	Electrical Conductivity in µS/cm at 25°C	IS 14767 :2000, RA 2016	800	1000	2000	418
5.	Odour	IS 3025 (Part 5): 2018	Unobjectionable	Unobjectionable	---	Unobjectionable
6.	Turbidity in NTU	IS 3025 (Part 10): 2023	5	---	---	<1.0
7.	Mineral Oil	IS 3025 (Part 39): 2021	No film	No film	---	<0.5
8.	Nitrate (as NO_3) in mg/l	IS 3025 (Part 34): 1988(RA 2019)	10	50	---	<0.2
9.	Fluoride (as F) in mg/l	APHA 24th Edition-2023, 4500 F D	1	2.0	---	<0.1
10.	Sulphate (as SO_4) in mg/l	IS 3025 (Part 24): Sec 1, 2022	25	100	---	3.1
11.	Chloride (as Cl) in mg/l	IS 3025 (Part 32): 1988 (RA 2019)	50	200	---	9.3
12.	Surfactants or Anionic Detergent in mg/l	IS 13428-2005(Annex K) RA 2018	0.1	0.2	---	<0.02
13.	Phosphate (as PO_4) in mg/l	APHA 24th Edition-2023, 4500-P-D	0.5	<0.1	---	<0.15
14.	Dissolved Oxygen in mg/l	APHA 24th Edition-2023, 4500-O-C	6	4	---	6.7
15.	Biochemical Oxygen Demand (as BOD) mg/l	IS 3025 (Part 44)-1993, RA:2019	2	5	50	0.5
16.	Total Kjeldahl Nitrogen (as N) in mg/l	APHA 24th Edition-2023, 4500 Norg – B	0.5	2.0	---	<0.1
17.	Ammonia (as total ammonia – N) in mg/l	IS 3025 (Part 34): 1988(RA 2019)	0.05	0.5	---	<0.5
18.	Dissolved Iron (as Fe) in mg/l	IS 3025 (Part 53): 2003 (RA 2019)	0.2	0.5	---	0.02
19.	Copper (as Cu) in mg/l	IS 3025 (Part 42): 1992(RA 2019)	0.05	0.5	---	<0.02
20.	Zinc (as Zn) in mg/l	IS 3025 (Part 49): 1994 (RA 2019)	0.2	0.5	---	<0.02
21.	Arsenic (as As) in mg/l	IS 3025 (Part 37): 2022	0.01	0.05	---	<0.005
22.	Cadmium (as Cd) in mg/l	IS 3025 (Part 41): 2023	0.003	0.003	---	<0.002
23.	Total Chromium (as Cr) in mg/l	IS 3025 (Part 52): 2014(RA 2019)	0.05	0.05	---	<0.05
24.	Lead (as Pb) in mg/l	IS 3025 (Part 47): 1994 (RA 2019)	0.02	0.02	---	<0.01
25.	Selenium (as Se) in mg/l	IS 15303: 2003 (RA 2018)	0.01	0.01	---	<0.005
26.	Mercury (as Hg) in mg/l	IS 3025 (Part 48): 1994(RA 2019)	0.0005	0.0005	---	<0.001

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27.	Phenolic Compounds (as C_6H_5OH) in mg/l	IS 3025 (Part 43): Sec 1, 2022	0.001	0.002	---	<0.001
28.	Cyanide (as CN) in mg/l	IS 3025 (Part 27): 1986(RA 2019)	0.05	0.05	---	<0.02
29.	Polynuclear hydrocarbons (as PAH) in mg/l	APHA 24th Edition, 6440:2023	0.0002	0.0002	0.001	<0.0001
30.	Total Pesticides	Calculation	0.0005	0.0005	0.001	<0.0005
31.	Polychlorinated biphenyls (as PCBs) in mg/l	ASTMD 5175-91, RA 2003	0.0002	0.0002	---	<0.0001
32.	Sodium Absorption Ratio	Calculation	---	---	26	0.88
33.	Boron (as B) in mg/l	IS 13428-2005(Annex L); RA:2018	---	---	1	<0.5
34.	Floating Materials	Observation	Absent	Absent	---	Absent
35.	Manganese (as Mn) in mg/l	IS 3025 (Part 59): 2023	0.4	---	---	<0.02
36.	Total Dissolved Solids (as TDS) in mg/l	IS 3025(Part 16)-2023	500	1500	2100	234
37.	Calcium Hardness in mg/l	APHA 24th Edition-2023, 3500 Ca B	200	---	---	108.0
38.	Magnesium Hardness in mg/l	APHA 24th Edition-2023, 3500 Mg B	200	---	---	61.2
39.	Barium (as Ba) in mg/l	APHA 24th Edition-2023, 3111 D	0.7	---	---	<0.05
40.	Total Alkalinity (as HCO_3) in mg/l	IS 3025 (Part 23): 1986(RA 2014)	---	---	---	216.0
41.	Sodium (as Na) in mg/l	APHA 24th Edition-2023, 3500 Na – B	---	---	---	26.3
42.	Potassium (as K) in mg/l	APHA 24th Edition-2023, 3500 K – B	---	---	---	6.4
43.	Free Residual Chlorine in mg/l	IS 3025 (Part 26) 1986 RA: 2021	---	---	---	<0.1

Report Prepared By:

for **Qualissure Laboratory Services**
Reviewed & Authorized By

Soumy Chakraborty, Microbiologist
(Authorized Signatory)

for **Qualissure Laboratory Services**
Reviewed & Authorized By

Bishnupriya Banerjee, Chemist
(Authorized Signatory)

——End of the Report——

Appendix 3: Result of IBAT screening

IBAT

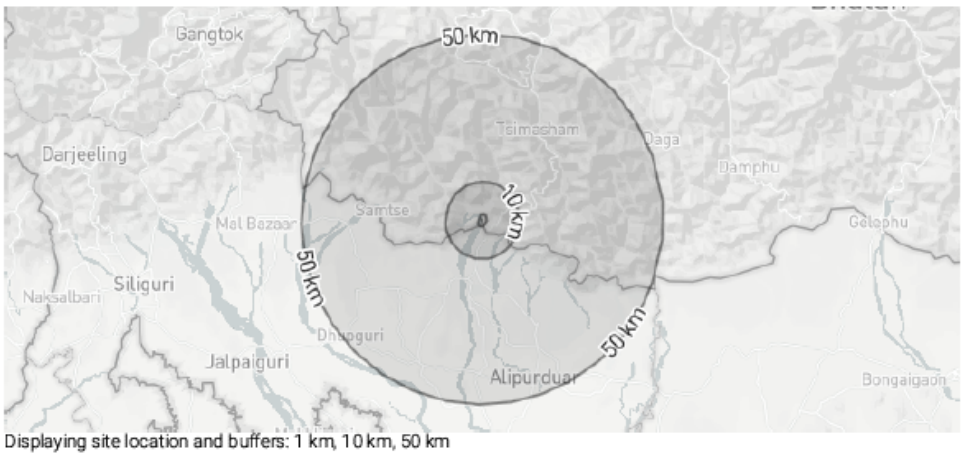
Integrated Biodiversity Assessment Tool
World Bank Group Biodiversity Risk Screen

AMOCHHU LAO

- **Country:** Bhutan
- **Location:** [26.9, 89.4]
- **IUCN Red List Biomes:** Terrestrial
- **Created by:** Deki Yonten

Overlaps with:

Protected Areas	1 km: 0	10 km: 0	50 km: 1	1
World Heritage (WH)	1 km: 0	10 km: 0	50 km: 0	0
Key Biodiversity Areas	1 km: 0	10 km: 2	50 km: 3	5
Alliance for Zero Extinction (AZE)	1 km: 0	10 km: 0	50 km: 0	0
IUCN Red List	1 km: 17	10 km: 14	50 km: 14	45
Critical Habitat				Likely



Displaying site location and buffers: 1 km, 10 km, 50 km

WORLD BANK GROUP

This report is based on IFC Performance Standard 6 (PS6) but applies to World Bank Environmental and Social Standard 6 (ESS6)

Priority Species

Habitat of significant importance to priority species will trigger Critical Habitat status (See PS6: para 16). IBAT provides a preliminary list of priority species that could occur within a 1 km, 10 km or 50 km buffer. This list is drawn from the IUCN Red List of Threatened Species (IUCN RL). This list should be used to guide any further assessment, with the aim of confirming known or likely occurrence of these species within the site area. It is also possible that further assessment may confirm occurrence of additional priority species not listed here. It is strongly encouraged that any new species information collected by the site be shared with species experts and/or IUCN wherever possible in order to improve IUCN datasets.

IUCN Red List of Threatened Species - CR & EN

The following species are potentially found within 1 km, 10 km or 50 km of the area of interest.
For the full IUCN Red List, including the results from the 1 km, 10 km and 50 km buffers please refer to the associated CSV in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome	Within buffer of
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Freshwater, Terrestrial	1 km
Amolops monticola	Mountain Cascade Frog	AMPHIBIA	EN	Decreasing	Freshwater, Terrestrial	1 km
Cuon alpinus	Dhole	MAMMALIA	EN	Decreasing	Terrestrial	1 km
Axis porcinus	Hog Deer	MAMMALIA	EN	Decreasing	Freshwater, Terrestrial	1 km
Manis pentadactyla	Chinese Pangolin	MAMMALIA	CR	Decreasing	Terrestrial	1 km
Haliaeetus leucoryphus	Pallas's Fish-eagle	AVES	EN	Decreasing	Freshwater, Terrestrial	1 km
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial	1 km
Trillium tschonoskii	Keun-yeon-yeong-cho	LILIOPSIDA	EN	Decreasing	Terrestrial	1 km
Hardella thurjii	Crowned River Turtle	REPTILIA	EN	Decreasing	Freshwater, Terrestrial	1 km

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome	Within buffer of
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial	1 km
Aquila nipalensis	Steppe Eagle	AVES	EN	Decreasing	Terrestrial	1 km
Nardostachys jatamansi	Indian Nard	MAGNOLIOPSIDA	CR	Decreasing	Terrestrial	1 km
Podophyllum hexandrum	Himalayan Mayapple	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial	1 km
Nilssonia gangetica	Indian Softshell Turtle	REPTILIA	EN	Decreasing	Freshwater, Terrestrial	1 km
Nilssonia hurum	Indian Peacock Softshell Turtle	REPTILIA	EN	Decreasing	Freshwater, Terrestrial	1 km
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial	1 km
Calidris tenuirostris	Great Knot	AVES	EN	Decreasing	Marine, Freshwater, Terrestrial	1 km
Caprolagus hispidus	Hispid Hare	MAMMALIA	EN	Decreasing	Terrestrial	10 km
Geoclemys hamiltonii	Spotted Pond Turtle	REPTILIA	EN	Decreasing	Freshwater, Terrestrial	10 km
Indotestudo elongata	Elongated Tortoise	REPTILIA	CR	Decreasing	Terrestrial	10 km
Emberiza aureola	Yellow-breasted Bunting	AVES	CR	Decreasing	Freshwater, Terrestrial	10 km

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome	Within buffer of
Varanus flavescens	Yellow Monitor	REPTILIA	EN	Decreasing	Terrestrial	10 km
Moschus leucogaster	Himalayan Muskdeer	MAMMALIA	EN	Decreasing	Terrestrial	10 km
Perdicula manipurensis	Manipur Bush-quail	AVES	CR	Unknown	Terrestrial	10 km
Pangshura sylhetensis	Assam Roofed Turtle	REPTILIA	CR	Decreasing	Freshwater, Terrestrial	10 km
Morenia petersi	Indian Eyed Turtle	REPTILIA	EN	Decreasing	Freshwater, Terrestrial	10 km
Nilssonia nigricans	Black Softshell Turtle	REPTILIA	CR	Decreasing	Freshwater, Terrestrial	10 km
Elephas maximus	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial	10 km
Melanochelys tricarinata	Tricarinate Hill Turtle	REPTILIA	EN	Decreasing	Terrestrial	10 km
Houbaropsis bengalensis	Bengal Florican	AVES	CR	Decreasing	Terrestrial	10 km
Hoya bhutanica		MAGNOLIOPSIDA	EN	Unknown	Terrestrial	10 km
Dactylorhiza hatagirea	Salampanja	LILIOPSIDA	EN	Decreasing	Terrestrial	50 km
Batagur dhongoka	Three-striped Roofed Turtle	REPTILIA	CR	Decreasing	Freshwater, Terrestrial	50 km
Ploceus megarhynchus	Finn's Weaver	AVES	EN	Decreasing	Terrestrial	50 km

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome	Within buffer of
Ailurus fulgens	Red Panda	MAMMALIA	EN	Decreasing	Terrestrial	50 km
Eutropis quadratilobus		REPTILIA	EN	Unknown	Terrestrial	50 km
Gyps tenuirostris	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial	50 km
Manis crassicaudata	Indian Pangolin	MAMMALIA	EN	Decreasing	Terrestrial	50 km
Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	EN	Decreasing	Freshwater, Terrestrial	50 km
Ardea insignis	White-bellied Heron	AVES	CR	Decreasing	Freshwater, Terrestrial	50 km
Litsea assamica		MAGNOLIOPSIDA	EN	Unknown	Terrestrial	50 km
Cryptocarya cavei		MAGNOLIOPSIDA	CR	Unknown	Terrestrial	50 km
Bulbophyllum leopardinum var. tuberculatum		LILIOPSIDA	CR	Unknown	Terrestrial	50 km
Ceropegia bhutanica		MAGNOLIOPSIDA	EN	Unknown	Terrestrial	50 km
Strobilanthes accrescens subsp. accrescens		MAGNOLIOPSIDA	EN	Unknown	Terrestrial	50 km

Restricted Range Species

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome	Within buffer of
Amolops monticola	Mountain Cascade Frog	AMPHIBIA	EN	Decreasing	Freshwater, Terrestrial	1 km
Amolops marmoratus	Marbled Sucker Frog	AMPHIBIA	LC	Decreasing	Freshwater, Terrestrial	1 km
Prodasineura odoneli		INSECTA	DD	Unknown	Freshwater, Terrestrial	1 km
Gynacantha odoneli		INSECTA	DD	Unknown	Freshwater, Terrestrial	1 km
Macromia pallida		INSECTA	DD	Unknown	Freshwater, Terrestrial	1 km
Prinia cinereocapilla	Grey-crowned Prinia	AVES	VU	Decreasing	Terrestrial	1 km
Megophrys parva	Concave-crowned Horned Toad	AMPHIBIA	DD	Unknown	Freshwater, Terrestrial	10 km
Paradoxornis flavirostris	Black-breasted Parrotbill	AVES	VU	Decreasing	Freshwater, Terrestrial	10 km
Spelaeornis caudatus	Rufous-throated Wren-babbler	AVES	LC	Decreasing	Terrestrial	10 km
Trochalopteron imbricatum	Bhutan Laughingthrush	AVES	LC	Stable	Terrestrial	10 km
Micryletta aishani	Northeast Indian Paddy Frog	AMPHIBIA	DD	Unknown	Freshwater, Terrestrial	50 km
Uperodon assamensis	Assamese Balloon Frog	AMPHIBIA	VU	Decreasing	Freshwater, Terrestrial	50 km
Minervarya chilapata	Chilapata Rainpool Frog	AMPHIBIA	VU	Decreasing	Freshwater, Terrestrial	50 km

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome	Within buffer of
Eutropis quadratilobus		REPTILIA	EN	Unknown	Terrestrial	50 km
Chrysomma altirostre	Jerdon's Babbler	AVES	VU	Decreasing	Freshwater, Terrestrial	50 km
Tylototriton himalayanus	Himalayan Salamander	AMPHIBIA	VU	Decreasing	Freshwater, Terrestrial	50 km

IBAT

Biodiversity features which are likely to trigger Critical Habitat

Protected Areas

The following protected areas are found within 1 km and 10 km and 50 km of the area of interest.
For further details please refer to the associated CSV file in the report folder.

Area name	Distance	IUCN Category	Status	Designation	Recommendation
Jigme Khesar Strict Nature Reserve	50 km	Ia	Designated	Strict Nature Reserve	Assess for critical habitat

Key Biodiversity Areas

The following key biodiversity areas are found within 1 km and 10 km and 50 km of the area of interest.
For further details please refer to the associated CSV file in the report folder.

Area name	Distance	AZE	Recommendation
Jaldapara Wildlife Sanctuary	10 km	No	Assess for critical habitat
Kamji	10 km	No	Assess for biodiversity risk
Gorumara National Park	50 km	No	Assess for critical habitat
Samtse	50 km	No	Assess for biodiversity risk
Toorsa Strict Nature Reserve	50 km	No	Assess for critical habitat

Species with potential to occur

IBAT

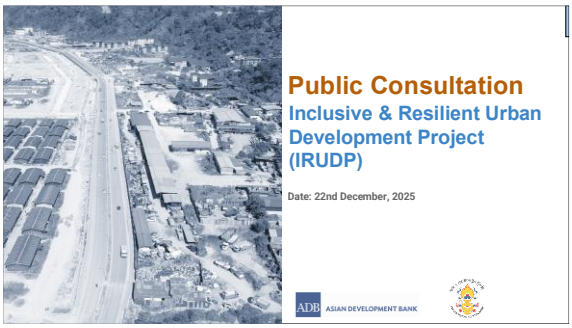
Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
AMPHIBIA	42	4	0	1	3	0	36	2
LILIOPSIDA	37	7	1	2	4	0	28	2
AVES	697	30	7	5	18	39	628	0
REPTILIA	114	20	4	9	7	5	86	3
INSECTA	110	0	0	0	0	1	104	5
MAMMALIA	144	25	1	8	16	15	103	1
MAGNOLIOPSIDA	100	13	2	5	6	3	78	6
GASTROPODA	1	0	0	0	0	0	1	0
MALACOSTRACA	1	0	0	0	0	0	1	0
ARACHNIDA	3	0	0	0	0	0	3	0
SORDARIOMYCETES	1	1	0	0	1	0	0	0
AGARICOMYCETES	4	0	0	0	0	0	4	0

Appendix 4: Details of stakeholder consultation meeting, December 22, 2025

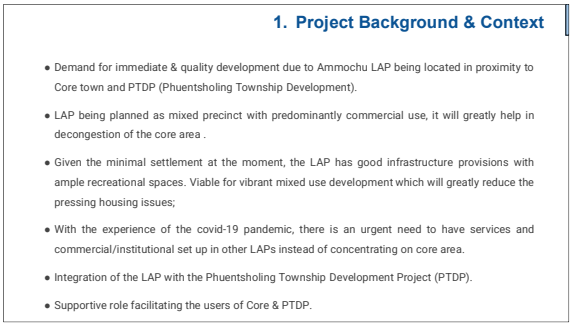
Thromde presentation for the Consultative Meeting

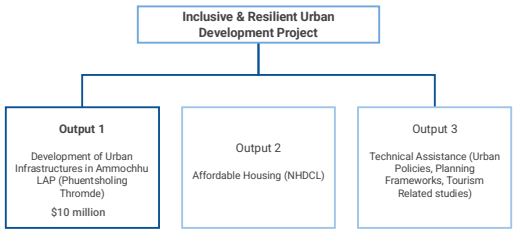
Presentation at the Public Consultation

Slide 1 and 2

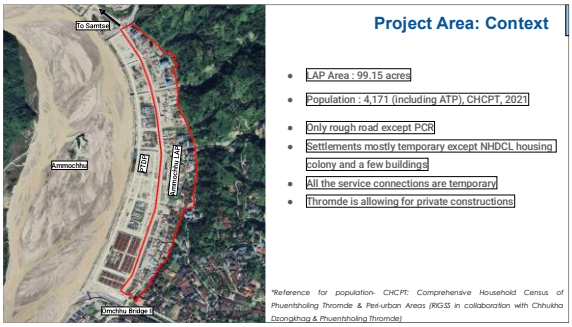


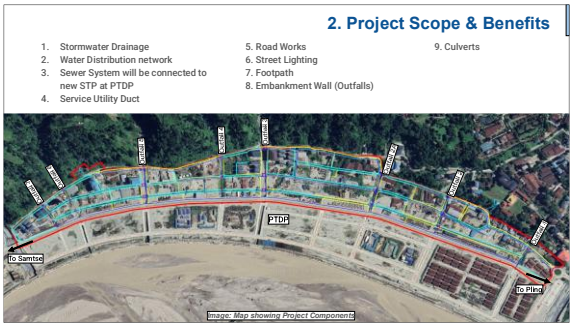
Slide 3 and 4





Slide 5 and 6





Slide 7 and 8

Project Scope: Priority Projects

DPR prepared in 2022. BOQ updated as per BSR, 2025

Project Cost Abstract for IRUDP, Ammochhu LAP
Phuentsholing Thromde
(as per Bhutan Schedule of Rates, 2025)

			1 $= Nu. 89.19 as of October 1, 2025	
Sl.No	Items	Cost (Nu.) BSR 2025	Cost in USD ($)	In Million USD
1.0	Stormwater Drainage	120,039,184.39	1,345,882	**1.35**
2.0	Water Distribution network	29,510,727.39	330,875	**0.33**
3.0	Sewer System	90,361,599.00	1,013,136	**1.01**
4.0	Service Utility Duct	139,079,756.58	1,559,365	**1.56**
5.0	Road Works	180,486,589.33	2,023,619	**2.02**
6.0	Street Lighting	25,491,986.85	285,817	**0.29**
7.0	Footpath	34,201,542.93	383,468	**0.38**
8.0	Embankment Wall	65,392,469.47	733,182	**0.73**
9.0	Culverts	155,258,427.23	1,740,760	**1.74**
	Total Cost	**839,822,283.17**	9,416,104	**9.42**
	Total Project Cost (Priority Activities)	***$ 9.42 million***		

*Out of the 15 infrastructure development components, 9 projects have been identified as priority activities to align with the available budget of **USD 10 million**. The remaining components will be implemented departmentally or through the RGoB budget.*

Current Scenario

Current scenario with unpaved roads, lack of drainage channels & unsafe outfall corridors

Slide 9 and 10

Current Scenario

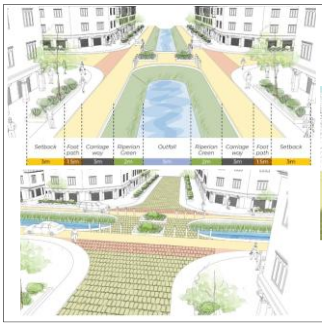
Images showing the current scenario with unaesthetic power line and road corridors

Proposals

Proposed Road RoW with clear pedestrian & carriage provisions

Slide 11 and 12

Proposals



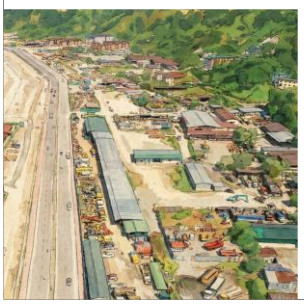
Proposed Road & outfall designs/road networks as per plan

Project Benefits

- Quality and holistic urban infrastructure development at one go
- Supportive extension to PTDP & Core area
- Includes construction of drains, outfalls, and retaining structures to effectively address seasonal debris flow issues and enhance site safety.
- Foundation for orderly future growth
- Output 3 of the project shall examine how the individual structure will be safeguarded against flooding/debris flow

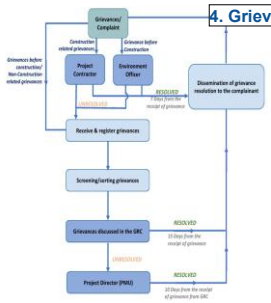
Slide 13 and 14

3. Project Status / Update



- **Project Financing: $15 million (10 mil civil works+5 mill Project Management Cost)**
- **Fact Finding Mission: November 17-22, 2025**
  - Discussion on project components
  - Site Visits
- Project Timeline: **5 years** (Phuentsholing Thromde & NHDCL)
- **Project Approval** Target: **June, 2026**
- Currently working on packaging the project activities (**2 packages**)

4. Grievance Redress Mechanism (GRM)



- Mechanism to receive and facilitate the resolution of complaints/grievances related to the Project.
- To take necessary steps in order to harmonize project activities as well as the wellbeing of the general public.
- Several mechanisms for lodging complaints will be made available once the project kickstarts
  - Email submission
  - Mobile phones/messages
  - Walk-in submission
  - Through Tshogpas/representatives

Minutes of Consultation Meeting

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ROYAL GOVERNMENT OF BHUTAN
PHUENTSHOLING THROMDE
POST CODE 21101, POST BOX NO. 02, PELKHIL LAM

PT/Ammochhu LAP/ 25-26/ Date:22/12/2025

Subject: Public Consultation Meeting for Inclusive & Resilient Urban Development Project (IRUDP), Ammochhu LAP
Date: 22nd December, 2025
Venue: MPH, Phuentsholing Higher Secondary School

ADB Officials/Representatives Present:
1. Sonam Zam, BHRM
2. Kali Sankar Gosh, Social Safeguard Consultant
3. Deki Yonten, Environmental Safeguard Consultant
4. Rada Dukpa, Gender Focal, BHRM
5. Changa Dorji, Gender Focal, Consultant

Thromde Officials Present:
1. Uttar Kumar Rai, Thrompon/Mayor
2. Pema, Executive Secretary
3. Govinda Sharma, Principal Architect
4. Nar Bdr, Nyedra Thuemi
5. Chhime Dolkar Phuntshok, Senior Urban Planner
6. Ugyen Pemo, Urban Planner
7. Yeshey L Dema, Legal Officer
8. Kinley Wangdi, Assistant Environment Officer
9. Purni Maya Tamang, Engineer
10. Rigyel, Asst. Procurement Officer
11. Cheni Maya, Sr. Technician
12. Chencho, Asst. Engineer

Attendance of plot owners/representatives: Attached

Background/Overview:

The Phuentsoling Thromde, in partnership with the Asian Development Bank, has been diligently preparing for the Inclusive & Resilient Urban Development Project (IRUDP), wherein the principal focus regarding the Ammochhu Local Area Plan (LAP) encompasses the development of critical infrastructures within the LAP. Although multiple public consultation meetings were convened at various phases; specifically during the initial LAP preparation in 2014, the LAP review in 2019, and the Urban Design preparation in 2022, this particular public consultation was organised to apprise the public and relevant stakeholders of the ADB funding secured for infrastructural development in the LAP, delineate the project scope, solicit feedback and observations, and address any associated concerns.

Public announcements regarding the meeting were disseminated via the Phuentsholing Thromde website and its official social media platforms on December 5, 2025. Furthermore, a public notice was published in the national newspaper, Kuensel, on December 6, 2025. The

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PT/Ammochhu LAP/ 25-26/ Date:22/12/2025

information was also circulated through the Ammochhu plot owners' WhatsApp group and relayed by the elected representative, Thromde Tshogpa.

Meeting:

The public consultation commenced with a brief address by the Executive Secretary, who conveyed deep appreciation to the ADB for its unwavering support to Thromde in executing various projects to date, and also expressed gratitude to the public for their participation in the meeting. Attendees were apprised of the initiation and approval process of the project, which entailed thorough examination and deliberation. It was underlined that the execution of such endeavors poses significant challenges. Participants were urged to engage actively, seek clarifications, and extend their support to ensure the realization of the project.

The following three presentations were made to the public as follow:

1. ***Project Update:***
   - The presentation, conducted by Phuentsholing Thromde, outlined the scope of the project and anticipated advantages. The public was briefed about the allocated budget and the various components slated for implementation. Additionally, the current status of the project and proposed activities were thoroughly discussed, including provisions for grievance redress both prior to and throughout the project's execution.
2. ***Social Safeguard Policy:***
   - The ADB social safeguard consultant delivered a brief presentation outlining the safeguard policies in place to ensure the smooth implementation of the project. It was emphasized that the project is well planned and adopts a holistic approach, covering multiple infrastructure components without causing adverse impacts, thereby indicating a highly positive overall outcome. The public was also presented with examples of best practices demonstrating how social welfare is integrated into projects of a similar scale. In addition, the consultant commended the meeting, noting that it was a meaningful public consultation in line with ADB's expectations.
3. ***Environmental Safeguard Policy:***
   - The environmental safeguard consultant delivered a presentation on the project's environmental aspects, highlighting that such assessments are a mandatory requirement for all ADB-funded projects. The presentation emphasized the importance of addressing community health and safety, natural hazards, and related risks during the project implementation phase.

Following each presentation, the session was opened for questions/concerns, and the

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discussions proceeded as follows:

#	Concerns/Queries	Clarifications Provided
1	***LAP Filling:*** • Concerns were raised about the ongoing land-filling activities in the LAP and their potential impact on future development once the project begins. • Thromde was also asked to clarify who would be responsible for carrying out the filling works.	• It was clarified that any land-filling activities in Ammochhu LAP, whether carried out by private individuals or the Thromde, are conducted in accordance with the levels specified in the Urban Design. All necessary development approvals must be obtained through the Thromde, ensuring that design levels conform to the plan. • Regarding responsibility for filling, it was explained that it is preferable for private owners to fill their own plots as needed, since development plans can vary between plots. For the Thromde to undertake filling across the entire LAP, all temporary structures would need to be cleared, which is difficult to coordinate. Therefore, the Thromde shall focus only on developing essential infrastructure, while individual plot owners will be responsible for filling their plots according to their specific design or construction requirements. The Thromde will, however, provide the required filling levels to ensure alignment with the infrastructure. • It was also noted that during the construction of the PCR (highway), the Thromde, in collaboration with DoST, attempted to fill the LAP as part of the PCR project but was unable to do so because existing structures could not be cleared, despite notifications being issued to plot owners.
2	***Drainage, flood & landslides:*** • The importance of drainage system and protection against disaster	• Thromde acknowledged the concern and clarified that disaster resilience, particularly against floods and landslides, remains a top priority and is therefore incorporated as a key focus area within the project. • Construction of the storm water drainage

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#	Concerns/Queries	Clarifications Provided
	(flood/landslides) were stressed and requested Thromde to include an extensive provision to address these concerns since the current system/provisions are not enough	system, embankment walls along the outfalls are the main components of the project.
3	***Ongoing Construction:*** • The public also raised concerns about how the upcoming project might affect ongoing construction activities, given that these works are already underway before the project begins.	• Thromde clarified that the ongoing construction should not face any issues, as all approvals have been granted in accordance with the detailed infrastructure designs.
4	***Development of Zones C, D, E of PTDP:*** • There were also queries regarding the anticipated timeline of developing zone C,D, E of PTDP	• Thromde explained that the PTDP is a completely separate project implemented by DHI, and its execution is entirely under their control. Additionally, Zones C, D, and E are located in a different district (Samtse), limiting the Thromde's role in their development. However, since these zones are nearby and could ultimately affect Phuentsholing, efforts were made to bring all PTDP zones under Phuentsholing's jurisdiction. As there was no response, the matter has remained inactive. • Thromde further noted that issues related to PTDP require separate discussions with DHI

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PT/Ammochhu LAP/ 25-26/ Date:22/12/2025

#	Concerns/Queries	Clarifications Provided
		and encouraged participants to raise such concerns directly with the relevant agencies. Thromde also committed to addressing these issues whenever such dialogues occur.
5	***Highway truck traffic:*** • The public highlighted that the increasing number of trucks on the highway is affecting livelihoods and settlements due to noise and dust pollution, as well as contributing to the deterioration of road infrastructure.	• It was acknowledged that the concerns regarding trucks operating on the highway particularly in an area expected to have high-density development and a major commercial hub are shared by the Thromde, and ADB has also raised questions on this issue. While recognizing the seriousness of the matter, it was noted that it also relates to the country's economy, and since truck operations on the highway are authorized directly by the central agency, the Thromde is currently not in a position to halt these activities. • However, the Thromde assured that these concerns have been communicated to higher authorities and that efforts to address the issue will continue.
6	***Compensation for existing structures:*** • A query was raised concerning compensation entitlements for existing structures that had been approved when the area was under Dungkhag administration. There was also a request to extend the timeline for relocating these	• Thromde clarified that entitlements to compensation for existing structures affected by planning must follow the established rules and regulations. Since the structure in question was constructed for industrial use when the area was under Dungkhag administration, the plot owner was requested to provide any proof or documentation of approval to be considered for compensation. • Concerning the request for an extension of time to shift or remove structures located within the road corridor, the public was informed that notifications were issued by the Thromde one and a half years ago, providing sufficient time for relocation. State land within the vicinity cannot be allocated, as the entire

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#	Concerns/Queries	Clarifications Provided
	structures and to allow their temporary continued use for industrial purposes on state land provided by the Thromde.	Ammochhu LAP is planned as a high-density mixed-use commercial zone, and industrial use is not compatible with this plan. Thromde also highlighted that it has been actively exploring available land in other LAPs where industrial activities are permitted, making the relocation of industries from Ammochhu LAP a priority, and will continue to seek suitable plots for industrial use elsewhere.
7	***Encroachment by private plot owner:*** • A representative from a private company raised a concern that an adjoining plot had encroached on their land, hindering their planned construction. The Thromde was asked whether this issue would be addressed by the Thromde or the Police.	• It was clarified that the Thromde addresses encroachment issues only on state land, and this particular case is complex, as the adjoining owner may challenge the Thromde's authority to intervene. Nevertheless, Thromde will review the matter and discuss possible ways to resolve the issue.
8	***Hazardous area in the hillside:*** • Concerns on Phuentsholing being a fragile area and particularly the area towards the hillside was raised and requested Thromde to not	• While Thromde acknowledged the concern, it was also emphasized that the perspectives of landowners on the hillside need to be considered, as they have aspirations to develop their land. It was further clarified that areas with very high hazard levels are designated as the E1 precinct, where construction is not permitted. • The public were informed on another ADB project underway (BARHKH) concerning the

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ROYAL GOVERNMENT OF BHUTAN
PHUENTSHOLING THROMDE
POST CODE 21101, POST BOX NO. 02, PELKHIL LAM

PT/Ammochhu LAP/ 25-26/ Date:22/12/2025

#	Concerns/Queries	Clarifications Provided
	allow construction on the hillside.	slope stabilization of the hillside area and are expected to provide recommendations on how to mitigate disasters.
9	***Landscaping / Plantation*** • Thromde was asked about the provisions for landscaping and plantation works, emphasizing that these should be given due importance.	• It was clarified that in the annual budgeting, Thromde always keeps a separate budget provision for 'landscaping & beautification' along with the budget for upkeeping of infrastructures.
10	***Facilitation for construction after Infrastructure is already developed in the LAP*** • Similar to the PTDP, where infrastructure was developed while leaving plots vacant for future construction, a similar situation is expected for Ammochhu LAP, as not all plot owners may build prior to the infrastructure development. Concerns were raised on how such developments would be facilitated, given	• Thromde responded that simultaneous development on private plots while the infrastructure development is ongoing would be preferable. However, since such a scenario is not ideal, development in future after the development of infrastructure would come with restrictions that developers would have to comply with to maintain the quality infrastructures.

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ROYAL GOVERNMENT OF BHUTAN
PHUENTSHOLING THROMDE
POST CODE 21101, POST BOX NO. 02, PELKHIL LAM

PT/Ammochhu LAP/ 25-26/ Date:22/12/2025

#	Concerns/Queries	Clarifications Provided
	that construction on individual plots after infrastructure development could potentially damage the infrastructure.	

While the consultation meeting was engaging, the Mayor expressed concerns regarding the relatively low levels of public participation in such gatherings and underscored the significance of collaboration and active involvement. Thromde asserted that it has consistently acted in the public's interest and solicited the community's support in these matters, as securing and executing a project of this magnitude entails considerable challenges and extensive scrutiny. Among the 12 Local Area Plans (LAPs) under Phuentsholing Thromde, the Ammochhu LAP stands out as the sole plan wherein its infrastructure will be developed holistically at one go, diverging from the typical approach of incremental construction based on governmental budgets. Consequently, Thromde urged the plot owners of the Ammochhu LAP to actively support and collaborate to ensure the project is completed timely without any complications.

དཔལ་ལྡན་འབྲུག་གཞུང་ ཕུན་ཚོགས་གླིང་ཁོལ་སྡེ།
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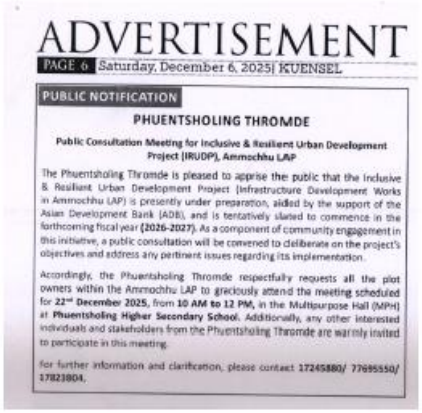
PT/Ammochhu LAP/ 25-26/ Date:22/12/2025

Fig: Images from the Public Consultation



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PAGE 6 Saturday, December 6, 2025| KUENSEL

PUBLIC NOTIFICATION

PHUENTSHOLING THROMDE

Public Consultation Meeting for Inclusive & Resilient Urban Development Project (IRUDP), Ammochhu LAP

The Phuentsholing Thromde is pleased to apprise the public that the Inclusive & Resilient Urban Development Project (Infrastructure Development Works in Ammochhu LAP) is presently under preparation, aided by the support of the Asian Development Bank (ADB), and is tentatively slated to commence in the forthcoming fiscal year (2026-2027). As a component of community engagement in this initiative, a public consultation will be convened to deliberate on the project's objectives and address any pertinent issues regarding its implementation.

Accordingly, the Phuentsholing Thromde respectfully requests all the plot owners within the Ammochhu LAP to graciously attend the meeting scheduled for 22nd December 2025, from 10 AM to 12 PM, in the Multipurpose Hall (MPH) at Phuentsholing Higher Secondary School. Additionally, any other interested individuals and stakeholders from the Phuentsholing Thromde are warmly invited to participate in this meeting.

For further information and clarification, please contact 17245880/ 77695550/ 17823804.

Fig: Announcement in the National Newspaper (Kuensel) left: Thromde Facebook page (Right)

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PT/Ammochhu LAP/ 25-26/ Date:22/12/2025

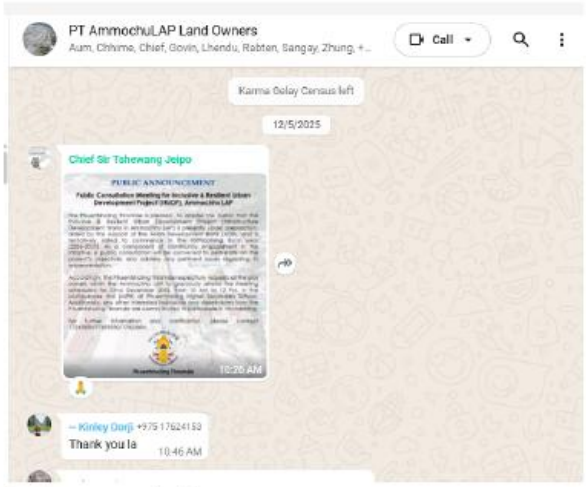

Fig: Announcement in Whatsapp group

Attendance Sheet

IRUDP, Ammochhu LAP: Phuentsholing Thromde

Community Consultation

Package Name:

Date : Dec 22, 2025

Place :

Sl No	Name of Participant	M - F	Address/Contact No	Occupation	Land owner/other(please specify)	Signature of Participant
1	Phuntsho Wangdi	M	17710396	Business man	Land owner	
2.	Kezang Norbu.	M	17605583	Business man.	Land owner	
3.	Phuntsho Dorjee	M	17698791	"	Representative	
4.	Tandin Bidha	F	17110171	"	Land Owner.	
5.	Karma Jigme	M	17110227	"	Representative	

Sl No	Name	M/F	Address/contact no	Occupation	Land owner/others (Specify)	Signature
6	Lt Col K Tharchin	M	Druklhang Alloy Ltd. 17965350	GM	Company representative	[signature]
7	Tenzin Wangdi	M	Thangtong Iron steel	CM	land owner	[signature]
8	Chimi Pem	F	77236151	–	Staff/Koamo Group	[signature]
9	Tandin Wangyel	M	17116111	Business	Land Owner	[signature]
10	Nar Bdr Rai	M	17664381	Thrimi	Thrimi	[signature]
11	Karma Choezang	M	17114539	BTL	BTL	[signature]

IRUDP, Ammochhu LAP: Phuentsholing Thromde

Community Consultation

Package Name:

Date :

Place :

Sl No	Name of Participant	M - F	Address/Contact No	Occupation	Land owner/other(please specify)	Signature of Participant
12	Lal Dhoj Ghalley	M	BTL	Sr. Technical Officer	–	[signature]
13	Gopal Subba	M	BPC	Engineer	–	[signature]
14	Lak Tshering L	M	BPC	Engineer	–	[signature]
15.	Dawa Doma	F	77610834	Owner —	–	[signature]
16.	Sonam Drukpa	M.	77115917	Owner —	–	[signature]

17	[illegible] WANGDI	M	Private 17603771		Land owner.	
18	Kuenga Gelayltsen	M	17110075			
19	Rastan Wangyu	M	17110308			
20	Rinzin Gyamtsho	M	17601580			
21	Jampel. Rigsar Construction Pvt Ltd.	M	17673952		—	
22.	Cheni Maya	F	17742801	Civil Servant P/ling Thromde.	—	

IRUDP, Ammochhu LAP: Phuentsholing Thromde

Community Consultation

Package Name:

Date :

Place :

Sl No	Name of Participant	M - F	Address/Contact No	Occupation	Land owner/other(please specify)	Signature of Participant
23	Chencho	M	17979040	P/ling Thromde	—	
24	Kinlay Wangdi	M	77695550	- 11 -	—	
25	Rigyel	M	17990299	- 11 -	-	
26	Purni Maya [illegible]	F	17823804	11		
27	Sonam Tshering	M	77207558	*	Representative	

IRUDP, Ammochhu LAP: Phuentsholing Thromde

Community Consultation

Package Name:

Date :

Place :

Sl No	Name of Participant	M - F	Address/Contact No	Occupation	Land owner/other(please specify)	Signature of Participant
23	Chencho	M	17979040	Pling Thromde	—	
24	Kinley Wangdi	M	77695550	"	—	
25	Rigyel	M	17990299	"	—	
26	Purna Maya Tamang	F	17823804	"		
27	Sonam Tshering	M	77207558	"	Representative	

Sl No	Name	M/F	Address /contact no.	Occupation	Land owner / other (please specify)	Signature
28	Pema Lhaden	F	17601651	Business	Land owner	
29	Tshering Zam	F	77103762	"	"	

Appendix 5: Grievance Registration Format

(To be available in English or other local language, Dzongkha)

The Phuentsholing Thromde welcomes complaint, suggestion, query, or comment regarding the project implementation. We encourage any person or group with a grievance to provide their name and contact information 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					
Village / Town					
Thromde/Dzongkhag					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide details of the grievance (who, what, where and how): ***Note: You may attach a document, letter, or note in the grievance form.**					
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)	
If – then mode: ▪ Note/Letter ▪ E-mail ▪ Verbal/Telephonic	
Reviewed by: (Name, Signature, Position)	
Action Taken:(Date, Venue of Meeting, Other details)	
Whether Action Taken Disclosed:	▪ **Yes** ▪ **No**

Means of Disclosure:

Appendix 6: Suggested Template for Record-Keeping of Grievances

S. No.	Date of receipt of grievance	Name and contact details of complainant	Description of complaint	Nature of complaint	Decisions taken	Response given to complainant and date	Whether closed/ resolved

Appendix 7: Sample Environmental Site Inspection Checklist for Contractors

DAILY MONITORING SHEET FOR CONTRACTORS

Contractor Monitoring Sheet

Name of Project: _____
Location of Project: _____
Chainage covered (for linear works): _____
Supervising Officer: _____
Contractor: _____
Contractor EHS Supervisor (or equivalent): _____
Date of monitoring: _____

Summary of Findings

Monitoring Item	Status	Remarks
1. Compliance with Local Permit Requirements	**(Secured / Application Submitted / Not Applicable)**	
Location/zoning permits		
Permit to construct		
Building permit		
Transport / hauling permits		
2. Compliance with IEE Requirements	**(Approved / Under Preparation / Submitted to PMU for Approval)**	
Site-specific EMP (SEMP)		
Corrective Action Plan, if any		
3. Compliance with SEMP		
Construction Site	**(Satisfactory / Needs Improvement / Not Implemented)**	
- Conduct of toolbox talk		
- Use of PPE		
- Rest areas for male and female workers		
- Toilets for male and female workers		
- Medical kits		
- Drinking water supply		
- Dust control		
- Noise control		
- Solid waste management		
- Wastewater management		
- Chemicals storage (fuel, oil, etc.)		
- Siltation or erosion control		
- Heavy equipment staging / parking area		
- Barricades around excavation sites		
- Access to residential houses/shops/businesses		
- Traffic routing signages		
- Lightings at night		
- Trench shoring / landslide protection		
Construction Workers' Camp Site	**(Available / Needs Improvement / Not Available)**	
- Quarters for male and female workers		

Monitoring Item	Status	Remarks
- Sleeping utilities (e.g. beds, pillows, blankets, mosquito nets, etc.)		
- Power/Electricity supply		
- Drinking water supply		
- Toilets for male and female workers		
- General purpose water supply (cooking, washing, bathing)		
- Cooking facilities and areas		
- Solid waste management		
- Wastewater management		
- Pest control		
4. Implementation of GRM	**(Yes / No or None / Under Resolution)**	
Complaints		
Complaints resolution		
5. Environmental Quality Measurement	**(Passed / Failed / Not Applicable)**	
Ambient air quality sampling		
Noise level measurement		
Receiving water quality sampling		

Other Issues: _____

_____

_____

_____

Attachments:
1. Copies of permits obtained, if any.
2. Photos taken at worksites, if any.
(photos attached in previous monitoring sheets should not be used again).
3. Laboratory results of environmental quality measurements, if any.

Prepared by: _____
Name, Designation and Signature

Appendix 8: Sample Environmental Site Inspection Checklist for PMU

INSPECTION CHECKLIST FOR PMU

SITE INSPECTION CHECKLIST

Project: _____ Date: _____
Location: _____
Chainage (for linear works): _____

Monitoring/Inspection Questions		Findings			Comments / Clarifications
1.	Supervision and Management Onsite	Yes	No	NA	
	a. Is an EHS supervisor available?				
	b. Is a copy of the SEMP available?				
	c. Are daily toolbox talks conducted on site?				
2.	The Facilities	Yes	No	NA	
	a. Are there a medical and first aid kits on site?				
	b. Are emergency contact details available on-site?				
	c. Are there PPEs available? What are they?				
	d. Are the PPEs in good condition?				
	e. Are there firefighting equipment on site?				
	f. Are there separate sanitary facilities for male and female workers?				
	g. Is drinking water supply available for workers?				
	h. Is there a rest area for workers?				
	i. Are storage areas for chemicals available and with protection? in safe locations?				
3.	Occupational Health and Safety	Yes	No	NA	
	a. Are the PPEs being used by workers?				
	b. Are excavation trenches provided with shores or protection from landslide?				
	c. Is breaktime for workers provided?				
	d. How many for each type of collection vehicle is in current use?				
4.	Community Safety	Yes	No	NA	
	a) Are excavation areas provided with barricades around them?				
	b) Are safety signages posted around the sites?				
	c) Are temporary and safe walkways for pedestrians available near work sites?				
	d) Is there a record of treated wastewater quality testing/measurement?				
5.	Solid Waste Management	Yes	No	NA	
	a. Are excavated materials placed sufficiently away from water courses?				
	b. Is solid waste segregation and management in place?				
	c. Is there a regular collection for solid wastes from work sites?				
6.	Wastewater Management	Yes	No	NA	

Monitoring/Inspection Questions		Findings			Comments / Clarifications
	a) Are there separate sanitary facilities for various types of use (septic tanks, urination, washing, etc.)?				
	b) Is any wastewater discharged to storm drains?				
	c) Is any wastewater being treated prior to discharge?				
	d) Are measures in place to avoid siltation of nearby drainage or receiving bodies of water?				
	e) Are silt traps or sedimentation ponds installed for surface runoff regularly cleaned and freed of silts or sediments?				
7.	Dust Control	Yes	No	NA	
	a. Is the construction site watered to minimize generation of dust?				
	b. Are roads within and around the construction sites sprayed with water on regular intervals?				
	c. Is there a speed control for vehicles at construction sites?				
	d. Are stockpiles of sand, cement and other construction materials covered to avoid being airborne?				
	e. Are construction vehicles carrying soils and other spoils covered?				
	f. Are generators provided with air pollution control devices?				
	g. Are all vehicles regularly maintained to minimize emission of black smoke? Do they have valid permits?				
8.	Noise Control	Yes	No	NA	
	a) Is the work only taking place between 7 am and 7 pm, week days?				
	b) Do generators operate with doors closed or provided with sound barrier around them?				
	c) Is idle equipment turned off or throttled down?				
	d) Are there noise mitigation measures adopted at construction sites?				
	e) Are neighboring residents notified in advance of any noisy activities expected at construction sites?				
9.	Traffic Management	Yes	No	NA	
	a) Are traffic signages available around the construction sites and nearby roads?				
	b) Are re-routing signages sufficient to guide motorists?				
	c) Are the excavation sites along roads provided with barricades with reflectors?				
	d) Are the excavation sites provided with sufficient lighting at night?				
10.	Recording System	Yes	No	NA	

Monitoring/Inspection Questions		Findings			Comments / Clarifications
	a) Do the contractors have recording system for SEMP implementation?				
	b) Are the daily monitoring sheets accomplished by the contractor EHS supervisor (or equivalent) properly compiled?				
	c) Are laboratory results of environmental sampling conducted since the commencement of construction activities properly compiled?				
	d) Are these records readily available at the site and to the inspection team?				

Other Issues: _____

_____

_____

_____

Prepared by: _____

Name, Designation and Signature