

Initial Environmental Examination

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Bhutan: Green and Resilient Affordable Housing Sector Project – Thimphu

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CURRENCY EQUIVALENTS

(as of 20 August 2021)

Currency unit	–	Bhutanese Ngultrum (Nu)
Nu1.00	=	\$0.01
\$1.00	=	Nu74.43

ABBREVIATIONS

ADB	- Asian Development Bank
AIDS	- acquired immunodeficiency syndrome
BBR	- Bhutan Building Regulation
BHU	- Basic Health Unit
BOQ	- bill of quantities
BPC	- Bhutan Power Corporation
CA	- Competent Authority
COVID-19	- corona virus disease
DCR	Development Control Regulation
DOFPS	- Department of Forest and Park Services
EA	- executing agency
EC	- environmental clearance
EIA	- environmental impact assessment
EMP	- environmental management plan
FNCA	- Forest and Nature Conservation Act
FNCR	- Forest and Nature Conservation Rules
FYP	- five-year plan
GBV	- gender-based violence
GRC	- Grievance Redress Committee
GRM	- grievance redress mechanism
HIV	- human immunodeficiency virus
IEE	- initial environmental examination
MOF	- Ministry of Finance
MOH	- Ministry of Health
MOLHR	- Ministry of Labour and Human Resources
MOWHS	- Ministry of Works and Human Settlement
NC19TF	- National COVID-19 Task Force
NEC	- National Environment Commission
NECS	- National Environment Commission Secretariat
NEPA	- National Environment Protection Act
NGO	- nongovernment organization
NHDCL	- National Housing Development Corporation Limited
NKRA	- national key result area
NIOSH	National Institute of Occupational Safety and Health
NMC	- National Mushroom Centre
NSB	- National Statistical Bureau
NCWC	- National Commission for Women and Children
OHS	- occupational health and safety
O&M	- operation and maintenance
PIAC	- project implementation assistance consultant
PIU	- project implementation unit
PMU	- project management unit

PPE	- personal protective equipment
PSC	- Project Steering Committee
REA	- rapid environmental assessment
RECOP	- Regulation for Environmental Clearance of Projects
RGOB	- Royal Government of Bhutan
SDG	- Sustainable Development Goal
SOP	- standard operating procedure
SPS	- safeguard policy statement
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.

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EXECUTIVE SUMMARY

The Green and Resilient Affordable Housing Sector Project (project) will assist the Government of Bhutan (GOB) establish infrastructures (i.e., shelters and recycled waste livelihood facilities) and provide services [i.e., business development, child care centers (crèches), integrated services for survivors of gender based violence] for vulnerable women (victims/survivors of violence, poor working mothers caring for children and marginalized informal sector workers) in target municipalities (*thromde*) while also adopting climate adaptation and disaster risk reduction in housing projects. The project will (i) serve as a strategic entry point towards transforming the current urban planning framework in Bhutan, within the broader context of livable cities aimed at achieving social development objectives, including Sustainable Development Goal 5 under the United Nations, (ii) demonstrate and institutionalize technology application in construction as a means to achieve sustainability and disaster-resilient human settlements; and (iii) show that partnership between government, municipalities, private land developers, and corporations is a key to development of a comprehensive and sustainable housing program.

Subproject Scope. This initial environmental examination (IEE) report has been prepared for Thimphu Subproject (subproject), which is one of the 9 subprojects to be financed under the Project. This subproject involves construction of 8 five-story residential buildings comprising of 110 units, with internal access road, parking, creation of a green space and a service center block. Expectedly, 110 families will benefit from this subproject, and this translates to around 550 beneficiary citizens (i.e., approximately 5 members per family). This housing complex will be constructed within a 1.93-acre (approximately 0.78 hectare) residential plot located in Semtokha in the south-eastern part of Thimphu. The table below summarizes in detail the components of the subproject.

Details of the Housing Complex in Thimphu

Sl. No.	Building Type	Number of Buildings	Total No of Units	Measurements
1	Category III (Type I)	2	20 (2 Bldgs. x 5 floors x 2 units)	Plinth area (1 floor): 203.17 m ² (2,186.11 sq. ft.) Unit area: 101.58 m ² (1,093.05 sq ft.) Building height: 19.275 m
2	Category IV (Type I)	3	30 (3 Bldgs. x 5 floors x 2 units)	Plinth area (1floor): 203.17 m ² (1,432.38 sq. f.t) Unit area: 66.54 m ² (716.19 sq ft.) Building height: 18.95m
3	1 BHK Apartment	3	60 (3 Bldgs. x 5 floors x 4 units)	Plinth area (1floor): 226.13 m ² (2,433.16 sq. ft.) Unit area: 56.5 m ² (607.94 sq. ft.) Building height: 19.42 m
	Total	8	110	
	Facilities			
4	Service Center (Occupying 2 floors)			
5	Internal road and parking (To fit 42 light vehicles and 40 2-wheelers)			

Sl. No.	Building Type	Number of Buildings	Total No of Units	Measurements
6	Other facilities <ul style="list-style-type: none"> • Pedestrian footpath • Recreational area/Green space • Drinking water storage tanks • Rainwater harvesting tank • Power supply sub-station 			

BHK = bedroom-hall-kitchen

Categorization. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. Initial step was to categorize the subproject based on its likely impacts of its most environmentally sensitive component(s) at all phases of implementation. Using ADB's Rapid Environmental Assessment checklist, the subproject is classified as Category B for Environment per SPS as no significant impacts are envisaged. Accordingly, this IEE has been undertaken to assess in more detail the likely environmental impacts of the subproject and to provide an environmental management plan (EMP) specifying the required mitigation and monitoring measures to ensure that these impacts are managed to acceptable levels. This IEE also emphasizes the need to incorporate pollution prevention and control technologies during the design, construction, and operation of the subproject, and adhere to relevant national laws, rules and regulations, as well as internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. With regard to national environmental assessment requirement, the Regulation for Environmental Clearance of Projects, 2016 (RECOP) provides the procedures for the categorization and issuance of environmental clearance for projects. Accordingly, the subproject is classified under RECOP as a Blue Category undertaking, and likewise requires the preparation of IEE by the proponent and subsequent approval by relevant competent authority prior to issuance of an environmental clearance.

Description of the Environment. The proposed site of the housing subproject is located in the vicinity of Thimphu city, which is considered a built-up area with existing residential, commercial and institutional establishments around. It is also bounded by major roads in the city and provides convenient and easy access during the construction and operation phase (or when the housing complex is occupied by the recipient citizens).

The subproject site is neither within nor located adjacent any ecologically critical areas, and subproject development interventions will not have any significant impact on the physical, biological and social environment. This IEE has been conducted to evaluate any potential environmental impacts of the subproject and propose measures to mitigate these impacts, including monitoring.

Assessment of Environmental Impacts. Potential environmental impacts were identified on the basis of review and analysis of the primary and secondary data or information and stakeholder consultations, and field visits to the site. Impacts were identified in relation to the different phases of subproject implementation — pre-construction, construction, and operation of the built infrastructure. Evaluation of the likely degree of impacts has been done on each of identified potential impacts. Based on this evaluation, mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists and experts responsible for the engineering and environmental aspects.

In order to ensure that the assessment of impact is robust, a biodiversity assessment has been undertaken relative to the subproject location. The Integrated Biodiversity Assessment Tool (IBAT) was used to screen and assess potential risks on the protected areas or critical habitat that may exist around the subproject site (default area of analysis of 50 km radius). Screening results show there is one key biodiversity area (KBA) within 1 km from the subproject site and that 26 IUCN Red List species of concern are identified within the default area of analysis. Further assessment has been undertaken with regard the identified KBA (Thimphu wetlands) and to 26 IUCN Red List species of concern. During field visits, the area of the subproject is outside the boundary of designated Thimphu wetlands, and any impacts to it during the construction and operation phases is unlikely. Likewise, the 26 IUCN Red List species of concern were assessed to determine the likelihood of them being found at the subproject site. While the subproject site is already in the built-up area of Thimphu, the probability of these species being found at the site is very low. Nevertheless, the assessment included necessary discussions with the Thimphu Forest Division of the Department of Forest, which confirmed that none of these species are found or sighted at the subproject site. Accordingly, these species are found or dwell at far higher altitudes in Bhutan.

Environmental Management Plan. From the results of assessment of impacts and mitigation measures, an environmental management plan (EMP) has been developed and included as part of this IEE, which outlines the following: (i) mitigation measures for environmental impacts during implementation; and (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting.

In order to ensure sound environmental management and safety during various phases of the implementation, the Contractor will be required to prepare a site-specific environmental management plan (SEMP) based on the EMP of this IEE. Contractor will submit its SEMP for approval to the project implementation unit (PIU) or project management unit (PMU). This will cover the following areas of impact which are potentially significant but can be mitigated by the adoption of good practice: (i) impedance of traffic, (ii) noise pollution and vibration, (iii) waste generation (iv) release of silt from excavations, (v) water pollution, (vi) air and dust pollution, (vii) community health and safety risks, and (viii) occupational health and safety.

The EMP and SEMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. Copies of the EMP and SEMP shall be kept on-site during the construction phase. The Contractor will be responsible for the organization, direction, and execution of environmental management related activities during construction of the proposed subproject. The Contractor will also undertake all activities in accordance with the relevant environmental requirements, including consent documentation and other regulatory and/or statutory and contractual requirements.

Grievance Redress Mechanism. The project will adopt a grievance redress mechanism (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's 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.

Implementation Arrangement. The executing agency is the Ministry of Finance and the implementing agency is the National Housing Development Corporation Limited (NHDCL) of the Government of Bhutan. The NHDCL will establish a PMU comprising officials including an Environmental Safeguard Officer who is a permanent employee of NHDCL. The PMU will be strengthened with external experts or consultants in environmental and social safeguards, including experts on finance, procurement, technical areas, and contract management. PIUs will be established at the local level or municipalities where the subprojects under the Project are located. In this subproject for Thimphu, the NHDCL will serve as the PIU. The PMU and PIUs will have responsibility for overseeing subproject management, including overseeing EMP implementation. The PMU will also have the responsibility for obtaining environmental clearance of the subproject from the relevant competent authority in compliance with RECOP.

The contractor will be required to (i) obtain all other statutory clearances prior to commencement of civil works; (ii) establish an operational system for managing environmental impacts; (iii) prepare a SEMP based on the EMP of this IEE, and submit to PIU or PMU for approval; (iv) carry out all of the monitoring and mitigation measures set forth in the approved SEMP; and (v) implement any corrective or preventative actions set out in safeguards monitoring reports that the PMU will prepare from time to time to monitor implementation of this IEE, EMP, and SEMP. The Contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

Information Disclosure and Consultation. The project has undertaken meaningful consultations¹ during the project preparatory stage. The objectives of the consultations are to ensure that project information is accurately and properly disseminated to all stakeholders and engage them in the environmental assessment process, ensure all issues from the stakeholders about the project are considered in the environmental management planning and ultimately addressed in the EMP of the IEE. Meaningful consultations also provide valuable guidance and direction to safeguard the interests of the stakeholders, developers and the environment. Stakeholder engagement will be a continuing activity of the PMU throughout Project implementation.

Written information and documents shall be disclosed at a location in which they can be easily accessed by stakeholders. This includes making draft environmental safeguards reports available for the public and providing a mechanism for the receipt of comments and making such documents available more widely by disclosing them on ADB and project websites. NHDCL through the PMU will submit to ADB the following documents for disclosure on ADB's website:² (i) the final IEE report; (ii) new or updated IEE reports and corrective action plan prepared during Project implementation, if any; and (iii) semi-annual environmental monitoring reports.

¹ Per SPS, 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; (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.

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

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 communities affected, the executive summary of the IEE will be translated in the local language and made available at the offices of PMU and Contractor, including satellite office of Contractor at the subproject site. Hard copies of the IEE will be available in the PMU, and accessible to citizens as a means of disclosing 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 the office of the PMU.

Monitoring and Reporting. EMP compliance monitoring will be undertaken by the PMU, with support of external experts or consultants. Consistent with reporting requirements set out in the Project Administration Manual, the Contractor will submit monthly reports to the PIU with jurisdiction over the subproject. 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. PIU will submit quarterly environmental monitoring reports to PMU, which will include summary of daily monitoring activities of Contractor and results of its independent monitoring or inspection activities. PMU shall consolidate quarterly reports from the PIUs, which include reports from the PIU for the Thimphu subproject, and results of 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.

Conclusion. The overall finding of this IEE is that the subproject will result in significant environmental benefits because of improved living condition of selected recipient citizens of Thimphu. The subproject is unlikely to cause significant adverse impacts because: (i) most of the subproject components involve straightforward construction, so impacts will be mainly localized; (ii) in most cases, the predicted impacts are likely to be associated with the construction process and are produced because of excavation, obstruction at specific construction locations, and earth movements; and (iii) being located mainly along roads and built-up area will not cause direct impact on terrestrial biodiversity values. The potential adverse impacts that are associated with construction can be mitigated to standard levels without difficulty through proper engineering practice and the incorporation or application of recommended mitigation measures and procedures in the EMP and SEMP. Consequently, the potential adverse impacts that are associated with the operation phase (i.e., the period when the housing facility is occupied by beneficiary citizens) can already be mitigated upfront through incorporation of environmental requirements in the detailed engineering design.

As such, no further environmental assessment is therefore required and the classification of Category B per ADB SPS is confirmed.

This IEE has been prepared based on preliminary designs of the subproject. If the design is revised or modified, the PMU shall update this draft IEE based on final detailed design and submit to ADB for review and disclosure. In compliance with the requirements of the RECOP, PMU shall obtain the necessary environmental clearance for the subproject from the relevant competent authority. No contract under the subproject shall be awarded until an environmental clearance covering said subproject is issued.

The approved updated IEE shall be treated as the final IEE and shall be attached in the bid and contract documents. No works can commence until (i) the final IEE approved by ADB is provided to the Contractor, and (ii) the SEMP prepared by the Contractor is approved by PIU 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.

I. INTRODUCTION

A. Background

1. Currently one third of the Bhutanese population live in urban centers and by 2037 this is expected to reach 50.4%. Urban areas also have higher number of urban poor who struggle to secure adequate housing at reasonable costs. An estimated 10% of Thimphu city's population lives in informal settlements. About a quarter of households (41,039) lacks access to improved sanitation and waste management is a concern as it does not reach every corner of the city. Most of the urban contract workers (cleaners, waste collectors, and semi-skilled workers) reside in informal squatter settlements in Thimphu and Phuentsholing as they are unable to afford decent housing elsewhere.³

2. Affordable housing is provided by the National Housing Development Corporation Limited (NHDCL), an agency that was delinked from the Ministry of Works and Human Settlements (MOWHS). Per the directive of the government, NHDCL plans, designs and provides affordable housing. However, due to increasing demand, there are still many challenges of not being able to cater to the housing needs of the clients.

3. The proposed Bhutan Green and Resilient Affordable Housing Sector Project (project) will deliver affordable housing in selected settlements in Bhutan. Improved livability, safety, and sustainability of human settlements through access to adequate affordable housing is a national priority.⁴ The Project will also strengthen policies, institutions, and regulatory framework of the housing sector in Bhutan.

4. **Affordable housing needs.** Currently, there is poor availability of affordable housing in Bhutan, particularly in urban areas where demographic trends are increasingly putting pressure on the residential land and housing stock. About 63.5% of urban households rent and only 19% of households own houses in urban areas.⁵ As demand for serviced land and housing increases and the supply is unable to keep up, house prices and rents are also rising, making housing unaffordable for low-income households. Low-income civil servants who fall in income brackets ranging from Nu900 (\$12) to Nu3,500 (\$50) per month are faced with rental stress, as they need to spend between an estimated 40%–60% of their income on housing costs.⁶ Likewise, majority of the urban poor including low-income contract workers (noncivil servants) are currently forced to live in informal settlements as there is a lack of affordable formal housing supply that is accessible to them. As of 2017, there was an estimated shortfall of 21,156 units nationwide.⁷ Currently, many low-income households have no option but self-build housing in peri-urban areas or overcrowd in the existing housing (to share costs) and overload infrastructure services, finding accommodation in substandard housing in poorly located and under-served areas (informal

³ Ministry of Works and Human Settlement. 2016. National Report, The 3rd UN Conference on Housing and Sustainable Urban Development. Thimphu.

⁴ Government of Bhutan, Gross National Happiness Commission. 2019. [Twelfth Five-Year Plan, 2018–2023: Just, Harmonious and Sustainable Society through Enhanced Decentralization](#). Thimphu. Affordable housing is defined as the ability for households to meet housing costs within 30% of gross monthly income.

⁵ Government of Bhutan, NSB. 2017. [Bhutan Living Standards Survey Report 2017](#). Thimphu.

⁶ Government of Bhutan, NSB. 2017. [Bhutan Poverty Analysis Report 2017](#). Thimphu. Civil servants are provided with rental housing allowance.

⁷ ADB. 2017. *Housing Finance Feasibility Study*. Consultant's report. Manila (SC107332); and ADB. 2018. *Housing Finance Feasibility Study*. Consultant's report. Manila (SC 107332).

settlements),⁸ or live in adjacent countries (footnote 3).⁹ Women are continuing to bear a disproportionate share of the burden and are vulnerable to housing insecurity exacerbated by overcrowding, which raises social pressures (e.g., domestic violence).

5. **ADB's intervention in the sector.** ADB has adopted a holistic approach in addressing the long-term housing sector needs in Bhutan. ADB provided assistance through a policy-based loan (PBL) under a programmatic approach to enable continuous reforms reflecting developments in the sector.¹⁰ The PBL subprogram 1, approved in 2019 for the financial market development program, supported the revision of the National Housing Policy (NHP).¹¹ In October 2020, PBL subprogram 2 was approved for developing a long-term strategy for public housing including fiscal measures and access to finance to women. The subprogram 3 under the PBL, approved in October 2021, will support conducting a nationwide housing survey and implementing financing schemes using the survey results. The PBLs will strengthen financial sector institutions' capacity and develop nonfinancial institutions to deliver housing finance solutions. The proposed Project, complemented by the PBL reforms, will support the government to (i) reduce the shortage of affordable housing which needs an urgent intervention; and (ii) create a robust medium- to long-term road map to achieve the policy objectives of the sector.

6. **Government policy.** Bhutan's Twelfth Five Year Plan, 2018–2023 prioritizes the government's strategic thrust for economic stability, economic diversification, and poverty reduction, which includes a medium-term outlook for affordable housing provision. Recently, the government approved the NHP and the Strategy for Housing (2020) promoting a vision for universal access to safe and affordable housing.¹² The NHP includes five core objectives, of which the following three stand out, namely to: (i) provide safe, affordable, and adequate rental housing for all; (ii) promote home ownership; and (iii) encourage partnership and cooperation among private and government entities in the provision of affordable housing. The policy's focus is on a multi-pronged approach to catalyze new investment including the release of land for housing infrastructure, making housing finance readily available to support economic development, and improve planning and policy coordination. Integrating these elements requires high levels of coordination and collaboration at the central government level, and among real estate developers, banks, and beneficiaries.

B. Developmental Impact, Outcome and Outputs of the Project

7. The project is aligned with the following impact: livability, safety, and sustainability of human settlements ensured (footnote 4). The project will have the following outcome: access to green and resilient affordable housing for low-income households improved.

8. **Output 1. Climate- and disaster-resilient, energy-efficient, and affordable housing units and public facilities for low-income households constructed.**¹³ Output 1 will support

⁸ Government of Bhutan, Ministry of Works and Human Settlement (MOWHS). 2016. [National Report: The 3rd UN Conference on Housing and Sustainable Development](#). Thimphu.

⁹ At least 26% of urban households live in shared accommodation with basic infrastructure services (footnote 3).

¹⁰ ADB. 2019. [Report and Recommendation of the President to the Board of Directors: Proposed Programmatic Approach and Policy-Based Loan for Subprogram 1 and Technical Assistance Grant to the Kingdom of Bhutan for Financial Market Development Program](#). Manila; and ADB. 2020. [Report and Recommendation of the President to the Board of Directors: Proposed Programmatic Approach and Policy-Based Loan for Subprogram 2 and Technical Assistance Grant to the Kingdom of Bhutan for Financial Market Development Program](#). Manila.

¹¹ Government of Bhutan, MOWHS. 2020. [National Housing Policy](#). Thimphu.

¹² Government of Bhutan, MOWHS. 2020. [Long Term Strategy for Housing](#). Thimphu.

¹³ Resilient housing design incorporates climate change and disaster risk-reduction measures to avoid, minimize, and/or recover from a disaster in a timely and efficient manner.

the NHDCL in building about 1,000 rental units, three integrated community service centers, and two recycled waste stations connected to services, in support of SDG 1. The government selected high-priority investments as subprojects.¹⁴ The increase in the supply of affordable rental housing is expected to immediately relieve the housing shortage and benefit lower-income civil servants (about 10%) and non-civil servants (about 90%), including marginalized municipal waste workers. The NHDCL will select beneficiaries most in need by applying beneficiary eligibility and selection criteria, with gender equality considered as part of the eligibility criteria as defined in the project administration manual (PAM). The building designs incorporate gender-inclusive features; enhanced safety against earthquake and fire hazards; and resource efficiency, making greater use of locally available materials.¹⁵ The building structures will employ reinforced-concrete frames and innovative pre-engineered structures. The project design has identified and incorporated climate and disaster resilience features, considering multiple hazards. The project will support green building certification through the International Finance Corporation's Excellence in Design for Greater Efficiencies (EDGE) certification program.¹⁶ The housing designs reflect local cultural heritage values and traditional architecture.¹⁷ Additional subprojects will be selected during project implementation in line with the NHP using the eligibility criteria set out in the PAM.

9. Output 2. Institutional capacities, policy, and regulatory framework of the housing sector strengthened. This output will (i) strengthen the NHDCL's housing design, construction, and management capacity—informed by climate and disaster risks and affordability considerations; (ii) review the building code and regulations; (iii) develop climate- and disaster-resilient building designs and related solutions to improve safety, resource efficiency, and gender and disability inclusiveness; (iv) conduct awareness training and a capacity building program for key project stakeholders on climate- and disaster-resilient design and the building code; (v) enhance the NHDCL's business model, strengthening its O&M capacity, and developing partnerships with the private sector; (vi) strengthen the housing management information system of the MOWHS by expanding it to include tenancy data and better understand and prepare evidence-informed policy updates to address demand and supply-side bottlenecks in the sector; (vii) develop a gender and socially inclusive national homeownership strategy, including a rent-to-own mechanism; and (viii) provide project implementation support, including supervision, and set up a safeguard unit in the NHDCL.

10. Due to the large demand of housing units in the country, NHDCL plans to carry out the construction in a phased manner with the Project considered as "Phase 1" comprising of about 1,026 – 1,062 housing units spread over 9 subprojects in six dzongkhags (districts) and sub-districts. These are prioritized in terms of pressing demand and availability of land and funds. Table 1 below shows a summary of the subprojects. Based on experiences under the Project, subsequent phases may be planned by the government in the future.

Table 1: Proposed Subprojects

	Location	District	Area (Acres)	Typology	Housing blocks	No. of Units	Service Centers
1	Tading	Samtse	9.00	G+2	37/34	444/408	

¹⁴ Priority subprojects are located in Nganglam; Phuentsholing (Amochu, Rinchending and Drungpa's Residence); Samtse (Tading); Samdrup Jongkhar (Dradulthang and Toed); Thimphu (Semtoka); and Trashiyangtse.

¹⁵ The gender-inclusive considerations include a preference for households headed by women and tenancy agreements signed by both spouses. In addition, the service centers will include childcare facilities, shelter for women, and offers employment opportunities. The green features include insulated walls, improved windows, use of timber and stone, water-efficient faucets.

¹⁶ [EDGE](#).

¹⁷ Government of Bhutan, MOWHS. 2014. [Bhutanese Architectural Guidelines](#). Thimphu.

2	Amochu (Bangay)	Phuentsholing	0.98	G+5	5	120	
3	Rinchending	Phuentsholing	5	G+2	18	108	Yes
4	Drungpa Residence Area	Phuentsholing	0.85	G+5	4	96	
5	Dradulthang	Samdrup Jongkhar	0.8	G+3	4	32	
6	Samdrup Jongkhar Toed	Samdrup Jongkhar	2	G+3	11	88	Yes
7	Nganglam	Pema Gatshel	2.82	G+1	8	32	
8	Semtokha	Thimphu	1.93	G+4	8	110	Yes
9	Trashiyangtse	Trashiyangtse	2.48	G+1	8	32	
			25.86		103/100	1,062/1,026	

C. Purpose of the IEE

11. The purpose of this IEE is to describe the assessment of environmental impacts due to the proposed Thimphu housing subproject based on the detailed design produced under the Project, and to specify measures to address impacts. This IEE is based on engineering design information, field visits, and primary and secondary data to characterize the environment. It contains the results of interviews and consultations with stakeholders. This IEE includes an environmental management plan (EMP) outlining mitigation measures and monitoring requirements, and environmental specifications to be appended to contract documents.

12. Screening using ADB's rapid environmental assessment checklist for urban development (Appendix 1) was initially conducted together with an accomplished No Mitigation Measures Scenario Checklist (Appendix 2), and results show that the subproject is unlikely to cause any significant adverse impacts, and therefore classified under Category B per ADB Safeguard Policy Statement (SPS), 2009. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS, 2009 requirements for environment category B projects.

13. The subproject is consistent with the EARF of the Project, which provides the selection criteria for future subprojects.

D. Methodology

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

- (i) Review of Project-related documents and literature relevant to the subproject;
- (ii) Site visits to the subproject site to review the existing environmental conditions and develop baseline information for the subproject area;
- (iii) Consultation with NHDCL to discuss subproject components, benefits, and impacts;
- (iv) Analysis of typical environmental impacts of subproject components and identification of suitable measures to mitigate potential impacts; and
- (v) Review and develop institutional arrangements and capacity building needs for implementation of environmental management and monitoring.

E. Structure of the Report

15. The IEE is presented in twelve chapters including the executive summary as follows:

- (i) Executive Summary. This chapter provides an overview and summary of the outcome of the IEE;
- (ii) Chapter 1. Introduction, which includes the Background, Outcome and Outputs of the Project, Purpose of the IEE, Methodology and Structure of the Report;
- (iii) 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;
- (iv) Chapter 3. Description of the Subproject, 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;
- (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 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
- (viii) 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;
- (ix) Chapter 8. Grievance Redress Mechanism for the Project;
- (x) Chapter 9. Environmental Management Plan, which includes the institutional arrangement, roles and responsibilities of stakeholders including contractors and environmental performance criteria;
- (xi) Chapter 10. Monitoring and Reporting, which includes capacity building, cost and other reporting obligations;
- (xii) Chapter 11. Conclusion, which provides overall analysis, conclusion and recommendations of the IEE.

II. POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Safeguard Policy statement

16. ADB's Safeguard Policy Statement (SPS) 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.¹⁸ 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.

17. **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 works. A full-scale 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, but ADB will conduct a desk review of the project's environmental implications.
- (iv) **Category FI.** The project involves the investment of ADB funds to or through a financial intermediary

18. 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, temporary and therefore the subproject is classified as Category B for Environment per ADB SPS.

19. For Category B project, ADB SPS also requires the conduct of initial environmental examination (IEE); preparation of corresponding IEE report, which includes an environmental management plan (EMP), consultation and disclosure requirements, establishment of a grievance redress mechanism (GRM), compliance monitoring and reporting, updating of the IEE in the event of unanticipated impacts, applying pollution prevention and control technologies and practices consistent with international good practices, ensuring that workers are provided with a safe and healthy working environment, and other elements as indicated in the suggested outline of IEE report in the SPS.

20. The project must also identify and assess the risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, avoid significant damage to physical cultural resources and the institutional responsibilities of all key parties involved in EMP implementation and project environmental management must be clearly designated. The work must not be initiated or contract awarded unless the project is approved by ADB and the EMP is included in the contract documents.

21. 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 general 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.

¹⁸ ADB. 2009. *Safeguard Policy Statement*. Manila.

22. **Meaningful Consultation.** ADB SPS, 2009 requires meaningful consultation with affected people that:

- (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;
- (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.

23. As a minimum, stakeholders of each subproject will be consulted regarding the scope of the environmental study and will then be informed during environmental assessment about the likely impacts of the subproject and proposed mitigation measures. The report will record the views of stakeholders and indicate how these have been taken into account in project development. A variety of approaches for consultations include public meetings, focus group discussions, workshops, and public information campaigns. Public consultations may include newspaper advertisement in the local and national newspapers well before the consultations giving brief project description, location, and specific contact data (including telephone numbers). In the meetings, presentations will be provided about the subproject's potential environmental and social impacts. Consultation sessions must have attendance sheets prepared and included as part of the documentation. See Table 2 below for the template.

Table 2: Template of Attendance Sheet for Consultation Meetings

S.N.	Name of Attendees	Sex (M/F)	Age	Affiliation and Position	Signature

24. Public consultation and involvement will be given highest priority in the implementation of mitigation measures. Public consultation will take place, and on the basis of decision of the consultation meeting, implementation of mitigation measures will be prioritized and will be carried out with the involvement of the local people.

25. **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 NHDCL websites.

26. Subject to approval by NHDCL and clearance by ADB, PMU will disclose the following documents on the project website, and endorse these same documents to ADB for disclosure on ADB website:

- (i) environmental assessment and review framework;
- (ii) the final IEE report for each subproject (per location);

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

27. 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 in the local language (Dzongkha) and made available at: (i) offices of PMU; and (ii) offices of the supervising/implementing unit or office.

28. Hard copies of the IEE will be available in the PMU and local supervising/implementing units, 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 to mass campaign the basic tenets of the IEE.

29. **Grievance Redress Mechanism (GRM).** A GRM must be established to allow affected people a trusted way to voice and resolve project-related concerns, and to enable the project to effectively address affected people's concerns. The GRM can be used to cover the environmental, involuntary resettlement and/or Indigenous Peoples safeguard requirements.

30. **Occupational Health and Safety.** The PMU must ensure safe and healthy worker conditions and prevent accidents, injuries, and disease. This includes identifying and minimizing the causes of potential hazards to workers; providing preventive and protective measures, worker training and awareness and other measures to minimize risks and hazards at the workplace; and ensuring emergency response and compensation for work related injuries and fatalities.

31. **Community Health and Safety.** The PMU must identify and assess the risks to, and potential impacts on the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

32. **Pollution prevention and control techniques.** The PMU must apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines, during the design, construction, and operation of the project.

33. **Unanticipated Environmental Impacts.** The PMU must 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 measures and resources to address any unanticipated impacts.

34. **Physical Cultural Resources (PCR).** The PMU must identify and avoid significant damage to any PCR by the project. Chance finds procedure must be used by contractors in the event that such PCR is discovered during project implementation.

35. **Bidding and Contract Documents.** The EMP must be verified by the PMU and included in bidding and contract documents and along with any specific provisions requiring contractors to comply with all other conditions required by ADB or provisions of the loan agreement

B. National Environmental Assessment Act and Related National and Local Legislations

Table 3: Summary of National Environmental Assessment Act and Related National and Local Legislations

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
Environmental assessment						
Environmental Assessment Act 2000	Establishes procedures for the assessment of potential environmental impacts and aims to determine the measures to avoid, mitigate, reduce the adverse impacts, and promote environmental benefits of projects, plans, and policies.	Environment Clearance	National Environment Commission	Subproject is subject to this Act as construction of buildings will bring about environmental impacts.	Design Phase / Pre-construction Phase	PMU
Regulation for The Environmental Clearance of Projects (RECOP) 2016	Describes the responsibilities and procedures for the implementation of Environmental Assessment Act 2000 in relation to the issuance and enforcement of environmental clearances at the project level. It defines specific activities of projects where competent authorities can issue an environmental clearance (EC) and those requiring NEC			The housing subproject is covered by this regulation. Project is categorized as Blue category requiring an IEE.		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	evaluation and approval of EC.					
National Environment Protection Act 2007	Provides an effective system of conserving and protecting the environment and established the NEC and other designated Competent Authorities and advisory committees responsible for independently regulating and promoting sustainable development.			Under this Act, the IEE of the subproject will be reviewed by NEC. The provisions of the EMP will be followed during subproject implementation to ensure compliance with this Act.		
Bhutan Environmental Standards 2010, and Drinking Water Quality Standards 2016	Sets minimum standards for i) ambient water quality, ii) industrial effluent discharge standards, iii) standard for sewerage effluents, iv) ambient air quality, v) industrial emission standards, vi) workplace emission standards, vii) vehicle emission standards and, viii) noise level limits.			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. PMU will ensure compliance of		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
				Contractor(s) to applicable environmental standards during construction.		
Waste Management						
Waste Prevention and Management Act of Bhutan 2009	Institutional framework on waste management to reduce generation at source, promotes segregation, reuse, and recycling, storage, transportation, environmentally-sound treatment and disposal of waste, and monitoring procedures and coordination at every organizational level	Waste disposal permit Demolition Permit	Thimphu Thromde	The subproject is a potential generator of solid wastes during construction and operation phases. The subproject will comply with this Act and ensure waste segregation, collection, storage and disposal as per Thromde requirements.	Design Phase / Pre-construction Phase / Construction Phase / Operation Phase	PMU, PIU, Contractor, NHDCL
Waste Prevention and Management Regulation 2012 (amended 2016)	This regulation establishes procedures and requirements to implement the Waste Prevention and Management Act2009.					
Water						
Water Act of Bhutan 2011	Ensures that water resources are protected, conserved, and/or managed in an economically efficient, socially	No specific permit required, but any development project needs to comply with the provisions of this	National Environment Commission	The subproject is near a surface water (Olarongchhu) and needs to comply with this	Design Phase / Pre-construction Phase / Construction Phase / Operation Phase	PMU, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	equitable, and environmentally sustainable manner.	Act and regulation.		Act. The subproject will ensure that the site is located at least 30m away from any river or stream.		
Water Regulation of Bhutan 2014	Promulgated to enforce the objectives and purposes of the Water Act 2011, effectively implement and enforce the Water Act by the Competent Authorities; and identify roles and responsibilities of designated Competent Authorities and other relevant organizations.			The subproject is expected to generate wastewater that could potentially impact the environment during construction and operation phases. PMU will ensure compliance with the requirements of this Act.		
Forestry and Biodiversity						
Forest and Nature Conservation Rules 2000 (revised 2006, 2017)	Provides rules for project activities that involve clearing and felling of trees, blasting, etc. It also define activities that are prohibited in forested areas, outlines procedures for sourcing sand and gravel, peat, stone,	Tree felling permit, if applicable to the site.	Thimphu Thromde, Environment Division/Forest Range Office	The subproject will not impact any protected areas, critical habitats or endangered species. However, the subproject is expected to cut 25 trees at the site, which	Design Phase / Pre-construction Phase	PMU, Contractor PIU,

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	and surface soil from forested areas.			requires permission from the Forest Department.		
Forest and Nature Conservation Act 1995	Allows community stewardship of forests and aims to provide protection and sustainable use of forests, wildlife, and related natural resources. Describes activities that require special permits from the Department of Forests and Park Services as well as other activities such as forest clearing and cutting of trees, hunting and polluting which are not allowed in Government Reserved Forests. All wild animals whether enlisted under Schedule I (totally protected species) or not, cannot be killed, injured, captured or collected unless under special conditions of self-protection and other genuine reasons.			The subproject will not impact any protected areas, critical habitats or endangered species. However, the subproject is expected to cut 25 trees at the site, which requires permission from the Forest Department.		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
Biodiversity Act 2003	Sets forth national sovereignty over genetic resources; ensures conservation and sustainable use of biochemical and genetic resources; promotes equitable sharing of benefits derived from genetic resources; promotes technology transfer and capacity building; recognizes and protects traditional knowledge, innovation, and practices of local communities associated with biodiversity; regulates the collection of genetic resources and prevents illegal access; recognizes and protects farmers' and breeders' rights; and regulates plant variety and property rights and use.	No specific permit required, but any development project needs to comply with the provisions of this Act.	National Environment Commission	Subproject is not located in ecologically sensitive areas. However, the subproject will need to continuously monitor the implementation of the subproject to ensure no protected species (especially the wandering or migratory kinds), if ever found at the site or vicinity in the future, will be affected.	Design Phase / Pre-construction Phase	PMU
Occupational Health and Safety						
Bhutan Constitution 2008	The following are relevant provisions on protection of workers:	No specific permit required, but any development project needs to comply with the	N/A	The subproject will involve workers. These provisions of the constitution on	Design Phase / Pre-construction Phase / Construction	PMU, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	<ul style="list-style-type: none"> • Article 5 (2.d) ensures a safe and healthy environment. • Article 9 (12) endeavors to ensure the right to work, vocational guidance and training and just and favorable conditions of work. • Article 9 (13) endeavors to ensure the right to rest and leisure, including reasonable limitation of working hours and periodic holidays with pay. • Article 9 (14) ensures the right to fair and reasonable remuneration for one's work. • Article 9 (17) takes appropriate measures to eliminate all forms of discrimination and exploitation against women including 	relevant provisions of the constitution.		workers' occupational health and safety will be complied by the subproject.	Phase / Operation Phase	

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	<p>trafficking, prostitution, abuse, violence, harassment and intimidation at work in both public and private spheres.</p> <ul style="list-style-type: none"> Article 9 (18) takes appropriate measures to ensure that children are protected against all forms of discrimination and exploitation including trafficking, prostitution, abuse, violence, degrading treatment and economic exploitation. Article 9 (22) provides security in the event of sickness and disability or lack of adequate means of livelihood beyond one's means of control. 					
Labour and Employment Act (LEA) 2007	Provides for the regulation of employment and	Foreign worker permit	Ministry of Labor and Human Resources	The subproject will involve contractors and	Design Phase / Pre-construction Phase /	PMU, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	<p>working conditions, including occupational health and safety, labor protection and relations as well as setting of occupational standards and certification.</p> <p>The Act aims to improve employees' work environment and working conditions to safeguard and keep work ability, prevent occupational accidents, diseases, and other physical or mental problems related to work.</p>			workers. PMU will ensure that Contractor(s) comply with the relevant provisions of this Act	Construction Phase / Operation Phase	
Regulations on Occupational Health, Safety and Welfare, March 2012 (supersedes the General Rules and Regulations on Occupational Health and Safety in Construction, Manufacturing, Mining and	Prescribes standards and procedures on occupational health, safety and welfare for workplaces, instruments, vessels, appliances, apparatuses, tools, devices, electrical safety and other hazardous conditions. It aims to ensure safety, health and welfare for employees	No specific permit required, but any development project needs to comply with the provisions of this regulation.	Ministry of Labor and Human Resources	The subproject will involve workers. The PMU will monitor compliance of the Contractor(s) in providing for safe and healthy working conditions during construction of the buildings.	Construction Phase / Operation Phase	PMU, Contractor, NHDCL PIU,

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
Service Industries 2006)	as well as other persons at workplaces from work-related risks to their health, safety and wellbeing					
Regulations on Working Conditions 2012 (first edition in 2009)	Under the MOLHR, these are 15 regulations which provide for the employment conditions required to implement the provisions of the LEA 2007 effectively. The 15 Regulations cover issues such as recruitment and management of foreign workers, child labor, hours of work, grievance procedure, sexual harassment, workers' compensation, etc.	No specific permit required, but any development project needs to comply with the provisions of this regulation.	Ministry of Labor and Human Resources	The subproject will involve workers. Contractors will be required to strictly comply with the relevant provisions identified in the regulations. The PMU will monitor compliance.	Construction Phase / Operation Phase	PMU, PIU, Contractor, NHDCL
Regulations on Occupational Health and Safety for Construction Industry 2012 (supersedes 2009)	These regulations set the occupational health and safety standards, and procedures on construction safety. It aims to ensure safety and health for employees, as well as other persons at the construction sites, from work related	No specific permit required, but any development project needs to comply with the provisions of this regulation.	Ministry of Labor and Human Resources	The subproject will involve workers. Contractor(s) will be required to provide workers with safe and healthy working conditions during construction. Workers will be provided with	Construction Phase / Operation Phase	PMU, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	risks to their health, safety, and wellbeing. It also prescribes the roles and responsibilities of the workers and employers in ensuring health and safety at the site.			safety and protection equipment, where needed. PMU will monitor compliance of the Contractor(s).		
Road Safety and Transport Act 1999	Provides for safe and efficient use of road systems and to ensure an efficient and a safe public transport system. Describes the duties of the drivers related to traffic safety signs and safety procedures to prevent and minimize transport accidents.	No specific permit required, but any development project needs to comply with the provisions of this Act.	Road Safety and Transport Authority	The subproject site is adjacent to main roads. Contractor(s) will be required to comply with the relevant provisions of this Act to prevent accidents in the construction sites. PMU will monitor compliance.	Construction Phase	Contractor / Trasporter
Disaster Management Act of Bhutan 2013	Establishes and strengthens institutional capacity for disaster management in institutions, mainstreaming of disaster risks reductions in policies and plans, and integrates and coordinates disaster management activities and how to	No specific permit required, but any development project needs to comply with the provisions of this Act.	Thimphu Thromde	The subproject is a housing project requiring designs to ensure disaster resiliency. Provisions for disaster resilience will be included in the infrastructure designs. Subproject will be also guided by the Thimphu Thromde Disaster	Construction Phase / Operation Phase	PMU, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	respond to emergencies.			Management Committee (DMC) in case of any emergency.		
Others						
Bhutan Building Regulation 2018	This regulation defines the set of rules that specify the minimum acceptable level of safety for building infrastructures in Bhutan. It has various specific objectives, which include, among others the following: (i) prescribe standards for the construction and demolition of buildings, (ii) prescribe requirements for the design and siting of single dwellings and associated buildings, (iii) prescribe standards and matters relating to the maintenance of fire safety and safety measures, (iv) provide for matters relating to the accreditation of building products,	Building construction approval / permit	Thimphu Thromde	The subproject involves building construction. The subproject will need to strictly comply with this set of rules and will be adhered to during design phase.	Design Phase / Pre-construction Phase	PMU

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	construction methods, designs, components and systems connected with building work, and (v) prescribe qualifications and provide for other matters relating to registration of building practitioners.					
Building Code of Bhutan 2018	This Building Code has been issued as part of and to ensure the effective implementation of the Bhutan Building Regulation 2018. It sets out the technical requirements, standards and design considerations which shall apply to construction of buildings in Bhutan. The Code ensures safety of buildings, protect public health and general welfare related to building constructions and its occupancy.			The subproject involves building construction. The subproject will need to strictly comply with this set of rules and will be adhered to during design phase.		
Bhutan Green Building Guidelines, 2013	This Guidelines was issued by the Ministry of Works and Human Settlements to introduce for the			The subproject involves building construction. Although not mandatory, the		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	basic concepts, sustainable green principles and approaches that will be practical for consideration in the design and construction of future buildings in Bhutan. It aims to inspire positive change in the built environment of Bhutan; motivate policies, regulations, standards, and projects that will minimize negative impacts of the built environment on the natural environment of the country while enhancing the positive impacts of sustainable building design and construction practices for the present and future generations.			subproject may use this set of guidelines as reference during design phase.		
Bhutanese Architecture Guidelines 2014	The Guidelines was issued by the Ministry of Works and Human Settlements to be used as a reference to understand the various elements of Bhutanese			The subproject involves building construction. Although not mandatory, the subproject may use this set of guidelines as		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	architecture and its values while providing a guide to what could be appropriate for new design and construction in Bhutan according to the values found in traditional architecture of Bhutan.			reference during design phase.		
Thimphu Thromde Development Control Regulations (DCR) 2016	<p>This is the second document tailor-made for the capital and supersedes the BBR 2002 and the Development Control Regulations 2004 in Thimphu.</p> <p>Based on this, wherever a local area plan (LAP) has been notified, its specific regulations, if any, shall be applicable within that local area alone.</p>	Building construction approval / permit	Thimphu Thromde	The subproject is located in Thimphu. It is required that the subproject comply with this set of rules and will be adhered to during the entire implementation period including the design stage.	Design Phase / Pre-construction Phase	PMU

C. COVID-19 Pandemic Measures and Protocols

36. In Bhutan, the first patient tested positive for COVID 19 was in March 2020. A year after the pandemic, less than 1,000 positive cases were reported (921 as of April 12, 2021), of which there are 45 active imported cases. So far one death is linked to the virus. Since the detection of the first COVID-19 positive case, several measures have been undertaken. At the national level, there is a National COVID-19 Task Force (NC19TF) chaired by the Prime Minister. This is the highest decision-making body in the country on all policy matters related to COVID-19 management. There are three multi-sectoral Regional COVID-19 Task Force and district and sub-district COVID-19 Task Force in each district. There is also a Health Emergency Management Committee (HEMC) tasked with decision-making regarding the matters related to health emergency management including the surveillance, quarantine and testing based on the scientific evidence.

37. The government, through the Ministry of Health (MOH), has a Media and Risk Communication team responsible for communication and information dissemination to the general public.¹⁹ Measures have been undertaken to prevent the import, transmission, contain and manage the disease are summarized below.

- (i) Creation of COVID-19 Taskforce and zonation in municipalities and districts;
- (ii) Mandatory 21-day quarantine for all in-coming travels arriving in the country from abroad under a designated quarantine facility, and 7-day quarantine for travelers to the border districts;
- (iii) 2 nationwide lockdowns to prevent community transmission, and restrictions on movement after 9PM;
- (iv) Installation and use of Druk Trace App or registry in all public places including public transport, hand wash stations and mandatory use of mask and regular advocacy and dissemination for social distancing through print, broadcast and social media. Protocols for shops, schools and offices;
- (v) Temporary closure of schools and introduction of online classes;
- (vi) Compulsory pre-registration online for all inter-district travel on the Check Post Management System, and quarantine for travelers; and
- (vii) First vaccination of all eligible persons in April 2021.

38. The government also has its COVID 19 Strategies and Protocols (e.g. for import and export of goods, protocols for testing, lockdown, movement with pass, containment of outbreak, containment, decontamination and disinfection, management of dead bodies). Specific standard operating procedures (SOPs) or guidelines are included in the following issuances that can be found on the MOH website, which are being updated from time to time depending on COVID-19 situation in the country.²⁰ These SOPs or guidelines are applicable to the project.

- (i) MOH, 2020a. SOP for decontamination and disinfection of COVID-19 contaminated area. March 2020;
- (ii) MOH, 2020b. SOP for Safe and Dignified Management of Dead body of Suspected or Confirmed COVID-19, March 2020;
- (iii) MOH, 2020c. Containment of COVID-19 outbreak in Cluster Surveillance 2nd-Sept-2020;

¹⁹ WHO, 2020. Bhutan Decision making for social and movement measures in the context of COVID-19 SNAPSHOT AS OF NOVEMBER 2020. Retrieved from https://www.who.int/docs/default-source/hgf/bhutan.pdf?sfvrsn=ce5445da_9

²⁰ <http://www.moh.gov.bt/covid-19-strategies-protocols-and-guidance/>

- (iv) MOH, 2020d. Additional Measures to prevent and contain local transmission in high-risk areas. May 2020;
- (v) MOH, 2020e. Strategy for Engaging High-Risk Communities for COVID Prevention & Control, April 2020; and
- (vi) MOH, 2020f. National COVID 19 Testing Protocols, December 2020.

39. A contractor has to apply online for foreign workers, after which a limited number may be approved, and there are mandatory protocols and costs to be borne by the contractor. The contractor will be required to have a COVID-19 Standard Operating Protocol (SOP) and plan for its project sites. See Appendix 3.

D. Relevant International Conventions and Treaties

40. Bhutan is a party to several multilateral environmental agreements. Of these conventions, the most relevant to the subproject are in Table 4. There are no elements of the subproject that contravene the direction and intentions of these conventions.

Table 4: International Environmental Agreements

	International Environmental Agreement	Ratified	Relevance	Remarks
1	Convention on Biological Diversity (1992)	23 November 1995	Integrate conservation and sustainable use of biological diversity into relevant sectoral plans Identify components of biological diversity important for its conservation and sustainable use.	The IEE process takes into consideration compliance with this agreement.
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington 1973) – also known as CITES	15 August 2002	Requires Parties to the Convention not to trade in listed species other than in accordance with the Convention	The subproject does not involve any trade in wildlife or plant species.
3	Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris 1972)	22 October 2001	Parties are responsible for not undertaking deliberate measures which might damage directly or indirectly the cultural and natural heritage	The IEE process takes into consideration compliance with this agreement. The Project's site selection criteria has put a condition that the site must not cause damage to Physical Cultural Resources and follow chance finds procedure in case of chance finds.

	International Environmental Agreement	Ratified	Relevance	Remarks
4	Vienna Convention for the Protection of the Ozone Layer	23 August 2004	Phasing out the chemicals that deplete the ozone	The IEE process takes into consideration compliance with this agreement, ensuring that the subproject follows NEC requirements, including prohibition on the use of ozone-depleting substances.
5	UN Framework Convention on Climate Change	25 August 1995	Bhutan has committed to remain carbon neutral, and to keep greenhouse gas (GHG) emissions less than the sequestration capacity of its forests for all times	The IEE process takes into consideration compliance with this agreement. The subproject will ensure to implement measures to reduce emission of greenhouse gases as much as possible.
6	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	26 August 2002 (accession)	Management hazardous waste in an environmentally sound manner and to follow a system for trans boundary waste movement	The IEE process takes into consideration compliance with this agreement, ensuring that the subproject follows NEC requirements, including management of hazardous wastes.
7	Montreal Protocol on Substances that Deplete the Ozone Layer	April 2004	Protection of the Earth's ozone layer by phasing out the chemicals that deplete it	The IEE process takes into consideration compliance with this agreement, ensuring that the subproject follow NEC requirements, including prohibition on the use of

	International Environmental Agreement	Ratified	Relevance	Remarks
				ozone-depleting substances.
8	International Plant Protection Convention	June 1994	Prevent and control the introduction and spread of pests and invasive species	The IEE process takes into consideration compliance with this agreement, ensuring that the subproject avoids planting invasive and non-native species.

E. Gaps in Legal and Guiding Instruments

41. The ADB SPS and national environmental laws are aligned with screening to determine the potential impact of a project on the environment, followed by appropriate environmental assessment, preparation of environmental management plans to avoid, mitigate, minimize and offset environmental impacts. While minor gaps are identified in terms of the other more specific ADB SPS requirements vis-à-vis the national environmental laws, gap-filling measures are available and can be readily complied with by the government through NHDCL as implementing agency. See Table 5.

42. The national procedures are comprehensive enough to ensure that any developmental activity/enterprise in sensitive and critical habitats/ecosystems, and affected rare or endangered species, or extraction of resources in large quantities are avoided from the screening stage. This includes impacts on religious and cultural sites as well.

43. Once a project is approved, it requires the proponent to comply to the terms and conditions of the approved Environmental Clearance with compliance monitoring and reporting during implementation of the EMP by the proponent. The project may also be independently monitored by the competent authority or NEC.

Table 5: Comparison of ADB SPS Requirements and National Environmental Regulations

	ADB SPS Principles	National requirements	Extent of Equivalence or Gaps	Gap-filling Measures
1	Conduct screening to determine the extent and type of required environmental assessment	Projects are screened into Green, Blue and Red categories that determine whether the level of environmental assessment If the development is within the E-1 (environmental conservation), E-2 (forest environments) precincts, the application has to be accompanied by a no objection certificate from the National Environment Commission (NEC).	No gaps	None required
2	Conduct environmental assessment	Green project – No environmental assessment Blue project- initial environmental examination (IEE) is required Red project- environmental impact assessment (EIA) is required	No gaps	None required
3	Examination of project alternatives	Under RECOP, Annex 3, Sections 6 and 8, the project must provide a detailed analysis of the negative and positive impacts of the proposed project and its alternatives including the “alternative of not undertaking the project”.	No gaps	None required
4	EMP preparation is part of IEE and EIA Process	The Environmental Assessment Act (EAA) provides for the formulation of environmental management plans (EMPs). The EMPs must identify environmental risks and address means of avoiding or minimizing adverse impacts (including direct, indirect and cumulative effects) and enhancing positive impacts. Applicants must also set out a monitoring program (both baseline and compliance monitoring) and are responsible for all project monitoring. Project monitoring is undertaken by the Competent Authority (CA) or NEC. The RECOP provides that: (i) “the CA shall be responsible for monitoring compliance” for projects requiring development consent and environmental clearance (EC), and (ii) the Secretariat [of NEC] shall monitor projects “that do not require development consent”.	No gaps	None required
5	Conduct meaningful consultation with affected people	Public consultation is mandatory for any IEE/EIA. Under the EAA, applicants have a duty to inform and consult with “concerned people” and organizations before submitting the	No gaps	None required

	ADB SPS Principles	National requirements	Extent of Equivalence or Gaps	Gap-filling Measures
		environmental assessment documents to the CA where the project is classified as a “significant project”. NEC or the CA is authorized to “ensure that concerned people are given adequate opportunity to express their views on the project and that their views are adequately taken into account.”		
6	EMP implementation and monitoring (with corrective actions, when needed)	<p>The EAA mentions that Applicants must [also] set out a monitoring program (both baseline and compliance monitoring) and are responsible for all project monitoring (project monitoring is undertaken by CA or NEC).</p> <p>RECOP requires that EMPs include the proposed mitigation measures, the need to budget mitigation measures, supervision, monitoring and evaluation requirements for the construction, operation and maintenance phases of the project cycle.</p> <p>RECOP provides that: (i) “the CA shall be responsible for monitoring compliance” for projects requiring development consent and EC, and (ii) the Secretariat [of NEC] shall monitor projects “that do not require development consent”.</p> <p>The Environmental Assessment Act states that “compliance monitoring of projects” is undertaken by the Secretariat [of NEC]...on becoming aware of non-compliance with the terms or other activities related to a project that may be dangerous to the environment.”</p>	No outstanding gaps in terms of policy. However, EMPs are not normally included in Contractor’s contracts to ensure implementation of EMPs.	Include EMP into Contracts and ensure compliance monitoring and submission of environmental monitoring reports.
7	Establish Grievance Redress Mechanism (GRM)	Different agencies have different GRMs.	Partial gap due to lack of specific guidelines that can be followed by projects.	To ensure equivalence, the project needs to establish a GRM process that could be adopted from the site level to the agency level, including option for access to country’s legal system

	ADB SPS Principles	National requirements	Extent of Equivalence or Gaps	Gap-filling Measures
				independently and regardless of the outcome of the project GRM process.
8	Appropriate public disclosure of EIA/IEE and EMP	Not mandatory to disclose, but documents are available in relevant government agencies.	Partial gap due to lack of specific directives or guidelines requiring mandatory disclosure of environmental assessment documents.	To ensure equivalence, the project needs to disclose the IEE through any means that could reach the general public.
9	Do not implement project activities in areas of critical habitats.	<p>Forest and Nature Conservation Act, 1995; Forest and nature Conservation Rules, Sections 62, 70 and EAA and RECOP relate to this issue.</p> <p>Under Bhutan's laws and regulations, it is prohibited to undertake any human activities within the core zone of a protected area unless determined necessary by forest/protected area officials to achieve nature conservation objectives. Outside the core area, no construction is allowed except with a written permit or authorization from the MoA, acting as CA under the EAA. A permit for land clearance may be granted in private lands under strict conditions but not to alter protected area status, water catchment areas and areas containing high forest.</p>	No gaps	None required
10	Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and	The NEC sets the permissible emission standards for a) ambient water quality, Industrial Effluent Discharge Standard, Sewage Treatment Plant (STP) Discharge Standards, Ambient Air Quality, Workplace Emission Standards, Vehicular Emission and Noise Limit Standards, Noise Level Limits but this is monitoring is not mandatory for construction	No gaps in terms of availability of standards in the country. However, the implementation of regulations pertaining to these standards is an issue. Further, the	To ensure equivalence, the Project should: (i) comply with the stricter internationally recognized standards or provide justification

	ADB SPS Principles	National requirements	Extent of Equivalence or Gaps	Gap-filling Measures
	Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices.	The Vehicle fitness test must be done annually by the vehicle owner. The agency responsible for this is The Road Safety and Transport Authority (RSTA)	values of the national standards are less strict than the internationally recognized standard values. Partial gap in terms of the legislation having no explicit requirement for adopting cleaner processes and good energy efficiency practices, although it might be considered implicit in the legislation	if the option under the Project is to use the national standards; and (ii) require the adoption of cleaner technologies and energy efficiency measures.
11	Safe working conditions	The Labour and Employment Act, 2007 governs employment and Occupational health and safety (OHS), including physical or mental health problems related to work. The Regulation on Occupational Health and Safety for Construction Industry, 2012 and the Regulation on Occupational Health, Safety and Welfare, 2016 have detailed requirements for contractors to follow to ensure the safety, health and welfare for employees and other persons at workplaces.	No gaps	None required
12	Conserve physical cultural resources Provide for the use of “chance find” procedures.	Any development activity within a heritage precinct requires a No objection certificate from the Ministry of Home and Cultural Affairs (MH&CA) Any valuable cultural property discovered must be immediately reported to the Department of Culture, Ministry of Home and Cultural through the concerned Dzongkhag.	Partial gap due to the absence of legislation or regulations to protect “chance finds”.	To ensure equivalence, the Project should include chance finds procedure that will be used during the implementation.

F. Other Statutory Requirements

44. **Application to the Bhutan Power Corporation (BPC).** The subproject will apply to BPC for allocation/installation of meter boxes and electricity connection at the subproject site, and for billing purposes during construction.

G. Applicable Environmental Standards

45. **Bhutan Environmental Standards 2010 (revised 2020).** The Bhutan Environmental Standards sets the minimum standards for (i) ambient water quality, (ii) industrial effluent discharge, (iii) sewerage effluents, (iv) ambient air quality, (v) industrial emission, (vi) workplace emission, (vii) vehicle emission, and (viii) noise level limits.

46. The Water Act of Bhutan, 2011 and the Water Regulation of Bhutan 2014 apply to all issues relating to water resources and their management. Based on these, there are water quality standards and guidelines, and effluent discharge standards into water resources. For example, the Drinking Water Quality Standards, 2016 ensures safe drinking water. It protects consumer health by describing the quality parameters for drinking water and the maximum permissible limit for each parameter. The Effluent Discharge Standard requires effluents to be treated using best available technology before discharging directly or indirectly to any water resource.

47. The Drinking Water Quality Standards, 2016, was developed in accordance with Section 13 (f) and Section 42 (a) and (b) of the Water Act of Bhutan, 2011, with the aim of ensuring safe drinking water and to protect consumer health. The standard describes the quality parameters set for drinking water and the maximum permissible limit for each of the set parameters, in order to limit the level of contaminants in drinking water.

48. Following requirements of ADB SPS, the Project shall apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in EHS Guidelines. When the government regulations differ from these levels and measures, the executing agency shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009. In view of this, Table 6, 7, 8 and 9 show the ambient air quality standards, noise level standards, effluent standards and drinking water quality standards to be followed by the Project. Other applicable standards are also provided in Table 10, 11, and 12.

Table 6: Ambient Air Quality Standards

Parameter	Averaging Period*	Bhutan's Ambient Air Quality Standard, 2010**(µg/m³)			WHO Air Quality Guidelines (µg/m³)	
					Global Update^ 2005	Second Edition ^^ 2000
		Industrial Area	Mixed Area***	Sensitive Area****		
TSP	Annual	360	140	70	-	-
	24-hour	500	200	100	-	-
PM ₁₀	Annual	120	60	50	20	-
	24-hour	200	100	75	50	-
PM _{2.5}	1-year	-	-	-	10	-
	24-hour	-	-	-	25	-
SO ₂	Annual	80	60	15	-	-

Parameter	Averaging Period*	Bhutan's Ambient Air Quality Standard, 2010**(µg/m³)			WHO Air Quality Guidelines (µg/m³)	
					Global Update^ 2005	Second Edition ^^ 2000
NO ₂	24-hour	120	80	30	20	-
	10-minute	-	-	-	500	-
	Annual	80	60	15	40	-
	24-hour	120	80	30	-	-
CO	1-hour	-	-	-	200	-
	8-hour	5,000	2,000	1,000	-	10,000
	1-hour	10,000	4,000	2,000	-	-
	15-minute	-	-	-	-	100,000

* 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 7: Noise Level 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).

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

Table 8: Effluent Standards

Parameters	Unit	NEC 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

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

49. Table 8 provides the standards for effluent for sewage treatment plant which may be the one applicable standards for any potential discharges (overflows) from septic systems (septic tanks and soak pits) of the housing subprojects. 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 nearly level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters.

Table 9: National Drinking Water Quality Standards, 2016

Group	National Drinking Water Quality Standards, 2016* (for Urban Drinking Water Supply)			WHO Guidelines for Drinking- Water Quality, 4 th 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 10: Workplace emissions standards

Parameter	Period	Unit measure of	Standard
Total suspended particulate matter TSPM	8-hour average	mg/m ³	10
Respirable suspended particulate matter RSPM (PM ₁₀)	8-hour average	mg/m ³	5
PM _{2.5} *	24-hour average	mg/m ³	25
	1 Year average	mg/m ³	10
Sulfur dioxide (SO ₂)	8-hour average	mg/m ³	1
Nitrogen Oxide (NO _x)	8-hour average	mg/m ³	1
Carbon monoxide (CO)	1 hour average	mg/m ³	5
Pb 17**	1 hour average	mg/m ³	0.0005
Ozone***	8-hour average	mg/m ³	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 11: 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 12: 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 tonnes	77
	Vehicles used for carriage of transport of goods with a maximum GVW exceeding 3.5 tonnes	
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.

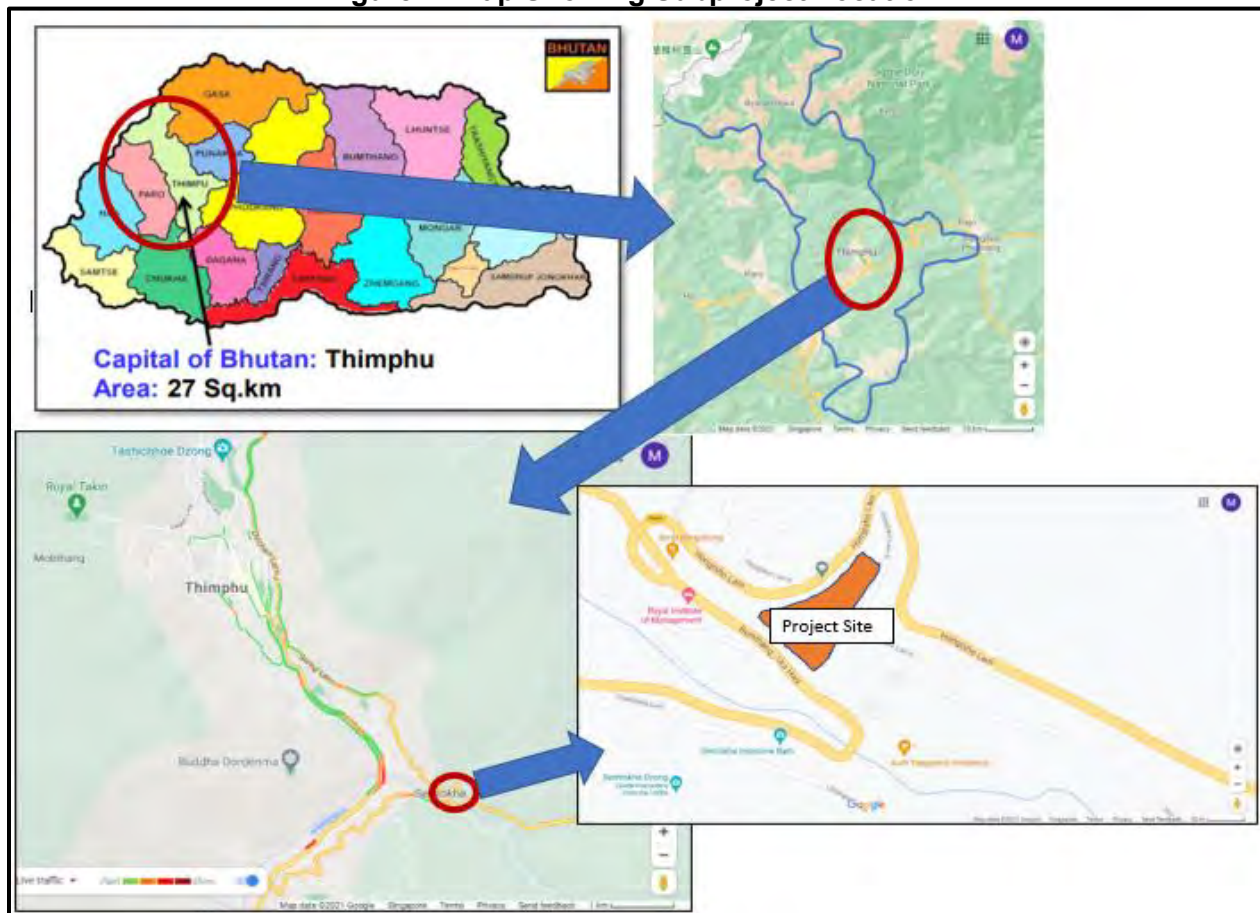
III. DESCRIPTION OF THE SUBPROJECT

A. Subproject Location and Area

50. Thimphu Dzongkhag (District) is located in the western part of the country (27°8' to 27°59' latitude and 89°13 to 89°46' longitude). It is spread over an area of 1,795.8 km² and consists of eight Gewogs, namely Chang, Dagala, Genyekha, Kawang, Mewang, Lingzhi, Naro and Soe. Mewang, Chang, Dagala, Genyekha and Kawang Gewogs falls directly under the Dzongkhag Administration while the 3 Gewogs of Lingzhi, Naro and Soe are under the Lingzhi Dungkhag Administration. The dzongkhag shares borders with People's Republic of China on the north, Paro Dzongkhag on the west, Chukha Dzongkhag on the south and Punakha Dzongkhag on the east. Thimphu Thromde (City) is the capital of Bhutan. It occupies an area of 26 km² and is located at an altitude of about 2330 masl. On the other hand, Thimphu Dzongkhag has an altitudinal range between 2100 m to 6800 masl (MOAF, 2017).

51. The subproject is located in Thimphu Dzongkhag, which is in the north-west of Bhutan, between the dzongkhags of Paro, Chukha and Gasa and Punakha (Figure 1). Within the municipal/Thromde area, the subproject site is located at Semtokha, 6.5 km from the center of Thimphu City ($27^{\circ}26'24.6''$ N and $89^{\circ}40'15.9''$ E) at an elevation of 2324masl.

Figure 1: Map Showing Subproject Location






Sources: Thimphu, Bhutan_2018 Urban Planning City Presentation.pdf and Strategic-Environment-Assessment-for-Thimphu-Structure-Plan-2018.pdf; and Google Earth on web.




52. The site for the proposed subproject is in Semtokha which is in the south-eastern part of Thimphu. The site is across the road from the Royal Institute of Management and below the National Highway to Punakha/Wangduephodrang. It is a 1.93-acre residential plot, for which an application for land user certificate is under process with the National Land Commission. Figure 2 shows the various features and notable receptors around the subproject site, and Table 13 for the specific descriptions of these receptors.


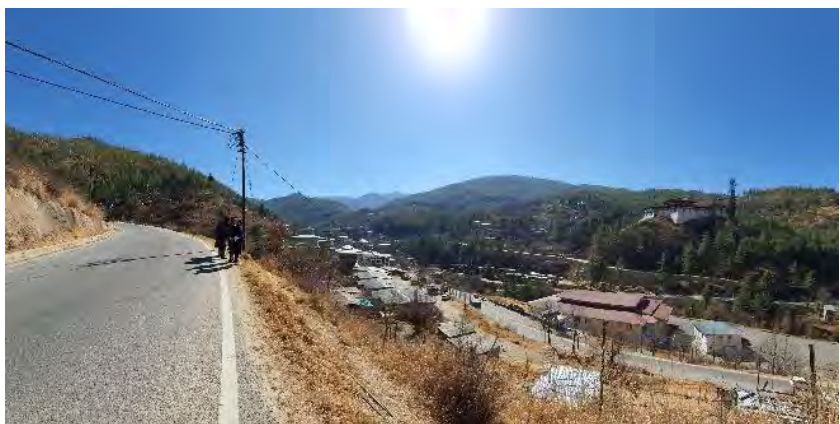

Figure 2: Features and Landscape Around Subproject Site



Table 13: Descriptions of Notable Receptors Around the Subproject Site

Features / Receptors	Photos of Reference
<p>(i) Residential Houses</p> <p>East- 20m from nearest site boundary</p> <p>West -80m from nearest site boundary</p>	
<p>(ii) Institution</p> <p>Royal Institute of Management Multipurpose Hall – 50m from nearest site boundary</p>	
<p>(iii) Physical Cultural Resource</p> <p>Semtokha Dzong – 226m from nearest site boundary</p>	

Features / Receptors	Photos of Reference
<p>(iv) Water body</p> <p>Olarongchhu – 97m from nearest site boundary</p>	
<p>(v) Roads</p> <p>Local Area Road</p> <p>(The Temporary shed is inside the plot and will be demolished)</p>	
<p>National Highway to Punakha/ Wangduephodrang</p>	
<p>Access Road to site from the National Highway to Punakha/ Wangduephodrang</p>	

Features / Receptors	Photos of Reference
	
National Highway to Punakha/ Wangduephodrang (below and above the site)	
(vi) Forest Government Reserved Forest – 115m from nearest site boundary	

53. Thimphu is in the highlands of Bhutan with naturally rough and hilly terrain, which makes the site bounded by varying slopes. Figure 3 below shows the contour map and inset photos of lowest and highest elevations bordering the site.

Figure 3: Contour Map of Site

B. Subproject Rationale

54. Over the past decades, the growth in urban population due to increasing rural-urban migration and increasing development in urban areas has exerted great pressure on existing services. An estimated 10 percent of Thimphu city's population lives in informal settlements.²¹ Unlike the past, where families traditionally lived under one roof, the nuclearization of families has created a gap between demand and supply of affordable housing. Moreover, based on assessment by the government, the existing housing which are not disaster resilient need to be demolished and upgraded to ensure safety and provided with modern amenities, that cater to both a variety of tenants.

55. Under the 12 Five Year Plan (FYP), the Government has a designated National Key Result Area (NKRA) that aims to improve livability, safety and sustainability of human settlements through access to adequate affordable housing, efficient and effective municipal services, and clean and green public spaces for social engagement. An integral part of this NKRA 15, is the provision of affordable housing, which is the primary objective of this subproject

C. Subproject Alternatives and Site Selection

56. There are no project alternatives because of the shortage of housing in the city. The government has placed great emphasis on improving livability and reducing disparities in access to affordable housing for low-income groups, and this subproject is part of the government's effort to reduce housing shortage.

57. Overall, while the housing development is intended for the low-income groups, the site selection has considered several factors that will ensure avoidance of or minimal environmental

²¹ RGOB, 2019. 12 FYP document

impacts, and will safeguard the welfare and well-being of the future occupants, such as, but not limited to, the following:

- (i) Complies with all requirements of relevant national, state and local laws, rules and regulations;
- (ii) Complies with all requirements of ADB SPS, 2009;
- (iii) Does not involve components, processes and technologies that pose significant threat to public health and the environment, such as incinerators, etc.;
- (iv) Does not involve works within or near environmentally sensitive locations (must be at minimum distance of 500m), including sites with national or international designation for nature conservation, cultural heritage, or any other purposes.²²
- (v) Does not result in destruction of or encroachment onto physical cultural resources such as archaeological monuments; heritage sites; and movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.
- (vi) Does not lead to degradation of cultural properties, and loss of cultural heritage values and tourism revenues.
- (vii) Not located in flood zones and/or adjacent to natural water courses (must not be within 30 meters from the edge of major streams, and/or within 15 meters from the edge of small streams);
- (viii) Does not lead to alteration of surface water hydrology of streams/waterways through diversion of flow or reclamation;
- (ix) Not located in areas that can cause adverse impact on human health, such as but not limited to the following:
 - Municipal solid waste dumps (must be at least 1 km away),
 - STPs (must be at least 500 m away),
 - Industrial area with polluting industries (must be at least 500 m away or at a distance wherein pollutants will not affect the ambient air quality at the site, whichever is more strict), and
 - High-tension cables (distance must be in compliance with the guidelines of the Bhutan Power Corporation and Bhutan Electricity Authority to avoid long term exposure to high electromagnetic fields (EMF)). The distance from high tension cable should ensure that the EMF is reduced to safe exposure level;²³
- (x) Area that has sufficient space for all allied infrastructures. If there is no centralized septage management in the town, the area shall have sufficient space for septic tanks/chambers designed to accommodate target number of occupants;
- (xi) Avoids area with risk of landslides, unstable lands, etc. based on historical data, including geotechnical studies, if possible;
- (xii) Avoids removal of trees where possible. When mature trees must be removed, new trees must be planted following the compensatory replacement required by the government;
- (xiii) Area that is included in territorial jurisdiction of the municipality/town/city (Thimphu city for this subproject), compliant with land use regulations, and any urban development plans or master plans of the national or local government;

²² The subproject shall comply with Thimphu's DCR-2016 particularly on sanctions pertaining to allowed locations for housing developments.

²³ US EPA: Questions and Answers About Electric and Magnetic Fields (EMFs).

- (xiv) Area where access to basic services can be practically built or established. These basic services include water supply, sewerage system, electricity, telecommunication, sanitation/solid waste management, etc;
- (xv) If area is outside the periphery of the urban center, the area should be accessible via public transport and/or has road infrastructures leading to civic centers, markets, institutions such as hospitals, schools, etc.;
- (xvi) Does not adversely affect the existing community resources/ facilities, such as roads, sanitation services, water supply, solid waste management, power supply, parking spaces, etc.; and
- (xvii) Ensures that the subproject design will not lead to depletion of water supply and degradation of groundwater and surface water in the area. The following should be considered:
 - Conservation measures integrated into the design;
 - Water supply is sufficient during the operation phase. Liaising with water supply provider should be part of the consultation and assessment; and
 - Not to overburden the sewerage system and other infrastructures in the area.

D. Subproject Components and Design

58. The subproject in Thimphu (that is the focus of this IEE) is one of 9 subprojects designed by the NHDCL that will provide affordable housing in six dzongkhags (districts), bringing the above benefits (and others) to an estimated 1,026 – 1,062 urban households - mostly low-income civil servants, corporate employees and wage workers.

59. For Thimphu, the subproject involves construction of 8 five-storey residential buildings comprising of 110 units, with internal access road, parking, creation of a green space and a service center block. Table 14 below shows the size of the various components of the subproject, while Figure 4 shows the layout.

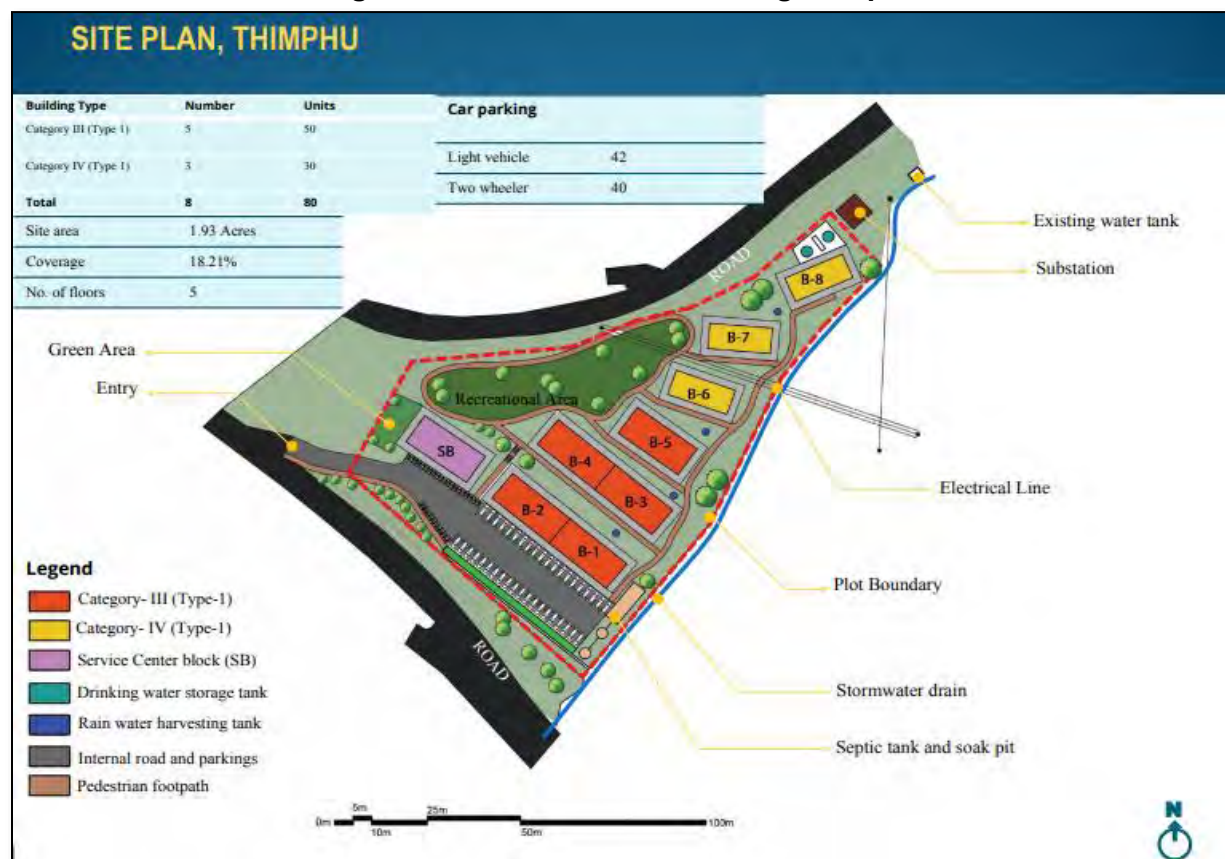
Table 14: Details of the Housing Complex in Thimphu

Sl. No.	Building Type	Number of Buildings	Total No of Units	Details
1	Category III (Type I)	2	20 (2 Bldgs. x 5 floors x 2 units)	Plinth area (1floor): 203.17 m ² (2186.11 sq. ft.) Unit area: 101.58 m ² (1093.05 sq ft.) Building height: 19.275 m
2	Category IV (Type I)	3	30 (3 Bldgs. x 5 floors x 2 units)	Plinth area (1floor): 203.17 m ² (1432.38 sq. f.t) Unit area: 66.54 m ² (716.19 sq ft.) Building height: 18.95 m
3	1 BHK Apartment	3	60 (3 Bldgs. x 5 floors x 4 units)	Plinth area (1floor): 226.13 m ² (2433.16 sq. ft.) Unit area: 56.5 m ² (607.94 sq. ft.) Building height: 19.42 m
	Total	8 buildings	110	
	Facilities			
4	Service Center (Occupying 2 floors)			
5	Internal road and parking (To fit 42 light vehicles and 40 2-wheelers)			
6	Other facilities <ul style="list-style-type: none"> • Pedestrian footpath 			

	<ul style="list-style-type: none"> • Recreational area/Green space • Drinking water storage tanks • Rainwater harvesting tank • Power supply sub-station
--	--

BHK = bedroom-hall-kitchen

Figure 4: Site Plan of the Housing Complex



1. Building Design²⁴

60. The buildings are designed keeping in mind the location within the Lungtenphu Local Area Plan and Development Control Regulation 2016, Building Regulation, 2018 and the Bhutan Building Code, 2018. These rules and regulations set out the requirements which apply to the construction of buildings, and prescribe the building dimensions, circulation space requirements, design standards, detailing of structures, light and ventilation requirements, water supply and sanitary control, electrical requirements and standards, fire safety, access, parking and provisions for disabled persons.

61. The structural design is in line with the following Special Publications and Indian Standards:

- (i) IS 13920_2016 (Ductile Design of Reinforced Concrete Structures);

²⁴ The building designs presented in this IEE report are preliminary, which may be updated accordingly. NHDCL will comply with all relevant regulations such as the Bhutan Building Code 2018, Bhutan Building Regulations 2018, etc., including the requirement for emergency or fire exits as may be required.

- (ii) SP16 (Design Aids for Reinforced Concrete to IS 456);
- (iii) IS 1893 Part 1 - 2016 (Criteria for Earthquake Resistant Design of Structures);
- (iv) IS 4326-2013 (Earthquake Resistant Design and Construction of Buildings);
- (v) IS 800 (Code of Practice for General Construction in Steel);
- (vi) IS 875_1 (Code of Practice for Design Loads-Dead Loads);
- (vii) IS 875_2 (Code of Practice for Design Loads- Live Loads);
- (viii) IS 875_3 (Code of Practice for Design loads- Wind loads); and
- (ix) SP 34 (Handbook on Concrete Reinforcement and Detailing).

62. The designs also comply with the Bhutan Green Building Guidelines, 2013, Bhutanese Architecture Guidelines, 2014, Bhutan Building Color Code, 2014 and the Design Guidelines for Differently Abled Friendly Construction, 2011.

63. **The Category III (Type I) Building.** This type of building will include 1 Living Room, 2 Bedrooms, 2 Toilets, 1 Kitchen and 1 Balcony. Each unit will have an area of 101.58 m² (1093.05 sq.ft.) and the Plinth (1 Floor) will have a total area of 203.17 m² (2186.11 sq.ft.).

64. **The Category IV (Type I) Building.** This type of building includes 1 Living Room, 2 Bedrooms, 2 Toilets, 1 Kitchen and 1 Balcony. Each unit will have an area of 66.54 m² (716.19 sq.ft.) including balcony, and the Plinth (1 Floor) will have a total area of 133.07 m² (1432.38 sq.ft.).

65. **The 1 BHK (Bedroom-Hall-Kitchen) Apartments.** This type of apartment will include 1 Living room, 1 Bedroom, 1 Toilet, 1 Kitchen and 1 Balcony. Each apartment will have an area of 56.50 m² (607.94 sq.ft) including balcony, and the Plinth (1Floor) will have a total area of 226.13 m² (2433.16 sq.ft.).

66. **Service Center.** The Service Center will have two floors with a plinth area of 194.00 m² and a total floor area of 388.00 m² (4,176.39 sq.ft.) each. The Ground Floor includes a lobby (5000 m x 3675 m), sleeping room (4325 m x 3700 m), indoor play area (7000 m x 5000 m), community police area (5000 m x 4250 m), commercial space(9450mx3700m), store (1275 m x 4250 m), pantry (4325mx1500m), and four toilets (2 M, 2F).

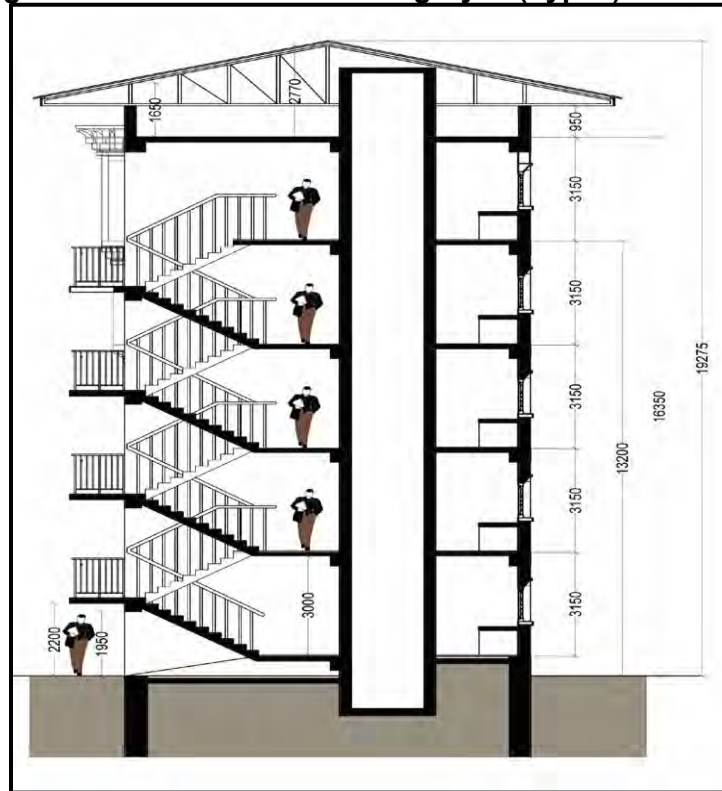
67. The first floor will house a counseling room (3850mx4200m), a community integration hall (5125mx7950m), skills development hall (7950 x 5000 m), temporary shelter room (4325mx6750m), registration area, washroom and four toilets (2 M, 2F).

Figure 5: Front View of Category III (Type I) Building²⁵



²⁵ See footnote 32.

Figure 6: Cross Section of Category III (Type I) Building²⁶



²⁶ See footnote 32.

Figure 7: Layout / Floor Plan of Category III (Type I) Building²⁷

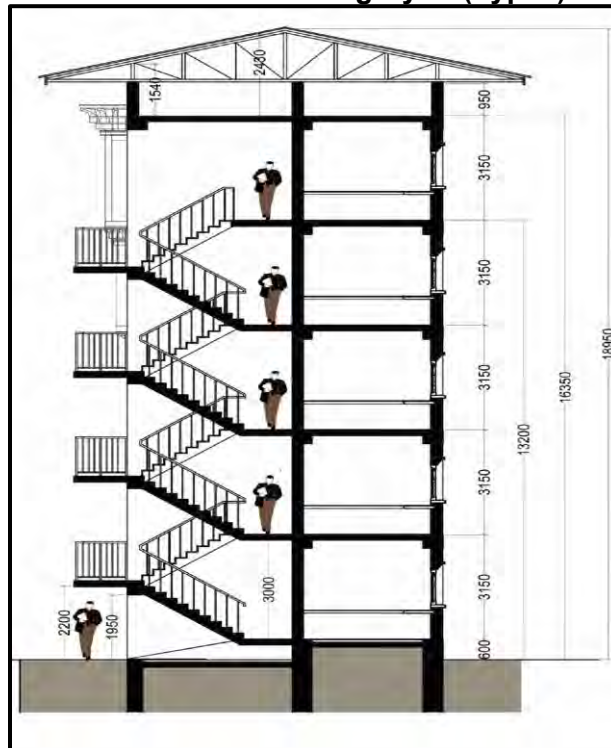


²⁷ See footnote 32.

Figure 8: Front View of Category IV (Type I) Building²⁸



Figure 9: Cross Section of Category IV (Type I) Building²⁹



²⁸ See footnote 32.

²⁹ See footnote 32.

Figure 10: Layout / Floor Plan of Category IV (Type I) Building³⁰



³⁰ See footnote 32.

Figure 11: Layout / Floor Plan of One-Bedroom (BHK) Apartment Building³¹

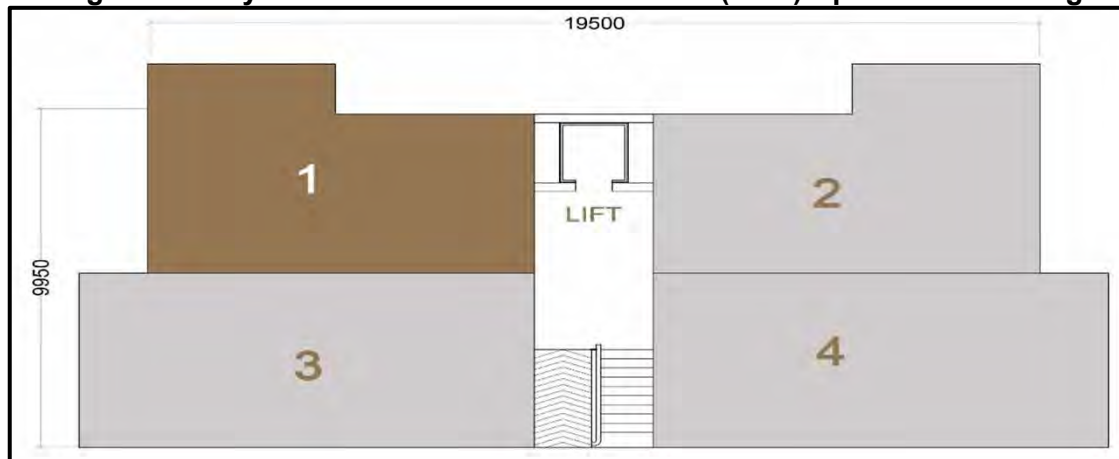
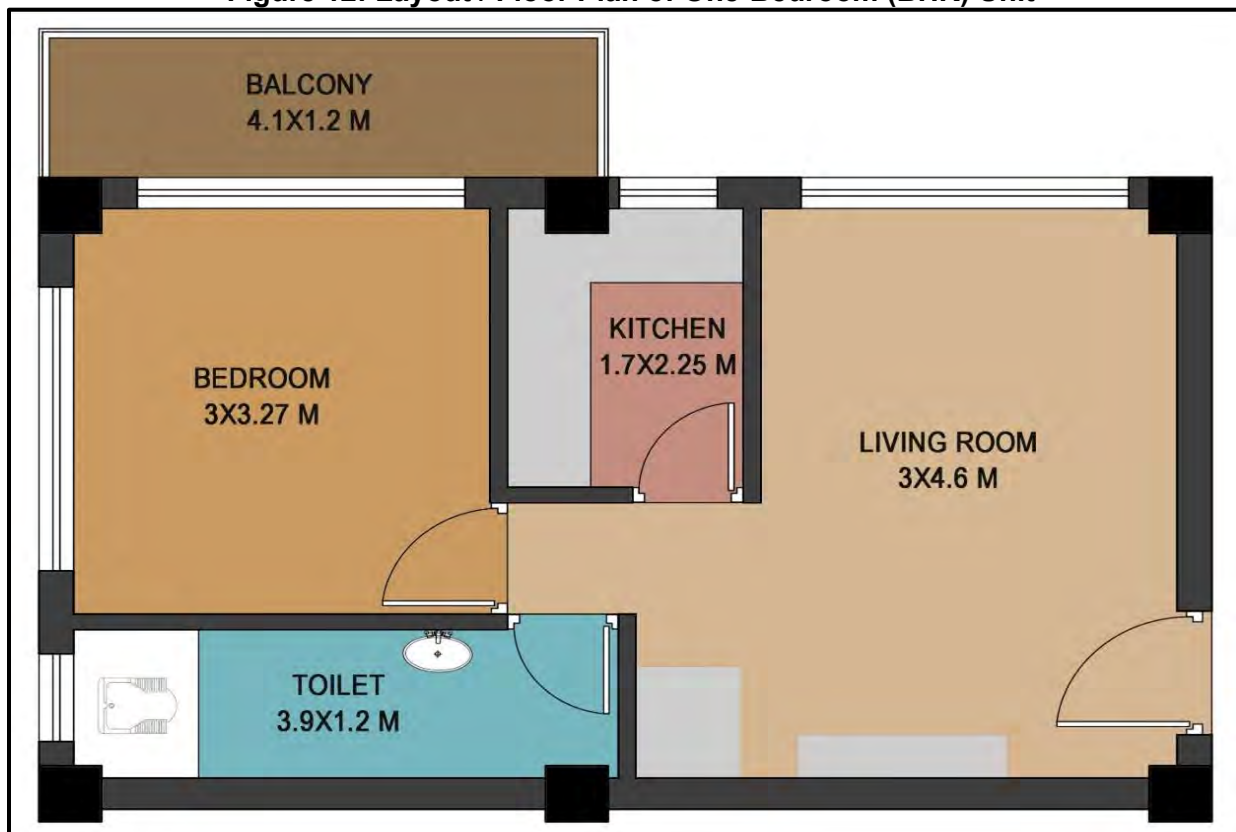
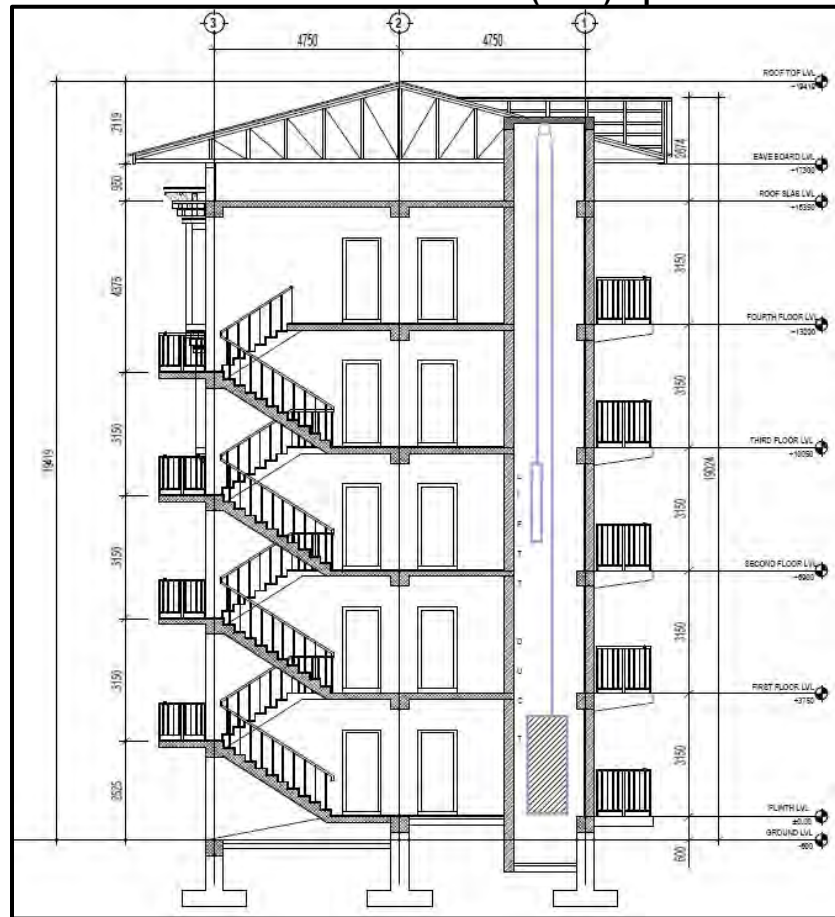


Figure 12: Layout / Floor Plan of One-Bedroom (BHK) Unit



³¹ See footnote 32.

Figure 13: Cross Section of One-Bedroom (BHK) Apartment Building³²



³² See footnote 32.

Figure 14: Layout / Floor Plan for the Service Center - Ground Floor³³



Figure 15: Layout / Floor Plan for the Service Center - First Floor



³³ See footnote 32.

68. **Site preparation works.** This will include demolition works, site clearance, tree felling and handing over of the site to the Contractor. The demolition work package is under preparation by NHDCL and will be awarded to a Contractor, who will prepare a demolition plan.

69. **Design Capacity.** For this housing development, the design assumes five persons to reside in each unit in the larger category apartments, and three to reside in the single bedroom apartment, which translates to about 430 total residents in this housing complex. As such, the amenities and facilities are designed according to this target number of residents, such that the capacity of drinking water storage tanks, rainwater harvesting tanks and septic tanks are sufficient.

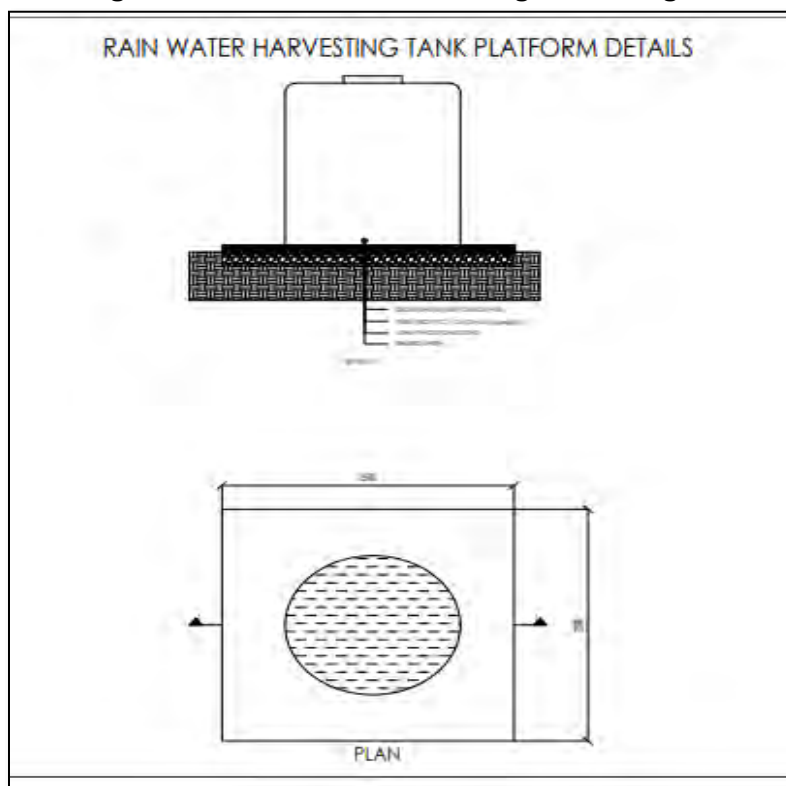
70. **Water supply details.** Currently the water for the existing housing complex is provided from the community water source from Chamgang. The municipality is responsible for ensuring regular supply of water to all buildings within the city.

71. Each building will be provided with two units of 2,500-liter water storage tank. Thus, the total storage capacity in the residential buildings is 40,000 liters. On average each person is expected to consume about 100 liters of water per day. In addition, the service block will also be provided with one 2,500-liter storage tank.

Table 15: Daily Water Requirement Calculation

Building	Total Number of Units	Number of Persons	Water Consumption
Category III and IV	50 units	50 units x 5 persons/unit = 250 persons	250 persons x 90 liters/person = 22,500 liters
1 BHK Apartment	60 units	60 units x 3 persons/unit = 180 persons	180 persons x 90 liters/person = 16,200 liters
Total for Residential Buildings			38,700 liters

72. **Rainwater harvesting.** To further supplement the water storage tanks, a 2,500-liter capacity rainwater storage tank will also be installed on the upper slopes near the water tank. Figure below shows the rain water harvesting tank details.

Figure 16: Rainwater Harvesting Tank Diagram

73. **Electrical power supply.** Electrical power supply source is already available at the site through the existing distribution network in the area. The existing buildings at the site, including the housing complexes and establishments around, are already connected to this power supply. But given the expected high number of occupants of the new housing facility in the future, a high-power supply load requirement is anticipated as well. Thus, NDHCL will outsource the design and technical requirements for this issue with the Bhutan Power Corporation (BPC). BPC is expected to assess the electrical requirements, provide the technical specifications, and install additional distribution lines and substation, if required. The cost of this will be borne by NHDCL.

74. **Septic tank and soak pits.** The septic tank will receive both WC waste and sullage from the buildings. Based on the estimated number of 430 persons, the overall dimensions of septic tank including wall is 11.55m x 3.85m. The tank will have two sections; with the first chamber having dimension of (7.45m length x 3.35m width x 1.8m depth) and the second chamber having dimension of (3.35m length x 3.35m width x 1.8m depth). The tank will be connected to two soak pits, each having diameter of 3m.

75. Accordingly, the septic tank is designed with impermeable bottom and sides, at least two chambers, and that the effluent complies with the government standards. Any plan to discharge the final effluent to a soak pit shall ensure that such final effluent complies with the standards for E. coli parameter. Table 16, Figure 17,

76.

77.

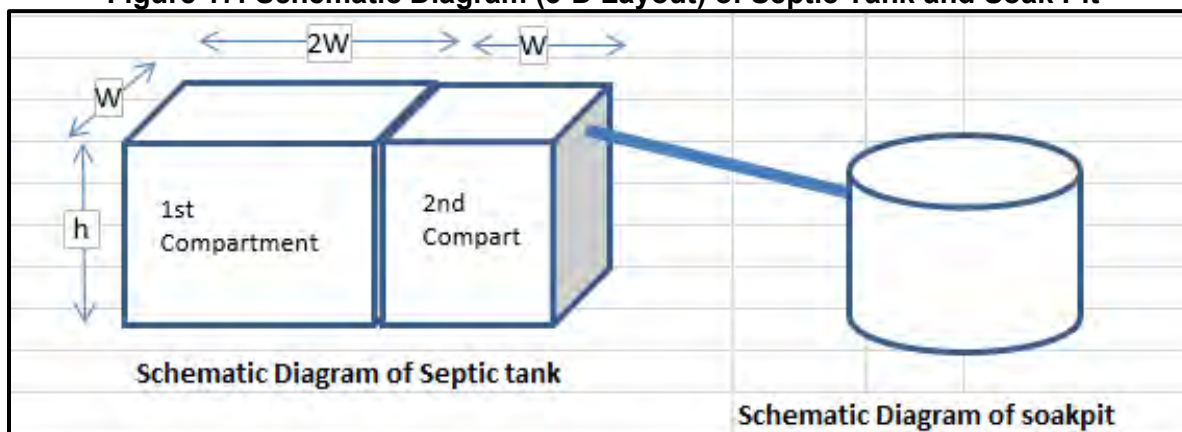
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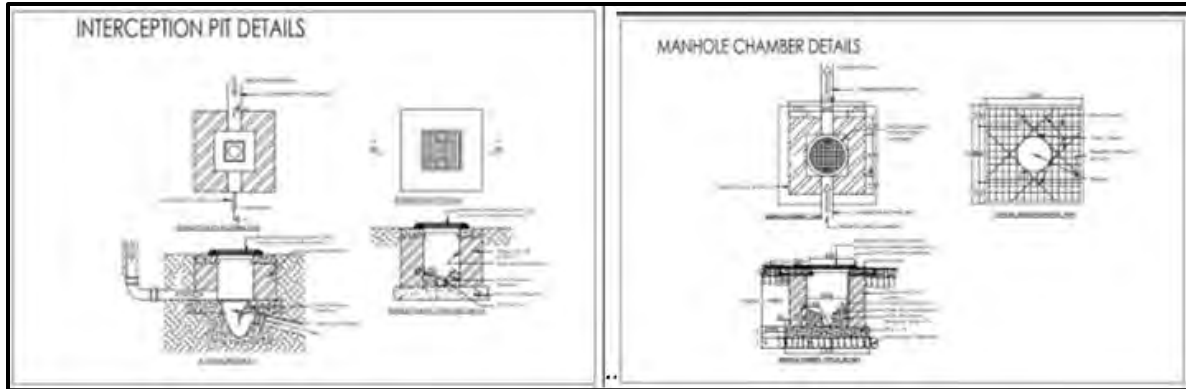
79. **Figure 18**, and Figure 19 below show the design of the septic tank and soak pit.

Table 16: Design Data for Septic Tank

Design Data / Parameters	Remarks
Average number of persons per unit	5 for 2 bedroom, 3 for 1 bedroom
Total number of persons	400 - 430
Septic tank will receive both WC waste and Sullage	
Volume of sewage entering the tank daily	43,200 liters
Ambient temperature in water	15 degrees Centigrade
Retention period for the wastewater in the septic tank	24 hours
Period between desludging	2 years
Depth of tank	1.8m
Gap between water level and underside of cover slab	0.3m
Length to breadth ration of tank	3
Sewage flow	108 liters
Sizing factor	1.15
Sludge and scum accumulation rate/person/year	40 liter
Volume of sludge and scum	36,800 liter
Required tank volume	80,000
Plan area of tank	44.44 m ²

Figure 17: Schematic Diagram (3-D Layout) of Septic Tank and Soak Pit





80. **Plumbing and Sanitation.** The plumbing and sanitation design are in compliance with applicable plumbing codes of practice. The designs include details on kitchen, bathroom and water closet (WC) outlets; the location of the septic tank and soak-pit, including manhole, layout plan of the internal plumbing system of each floor, with details of pipe sizes and material. Water meters will be provided for each dwelling unit. The building drains will be connected to the existing stormwater that runs N-S along periphery/boundary of the site into the Olarongchhu, as shown in Figure 20 below.

Figure 20: Storm Water Canal/Drainage Adjacent the Site

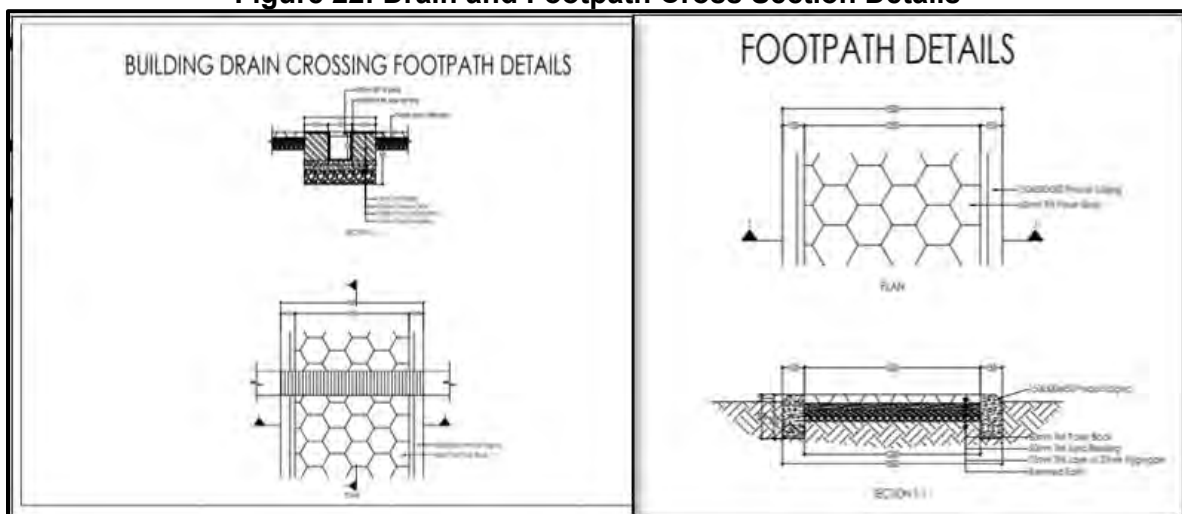


81. **Site accessibility, entry, exit and internal roads.** The existing entry from Lungten Lam, just above the Royal Institute of Management (see Figure 21 for the layout and Table 13 for actual photo at the site), will be used for the site, so there is no need to construction approach road. There will be only one entry and exit for the site. At the entry, the parking is designed to accommodate 42 light vehicles and 40, 2 wheelers. Figure 21 also shows the internal road and parking details. From the main parking, internal roads to connect each building will also be accessible through the pedestrian footpath from the Parking. The housing complex will have a boundary wall with chain link fencing. Figure 22, Figure 23, and Figure 24 show the design layout and cross sectional details of these external facilities.

Figure 21: Layout of Site Access, Internal Road and Pedestrian Footpaths



Figure 22: Drain and Footpath Cross Section Details



- (ii) Concrete: IS-456_2000 (Plain _ Reinforced Concrete Code of Practice);
- (iii) Masonry (manufactured): IS 2185:2005 (Part 1);
- (iv) Wood: IS 3629:1986, IS 883:1994; and
- (v) Earth and stone: IS 2185:2005 (Part 1).

83. Specific to major construction earth-based materials such as aggregate, sand and stone, these will be sourced from local authorized suppliers from Phuentsholing and Thimphu. Other materials such as plywood, tiles and bathroom fixtures will be purchased from local suppliers or directly from India.

84. **Construction Technology.** The contractor will engage earth moving equipment, excavators, tower cranes if available, prefabrication of doors and windows off site, use of construction management software to manage, monitor and ensure timely delivery of projects.

85. **Disaster and emergencies.** The buildings are designed for seismic performance (IS 1893:2016, Zone V, $Z=0.36$, $I=1.37$, $R=5$, Damping=5%). A retaining wall will be constructed along the lower portion of the site, just immediately above Lungten Lam to minimize the risk of landslide. Other site hazard mitigation measures like storm water drains and retaining walls will also be constructed. Also, the area immediately below the highway, which is on steeper terrain, will be left untouched to avoid disturbing the slope and increasing landslide risks.

86. **Fire safety.** In terms of fire safety, the building designs are in compliance with the Bhutan Building Standard (BTS)-014 and Part 6 of the Building Code 2018. According to the Code, Exits must be located so that the travel distance to the exit on each floor does not exceed the distances set out in the table at the foot of this clause. For Residential Building the travel distance is 22.5 m.

87. Each building will be provided with a fire dry hydrant, that will be utilized when the fire engines is mobilized from the Thromde during a fire emergency. A hose pipe will be stored in the staircase landing area of the selected building.

88. **Solid Waste Management.** Thimphu Thromde has an established waste collection systems in the urban areas. Currently, Thimphu Thromde authority has outsourced the collection and disposal of waste to three private companies, namely: (i) Greener Way, which is responsible for the central region of the municipality; (ii) Clean City, which is responsible for the northern region of the municipality; and (iii) Green Bhutan Service, which responsible for the southern region of the municipality. The subproject site falls within the coverage of Green Bhutan Service. Currently, waste is collected three times a week between 8.30AM-1PM. Wet waste is collected on Saturday and Dry Waste every Monday and Thursday. The final waste after segregation by the private companies is disposed at the landfill site in Memelhakha.

Source: Thimphu Thromde official website

Source: Thimphu Thromde official website

89. **Green area and landscaping.** 41.4% of the 1.93 acres of land will be left as green area. This area serves as a buffer from the highway above and the buildings below, reducing noise impacts from vehicular traffic above. The green area is well located and easily accessible to all buildings through pedestrian footpaths. Once the construction is over, the green area as well as periphery of the site will be planted with local species. Although the plan for the green area is still under process, much of this area will be left as open space with a few benches and tables.

90. **Aesthetics.** The Architectural drawings will comply with the Bhutanese Architecture Guidelines 2014 and the external façade of the buildings will be compatible with existing buildings and structures in the local area. Wherever possible, local building materials will be used.

E. Subproject Implementation Schedule

91. The preliminary design works have already begun and once the final approvals have been obtained, the contract works will be advertised. Site works are expected to begin as soon as contractors are selected. The construction work will be complete in 18 months as per the schedule given below.

Table 17: Work Schedule

	Activity	Months Period											
		2	4	6	8	10	12	14	16	18	20	22	24
1	Approval of architectural drawings												
2	Preparation of BOQ												
3	Advertisement of contract works												
4	Establishment of PIU and supervision team												
5	Handing over of site to Contractor												
6	Construction												
7	Taking over of site from Contractor												

F. Resource Utilization

92. The construction of 8 buildings will require a significant amount of resources. With the design process still ongoing, the total quantity for each resource is yet to be quantified. In general however, the major construction materials required include stones, aggregates, sand, cement and timber. Aggregate, sand and stone and timber will be sourced from local authorized suppliers from Thimphu, Paro or Punakha.

93. Approved construction materials approved will be sourced from local Bhutanese manufacturers (TMT rods, bricks, cement) but others such as tiles, paints, lights, plumbing and interior fixtures will most probably be imported from India (or otherwise as determined by NHDCL) as Bhutan does not manufacture these items.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Baseline information

94. The subproject is located in Semtokha, which is 5-6 kilometers away from the main city of Thimphu.

Figure 26: Map Showing Subproject Site



Source: Google earth

95. Within the city, it is located in the Langjuphakha local area plan.

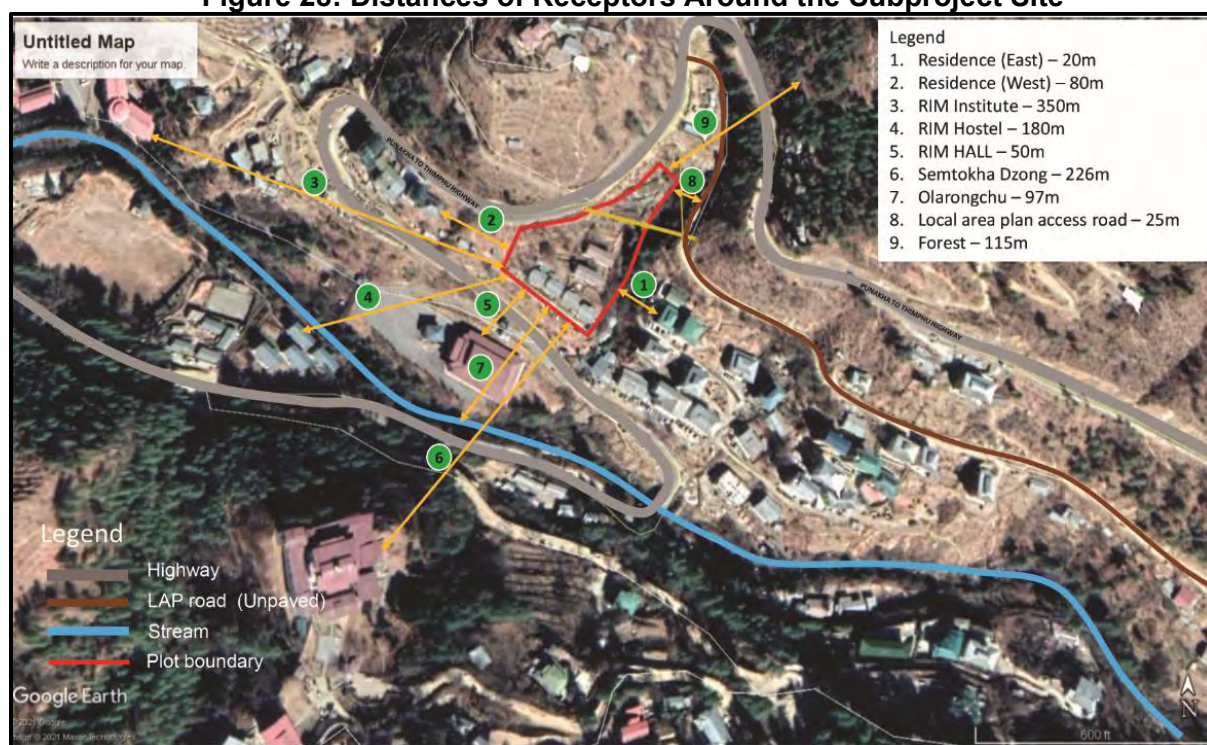
Figure 27: Subproject Site and Surrounding



B. Subproject Influence Area

96. The major environmental impacts during both construction and operational phases (e.g., drainage congestion, noise/air pollution, water/environmental pollution, traffic congestion) are unlikely to affect areas beyond 200m from the subproject site. Thus, the 200m from the subproject boundaries are considered as the subproject influence area. Figure 28 shows the distances of receptors around the subproject site.

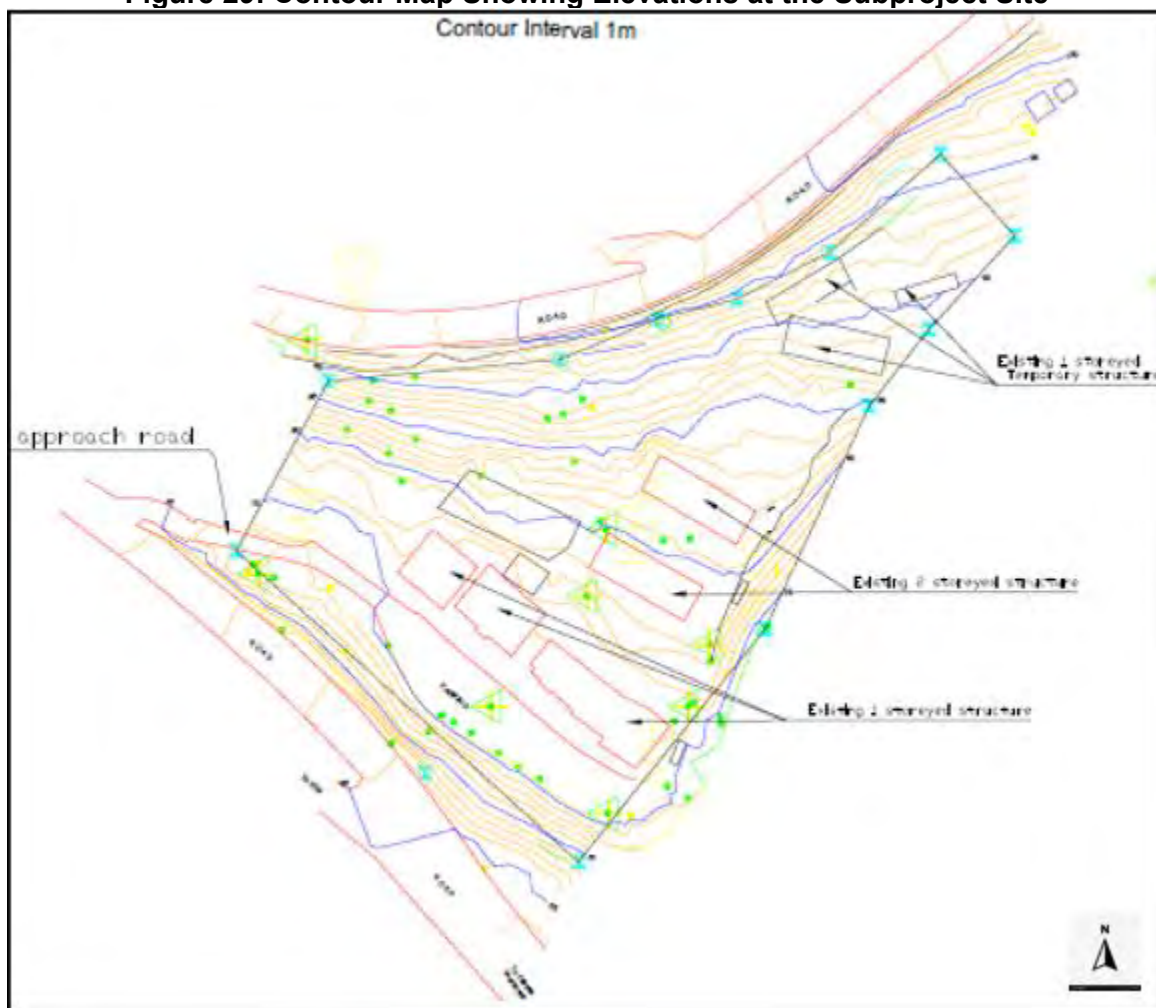
Figure 28: Distances of Receptors Around the Subproject Site



C. Land Environment

97. **Land Use, Topography, and Geology.** Thimphu Dzongkhag is the most developed district in the country. It is home to the nation's capital city and the dzongkhag itself has roughly 42.9% of its area under forest cover, with the northern region falling under the Jigme Dorji National Park. Thimphu is vibrant with an abundance of restaurants, hotels, nightclubs and shopping centers. It is also the main center of commerce and government in the country. It is situated in the constricted linear valley of the Wang Chhu (River) or also known as Thimphu Chhu. The source of the Wang Chhu is the Himalayan peaks at an altitude of about 7000 m asl. The many tributaries that flow from the Himalayan peaks largely dictate the topography of the Thimphu valley. Thimphu valley is restricted by a steep eastern ridge that rises from the riverbed and a gradual sloping topography is found on the western banks of the Thimphu Chhu. At the subproject location, the site is bounded by varying slopes, with the highest level at the northern side and lowest at the southern side. Figure 29 shows the contour map at the site.

Figure 29: Contour Map Showing Elevations at the Subproject Site



98. The geological formation of the Thimphu Dzongkhag region mainly consists of highly metamorphosed gneisses, schist, subordinate quartzite, calcium silicate rocks, and marbles. These formations belong to the pre-Cambrian age (600 million years ago).³⁴

D. Water Environment

99. Thimphu lies in the valley of the WangChhu, which is 370 km long and consists of three major tributaries from the three valleys of Thimphu, Paro and Haa. The tributary flowing through Thimphu valley is also known as Thim Chhu and flows south and joins the other two tributaries, finally flowing into the Indian plains through Chukha district. The overall catchment of Wangchhu is 4,596 km² and it has an annual flow of 5,209 million m³ (NEC, 2016).

100. In the vicinity of the subproject site, the Olarongchhu is the nearest receiving body of water. This water body lies at about 97m from the nearest boundary of the site (see Figure 28). Figure 30 below also shows an inset photo of Olarongchhu. This river serves as a natural drain in the area.

³⁴ Government of Bhutan, Ministry of Works and Human Settlement. 2004. *Thimphu Structure Plan*. Thimphu.

Figure 30: Map Showing the Site and Olarongchhu



E. Air Environment

101. **Temperature.** Thimphu Dzongkhag has a temperate climatic condition with warm summers and cold and dry winters. According to the National Statistics Bureau, the average maximum temperature in 2019 was recorded to be 22.7°C, while the average minimum was recorded to be 6.1°C. Overall, the average temperature for the dzongkhag was recorded to be 14.4°C. In addition, the total rainfall collected at Simtokha station was 394.1 mm.

Table 18: Monthly Maximum, Minimum and Average Temperature for Semtokha, Thimphu

Temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Max	16.1	18.6	21.3	22.9	24.5	29	29.7	28.7	28.2	21.3	18.2	14.1	22.7
Min	-4.3	-1.2	2.1	6.1	10.1	14.2	15.8	15.3	13.3	5.5	-0.4	-3.7	6.1
Avg	5.9	8.7	11.7	14.5	17.3	21.6	22.8	22	20.75	13.4	8.9	5.2	14.4

Source: NSB, 2019.

Table 19: Total Monthly Rainfall at Existing Station in Semtokha, Thimphu

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total (mm)
0	0.8	25.2	20.5	28.8	40.8	96.6	121.5	40.6	4.3	0.0	15.4	394.1

Source: NSB, 2019.

102. **Ambient Air Quality.** As the city with the highest population, vehicles and development activities, the air quality in Thimphu has been deteriorating over the years as with each additional development activity and vehicle. Areas such as Debsi and Kabesa that were considered rural a decade ago are now filled with construction works and newly built structures. Additionally, Thimphu is seeing more rural to urban migration and the urban region of the dzongkhag continues to expand. The NEC report on air quality status for Thimphu in 2011–2012 reported that PM₁₀ levels had doubled since 2007 and is increasing each year.³⁵

³⁵ Government of Bhutan, National Environment Commission. 2013. *Brief report on air quality status over 2011 and 2012.* Thimphu.

103. The air quality of Thimphu from 2017 – 2019 is shown in Table 20. The air quality parameters such as total suspended particulate matter (PM₁₀ and PM_{2.5}) of Thimphu are both below the ambient air quality standard for mixed area set by NEC which is 60 µg/m³. Other air quality parameters such as Sulphur Dioxide and Nitrogen Oxide are recorded as negligible, but an increasing trend in the level of these two parameters are noticed.

Table 20: Air Quality of Thimphu 2017-2019 (City Center)

Air quality parameters	2017	2018	2019	Ambient air quality standard (mixed area)
Station: Thai Pavilion, Thimphu, Unit: µg/m ³				
Total suspended particulate matter (PM ₁₀)	36.86	23.57	24.03	60.00
Total suspended particulate matter (PM _{2.5})	22.44	15.92	16.95	40.00
Sulphur Dioxide (SO ₂)	0.20	0.32	0.49	60.00
Nitrogen Oxides (NO _x)	5.06	6.76	16.93	60.00

104. In general pollution is higher in winter during the dry seasons as compared to summer, due to the increase in the use of wood and kerosene for fire. Pollution is higher in winter during the dry seasons as compared to summer, due to the increase in the use of wood and kerosene for fire.

F. Noise Environment

105. The acoustic environment at the subproject site and vicinity is perceived to be relatively quieter than any other areas in the center of Thimphu. Noise level is perceived to elevate only during the busy hours of the day when traffic movements increase on the roads and when other construction activities resume in the area.

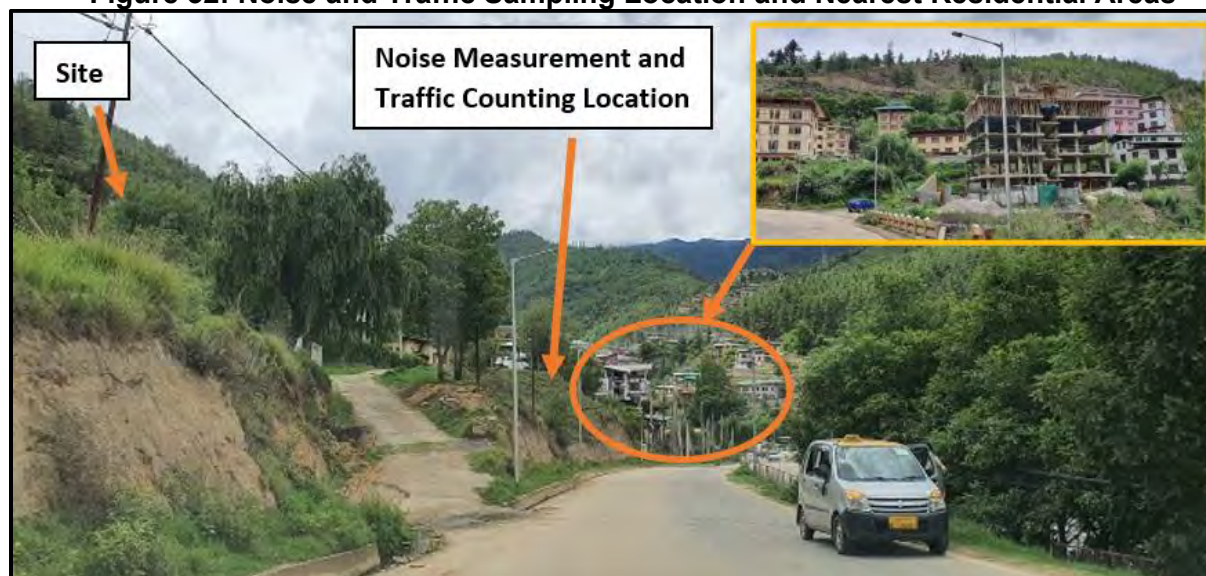
106. Random noise level measurements were undertaken during the morning rush hours at the vicinity of the site. Sound measurements were taken for 15 minutes at 6:15 AM and at 9:17 AM, using the sound meter on an Android Phone (Samsung Note10+). The weather was cloudy with slight drizzle in the early hours but only cleared after 11:00 AM. Sound measurements were 36.6 dB (6:15 AM) and 48.3 dB (9-10 AM).

Figure 31: Sound/Noise Level Measurement
(Semtokha Dzong behind Royal Institute of Management)



107. Apart from Semtokha Dzong and RIM, other residential and small commercial establishments are near the subproject site. The nearest residential areas are just few tens of meters from the site as shown in the Figure below.

Figure 32: Noise and Traffic Sampling Location and Nearest Residential Areas



G. Ecological Environment

1. Forest cover and biodiversity

108. Thimphu dzongkhag has only 53% forest cover, as compared to the national forest cover of 71%.³⁶ Because of its altitudinal range (2100 to 6800 masl), the forest varies from cool broad-leaved mixed with blue pine and mixed conifer at the valley bottom and settlement areas, hemlock and broadleaved, mixed conifer to pure Fir zone and alpine meadows at higher altitudes. The closest forest towards the south of Thimphu city provides habitat for a number of wildlife species. The common ones are Sambar (*Cervus unicolor*), Barking deer (*Muntiacus muntjak*), Wild boar (*Sus scrofa*), Monkey (*Rhesus sp.*) and Grey Langur (*Presbytis entellus*) and Himalayan Black Bear (*Selenarctos thibetanus*), while the rarer ones are Leopard (*Panthera pardus*), Wild dogs (*Cuon alpinus*), Yellow Throated Marten (*Martes flavigula*), Red Panda (*Ailuurus Fulgens Fulgens*) and Serow (*Capricornis sumatraensis*).³⁷ Areas where such rare species exists within the forest management units are protected as protection management circles and as core zones/critical habitats in protected areas. Sometimes barking deer, wild pigs, black bears and monkeys are reported within city limits especially during autumn.

109. For the specific site of the subproject, vegetations are basically naturally growing small shrubs and trees, in addition to agricultural crops grown by the residents in the area. Sighting of wild animals, particularly the protected species, at the site is very rare. Figure below shows the actual photos of the site.

Figure 33: Natural Vegetations at the Subproject Site



³⁶ FRMD (2020). Forest Facts and Figures-2019. Forest Resource Management Division. Department of Forest and Park Services. Thimphu, Bhutan

³⁷ DOFPS, 2016. Chamgang Forest Management Plan, (2017-2027)

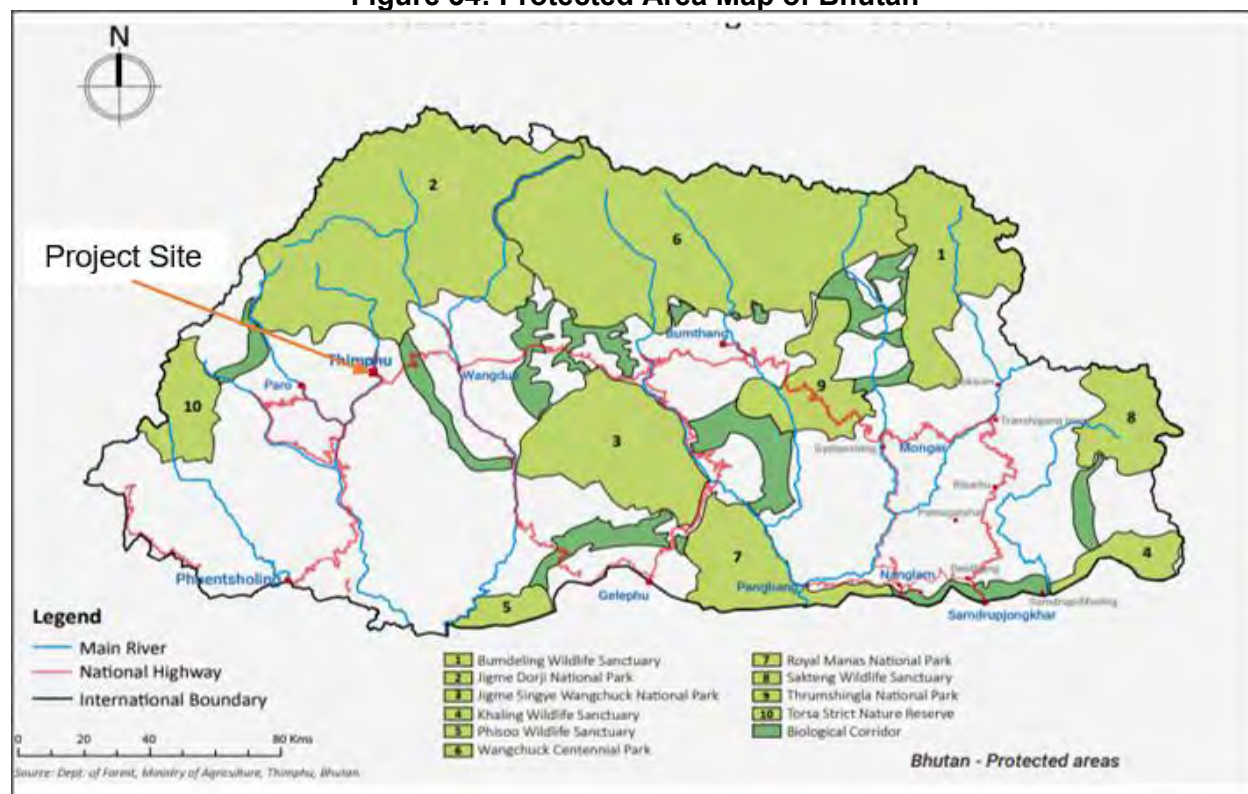
2. Protected Areas and Critical Habitats

110. The northern region of Thimphu Dzongkhag falls under Jigme Dorji National Park (JDNP). JDNP is one of the oldest protected areas and it encompasses an area of 4,319 km². It is located in the northwestern region of the country and WCNP lies on the east of the park. The altitudinal range of the park ranges from 1200 to 7314 m asl. The Park covers five dzongkhags, Gasa (entirely), Punakha, Thimphu, Paro and Wangdue Phodrang. In addition, it covers fourteen gewogs of which Kazhi gewog of Wangdue is located in the park. The Park also covers the source of four major rivers, namely Pachhu, Wangchhu, Phochhu and Mochhu, which provide income from hydro-electricity generation in the downstream valleys. JDNP is well known for its medicinal plants, natural hot springs, medicinal waters and also is home to all four national wildlife symbols: Blue Poppy (*Meconopsis grandis*), Takin, Raven and Cypress (*Cupressus corneyana*). Mt. Jomolhari, which straddles the Yadong County of People's Republic of China and Paro district of Bhutan is also located in the northwestern region of the park. The mountain is venerated and sacred to Buddhists in the country as it is home of the deity Jomo (Peljor, 2017). The Park is home to 6000 persons and 1500 households. Additionally, 50 species of mammals, 1434 species of plants and 313 species of birds are found in the park.

111.

112. Figure 34 shows the location of Thimphu city which is more than 10 km from the southern border of Jigme Dorji National Park.

Figure 34: Protected Area Map of Bhutan



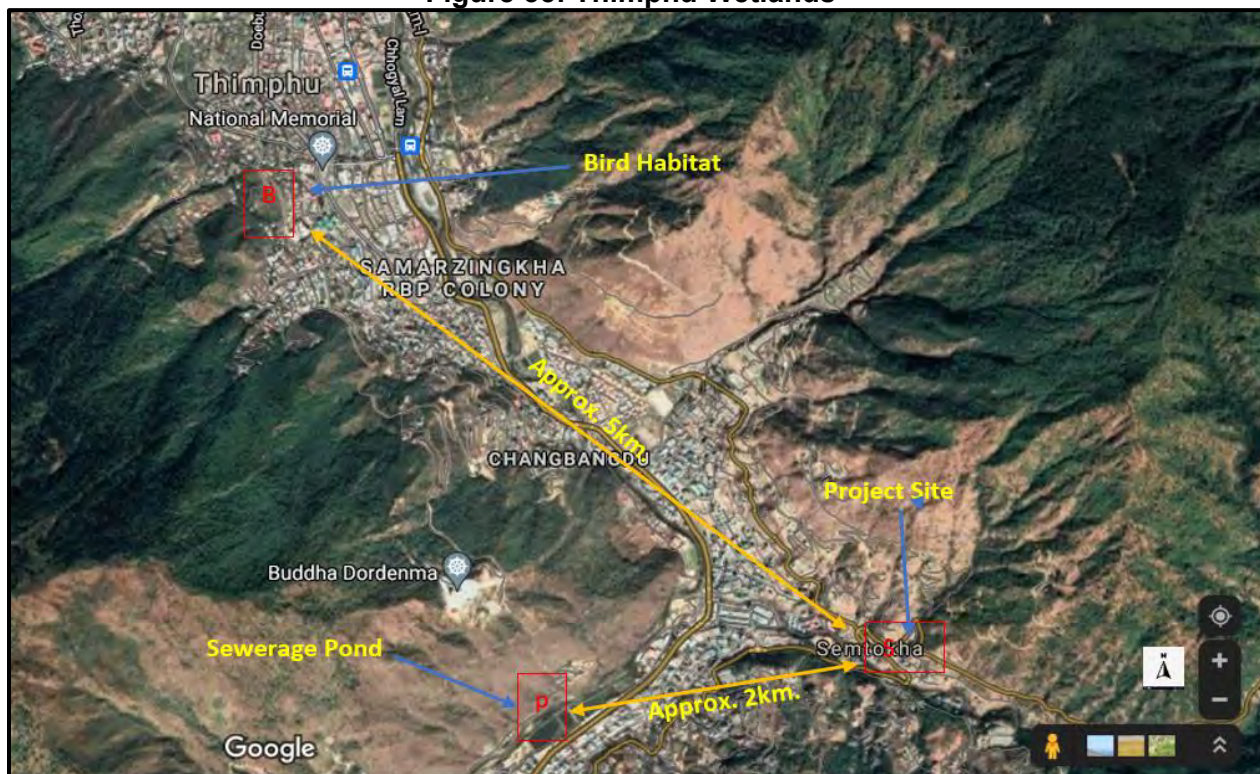
Source: MOWHS, 2018³⁸

³⁸ MOWHS, 2018. Report-on-Nganglam-Regional-Hub-Development-Plan-1

113. **Critical Habitats.** The Integrated Biodiversity Assessment Tool (IBAT) was used to screen and assess potential risks on the protected areas or critical habitat that may exist around the subproject site (default area of analysis of 50 km radius). Screening results show there is one key biodiversity area within 1 km from the subproject site and that 26 IUCN Red List species of concern are identified within the default area of analysis. See Appendix 4 for the results of IBAT Screening.

114. Further assessment has been undertaken with regard the identified KBA (Thimphu wetlands) and to 26 IUCN Red List species of concern. During field visits, the area of the subproject is outside the boundary of designated Thimphu wetlands, and any impacts to it during the construction and operation phases is unlikely. Below is a map showing the location of the two Thimphu wetlands and their proximities to the subproject site. According to Divisional Forest Officer of Thimphu, these two wetlands (Bird Habitat and Sewerage Pond) are where sighting of birds is recorded. Per BirdLife International, the Thimphu wetlands is considered as important bird area (IBA) for Wood Snipe species.³⁹ While the wetlands encompass an area in Thimphu, the nature of the subproject will not impact this sensitive area.

Figure 35: Thimphu Wetlands



Source: Divisional Forest Officer, Thimphu

115. Likewise, the 26 IUCN Red List species of concern were assessed to determine the likelihood of them being found at the subproject site. While the subproject site is already in the built-up area of Thimphu, the likelihood of these species being found at the site is very low. Nevertheless, the assessment included necessary discussions with the Thimphu Forest Division of the Department of Forest, which confirmed that none of these species are found or sighted at

³⁹ Justification of Red List category: This secretive snipe is estimated to have a small, declining population, as a result of the widespread loss of wetlands habitats in its breeding and wintering grounds. It may only occur in a single population and has precautionarily been treated as such here, therefore it qualifies as Vulnerable.

the subproject site. Accordingly, these species are found or dwell at far higher altitudes in Bhutan. Table 21 below summarizes the result of this particular assessment.

Table 21: Assessed Presence of Species of Concern at the Subproject Site

	Species Name	Common Name	Taxonomic Group	IUCN Category	Present? ^a
1	<i>Manis pentadactyla</i>	Chinese Pangolin	Mamalia	CR	No
2	<i>Aythya baeri</i>	Baer's Pochard	Aves	CR	No
3	<i>Gyps bengalensis</i>	White-rumped Vulture	Aves	CR	No
4	<i>Sarcogyps calvus</i>	Red-headed Vulture	Aves	CR	No
5	<i>Ardea insignis</i>	White-bellied Heron	Aves	CR	No
6	<i>Gyps tenuirostris</i>	Slender-billed Vulture	Aves	CR	No
7	<i>Cheirostylis sherriffii</i>		Liliopsida	CR	No
8	<i>Oreorchis sanguinea</i>		Liliopsida	CR	No
9	<i>Onosma griersonii</i>		Magnoliopsida	CR	No
10	<i>Meconopsis bhutanica</i>		Magnoliopsida	CR	No
11	<i>Astragalus paroensis</i>		Magnoliopsida	CR	No
12	<i>Ailurus fulgens</i>	Red Panda	Mamalia	EN	No
13	<i>Cuon alpinus</i>	Dhole	Mamalia	EN	No
14	<i>Moschus chrysogaster</i>	Alpine Musk Deer	Mamalia	EN	No
15	<i>Moschus fuscus</i>	Black Musk Deer	Mamalia	EN	No
16	<i>Moschus leucogaster</i>	Himalayan Muskdeer	Mamalia	EN	No
17	<i>Panthera tigris</i>	Tiger	Mamalia	EN	No
18	<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle	Aves	EN	No
19	<i>Aquila nipalensis</i>	Steppe Eagle	Aves	EN	No
20	<i>Ceropegia bhutanica</i>		Magnoliopsida	EN	No
21	<i>Isodon atroruber</i>		Magnoliopsida	EN	No
22	<i>Meconopsis superba</i>		Magnoliopsida	EN	No
23	<i>Carex nigra</i> subsp. <i>drukylensis</i>		Liliopsida	EN	No
24	<i>Strobilanthes accrescens</i> subsp. <i>accrescens</i>		Magnoliopsida	EN	No
25	<i>Tor putitora</i>		Actinopterygii	EN	No
26	<i>Trillium govanianum</i>	Himalayan Trillium	Liliopsida	EN	No

^a Source of confirmation: Thimphu Forest Division of the Department of Forest

H. Socio-economic Environment

116. The northern region of the Dzongkhag consists of very rugged terrain and thus cultivated agricultural land is very limited (about 0.96% of the total area). On the other hand, the southern regions along the Thim Chhu valley are where the cultivated agricultural lands are located. The dominant land use types in the Dzongkhag include Apple orchard, *Chhuzhing* (irrigated/wetland) and *Kamzhing* (dryland). Rice and wheat are significantly more grown in the dzongkhag compared to other crops like potatoes, chilli, apple, green vegetables and maize.

117. In terms of Industry, the total number of industrial firms as of 2019 was 8,789, of which 6,235 were registered as cottage, 1,453 as small, 858 as medium and 243 as large. Of the 933, 7,686 firms are registered as either cottage or small. 675 firms (459 cottage and 216 small) fall under the category of production & manufacturing. Whereas 6,515 firms (5,759 cottage and 756 small) fall under the category of services. Lastly, 496 firms (both cottage and small) fall under the category of contract (NSB, 2019).

118. As of 2019, Thimphu Thromde has 14 primary schools (6 public, 8 private), 3 public lower secondary schools, 7 middle secondary schools (6 public, 1 private), 10 higher secondary schools (4 public and 6 private) and 15 NFE centers. Thimphu Dzongkhag excluding Thromde has 6 primary schools (5 public and 1 private), 1 public lower secondary school, 3 public middle secondary schools, 2 higher secondary schools (1 public, 1 private), 2 public extended classrooms and 7 NFE centers (NSB, 2019). Additionally, according to the 2017 Population and Housing Census of Thimphu Dzongkhag, the district currently has 35,085 students aged 6 and above attending school, of which 17,370 are male and 17,715 are female. Thimphu Thromde alone has 29,762 students currently attending school, 14,777 male and 14,985 females. In regard to NFE learners, Thimphu Thromde has 324 learners, and the Dzongkhag (excluding thromde) has 69 learners. Thimphu Dzongkhag also consists of three technical and vocational education institutes, namely Thimphu TTI, Institute of Zorig Chusum and Royal Institute of Tourism and Hospitality. The dzongkhag also has 3 hospitals, 1 Basic Health Unit (BHU) I, 12 BHU II, 3 Indigenous units, 3 ORCs with shed and 13 ORCs without sheds.

119. **Demography.** According to the 2017 Population and Housing Census of Bhutan (PHCB), the total population of Thimphu dzongkhag was 138,736 persons of which 72,522 were male and 66,214 were female. The total population of Thimphu Thromde was 114,551 persons, of which 58,996 were male and 55,555 were female (NSB, 2017).

120. Additionally, the overall literacy rate in Thimphu Dzongkhag is 83.9% whereas the adult (aged 15 years and above) literacy rate is 81.7%. The literacy rate of males in both rural and urban areas is 88.7% (90.3% in urban and 81.4% in rural). On the other hand, the literacy rate of females in both rural and urban areas is 78.6% (80.2% in urban and 70.1% in rural). The literacy rate of Thimphu Dzongkhag has increased by 10.6% points from 73.3% in 2005. The percentage of school attendance of six years and above was 28.1% (NSB, 2017).

121. Thimphu Dzongkhag has 105,875 persons within the working-age population category (15 years and above): 55,812 are males; and 50,063 are females. In urban areas, the working-age population makes up 83.1%, and in rural areas, it is 16.9%. Of the total working-age population, 61,057 persons (57.7%) are economically active or in labor force. These include people who are either working or looking, or available for work. The rest of the working-age population, totaling 44,818 (42.3%), are economically inactive. These include students, monks/nuns, housewives, retired or sick people etc. (NSB, 2017).

122. **Traffic Condition.** The subproject site is bounded by two main roads where the flow of traffic is observed to be moderate for the busiest time of the day. The road below the site is the highway from Thimphu to Punakha/Wangdue. The traffic volume and flow on the highway in between the site and Royal Institute of Management (RIM) was studied for two hours on 16 June 2021 from 9:17AM – 11:17AM, which is typically the busiest time of the day. See google map below for visual reference. The number of vehicles were segregated based on the flow or direction, as follows: (i) towards Mani Dungkor (Bhumthang – Ura Highway on the map), (ii) From Mani Dungkor (Bhumthang – Ura Highway on the map), (iii) to RIM, and (iv) out of RIM.

Figure 36: Location of Traffic Flow Assessment

123. In total within the first hour, there were 7 cars per minute which reduced to 5 cars per minute after 10:17AM. As the subproject site is located close to the Royal Institute of Management (RIM), the early morning traffic includes transport of trainees and staff going to work or study at RIM. This sampling and observation suggest that traffic flow is not an issue on this side of Thimphu even during the known busiest period of the day.

Table 22: Results of Traffic Count

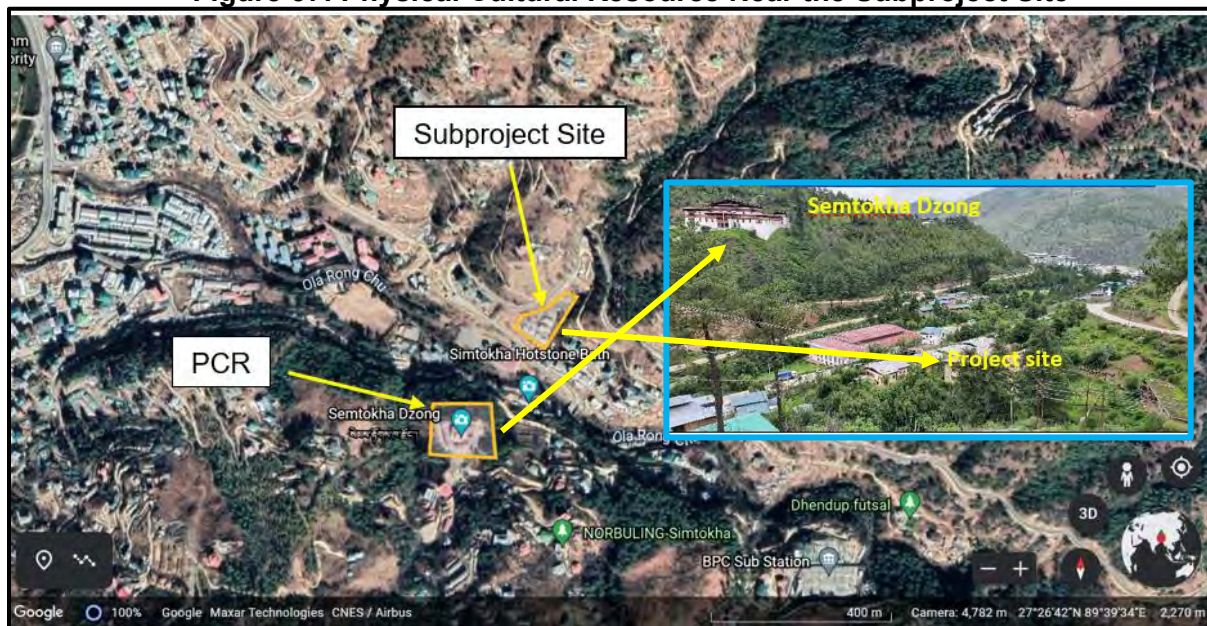
Time	Towards Mani Dungkor	To RIM	From Mani Dungkor	To RIM	Out of RIM
9:17-10:17 AM	202	50	132	8	13
10:17-11:17 AM	170	9	102	0	8
Total vehicles	372	59	234	8	21

1. Physical and Cultural Resources

124. Thimphu Dzongkhag is home to 92 religious institutions and 353 religious monuments. Tashichho Dzong is one of the more famous religious/political structures in the country as it has been serving as the seat of the government since 1952 and currently houses the throne room and offices of the king, the secretariat and the ministries of home affairs and finance. Other famous structures include the Semthokha Dzong, also known as the oldest Dzong in Bhutan, National Memorial Chorten, Dechencholing lhakang, Changankha lhakang, Buddha Dordenma Statue, Druk Wangyal Chortens in Dochula and many more.

125. Semtokha Dzong is the nearest physical cultural resource (PCR) structure, which is about 226 m from the nearest boundary of the subproject site. Semtokha Dzong is perched on a hilly location that has significantly higher elevation (at about 3,260 masl) than the subproject site (at about 3,225 masl). Figure below shows the location of this PCR.

Figure 37: Physical Cultural Resource Near the Subproject Site



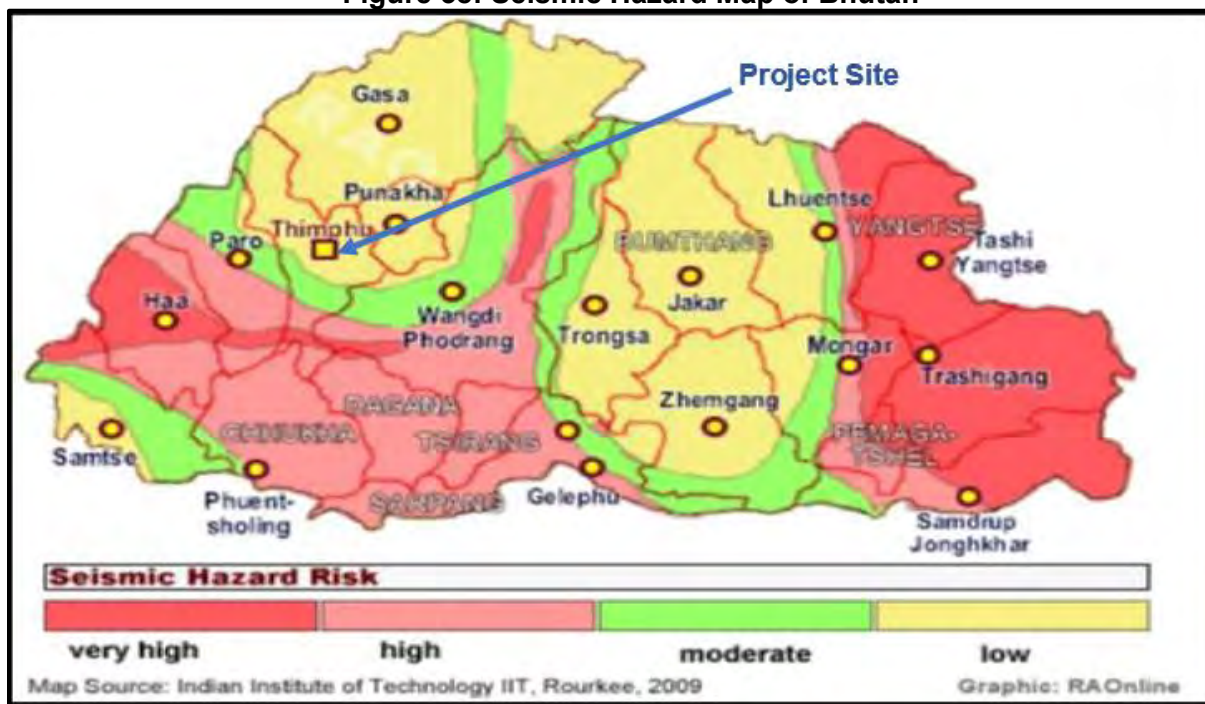
Source: Google earth on web (delineation of site and PCR boundaries as shown on the map are only approximate).

2. Natural hazards

126. Though detailed and comprehensive seismic zonation of Thimphu has not yet been conducted, Thimphu is located in the proximity of northeastern India, which according to the Bureau of Indian Standards (BIS), is in the “most active” seismic Zone V. Keeping this in mind, Thimphu began implementing Bhutan building codes for reinforced concrete buildings after 1997.⁴⁰ Bhutan, including Thimphu was greatly affected by earthquakes in neighboring India.

⁴⁰ Thimphu Throme, 2016. Earthquake Contingency Plan, Thimphu Thromde

Figure 38: Seismic Hazard Map of Bhutan



Source: Indian Institute of Technology. Roorkee, India

127. The seismic hazard map of Bhutan shows that Thimphu lies in a low hazard zone (rated in a 4-point scale of low to very high).

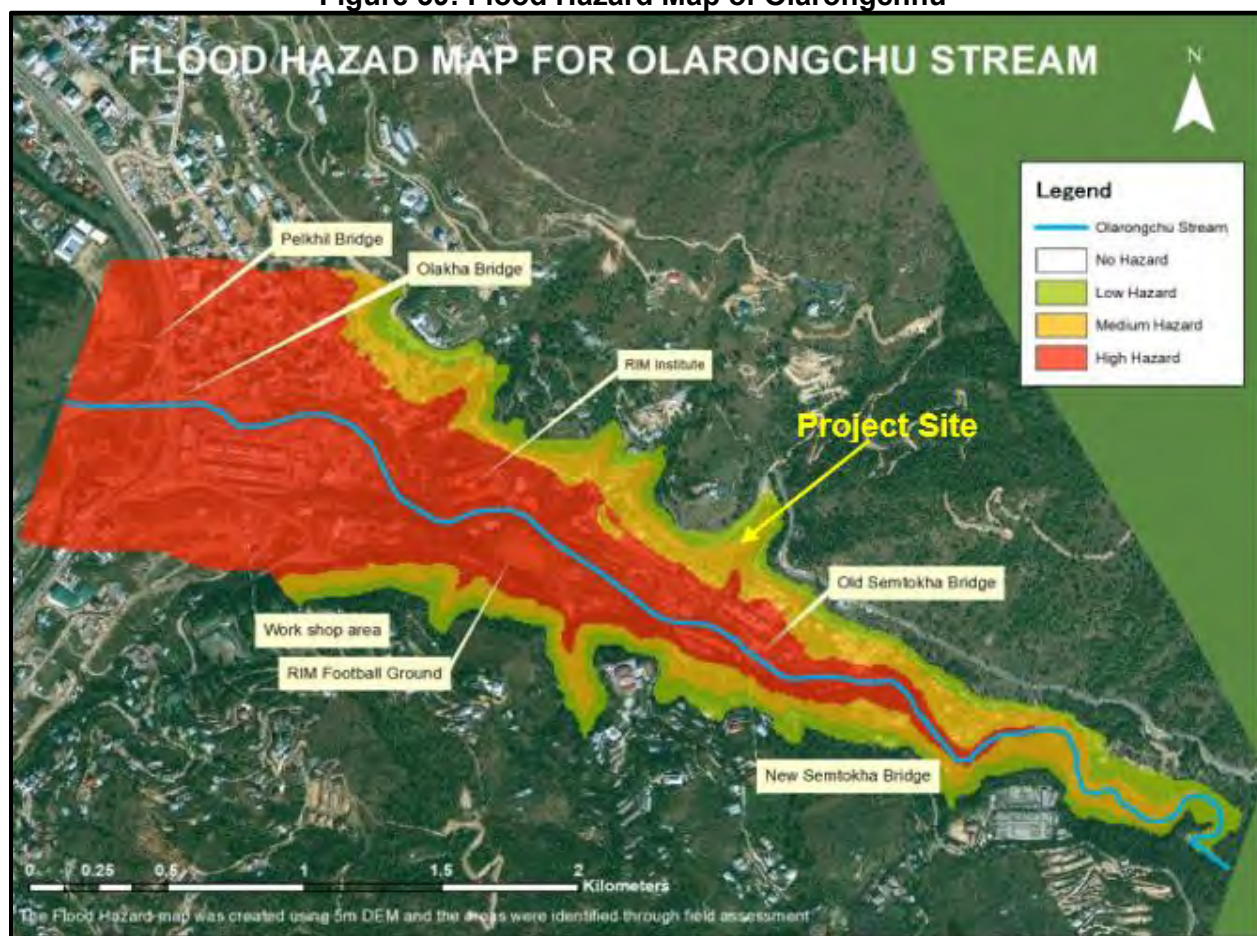
128. Although the 2011 earthquake damaged 97 buildings and 6 schools, 80% were traditional rammed earth buildings.⁴¹ Therefore, the risk of damage due to earthquakes must be taken into consideration during the design stage.

129. In addition to earthquakes, the district also faces the risk of floods. The Wang Chhu basin is one of the four principal river basins in Bhutan, and its main river, the Wang Chhu, flows through Thimphu. The closest stream is the Olarongchhu that flows below the highway and flows into the Wang Chu. This stream is fed by the three tributaries: Khasi Karim Chu, Badi Chu and Chamgang Chu.

130. The Flood Engineering and Management Division created a hazard map using a buffer zone of 30m on both sides of the streams and elevation of the area. Areas closer to streams with lower elevation are ranked with higher hazard, while areas further away from stream with higher elevation are ranked with lower hazard. Based on the flood hazard map of the Olarongchu, the subproject site is in a low hazard especially because it is at a higher elevation and at a distance of about 97 m away from the stream. Also, it is buffered from the stream by the national highway and the multipurpose hall of the Royal Institute of Management. In addition to earthquakes and floods, the district is also affected by windstorms, fires and landslides.

⁴¹ Thimphu Thromde Earthquake Contingency Plan

Figure 39: Flood Hazard Map of Olarongchhu



Source: MOWHS (nd) Flood Hazard assessment of Thimphu Dzongkhag. A detailed assessment of flooding problems in Thimphu Dzongkhag, Bhutan. Flood Engineering and Management Division Department of Engineering Services, Ministry of Works and Human Settlement

V. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

131. ADB SPS, 2009 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.

A. Impacts Rating System

132. The approach for the environmental assessment of this subproject involved the following steps:

- (i) Review of baseline information on the subproject area and site location;
- (ii) Initial environmental screening using ADB's Rapid Environmental Assessment (REA) checklist (Appendix 1) and No Mitigation scenario scoping checklist (Appendix 2);
- (iii) Consultation with the design team on the proposed infrastructure design and plan;
- (iv) Site visit and consultation with project staff; and
- (v) Discussions between NHDCL, Thromde and current residents.

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

- (i) Type/nature of activities proposed;
- (ii) Subproject footprint/spatial scale of the proposed infrastructure work/magnitude of impact;
- (iii) Likelihood of the impacts from occurrence;
- (iv) Existing baseline conditions at the subproject site and within the subproject zone of influence, which in this case is up to 200 m;
- (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 23: 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 24: 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 Subproject 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

134. **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. Criteria for determining receptor sensitivity of the project's potential impacts are outlined in the following table.

Table 25: Parameters for Determining Sensitivity

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

135. **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 26: Significance of Impact Criteria

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

B. Summary of Impacts Rating for the Subproject

136. The subproject'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 subproject on the key environmental parameters and significance of these impacts are presented in the following table.

Table 27: Summary of Rating of Potential Impacts

Activity/ Impact	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Design and Pre-Construction phase								
Land Acquisition – Change in land use	Long term	Local	No	Unlikely	Minor	Mild	Low	Negligible
Disruption of utilities and services	Short term	Local	Yes	Occasional	Minor	Mild	Low	Negligible
Tree Removal	Long term	Local	No	Certain	Minor	Mild	Low	Negligible
Consents, Permits and Clearances	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Natural Hazards and Disasters	Long term	Local	Yes	Likely ^a	Medium	Mild	Moderate	Negligible
Community Awareness	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Construction Phase								
Worker recruitment - Occupational Health and Safety	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Construction of site office, worker camps and storage sheds, stockpile areas	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Demolition	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Excavation	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Water supply	Already available through local water supply							
Electrical connections	Already provided at the existing housing colony							
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

Activity/ Impact	Duration of Impact	Spatial Extent	Reversible or not	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	Minor	Mild	Low	Negligible
Ground water quality	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Drainage congestion	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Impact on ecologically sensitive areas (critical habitat, wetlands, etc.)	Short term	Local	Yes	Unlikely	Negligible	Low	Low	Negligible
Impact on endangered species	Short term	Local	Yes	Unlikely	Negligible	Low	Low	Negligible
Impact on Physical Cultural Resources	Short term	Local	Yes	Unlikely	Negligible	Low	Low	Negligible
Socio-economic status/livelihood	Short term	Local	Yes	Certain	Minor	Mild	Positive	Positive
Community Health and Safety	Short term	Local	Yes	Certain	Medium	Mild	Low	Negligible
Aesthetic impacts	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Operation Phase								
Maintenance and operation of the housing complex	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Disaster and natural hazards	Long term	Local	Yes	Likely ^a	Medium	Mild	Moderate	Negligible
Worker health and safety	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Socio-economic status/livelihood	Long term	Local	Yes	Certain	Medium	Mild	Positive	Positive

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

137. The potential environmental impacts expected during the pre-construction phase are mostly due to the nature of the activity (Construction of buildings) and project location.

C. Anticipated Impacts and Mitigation Measures During Design / Pre-construction Phase

138. Potential environmental impacts expected during the pre-construction phase are mostly due to the design and location and are discussed as follows:

1. Impacts Due to Subproject Location

(i) Protected areas, critical habitats and endangered species

139. **Impact.** The subproject is located within the municipality, which is a built-up area. The closest legally protected area Jigme Dorji National Park is over 10 km north of the city, and the closest Forest Managed Forest (Forest Management Unit) is at Chamgang, under Dagala gewog, about 5km from the highway. There are no biological corridors or special conservation areas, wetland or endangered/threatened/endemic species adjacent or within corridor of impact of the proposed subproject. The designated land use is for housing and there are already 7 existing buildings and temporary structures at the site with little or no vegetation. Therefore, the subproject will not impact any critical habitat, endangered or vulnerable species.

140. In Chapter IV of this IEE, initial screening and assessment show that the subproject site is not a critical habitat for any of the IUCN Red List species of concern. With confirmation from the Thimphu Forest Division of the Department of Forest, these species of concern are not found at the subproject site or its immediate vicinities. Therefore, impact of the subproject to any critical habitat or species of concern is unlikely.

141. **Mitigation.** No mitigation is required. The upfront site selection criteria used under the subproject ensured that the site will not be located within or near protected areas nor will the development of the subproject impact other ecologically sensitive areas or endangered/critically endangered biodiversity species.

(ii) Physical Cultural Resources

142. **Impact.** The closest religious and historical site is the Semtokha Dzong perched on the opposite hill across the site but at a distance of about 226m towards the south but is separated by the main highway, the Olarongchhu and the access road to Chamgang Forest Management Unit. This PCR is located at significantly higher elevation (at about 3,260 masl) than the subproject site (at about 3,225 masl), and any blocking effect or interference of the future housing facility to the line of sight or view of the PCR is highly unlikely. Therefore, the subproject will not pose any impact to the Dzong.

143. **Mitigation.** No mitigation required. The upfront site selection criteria used under the subproject also ensured that planned development for the site will not result in destruction of or encroachment onto physical cultural resources such as archaeological monuments; heritage sites; and movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.

(iii) **Risk of natural hazards such as earthquakes and climate change considerations**

144. **Impact.** Due to its proximity to the northeastern parts of India, which are in the ‘most active’ seismic Zone V (according to Bureau of Indian Standards), the majority of Bhutan is also either in Zone IV or V. Although the 2011 earthquake damaged 97 buildings and 6 schools, 80% were traditional rammed earth buildings.⁴² The seismic hazard and risk in Bhutan study⁴³ found that seismic hazards are highest in the southern part of Bhutan where the Main Himalayan Thrust (MHT) is shallow, and site conditions lead to amplification of shaking.

145. In addition to earthquakes, the district also faces the risk of floods. The Wang Chhu basin is one of the four principal river basins in Bhutan, and its main river, the Wang Chhu, flows through Thimphu. The closest stream is the Olarongchhu that flows below the highway and flows into the Wang Chu. This stream is fed by the three tributaries: Khasi Karim Chu, Badi Chu and Chamgang Chu.

146. The main associated risks and impacts in the design phase is insufficient building design and non-compliance to the plans, regulations and building codes which could result in limitations and inappropriate design without adequate consideration for seismicity and other natural hazards including climate change.

147. **Mitigation.** Mitigation measures have been incorporated in the design phase. The design process will take into consideration the requirements of Bhutan Building Rules (BBR) 2017⁴⁴ and other relevant rules or regulation as discussed in Chapter II of this IEE, and the proposed subproject will be guided by the Thimphu Structure Plan 2002-2027. Compliance to these rules, regulations and plans implies that the structural design will have considered and incorporated measures to minimize the risks of earthquakes, windstorms.

148. Climate considerations will also be taken care of through choice of building materials. Choice of construction materials must be based on climatic conditions and suitable for monsoon rains and winter snow conditions.

149. Therefore, the approval process ensures that natural hazards, climatic conditions, and local area plans are duly considered. Any changes to approved plans will be resubmitted to the Development Control Division, Thromde Office.

(iv) **Disruption of existing utilities and services**

150. **Impact.** There is one electrical transmission line that passes through the site, which could be disrupted during the construction phase. Apart from this, there is no other public utilities that will be disrupted by the subproject.

151. **Mitigation.** The survey team has conducted details site assessment based on which the layout of each individual building has been planned to avoid impacting the transmission line. The project team has also discussed the layout plan with the Bhutan Power Corporation (BPC) and it

⁴² Thimphu Thromde Earthquake Contingency Plan

⁴³ "Seismic hazard and risk in Bhutan," *Natural Hazards: Journal of the International Society for the Prevention and Mitigation of Natural Hazards*, Springer; International Society for the Prevention and Mitigation of Natural Hazards, vol. 104(3), pages 2339-2367, December.

⁴⁴ Bhutan Building Rules 2017 (Replaces the Bhutan Building Rules 2002 and Rural Construction Rules 2013), www.mowhs.gov.bt/wp-content/uploads/2017/05/Bhutan-Building-Rules.pptx

found that there is no need to relocate the power line. However, during construction, machine /operator drivers will be cautioned and instructed to ensure that the lines are not accidentally struck by machines during loading and unloading of construction materials. 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.

2. Consents, Permits and Clearances

152. All developments within the city is controlled by the Municipality, which is responsible for ensuring that developmental activities are aligned with the structural plan for Thimphu. Without approval of the subproject plan by the Thimphu municipality, subproject implementation may not be able to proceed.

153. **Mitigation.** Site surveys and preliminary designs have been completed and the detailed design is under process. The construction approval process is standard. The land ownership certificate, official site plan along with the structural, electrical, sewerage, water supply and plumbing drawings certified by the design team will be submitted to the Development Control Division (DCD) of the Thromde. If the designs and drawings meet all the requisite requirements as per the rules, standards and guidelines, construction approval will be granted. If there are any reservations from the DCD, Thromde, this will be communicated back to the design team for rectification and revision of drawings.

154. Environmental clearance approval will be sought from the NEC based on the IEE.

3. Tree removal

155. **Impact.** There are 25 trees which would need to be cut to construct the new buildings, create parking and internal access road.

156. **Mitigation.** Permit for tree felling will be sought from the Environment Division, Thromde Office prior to initiating the work. Once this is done, the trees can be cut, and the timber can be reused as fuelwood. Compensatory tree planting may be implemented at the replacement ratio of 2 trees for every tree felled. Saplings used for this compensatory scheme may be planted around the vicinity of the site.

4. Aesthetics

157. **Impact.** The entire housing subproject will be located within 1.93 acres of property allocated to NHDCL, specifically for housing. If not properly designed, the buildings can have negative aesthetic impacts as the site is in a highly visible area along the highway.

158. **Mitigation.** The design team will consider requisite development controls (such as building height, ground coverage and minimum setbacks from roads and adjacent plots), as per the allowable local area plan. The building designs will also utilize the Bhutanese Architecture Guidelines⁴⁵ as a reference to ensure that the buildings blend in with the surrounding while maintaining certain elements of traditional Bhutanese architectural designs. Landscaping and revegetation will further improve site conditions once these activities are completed.

5. Compliance with ADB Loan Agreement and Safeguard Policy Statement

⁴⁵ MOWHS, 2014. The Bhutanese Architecture Guidelines

159. **Impact.** There is a general lack of awareness by most contractors on ADB SPS and EMP requirements, and this is the reason why mitigation measures are not normally budgeted in the contract cost. Due to COVID 19 restrictions, there is also a huge shortage of skilled national workers.

160. **Mitigation.** The procurement unit will incorporate the cost of OHS and the EMP as well as specific provisions requiring contractors to comply with all other conditions required by ADB into the bidding and contract document. Once the Contractor is selected, the PIU will arrange to conduct awareness for contractors on their responsibilities in EMP implementation, in compliance with ADB and RGOB requirements, self -monitoring and reporting procedures.

161. The construction schedule must consider the current shortage of skilled manpower and constraints in importing foreign workers due to the COVID 19 pandemic so that the construction is completed on time.

162. The Bhutan Schedule of Rates - 2020 includes a Guideline for Occupational Health and Safety Cost to be used by procuring agencies for estimating the Bill of Quantities (BOQ) for each contract.⁴⁶ Inclusion of the cost of OHS is the minimal mandatory requirements for a construction site. In addition to this, the Contract must specify that the minimum age of employment shall be 18 years and the Contractor is liable for the cost of providing accident compensation for all the employees in case of work-related injury or accidents.

163. Due to the high demand for waste disposal in Thimphu and the uncertainty in terms of the waste disposal location for excavated soil, the cost of transportation of waste from the construction site must be incorporated into BOQ to avoid additional claims or improper disposal of waste.

6. Project Disclosure and Community Awareness

164. **Community awareness and project disclosure.** The neighboring community must be informed of the subproject activities and schedule so that they are well informed and aware of the subproject activities in advance. The first round of consultation with project affected families and current residents has already been carried out. The Project must disseminate information on the objectives of the proposed subproject, the preliminary design of proposed subproject components; potential environmental and social impacts (positive and negative) of the subproject, and proposed mitigation measures for the perceived negative impacts; and the Grievance Redress Mechanism and contact details of the subproject. Subproject signboards must be designed and constructed according to the design standards and specifications of the Thromde. The signboards must disclose subproject contact information for easy contact for any issues or clarification.

D. Anticipated Impacts and Mitigation Measures during Construction Phase

1. Socio-economic impacts

165. **Impact.** The subproject will generate employment and business opportunities for local suppliers of construction materials as well as material transporters and machine operators. The

⁴⁶ Department of Engineering Services, MoWHS, 2020. The Bhutan Schedule of Rates - 2020 includes a Guideline for Occupational Health and Safety Costs

socio-economic benefits of obtaining temporary employment in construction workforces, can be significant for low-income people within and outside Thimphu.

2. Site preparation and construction of site office, worker camps and material storage sheds

166. **Impact.** Once the contract is awarded, the site will be handed over to the Contractor by the PMU. During site preparation, the contractor may need additional space or area for building site office, parking area, worker camps and material storage. Without any space for these facilities, the implementation of the subproject activities may not proceed smoothly and may delay Project timeline.

167. **Mitigation.** While there is ample space at the site, any additional space required to park machinery, build storage sheds or for other purposes will be leased from adjacent lands, with the assistance from the PIU. The responsibility of finalization of land agreement and payments to the landowner or to the Thromde will lie with the Contractor. The Contractor must set aside a secure enclosure/shed for the storage of cement, lubricants, solvents, paint, electrical and other breakable material. Fuel and other petroleum products must be stored at storage areas away from water drainage and protected by impermeable lining and banded 110% by volume. Contractor may also choose to arrange off-site accommodation for its workers, especially if it prefers to use the available space more effectively for site office, parking for heavy equipment and material storage.

3. Recruitment and management of workers

168. **Impact.** The COVID 19 safeguard restrictions on recruitment of foreign workers will require the Contractor to hire national workers. This will significantly and positively benefit the current economic and unemployment scenario by providing local employment and benefit sharing. However, it is generally still necessary to import foreign skilled workers because it is very difficult to find skilled national workers.

169. Presence of workers will increase the demand for services like temporary housing, drinking water and sanitation. There is also the risk of gender discrimination and potential health and safety impacts for female employees due to unclean sanitary facilities. A mix of local and foreign construction workers may cause social conflict and the sudden influx and large number of workers living together in one location may also cause disturbance to the neighborhood. The operation of construction camps will generate sewage and other waste from workers.

170. **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”⁴⁷ and avoid recruiting 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, Dengue and COVID 19. The prevailing requirements of the Ministry of Health and the COVID Taskforce, which include mandatory quarantine requirement, and payments for quarantine, isolation and testing.

⁴⁷RGOB. Regulations on Working Conditions, 2012

171. The Contractor will be required to provide workers with good quality temporary accommodation, with ample and safe drinking water, electricity and sanitation facilities with separate toilets for females. Worker camps will be self-contained, regularly cleaned and properly organized to handle waste issues according to the succeeding section on waste management. For good reference, the Contractor will follow the standards for workers accommodation per guidance note by the International Finance Corporation and European Bank for Reconstruction and Development entitled *“Workers’ accommodation: processes and standards: A guidance note by IFC and the EBRD”*.

172. The Contractor will be responsible for briefing all workers on required social behavior and imposing sanctions for inappropriate conduct. The number of complaints received from neighboring residents will be recorded with action taken.

173. The Contractor with more than 12 workers must submit a Notification of Construction Work (in writing and as per the information required) within 7 days after the commencement of the work, to the Chief Labour Administrator, and also repeat the same within 7 days of completion of the work.

4. Occupational Health and Safety

174. **Impact.** The construction industry entails working at height, excavation, use of machinery and constant exposure to noise, dust, and equipment. Construction noise such as welding, 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 workers, (iii) use of unskilled workers, (iv) working long hours with inadequate facilities, and (v) lack of dedicated personnel to ensure worker health and safety and lack of general safety awareness.

175. **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;⁴⁸ and by Regulation on Occupational Health, Safety and Welfare, 2012, and nominate a Health and Safety Focal Person (or equivalent) who will have the overall responsibility to ensure safe working conditions and environment for all workers. The contractor will provide required and appropriate PPE (e.g. safety boots, helmets, gloves, protective clothes, dust mask, goggles, and ear plugs), at no cost to the workers, maintain a PPE issue register, and enforce its use with sanctions for non-compliance. Contractor will institute protocols to deal with accidents (including evacuation of injured person to the nearest hospital), emergencies and grievances at the worksite and communicate this to all workers. Briefings and awareness on health and safety and required social behavior will carry out during toolbox talks. To prevent accidents during electrical installation, only trained and competent electrical workers must be hired. The site will be provisioned with first aid kits and safety signage at critical and risky/precarious areas. Records of all accidents will be maintained including measures taken and workers will be compensated for work injuries and fatalities. The subproject site is located about 2 km from the Army Hospital, and about 3 km from the Jigme Dorji National Referral Hospital so easy access to health facilities is not a concern but the Contractor must provide transportation during emergencies for workers.

⁴⁸IFC World Bank Group. 2007. [Environmental, Health, and Safety \(EHS\) Guidelines – General EHS Guidelines: Construction and Decommissioning](#).

176. The Contractor will be required to institute minimum COVID-19 measures such as hand washing facilities, installation of the Druk Scan App for movement of visitors and workers, mandatory use of masks, social distancing norms and any other protocols as per the prevailing requirements of the Ministry of Health and the COVID-19 Taskforce.

5. Demolition of existing structures

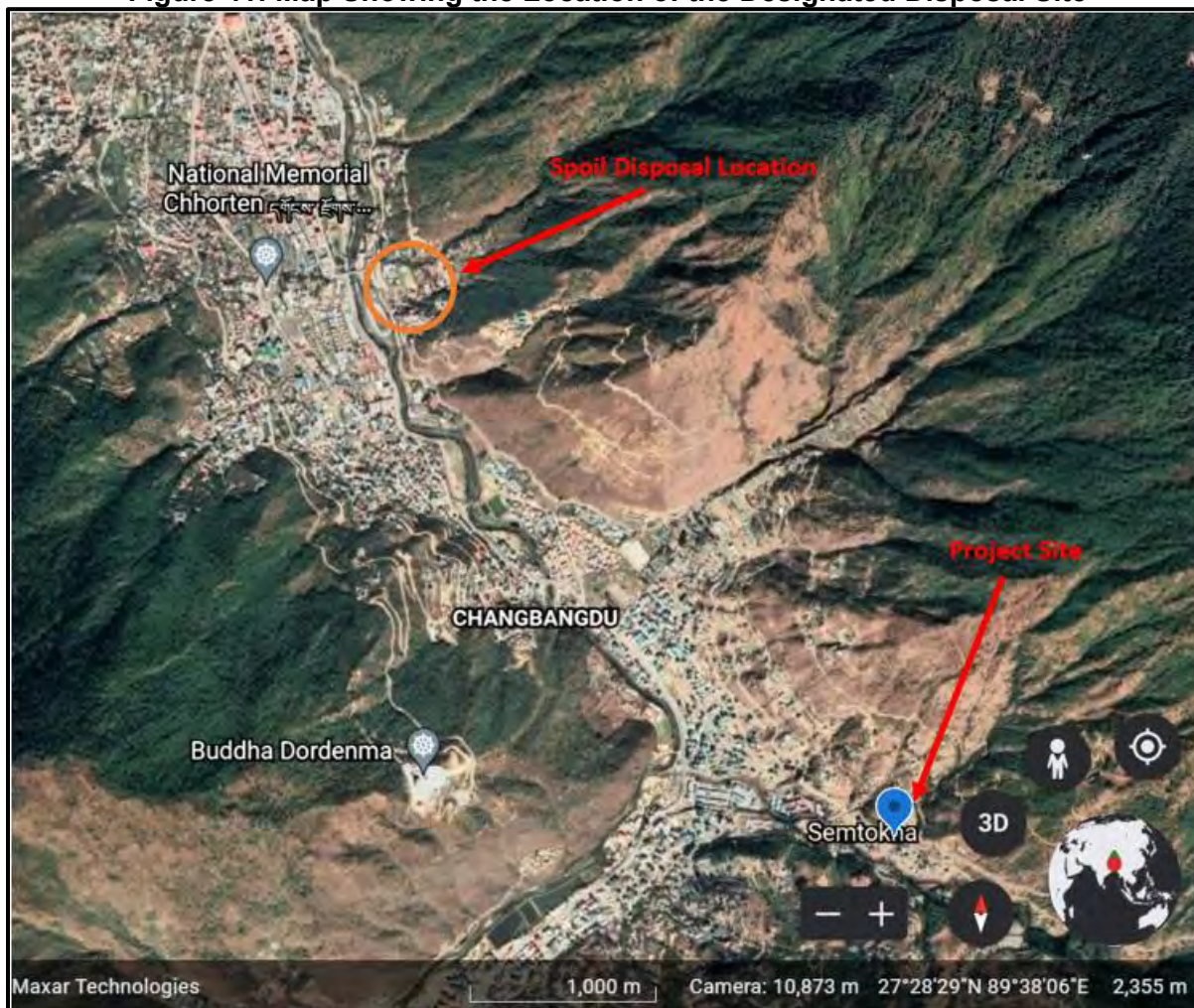
177. **Impact.** There are four concrete structures and three temporary structures that will need to be demolished, cleared and in its place the new buildings will be constructed. This will cause dust, noise and result in demolition waste that needs to be properly disposed. It will also pose occupational risks to the workers.

Figure 40: Structures to be demolished



178. **Mitigation.** The PMU/PIU will seek the necessary permit for demolition from the Thromde and prepare a demolition plan that will address impacts on air and dust, disturbance to the community and worker safety while ensuring that the entire process is completed within the stipulated period. Reusable construction materials will be segregated and transported to be used at the National Mushroom Centre location in Babesa. Other demolition waste will be segregated into recyclable, non-recyclable parts and hazardous waste and accordingly dispatched to registered waste collectors. Unusable waste will be transported without spillage to the designated disposal site. No demolition or other types of unusable wastes will be stored at the site or its vicinities. Figure 41 below shows the location of the disposal site (Yangchenphu area) which is about 4 km from the subproject site. The Occupational Health and Safety requirements such as briefing on safety, supervision of workers, safety during use of heavy machinery as detailed under various sections must be complied with.

Figure 41: Map Showing the Location of the Designated Disposal Site



6. Excavation work

179. **Impact.** Excavation work will be carried out for the footing of 8 buildings, which will result in loose soil requiring space for storage and creating dust piles during windy days.

180. **Mitigation.** As the site is an undulating area, most of the excavated material from the upper slopes will be reused for filling in the building foundations and for levelling the parking and recreational areas. The remaining soil if any will be disposed in manner similar to the demolition waste - at a Thromde approved site. Also, dry sediment areas will be sprinkled with water to minimize dust.

7. Raw Materials Sourcing and Storage

181. **Impact.** The buildings will require a number of construction materials such as steel for footing, columns, beams and slab; random rubble masonry wall for foundation, hard stones for stone filling; cement, sand, graded crushed rock for concrete works, aerated autoclaved concrete blocks for walls, fiber-reinforced plastic for window frames and cornices, wood plastic composite

for door frames, tiles for flooring, unplasticized polyvinyl chloride for windows, mild steel for railings, steel tubular truss, and pre-painted galvanized iron sheet roofing. For toilets and drainage, construction materials include chlorinated polyvinyl chloride pipes, high density polyethylene pipe, water closet squatting pan and water closet pedestal. All these materials will come from different suppliers and locations. Storage of all these materials will also be an issue at the subproject site. Without proper planning on sourcing and materials may lead to implementation delays and loss of materials.

182. **Mitigation.** The quantity of material required will be estimated based on the final detail design and preparation of Bill of Quantities. Most raw materials will be imported but wherever possible, locally available building materials will be used.

183. Aggregate, sand and stone will be sourced from local authorized suppliers from Thimphu, Paro or Punakha. Other materials such as plywood, tiles and fixtures will be purchased from local suppliers or directly from India as per the decision of the Contractor. To minimize wastage and to avoid storage issues, the Contractor will prepare and plan material requirement and delivery as required during each phase of the construction. The NHDCL will use pre-engineered material for the construction of the buildings structure. Pre-engineered material will be imported from India.

184. In terms of storage, the Contractor will schedule material procurement to prevent both shortage and storage issues, construct material storage shed, maintain inventory, and keep valuable items locked. He could appoint security guard to minimize the risk of losing construction material.

8. Water Requirement

185. **Impact.** The water supply for Semtokha and Babesa is covered through the 6.50 MLD capacity water treatment plant at Megaypang funded by the ADB, but the current housing colony has its own water source from Chamgang. When the community faces water shortage (at the most for 2 days in a week) either due to damaged or blocked pipes, the residents work together to repair the water supply line or clear the water source. The construction work and the influx of a number of workers will create an additional demand for water for drinking, cooking, washing as well as construction and its associated activities (sprinkling/spraying and cleaning).

186. **Mitigation.** The Contractor will be required to ensure adequate water for domestic (drinking, cooking, washing and sanitation) and construction purpose. The existing water supply line will be utilized for this subproject so there is no need to install new water pipelines or seek water sources. To reduce the risk of water shortages and to conserve water, the Contractor will install adequate water tanks or mobilize water tankers during periods of shortage. To conserve water, all water supply pipes will be checked, repaired and maintained regularly to prevent leakages or blockages.

9. Electrical Requirements

187. **Impact.** Electricity for the construction 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.

188. **Mitigation.** Within the municipality, the Thromde is responsible for providing electrical services. Currently, all the existing buildings are already connected to the electrical supply network provided by the Bhutan Power Corporation (BPC). Therefore, there is no need to apply

for new electrical connections and existing meters can be utilized, with payment for usage by the Contractor. However, the Contractor would need to request from BPC for service on the handling of existing electricity lines before, during and after the demolition works as temporary dismantling and reinstallation of electrical lines will be necessary.

189. The construction of a substation with adequate electrical supply to cater to the additional residential units at the site will be outsourced to BPC, thereby ensuring reliable electrical supply to all the buildings once they operate or occupied in the future.

10. Sewerage Requirement

190. **Impact.** The sewerage treatment plant is located in Babesa. It caters to sewer lines coming from the core city area except for periphery E4 areas such as areas above Semtokha Dzong and Lubding where the site is located. Without any adequate sewerage system at the site, discharge of greywater and blackwater from the site and workers' camp could pollute the receiving bodies of water in the area.

191. **Mitigation.** Any workers' camp to be temporarily built at the site and other temporary sanitation facilities at construction site will be connected to septic tanks which will be used until the end of the construction period, after which these will be decommissioned, cleared out and filled in with soil. If there is any available authorized provider in the city, movable portable toilets with septic tanks can be rented by the Contractor as an option, which can be desludged or emptied on a regular basis by the service provider.

11. Mobilization and Operation of Construction Equipment

192. **Impact.** The operation of vehicles and mobile construction equipment at the construction site are risky if adequate precautions are not followed. These 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.

193. **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 him 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.

12. Erosion and Sedimentation

194. **Impact.** Thimphu experiences heavy monsoon rains and therefore the risk of debris and soil being carried by rainwater is extremely high. Heavy monsoon rains will wash away the exposed parts of the site, leading to erosion of exposed surfaces and sedimentation/siltation at the Ola Rong Chu stream. The demolition, excavation, construction of worker camps and material storage all require drainage to ensure that materials are not washed away during the rainy season, adding to the erosion.

195. **Mitigation.** All excavation work should be mostly completed before the onset of the incessant rain to reduce the runoff. There is already a storm drainage to channel the water from the area upslope of the highway to the stream below, to which the site drainage will be connected. The Contractor must construct drains to divert clean stormwater away from areas where loose

excavated soil is exposed by constructing drains with silt traps that is connected to this main stormwater drain.

13. Ambient Air Quality

196. **Impact.** The use of fuelwood for heating in winter will result in air pollution from fires. Also, exhaust emission from operation of machinery and vehicles will contribute to the air pollutant load (primarily particulate matter (PM), NO_x, SO_x, CO etc.) in the ambient air.

197. **Mitigation.** The Contractor will ensure that construction equipment and vehicles are maintained in good condition and have passed the RSTA emission test. Vehicles transporting soil, sand and other construction materials and waste will be covered with tarpaulin sheets to reduce the release of dust along transport routes. Stockpiles of soil, sand and other construction materials will be covered to prevent it from being carried off on windy days.

198. **Workers' Camp.** The Contractor will provide alternative fuel (electricity or LPG) at workers' camp and restrict use of firewood for cooking. This practice may be allowed for heating (as this is permitted in the city). However, open burning of waste will be restricted and enforced strictly.

14. Dust Generation

199. **Impact.** Dust will be generated during demolition, excavation, transportation and unloading of sand and other construction materials as well as during material storage. Dust generated will potentially elevate the level of air pollution in the area in terms of particulate matter.

200. **Mitigation.** To prevent too much dust from demolition and excavation works, the area will be enclosed/cordon to contain dust and noise. Water will be sprayed over bare or newly excavated areas especially on windy days and wherever possible excavated soil will be reused for leveling the site and for green belt development. Excess excavated soil will be removed from the site within 2 weeks of excavation and dispose at the designated disposal site. Material transporters will be instructed to cover dust generating materials to prevent dust and spillage along transport routes.

15. Noise and Disturbance to the Neighboring Community

201. **Impact.** During the construction period, the main sources of noise will be from the actual construction activity such as use of welding machines, sawing of wood, concrete mixing, batching plant operation, excavators and movement of vehicles and trucks. The impacts from construction work will be most disturbing during early morning hours or late into the night.

202. Another source of disturbance especially in the evenings is when workers play loud music, engage in brawls or drunken behavior. All these impacts are centered on work sites and camps, and last until the end of the construction period.

203. **Mitigation.** Measures to minimize disturbance to the community include restricting construction work between 9PM -8AM,⁴⁹ briefing workers on their obligations regarding proper management of work and behavior with sanctions for inappropriate behavior or repeated complaints from the residents. The vehicle owners will be encouraged to develop and implement

⁴⁹ Per Thimphu Development Control Regulations, 2016

a preventive maintenance schedule for all heavy construction equipment and machinery to minimize noise and vibration. No woodwork should be allowed on the premises to restrict the use of sawing machines, and doors and windows must be fabricated offsite or outsourced.

16. Solid Waste Generation and Management

204. **Impact.** 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. Improper disposal of waste will lead to land contamination, proliferation of vectors of diseases, foul odor and other nuisance impacting local communities.

205. **Mitigation.** According to the Waste Prevention and Management Act 2009, any person polluting the environment or causing ecological harm shall be responsible for the costs of mitigation and restoration. Every business entity is required to provide appropriate bins for waste storage and safe collection, segregate hazardous wastes within the premises, maintain cleanliness of the respective premises or surroundings.

206. The Contractor will ensure that workers are briefed on proper waste management and good housekeeping at worker camps enforced. Separate bins for “bio-degradable” and “non-biodegradable” for staff quarters and worker camps, and a separate bin for hazardous waste. Waste storage areas will be identified until these are collected by the municipal trucks. Hazardous waste will be stored separately and disposed with the guidance of Thromde. Demolition waste will be removed from the site and brought to designated disposal sites.

207. If required by the Thromde, the waste will be transported along the designated route, and during specific times if specified in waste disposal permit without any spillage along the route (and clean the route if spillage occurs). Again, if required by Thromde, waste dumped must be levelled and compacted, and the Thromde Officer updated on quantities disposed.

17. Community Health and Safety

208. **Impact.** The construction site lies at lower elevation than the highway on the upper slope and is separated from other private housing by a drain. As such, it does not fall along areas commonly used by passers-by/pedestrians. The only risk to public safety is during transport of materials. Public will also be at risk if they walk into the site when work is ongoing, or if there are materials falling from the building site.

209. **Mitigation.** Measures to minimize risks to community health and safety include cordoning or barricading the construction site to restrict public from the site, controlling access to the site, installing signboards to notify passers-by of ongoing work, installing warning signs near access road and entry points, restrict unloading or storing of construction material along access road, on top of drains and footpaths, designating personnel to warn passers-by and guide trucks during material delivery, scheduling materials delivery times to avoid peak traffic hours and imposing speed limits for trucks near the construction site.

18. Congestion and Traffic Management

210. **Impact.** The stretch of the highway in Semtokha will be utilized during construction phase for the movement of heavy vehicles carrying construction materials.

211. **Mitigation.** The Contractor will identify risky areas and post warning/safety signs near the entry to the site. Drivers will be instructed to observe and reduce speed limit and material drop off times will be restricted during peak traffic times [(scheduling and designate hours for material drop off (e.g., 8.30-9.30AM and 4-6PM)].

19. Chance Finds

212. **Impact.** Given that the locations and areas, where earthmoving works will be required are known, chance finds may be remote as the existing buildings on the site have been there for many years now. 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.

213. **Mitigation.** Contractor(s) need to be made aware of a chance finds procedure. In case underground assets or archaeological artifacts are encountered during excavation, construction activities including within a 30-meter radius in the area will be stopped immediately by the Contractor and the discovery will be reported by the site engineer or representative of Contractor to PIU. In particular, the following chance finds procedure should be strictly observed:

- (i) In case of suspected chance finds, the Contractor shall immediately stop all works;
- (ii) Contractor to report immediately within the same day to the PMU or PIU regarding the suspected chance finds;
- (iii) PMU or PIU to advise Contractor to strictly follow the full stoppage of works;
- (iv) PMU to report the potential chance finds to the Department of Culture, Ministry of Home and Cultural Affairs, and the latter to investigate; and
- (v) No works shall resume until clearance is provided by the Department of Culture, Ministry of Home and Cultural Affairs.

20. Emergencies Such as Earthquakes and Fire Hazards

214. **Impact.** Although the seismic hazard map of Bhutan (see chapter on baseline information) indicates that Thimphu lies in a low hazard zone and the site is not included under the flood prone zone under the Flood Hazard Assessment for Thimphu Dzongkhag,⁵⁰ Thimphu has experienced earthquakes and fires in the past and there is always a possibility that it could be very well experienced again during the subproject implementation period.

215. **Mitigation.** The housing complex is included under the mandate of the Thimphu Thromde Disaster Management Committee (DMC) led by the Thrompon (Mayor) and managed by the Environment Division. As the capital city, Thimphu has easy access (compared to other districts) to required resources from line ministries. It has a Thromde Emergency Operation Center (TEOC) and is within 5km of the two largest hospitals in the country.

216. Mitigation measures for workers are already covered under OHS. Emergency numbers of Fire, Police must be posted near the fire extinguisher or at a visible location. In case of a major disaster/earthquake, the Contractor and PIU will follow the instructions from the Thimphu Thromde Disaster Management Committee (DMC).

21. Completion of construction work

⁵⁰ MoWHS, 2019. Flood Hazard Assessment for Thimphu Dzongkhag, FEMD, DES, MoWHS, 2019

217. **Impact.** The housing complex cannot be complete and ready for its tenants until the infrastructure works are inspected for completion, the site is cleaned of construction debris and damages repaired. However, there is a risk that site could be abandoned and left with unmanaged wastes, debris and other temporary structures used during the construction phase.

218. **Mitigation.** Once the construction is over, the Contractor will be responsible for ensuring decommissioning of all temporary worker camps. All temporary structures will be dismantled/demolished, temporary septic tanks and soak pits covered with an adequate amount of soil and construction materials, cleaning the site of debris before handing it back to PIU. 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.

219. 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.⁵¹

E. Anticipated Impacts and Mitigation Measures During Operation Phase

1. Impacts

220. At this stage, potential impacts are mostly beneficial as the new tenants will get to live in the newly constructed housing complex, which is affordable, suited to the climatic conditions and more resilient to disasters. The only concerns during the operation phase is the wear and tear on the building, breakdown of electrical and plumbing fixtures/systems, and risk of natural hazards and fire.

221. Over the long term, generation of liquid and solid wastes will also generate impacts to the environment if not managed well.

2. Mitigation Measures

222. **Maintenance and delivery of services.** The NHDCL has a Real Estate Management Services Division/Unit (REMSD) that is responsible for managing and carrying out maintenance work on its buildings. It also has a pool of trained and certified electricians, plumbers and masons in case repairs are urgently required. Other maintenance requirements are regular cleaning of the complex either by the residents or through the hire of sweepers.

223. The NHDCL will recruit staff to ensure delivery of the services such as Creche operation, etc.

224. **Fire and Natural Hazards.** NHDCL must ensure that the focal resident person or caretaker is trained in using fire extinguishers and that these are regularly checked and maintained. The emergency numbers of Fire, Police must be posted near the fire extinguisher or at a visible location. NHDCL must also ensure for the conduct of periodic fire drills, posting of emergency exit plans, designating evacuation areas, dissemination of other emergency plan information, and all other activities that will raise awareness among residents on how to behave and respond in times of fire or natural disasters.

⁵¹ IFC World Bank Group. 2007. [*Environmental, Health, and Safety \(EHS\) Guidelines – General EHS Guidelines: Construction and Decommissioning.*](#)

225. REMSD will follow instructions from the Thimphu Thromde Disaster Management Committee (DMC) on procedures to follow in case of emergencies.

226. **Water shortage.** The infrastructural drawings have incorporated rainwater harvesting, which will significantly reduce the demand for water during the operation phase and adequate water tanks will be installed onsite.

227. **Liquid and Solid Waste generation.** This is not a significant concern as the site is serviced by the municipal waste disposal service providers. NHDCL will promote waste segregation, storage and disposal as per Thromde collection requirements and procedures and ensure that garbage is not allowed to accumulate on the premises. The new buildings will be connected to septic tanks with soak pits to be desludged/emptied by vacuum tanker services provided by the Thromde. In the future, when the area is connected to a sewerage treatment plant, the buildings will then be connected to the sewer pipeline network.

F. Cumulative Impacts and Mitigation

228. Thimphu City has expanded from 8 km² in 1998 to 26 km² in 2001. The city is only 15 km long and 3 km wide. The Thromde boundary extends from Changtagang in the North to Ngabiphu in the South.⁵² As the capital city, Thimphu already comprises of numerous governments, non-government, institutions (religious, army, police), educational schools and colleges, private residences, shops, businesses, automobile workshops and showrooms.

229. As the capital city, Thimphu houses the majority of government, non-government offices and private offices. It is the primary destination for rural-urban migrators. With a total population of 114,551, Thimphu City alone contributes 41.8% to the total national urban population.⁵³ The projected population for Thimphu is 171,095 by 2025 and 263,152 by 2047. The increasing population has placed great demand for housing, resulting in construction boom with increasing number of private homes, buildings, offices and hotels. As such, the number of major drawings received for approval by the Thimphu Thromde has increased from 164 in 2015 to 344 in 2019 and the number of minor drawings (repairs/extensions) from 383 in 2015 to 658 in 2019.

230. In addition to the increase in population, Thimphu city is the center of most development activities. As of June 2020, the district had 698 registered cottage, small, medium and large industries, which had reduced from 716 in 2019, mostly due to reduction in medium and large firms. On the other hand, the number of services almost doubled from 2,747 to 4,084 from 2019 to 2020 due to spike in cottage-sized services. The number of contract firms dropped drastically from 1,286 to 592 between 2019 to 2020 with the highest reduction in medium firms. Thimphu also has a total of 54,074 registered vehicles.⁵⁴

231. Other ongoing and future infrastructure developmental works within the city include expansion of internal roads, sewerage system/network, development of priority bus service infrastructure, pedestrianization of downtown Thimphu City, and Low or Zero Emission bus fleet, low emission transport master plan, drinking water supply and water treatment plant construction and expansion of health and education systems and structures.

⁵² MOWHS, 2018. Annual Information Bulletin.

⁵³ MOWHS, 2019. Annual Information Bulletin. The total urban population of Bhutan is 274,316 (PHCB 2017)

⁵⁴ NSB, 2020. Statistical Yearbook of Bhutan. National Statistics Bureau.

232. The housing project will add to the more than 300 infrastructure/building construction works that are already ongoing in the city. As each additional construction or development activity such as road, sewerage is initiated, the cumulative pollution from each additional construction will reduce the ambient air quality. If there is no mitigation, the health of the resident and workers will be negatively impacted, with health and economic consequences. Also, it will add to the already increasing water requirement in the city. Excavation/cutting will result in sediment mobilization and erosion, possibly with sediments blocking drains and entering the Olarongchhu downslope and material transporting trucks will increase due to the increase in demand for construction materials.

233. However, all these construction impacts are short to medium term, and are not permanent will be visible and have social and environmental impacts during the construction period of 24 months. The major demolition and earthworks will take a couple of months in the year and is therefore transient and centered within the subproject influence zone of 100m surrounding the 1.9-acre site.

G. Environmental Benefits and Enhancement Measures

234. Despite the transient negative environmental and social impacts, the subproject will generate substantial environmental benefits and enhancements measures as described below.

1. Provision of affordable housing and improved living conditions

235. The subproject will provide affordable housing for marginalized urban workers in Thimphu, who cannot afford private apartments or decent housing elsewhere. The subproject will also provide adequate spaces for children's play and youth development while providing job opportunities for skilled and unskilled workers.

236. The provision of integrated service center as part of the affordable housing and green recreation area will have a major positive impact on living conditions and lifestyle of wage workers and their families. The service centers will provide crèches for working mothers (operated on PPP model), health services including awareness campaigns on preventive measures for COVID 19 infection and similar diseases, psychological counseling, legal assistance, court representation, police protection, temporary shelter, livelihood and employment skills development, and assistance in community reintegration. Upon completion of the integrated service center, it will be operated with technical backstopping from the National Commission for Women and Children (NCWC).

2. Water conservation

237. Rainwater harvesting and water storage tanks will ensure that residents do not have to face water shortage constraints. Provision of well-designed piping system will reduce potential leaks and unnecessary wastage of water.

3. Disaster risk reduction and climate resilience

238. Considering the city's vulnerability due to its terrain and climatic conditions and its location making it prone to natural hazards, the subproject will promote the development of sustainable and disaster and climate resilient infrastructure.

239. The Project will enhance the capacity of NHDCL to design and build disaster resilient infrastructure, adapted to disasters and natural hazards such as earthquakes, windstorms and floods and to select construction materials, taking into consideration the potential increase in temperatures, rainfall and extreme weather conditions in the future. It will create awareness of both NHDCL and the private contractors/sector on safe construction practices.

H. Summary of Impacts and Mitigation

240. Given the site location and the surrounding environment, the subproject will not have any impact on protected area, critical habitats or endangered and vulnerable species. Apart from 25 trees, there is no need for a large-scale clearance of natural vegetation.

241. The sensitive receptors that lie within the zone of influence (within 200m of the proposed infrastructure development work are the shops, institutions, offices, and residents in the area. While the positive benefits of low-income housing and generation of employment are high, there are several moderate impacts on as the infrastructure development work will involve demolition, excavation, material transportation and construction of worker camps.

242. In general, the implementation of construction work is not expected to cause major negative impacts spatially or temporally due to the following reasons:

- (i) The construction work itself is relatively straightforward and can be completed in a fairly short time. The selection process will ensure that Contractor(s) selected have adequate experience in such infrastructure works. The construction work will be contracted out as per prevailing government procedures and the Contractor will therefore be accountable for managing the construction sites responsibly and to deliver quality structures within the stipulated period;
- (ii) As part of their responsibility to prevent unwanted/unsafe development, the Thromde monitors all building construction through regular site visits during various stages of the construction process (foundation, completion of each floor, and roofing). The issuance of an occupancy certificate upon completion of the subproject is based on compliance to the approved construction approval and site inspections. This check and balance system ensures that appropriate design and structural considerations are adhered to;
- (iii) Construction impacts will be limited to the immediate area and its surroundings, and therefore the zone of impact is less than 100m. Both demolition and excavation work will be confined to the existing structure and building footprint. These impacts will not last more than two to three months at a time (provided work is carried out phase wise);
- (iv) Currently there are hundreds of ongoing building constructions in the city, and up until the COVID 19 pandemic, most of these sites employed foreign workers. To date, there have been no significant issues of social conflicts due to foreign workers;
- (v) The construction team will comprise of small teams 30-40 workers in one building at any given time. Also, work will be staged so that, as one team completes a task, the next team can be brought to the site, (e.g., stoneworkers, masons, tilers, woodwork, painters, electrician, plumbers etc.);
- (vi) The major sources of air pollution will be exhaust emission from vehicles transporting construction materials and operation of machinery, smoke from workers camps. Dust will emanate from material stockpiles, excavation work and road construction works. These are transient and limited to the work site and

- transport route, and can readily be mitigated through the measures discussed in this chapter; and
- (vii) Potential impacts associated with post-construction include the improper use and lack of care to the new buildings, generation of waste, possible water shortage and incidence of emergency or natural disaster. Mitigation measures are also discussed in this chapter.

243. All these concerns are addressed in this chapter and in the Environmental Management Plan chapter, which will be included in the bid documents. The PIU will conduct an orientation for both its staff as well as selected contractor(s) on ADB SPS, national regulations and EMP requirements, and COVID 19 safeguard requirements and procedures.

244. Given the above planning process, no significant environmental impacts are anticipated as long as (i) the design process adheres to required standards and guidelines and regulations, (ii) the requisite approvals are sought before and during construction, and (iii) the EMP is followed by the Contractor, regularly supervised by PIU with correctives actions taken immediately. On the social front, the subproject must follow the actions proposed in the resettlement plan and ensure that all required recommendations for compensation and relocation are carried out prior to the commencement of the infrastructure development work and the Grievance Redress Mechanism is instituted. Post construction, NHDCL must ensure regular maintenance and repair of its newly constructed structure so that its residents can enjoy the benefits of the new housing colony.

VI. ANALYSIS OF ALTERNATIVES

A. Alternatives Related to Site Location

245. Since the subproject is geared for urban low-income staff and wage workers, to provide maximum benefit to future tenants, the subproject site must be located at a reasonable distance from their workplace, namely Thimphu City, so as to reduce transportation cost. In this respect, the site selected is ideal as the primary tenants are the staff from the National Mushroom Centre, which is at a distance of about 50 m from the site. For other tenants who are working for the government, most of the government offices are located within a radius of 3 – 5 km from the site.

B. Alternatives Related to Design and Technology

246. Two design were initially developed for the site. The previous design had incorporated an additional access road to the site, with a take off point from the Thimphu- Wangdue National highway. Although the length of the new proposed road was less than 50m, this required slope cutting and stabilization works and would also create more congestion along the highway.

247. The second design only uses the existing access road, thereby resulting in a larger recreation area and more parking spaces. This only minimizes the risk of landslides from road cutting works, and slope stabilization.

C. Environmental Implications of Alternatives

248. There are many positive implications of the selected alternative. Firstly, there is a reduction in vegetation clearance and excavation work and reduced subproject footprint. The new subproject design only utilizes 18.21% of the 1.93 acres. In the last few decades, Thimphu Throm has grown rapidly is facing increasing environmental pressure from improperly planned housing,

development of inappropriate structures, overcrowding and traffic congestion. The location of the housing complex away from the city core helps to reduce this overcrowding.

D. Implication of No-Project Alternative

249. Both the “no project” and “with project” options have been studied and a comparison of ‘No Project’ and ‘with Project’ options are presented in the Table below.

Table 28: Comparison of “with project” and “no project” options.

Description	No Project	With Project
Social impacts	Maintain status quo The tenants will continue to live in the existing housing complex	The Project will assist the Royal Government of Bhutan (RGOB) establish housing infrastructures for 80 marginalized informal sector workers in Thimphu (old and new tenants)
Physical impacts	The existing housing structures at the site were build decades ago and not designed to withstand natural disaster such as earthquakes	The planned housing complex will be designed based on the terrain, geology and local area plan.
Potential impacts due to seismic risks, environmentally friendly and climate resilient	Existing structures are old and not earthquake resilient or adapted for climate change	Design of buildings are as per Bhutan Building Regulations 2018, Bhutan Building Code of Bhutan 2018, Bhutanese Architectural Guidelines, 2014 and the Bhutan Green Building Guidelines, 2013. The subproject will integrate innovative approaches to enhance resilience to geophysical events, extreme weather events, incorporate green space and adequate parking for all tenants
Environmental impacts Potential impacts to ecologically sensitive areas, critical habitats, biodiversity and physical cultural structures	No impact as the site is located within city boundaries	Same as ‘no project’ scenario
Social impacts Potential impacts to indigenous people	There are no indigenous communities at or near the subproject site	Same as ‘no project’ scenario
Disruption to local residents during construction	None	There will be some disturbance to local residents living in close proximity to the construction site during the construction period especially due to construction noise There is a potential for traffic congestion to occur with increase in material transporting vehicles
Employment opportunities for locals	None	The subproject will provide employment opportunities for able, skilled and non- skilled workers (both foreign and local)
Disaster and natural hazards	The roofs of traditional mud and stone-built houses across the country continue to be broken or completely	The subproject will be able to integrate new designs to ensure the housing facility is disaster-resilient.

Description	No Project	With Project
	blown away, damaging homes and threatening occupant's lives	

250. **“No Project” option:** The “No Project” option means that the existing housing crunch, a chronic issue being faced by Thimphu residents, will continue. Currently, the 1.93-acre site only houses 21 families. The lack of affordable housing further aggravates already existing urbanization woes such as increasing illegal settlements and temporary huts, overcrowding, waste generation, inadequate sanitation resulting in unhealthy living conditions. The unaffordable housing also undermines a wage earner’s ability to save money further widening the gap between the rich and the poor. This situation particularly impacts the low income and vulnerable population the most, as they continue to reside in housing complexes ill-suited to withstand the seismic risks and natural hazards.

251. **“With Project” option:** The new project will provide affordable housing for 80 families. The new housing complex will be designed to suit the topography, geology and existing land use. It will incorporate universal design features (ramps, sufficient parking, pedestrian footpaths and efficient drainage systems), will be disaster resilient and fitted with fire hydrants and fire extinguishers, incorporate environmentally friendly/green features such as use of locally produced materials, improved window designs, waste management units, centralized sewer plan, open green spaces, provide adequate access and parking. Above all, it will provide opportunities for vulnerable families especially women with the opportunity to save money, and live in a healthy, spacious environment. The project will also generate employment opportunities for both skilled and non-skilled workers during the construction phase.

VII. INFORMATION, DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Consultation and Participation

252. Consultation, participation, and disclosure constitute an integrated process in the project design preparation and implementation. As required by ADB SPS, NHDCL will disseminate information to affected persons and consult with them in a manner that is commensurate with the anticipated project impacts on the affected communities. NHDCL will inform and consult with the affected persons on resettlement and compensation options and provide them with project-related information during resettlement planning and implementation. Disclosing information will precede consultation.

B. Approach and Methodology

253. Key stakeholders were identified during the project planning process are as follows:

- (i) Current residents in the housing complex- the cottages (5 families), concrete buildings (8 families) and temporary units (8 families), which include staff of the National Mushroom Centre and other civil servants;
- (ii) Future potential residents;
- (iii) Thimphu Thromde and Thimphu District Forest Office; and
- (iv) Residents and shop owners of the neighboring community.

254. **Consultations during COVID-19 Pandemic.** Meaningful consultations will continue even as the COVID-19 pandemic prevails. Consultations will be undertaken through a combination of online, virtual and in-face consultations. Field consultations will be undertaken only when necessary, but following safety guidelines to ensure project team members and participants are not put at high risk of contracting COVID-19. A set of guidelines has been developed for the project to ensure that the conduct of consultations will be a safe activity for the organizers and participants (see Appendix 5). This set of guidelines may be adopted wholly or adjusted depending on the prevailing local and national guidelines on COVID-19.

C. Preliminary and Follow up Consultations

1. Consultation and project disclosure with relevant stakeholders

255. NHDCL has informed and sought clarification from the District Forest Office on the proposed activities to confirm that there are no environmental impacts on forest cover or vegetation. Consultation was carried out with Thimphu Thromde as well to determine the types of approval required.

256. Consultations with Management staff of National Mushroom Centre (NMC) Staff living in the National Housing Development Corporation Limited (NHDCL) Housing Colony, Semtokha & Thimphu Thromde on 26 February 2021. The Objective of the consultation was to inform project affected people about the plan for development of the current National Mushroom Centre housing site for affordable housing through ADB support; to make participants aware of the safeguard requirements, to agree on a plan to vacate the identified buildings ahead of the project approval and implementation phase; and discuss any forms of assistance that NHDCL could provide to ease the process of vacating and relocation of affected people.

257. In summary, NHDCL presented the objective of the Project, details on Thimphu site with regard to planned structures and access and provision of services for the site during construction and on completion. Current NMC occupants of houses even with families will be given adequate notice to move.

258. The General Manager, NHDCL contacted the staffs living at National Mushroom quarters to organize the meeting and survey/interviews were conducted with the Project 21 Affected Families living in the Thimphu housing site on 1 March 2021 by the NHDCL and the social safeguards consultant. During the meeting, NHDCL briefly presented the objective of the Project, project sites and then details on Thimphu site with regard to planned structures and access and provision of services for the site during construction and on completion, ADB Consultant explained briefly the safeguards requirements including the tentative scheduling of construction to determine sequence of dismantling of structures and thereby the vacation of structures by current resident. Site preparation activities and the moratorium on cultivation of plants was also discussed.

259. The project affected families were asked whether they currently faced any issues with drinking water, and waste management. The participants informed that the current housing colony has its own water source from Chamgang. When they face water shortage, either due to damaged or blocked pipes, the residents go together to repair the water supply line or clear the water source. At the most, the community faces water shortage only for 2 days. In terms of waste management, the area is serviced by the municipal waste truck collects organic and general household waste twice (one day organic, one day inorganic), so there are no issues with waste collection and disposal. Apart from these two there are no environmental concerns with the site.

260. During the consultation, the participants expressed their opinions and suggestions about the implementation of the Project. The summary of the consultations is presented in the table below.

Table 29: Topics Discussed During Public Consultation

Topic	Key questions	Clarification by NHDCL
Project objective, design	Selection of new tenants	Those with tenancy agreements with NHDCL will have to do lucky dip to stay in the new quarters NMC will be treated separately i.e., that they would not be added to the general waiting list, but their names will be maintained in a separate list.
Lease time	Request for extension on lease for five more years	There is a demand to reduce the rental tenure from 10 years to less and therefore this cannot be entertained by NHDCL but is subject to discussion with the Board as a policy issue.
Selection of tenants	Request for selection of low-income families first	NHDCL further assured that the 12 families would be given an opportunity to occupy the new housing units but that the units would be of Class III and Class IV category with space around 600 sq.ft. and rentals below Nu. 5000/month
Selection for new housing complex	request for assurance letter for getting housing in the next complex after completion	The request was included in the minutes and will be considered as a special case
Vacating and finding new affordable housing	Sudden release of staff with a ten-year lease are worried about finding affordable housing after vacating	NHDCL stated that their maximum 10 years lease agreement contract will be considered. For the remaining years, they will be given preference after the completion of the Project.
Rental assistance	Request for additional house rent assistance	As per Government approval, all civil servants are already being given 20% rent allowance based on their salary, while rental amounts are actually lower than the 20%, indicating that tenants have been enjoying the benefit for 7 years already
Housing quota	whether all NMC would get housing quota and if that will be retained for new staff coming on transfers	NHDCL explained that the housing cannot be transferred to new staff who would have to put in an application like everybody else and wait for allotment on vacancy. 30% are for non-civil servants those who are working as wage workers for NHDCL or municipal workers for Thromde NHDCL explained that they have been doing allotment as per the waiting list of applicants and strictly follow the serial number to see which applicant is next in line to receive allotment. There is allotment rule which has to be followed especially in Thimphu where there is huge demand but concurrent scarcity and thus NHDCL is compelled to follow procedure. NHDCL also clarified that the registration and application system for housing had gone online hence all need to apply and cannot be registered separately. This Government to Citizens (G2C) portal is hosted with Cabinet Secretariat for robustness and functionality.
ESP housing in interim period	One ESP had been staying in temporary	NHDCL stated that they would assist in providing skilled manpower, but materials have to be mobilized by NMC/

Topic	Key questions	Clarification by NHDCL
	houses built with materials provided by NMC. He requested if the ESP could stay until the plots the dwellings are located in currently is developed.	Project Affected persons. They advised that it is better that NMC takes the material because whatever usable material is left at site may be auctioned.
Schedule for vacating housing area and construction work	Clarification was sought on the date existing tenants are required to vacate.	NHDCL mentioned that they will get back on this soon through the letter notifying the deadline to vacate the housing. They also reiterated that all crops have to be claimed by July and no crops should be planted after the current crop on land namely potato etc. have been harvested. This is because NHDCL would commence the work tentatively by September 2021
Water supply	The project affected families informed that the current housing colony has its own water source from Chamgang.	As an additional measure, the project design also incorporates rainwater harvesting
Waste management	The project families confirmed that the area is serviced by the municipal waste truck collects organic and general household waste twice (one day organic, one day inorganic)	This will continue to be used as per municipal norms

261. Copies of minutes of all consultation meetings done are in Appendix 6.

D. Future Consultations during detailed design stage

262. Once the detailed design of the housing complex is finalized, NHDCL through PMU, will prepare a brief and disclose the same through the conduct of meaningful consultations with the stakeholders, including those identified during the reconnaissance visits but were not included in previous consultations. 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 NHDCL site and head office, informing the public of their availability, and providing a mechanism through which comments can be made.

E. Information Disclosure

263. NHDCL will disclose relevant information regarding the project on the website, and in print form, which will be available to interested parties at the PIU. The subproject contact details will also be posted on the signboard installed at the construction site, so that any person can call the PIU for subproject related information.

264. This IEE, which includes the EMP, and all other safeguard documents will also be disclosed on the ADB website for information. If any changes are made to the subproject design or location, this IEE will be updated, and likewise disclosed accordingly.

VIII. GRIEVANCE REDRESS MECHANISM

265. The Project will adopt a three-tier Grievance Redress Mechanism (GRM) in implementing the Project. The GRM will receive, evaluate, and facilitate the resolution of social, environmental or any 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. The GRM described below has been developed in consultation with stakeholders. Public awareness campaign will be conducted to ensure that awareness on the Project and its grievance redress procedures is generated and shared with affected persons and other stakeholders. The campaign will ensure that the poor, vulnerable and others are made aware of the need for and process in availing the GRM.

266. The GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the Project. A sample grievance redress form is in Appendix 7. The three-tier GRM for the Project is outlined below, each tier having time-bound schedules and with responsible persons identified to facilitate and address grievances at each stage, as required. Public awareness campaigns will ensure that awareness on grievance redress procedures is generated through the campaign. The Environmental and Social Safeguard Officer of PMU will have the overall responsibility for timely grievance redress on environmental and social safeguards issues.

267. **Who can file a complaint:** A complaint may be registered by stakeholders who may be, directly or indirectly affected by the Project. A representative can register a complaint on behalf of the affected person or group, provided that the representative is identified by the affected person or group and submits evidence of the authority to act on their behalf.

268. **What type of grievance/complaint:** Any comments, complaints, queries and suggestions pertaining to safeguard compliance - environment, involuntary resettlement, and indigenous people, design related issues, compensation, service delivery or any other issues or concerns related to the Project can be registered. The complaint must indicate the name, date, address/contact details of the complainant, location of the problem area, along with the problem.

269. **Where and how to file a complaint:** The contractor's site office will be the primary point for receiving and lodging any complaint. Apart from that, grievances/suggestions/queries from affected persons can be dropped into suggestion boxes or conveyed through phone or e-mails. Affected persons or any complainant will also be able to register grievances on social, environmental or other related issues, personally to the Complaint Cell at PIU level.

270. **Process and Timeframe:** The grievance redress process and timeframe involved in the GRM is described below:

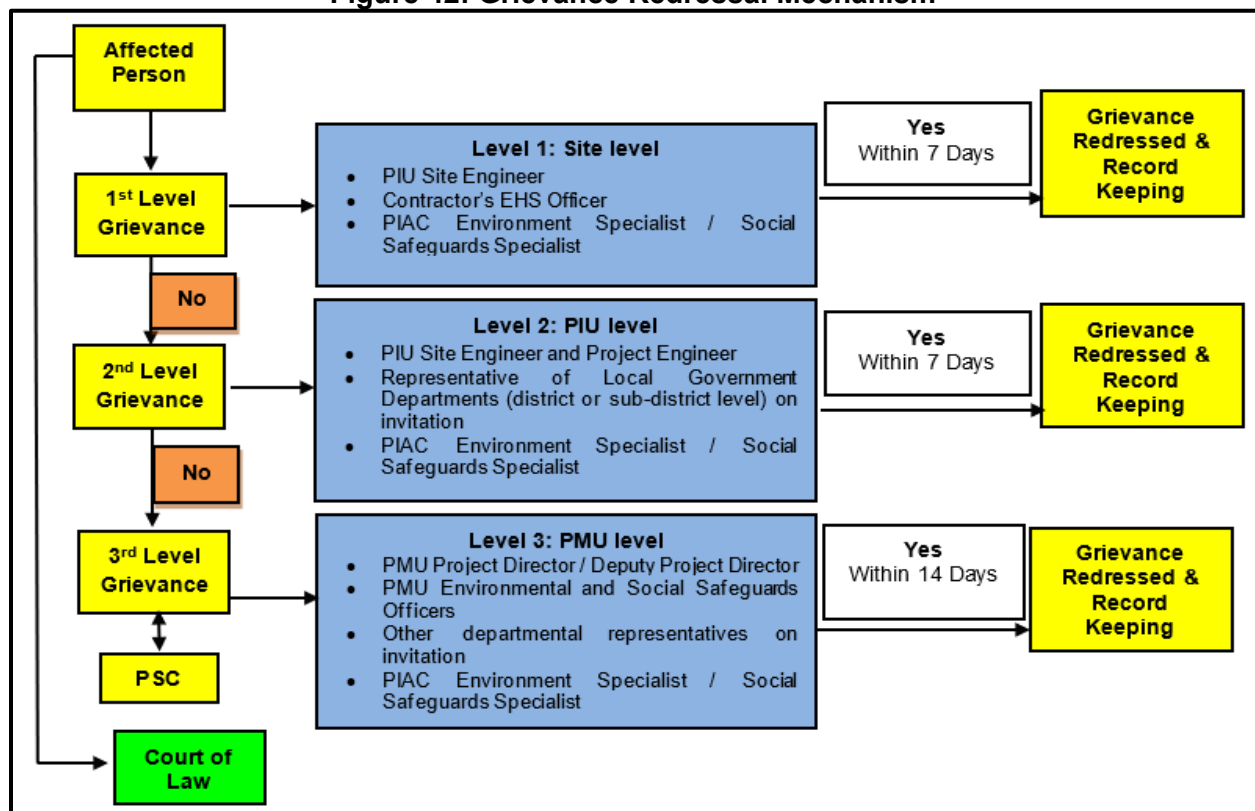
- (i) **1st Level Grievance (Field Level):** In case of grievances that are immediate and urgent in the perception of the complainant, concerned officer of PIU will direct the contractor to resolve the complaint and ensure that it is resolved. If the grievance is not under the contractor's scope, the Project Implementation Assistance Consultant (PIAC) will resolve this issue with the support of respective PIU. Efforts will be made to resolve all grievances within two days from the date of receipt of a complaint / grievance. Relevant government representatives from the respective districts and sub-districts, where the subproject will be implemented, can be consulted as and when required.

- (ii) **2nd Level Grievance (PIU):** Grievances that cannot be redressed at first level within two days will be brought to the notice of the Complaint Cell at PIU level. The Project Engineer will try to resolve the grievance/ complaint within a timeframe of 14 days of receiving the complaint from the first level. The PIU may consult/seek the assistance of the Environment and Social Safeguard Officers at the PMU level. Government representatives from the respective districts and sub-districts where the subproject will be implemented can be consulted as and when required. Any unresolved complaint at the second level will be taken up to the third level.
- (iii) **3rd Level Grievance (PMU):** All the grievances that are not addressed at 2nd level by PIU will be brought to the third level. The third level will meet once a month and determine the merit of each grievance/s brought to the committee. The third level grievance redress committee will resolve the grievance within 14 days of receiving the complaint from the second level. The Environmental Safeguards Officer or Social Safeguards Officer, PMU will provide feedback to the complainant. Any critical or unresolved matter may be taken to the Project Steering Committee (PSC) for solution.

271. MOF will chair the PSC which will comprise government officials from the Ministry of Works and Human Settlement (MOWHS), National Land Commission (NLC), the Gross Happiness Commission (GHNC), the National Commission for Women and Children (NCWC), the NHDCL, and representatives of selected subproject districts. The PSC will be established to oversee the project implementation and provide strategic and policy guidance and will meet at least biannually and as required.

272. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage, such as Thromde or court of law in the respective district. This can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

273. The process of the Project GRM is given in Figure 42.

Figure 42: Grievance Redressal Mechanism

EHS = environmental health and safety, NHDCL=National Housing Development Corporation Limited, PIAC = project implementation assistance consultant, PIU= project implementation unit, PMU =project management unit, PSC= project steering committee

274. The timeframes within which to resolve the issues may be adjusted accordingly during extraordinary circumstances, such as lockdowns or travel restrictions imposed by local or national governments due to the ongoing COVID-19 pandemic. The adjustment will depend on the period of interruption during these events and will be decided upon by the PMU.

275. **Information Dissemination Methods about GRM.** Periodic community meetings will be held by PIUs, and PIAC with affected communities to understand their concerns and help them through the process of grievance redress (including translation from local dialect/language, recording and registering grievances of non-literate affected persons and explaining the process of grievance redress) if required. The above Grievance Redress Process will be discussed with the different stakeholders during stakeholder consultation meetings. These meetings will be held with affected persons and community members (beneficiaries) and the concerned local government representatives where civil works are proposed. The process and timelines for grievance redress and contact details of the persons responsible for grievance redress will be shared in the stakeholder meetings. Action taken in respect of all complaints will be communicated to the complainant by letter, over phone or e-mail or text messaging.

276. **Consultation Arrangements for GRM.** This will include group meetings and discussions with affected persons, to be announced in advance and conducted at the time of day agreed on with affected persons and conducted to address general/common grievances; and if required with the Environment/Social Specialist of PMU/PIU for one-on-one consultations. Non-literate affected persons/vulnerable affected persons will be assisted to understand the grievance redress

process, at the site office of the contractor and at PIU level, the official appointed to receive grievances will assist the non-literate affected persons to register complaints and follow-up with actions at different stages in the process.

277. Record Keeping. Records of all grievances received, including contact details of complainant, date of receiving complaint/grievance, nature of grievance, agreed actions and measures, the date these were affected, and outcome will be kept by PIU. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PIU office, and on the website of PMU, as well as reported in the semi-annual social and environmental monitoring reports to be submitted to ADB. The Environmental Officer and the Social Safeguard Officer will be responsible for maintaining the grievance record. Suggested template for record-keeping of grievances is in Appendix 8.

278. Periodic Review and Documentation of Lessons Learned. The PMU, and PIUs, supported by the PIAC specialist will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

279. Costs. All costs involved in resolving the complaints (meetings, consultations, communication, and reporting/information dissemination) will be borne by the PMU.

280. ADB Accountability Mechanism. If the established GRM is not able to resolve the issue, the affected person can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make effort in good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the Bhutan Resident Mission (BHRM)). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the Project-relevant information to be distributed to the affected communities, as part of the Project GRM.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Institutional Arrangement

281. Overall Project Institutional Arrangement. The Ministry of Finance (MOF) is the executing agency and the National Housing Development Corporation Limited (NHDCL) is the implementing agency of all outputs of the proposed Bhutan Green and Resilient Affordable Housing Sector Project. MOF and NHDCL will engage relevant government agencies⁵⁵ and NGOs in designing and operationalizing the Project. International and national consultants will be recruited to provide expert assistance. A central project steering committee (PSC) set up under the Project will facilitate and ensure adequate coordination among relevant stakeholders and provide guidance for PMU and PIUs for this proposed Project. In particular, the PSC will: (i) meet at least semi-annually or more frequently if required; (ii) provide guidance for and ensure the implementation of government and ADB policies for the proposed Project; (iii) assist in resolving any interagency implementation problems; (iv) review relevant reports and audit statements from

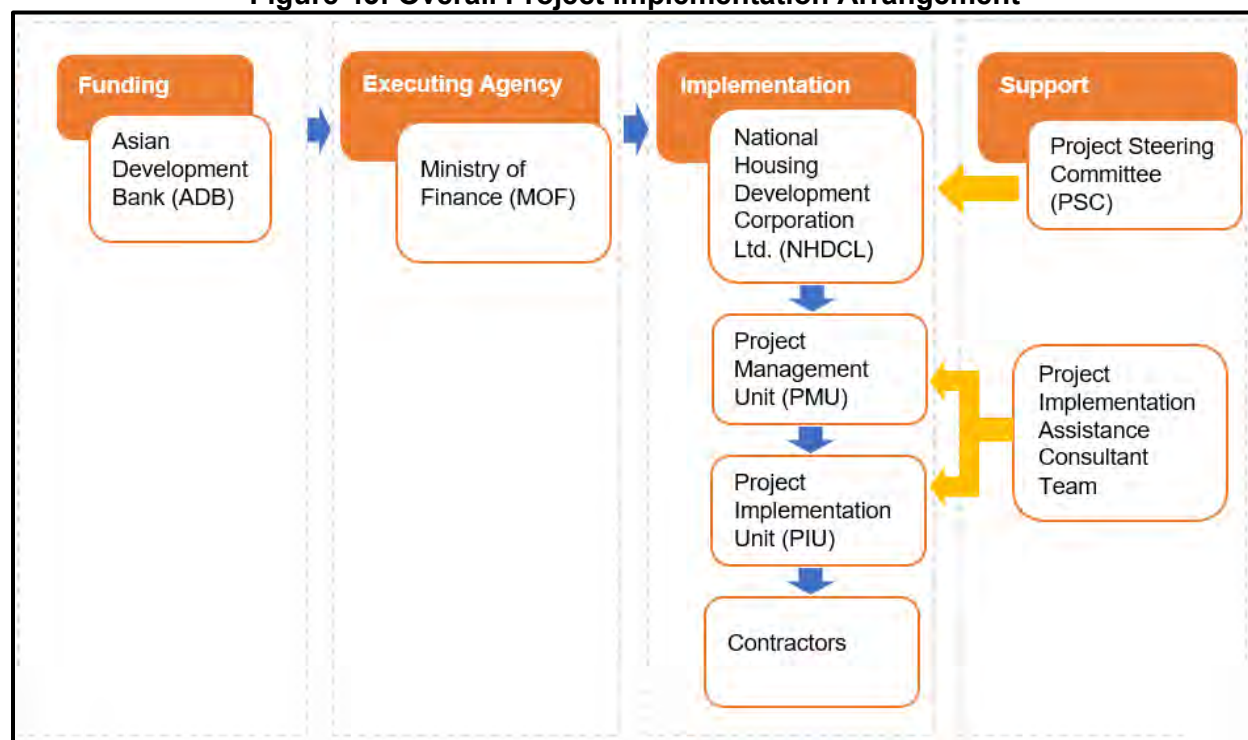
⁵⁵ Department of Disaster Management (Ministry of Home and Cultural Affairs); Department of Engineering Services; Department of Geology and Mines; etc.

PMU and PIUs, as and when required; and (v) ensure that conditions of the Loan Agreement with ADB are met.

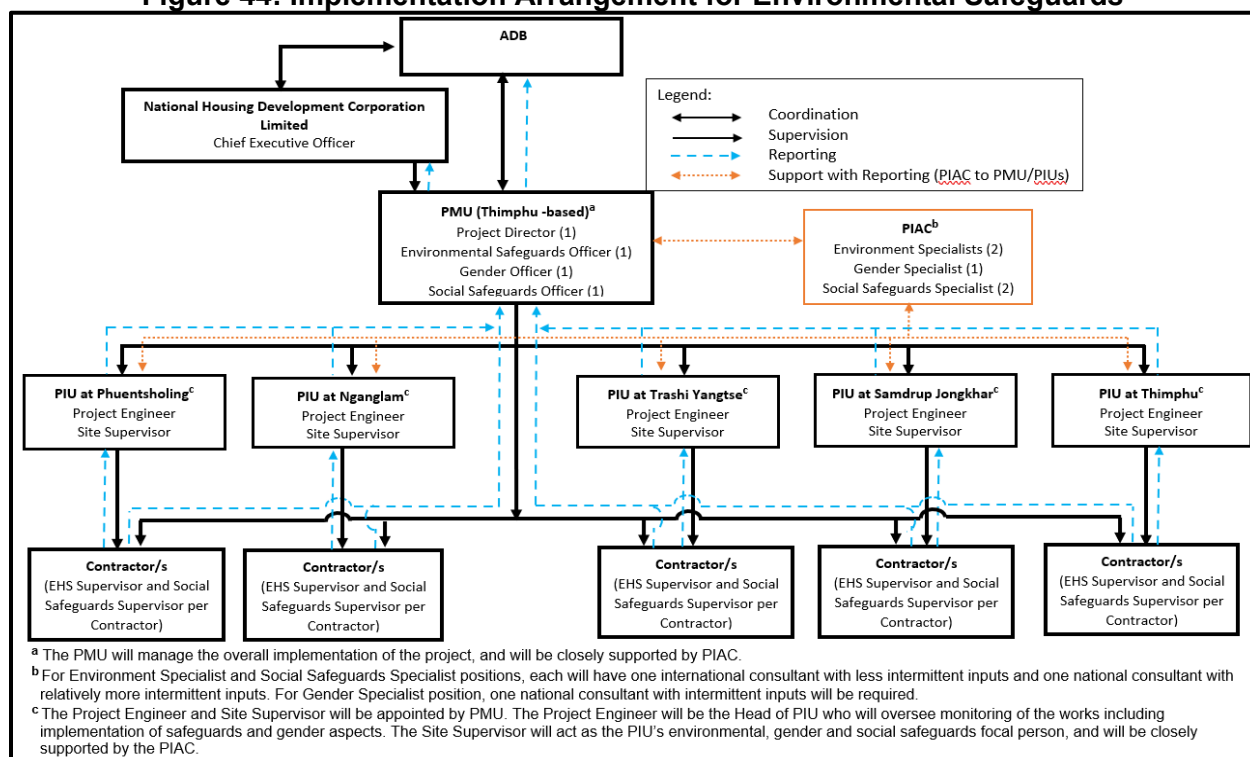
282. NHDCL being the implementing agency for the Project, will be responsible for management, coordination and execution of all activities funded under the loan. A PMU at NHDCL will be created, which will be responsible for implementing the Project. The PMU will be headed by a Project Director and supported by PIUs at the district and/or sub-district levels.

283. The PMU and PIUs will be further supported by a Project Implementation Assistance Consultant (PIAC) in project management and implementation. Figure below details the responsibilities for the project preparation, construction and operation.

Figure 43: Overall Project Implementation Arrangement



284. **Specific Institutional Arrangement for Environmental Safeguards.** Figure below depicts the implementation arrangement for environmental safeguards.

Figure 44: Implementation Arrangement for Environmental Safeguards

ADB = Asian Development Bank, EHS = environmental, health and safety, PIAC = project implementation assistance consultant, PIU = project implementation unit, PMU = project management unit.

285. Project Management Unit. The PMU will work closely with the PIUs in implementing the environmental safeguards requirements of the Project. The PMU will be staffed with at least one (1) environmental safeguards officer who will lead the efficient overall implementation of environmental safeguards. With support from the PIUs and PIAC, the PMU will have the following responsibilities:

- (i) Ensure subprojects comply with the national and local statutory and legal environmental requirements, ADB SPS 2009, EARF and environmental safeguards provisions of the ADB loan covenant;
- (ii) Ensure subprojects conform to exclusion criteria and subproject selection guidelines as stipulated in the EARF;
- (iii) Review and approve the environmental categorization of future subprojects;
- (iv) Review and approve subproject IEE reports, including EMPs, and ensure that subproject IEEs and EMPs are updated based on final detailed designs and submit to ADB for clearance;
- (v) Ensure that no civil works commence until updated IEE based on final detailed design is cleared by ADB;
- (vi) Ensure that the IEEs including EMPs are updated in case of changes in detailed design that may occur during implementation phase;
- (vii) Ensure that IEEs with EMPs are included in bidding documents and civil works contracts;
- (viii) Ensure that the requirement for contractors to prepare their respective Health and Safety (H&S) Plans including COVID-19 H&S Plans is included in bidding documents and civil works contracts;
- (ix) Review and approve site-specific EMPs (SEMPs) of contractors;

- (x) Provide oversight on environmental management aspects of the Project, and ensure EMPs and SEMP are implemented by contractors;
- (xi) Establish a system to monitor environmental safeguards of the Project including monitoring the indicators set out in the monitoring plan of the IEE;
- (xii) 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;
- (xiii) 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;
- (xiv) With support from PIAC, consolidate quarterly monitoring reports from the PIU and submit semi-annual environmental monitoring reports (SEMRs) to ADB;
- (xv) Ensure availability of budget for safeguards activities;
- (xvi) 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;
- (xvii) Address any grievances brought through the grievance redress mechanism (GRM) described in this IEE report in a timely manner;
- (xviii) Undertake regular review of safeguards-related loan covenants, and the compliance during project implementation; and
- (xix) Organize periodic capacity building and training programs on safeguards for stakeholders, PMU, PIUs and contractors.

286. **Project Implementation Unit (PIU).** The PIU will be responsible for the day-to-day activities of project implementation in the field and will have direct supervision to the contractors at subproject sites. The PIU will be headed by a Project Engineer who will oversee the overall implementation of the Project including safeguards. The PIU will also appoint a Site Engineer who will oversee and monitor the day-to-day progress and implementation of the environmental provisions in the EMP. With support from PIAC, the Site Engineer will:

- (i) Ensure compliance with government and ADB requirements on environmental safeguards;
- (ii) Conduct regular site visits, including spot checks, to ensure the EMPs and/or SEMPs are properly implemented;
- (iii) Review monthly reports from contractors;
- (iv) Prepare quarterly reports on all aspects concerning environmental assessment, management, and monitoring;
- (v) Obtain approval of the quarterly reports from the Project Engineer, and submit approved reports to PMU;
- (vi) Address any grievances brought about through the GRM described in the EARF in a timely manner; and
- (vii) Support all other environmental safeguards-related activities and tasks of the PMU as may be needed.

287. **Environment Specialist Consultant.** The PIAC shall have an Environment Specialist Consultant who will assist and train PMU and PIUs in implementing the EMPs of subprojects, including the review and updating of all necessary environmental safeguard documentation as required by ADB SPS and national laws, regulations, policies and guidelines applicable to each subproject. The Environment Specialist Consultant will also train PMU and PIU on how to monitor

safeguards compliance during O&M phase. Other specific tasks of the consultant are to assist PMU and PIUs to:

- (i) Conduct consultations/discussions with environmental regulatory agencies and other stakeholders;
- (ii) Identify all applicable and relevant national laws, regulations, policies and guidelines and preparing environmental assessment;
- (iii) Undertake environmental categorization for the proposed future subprojects;
- (iv) Carry out IEE for the proposed future subprojects and formulating environmental management plans (EMPs) for the different components of the civil works in line with ADB and national requirements;
- (v) Undertake assessment of existing safeguards system under the Project, identifying areas for improvement, and development of appropriate safeguards implementation arrangement. This assessment will form part of the IEE, and results will be included in the IEE report;
- (vi) Carry out (a) environmental baseline data collection, (b) assessment of project hazards and risks that may be posed to the environment and people, (c) EMP development or formulation, (d) meaningful consultations with project-affected people; and (e) other preparatory activities necessary for finalizing the subprojects' environment safeguard documents;
- (vii) Prepare IEE report, environmental management plans (EMPs) as required by country's environmental legal frameworks and ADB SPS;
- (viii) Ensure that the relevant provisions of EMPs, including costs of implementing the EMPs, are fully included in bid and contract documents, particularly in the bill of quantities (BOQ) and cost line items;
- (ix) Review designs, bidding documents, BOQ, and safeguard documents to ensure health and safety considerations including issues related to COVID 19 pandemic, are adequately covered and costed;
- (x) Calculate and provide the indicative cost estimate to implement EMPs, environmental monitoring programs, awareness programs, etc.;
- (xi) Assist with any capacity building activities for stakeholders;
- (xii) Ensure quality and format of IEE reports, and other environmental safeguard documents following ADB Handbook of Styles and Usage;
- (xiii) Comply with disclosure requirements per ADB SPS;
- (xiv) Implement proposed environmental mitigation measures and ensure the implementation of EMPs during construction phase;
- (xv) Monitor implementation of SEMP;
- (xvi) Monitor required environmental parameters and preparing semi-annual environmental monitoring report (SEMR) per the requirement of ADB; and
- (xvii) Prepare all necessary environmental reports per requirement during implementation of the civil works contracts.

288. **Civil Works Contract and Contractor.** The IEE with EMP will form part of bidding and contract documents and verified by PMU. The Contractor will be required to designate an environment, health and safety officer (or equivalent) to ensure implementation of EMP during civil works. Contractor is to carry out all environmental 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.

289. 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 during bid preparation and cost estimation;
- (iii) Hire or designate a full time Environment, Health and Safety Officer (or equivalent) responsible for compliance to ADB SPS requirements, national regulations and the EMP. The officer/staff must have a clear terms of reference and responsibilities to ensure that all environmental and social concerns are properly managed;
- (iv) Ensure regular reporting to the PIU on work progress and alert management on any potential issues or delays;
- (v) Strictly follow National COVID 19 protocols and instructions issued by the Ministry of Health and the COVID Task Force, and immediately report to the PIU upon detection of COVID positive cases at the project site;
- (vi) Obtain the necessary permits and clearances as required to implement the Project;
- (vii) Ensure that all worker recruitment and OHS requirements are complied;
- (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) Follow chance finds procedures to discovery of any physical cultural artifact.

290. A copy of the EMP/approved SEMP 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 constitutes a failure in compliance and will require corrective actions.

291. 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.

Table 30: Environmental Safeguards Roles and Responsibilities

Project Management Unit	Environment Specialist Consultant	ADB
Pre-construction stage		
Environmental officer of the PMU, with assistance from the environment specialist consultant, to conduct Rapid Environmental Assessment (REA) for each site of proposed subprojects using checklist available from ADB. Based on the REA,	Environment Specialist Consultant will assist PMU and conduct IEE (or update existing IEE) for all subprojects, which will include an EMP. The environmental expert and other consultants will work	ADB to review the REA checklists and reconfirm the categorization.

Project Management Unit	Environment Specialist Consultant	ADB
categorize the project based on ADB SPS. Submit all categorization forms to ADB.	with the design team to ensure all relevant environmental considerations are included in the design. The PMU consultants (environment and social) will assist PMU in the conduct of public consultations during IEE process and incorporate consultation findings into project designs and IEE.	
Based on its review, PMU will approve the IEE and send to ADB for review and clearance before contract award. The IEE also made available on request. Ensure IEE with the corresponding EMP is part of contract documents for category B subprojects. If the proposed infrastructure is classified as category C, the PMU to provide generic mitigation measures, if any, to be implemented. For Category C, no IEE/EIA is required, and only a review of the environmental implications is necessary.	After the approval of IEE by PMU and clearance by ADB, the Environment Specialist Consultant will assist PMU in disseminating the IEE to public for information as required by ADB SPS.	ADB will review and provide clearance of IEE/EMPs before award of contracts. ADB will disclose cleared and government endorsed IEEs on its website.
Environmental officer of PMU to provide guidance to the PMU consultant team to ensure compliance of all undertakings with regulatory requirements with regard to environment. This shall include guidance in preparation of the documents as required for the issuance of environmental clearance and other necessary clearances such as for example forest clearances if required, submission of application forms, and liaising with agencies towards obtaining these clearances from relevant government agencies. Environmental officer of PMU shall notify the ADB on obtaining of these clearances, including the conditions specified if any in the clearances, and integration of these into the contracts/EMP.	The Environment Specialist Consultant shall support the PMU environmental safeguards officer in compiling the necessary information required for submission of application forms for clearances, obtaining NOC from local authorities, etc., including coordinating with the NEC/MOWHS on a regular basis and provide necessary documentation and clarifications as required until the environmental clearance is issued.	ADB to ensure that the clearance requirements are included in the contract provisions/EMP.
Environmental officer of PMU to ensure that the IEE containing the EMP of each subproject is included in the bid and contract documents. At the same time, the Environmental officer of PMU to ensure that the total budget for implementing the EMP is included in the bid and contract documents.	The Environment Specialist Consultant will support the PMU environmental safeguards officer in ensuring that each Contractor: (i) prepares its SEMP based on the EMP in the IEE, and (ii) has budget allocated for the implementation of the SEMP.	
Construction Stage		
PMU to review the monthly monitoring reports from the environment specialist consultant to ensure that all mitigation measures are implemented. PMU to consolidate the monthly reports and submit	Contractor to conduct environmental monitoring and implement SEMPs/EMPs. The Environment Specialist Consultant will assist the PMU environmental	ADB to review the reports and provide necessary advice/guidance needed to the PMU.

Project Management Unit	Environment Specialist Consultant	ADB
semi-annual reports to ADB for review. Corrective actions to be undertaken if needed.	officer in (i) review and approval of contractor's implementation plans such as EMPs/SEMPs, and (ii) monitor the implementation of mitigation measures in the EMPs/SEMPs by contractors. The Environment Specialist Consultant will also prepare monthly progress reports including a section on implementation of the mitigation measures and submit to PMU for review.	
Operation Stage		
PMU to conduct monitoring, as specified in the environmental monitoring plan of EMP. NHDCL to monitor the performance, if required and as specified in monitoring plan of EMP.		ADB to review semi-annual environmental monitoring report and disclose on its website. ADB to prepare Project Completion Report
PMU to continue submission of semi-annual environmental monitoring report to ADB until ADB issues a Project Completion Report.		

ADB = Asian Development Bank, EIA = environmental impact assessment, EMP = environmental management plan, IEE = initial environmental examination, NHDCL = National Housing Development Corporation Limited, NOC = no objection certificate, PMU = project management unit, REA = rapid environmental assessment, SEMP = site-specific environmental management plan, SPS = safeguards policy statement.

B. Environmental Management Plan Matrices

292. 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.

293. It is a commitment by NHDCL to implement the proposed management measure and therefore must be incorporated into the bidding documents, subproject construction contracts and also monitored during operation and maintenance.

Table 31: Environmental Management Plan

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Design / Pre- construction phase					
1.Subproject Location	Impact on protected area, critical habitats and endangered species	None required as the subproject site is located within the city limit, and the site is located within the municipality at a distance of more than 10km from the nearest protected area. The designated land use is for housing and there are already 7 existing buildings and temporary structures at the site with little or no vegetation.	NA	PIU	PMU
	Impact on Physical cultural Resources (PCR)	No mitigation required as the subproject site is not located at a distance that could impact a PCR. The nearest PCR is Semtokha Dzong, which is at approximately 226m away.			
	Risk of natural hazards such as earthquakes and climate change considerations	<ul style="list-style-type: none"> • Design of buildings in line with Bhutan Building Rules, 2017, Bhutan Building Regulations 2018, Bhutan Building Code of Bhutan 2018, Bhutanese Architectural Guidelines, 2014 and the Bhutan Green Building Guidelines, 2013. • Choice of construction materials must be based on climatic conditions and suitable for monsoon rains and winter snow conditions. • Design should be guided by the Thimphu Structure Plan 2002-2027. 	Included in Subproject design cost	PIU	PMU
Disruption of utilities and services	Impacts due to or on the existing transmission lines running through the site.	<ul style="list-style-type: none"> • Discuss with Bhutan Power Corporation on whether building locations are at a safe distance from transmission lines (TL) or whether the TL needs to be relocated/shifted to prevent disturbance. • Incorporate existing transmission line in design and for consideration during work implementation • Caution machine /operator drivers to ensure that the lines are not accidentally struck by machines during material loading and unloading. 	Included in Subproject design cost	PIU	PMU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		<ul style="list-style-type: none"> 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 			
Consents, permits and clearances	Failure to comply with national regulation and procedures can delay project progress	<ul style="list-style-type: none"> Seek approval for building design and construction approval from the Development Control Division, Thimphu Thromde. Seek approval for environmental clearance from NEC. 	PMU Operating cost	PIU	PMU
Removal of trees	25 trees need to be cut	<ul style="list-style-type: none"> Seek approval removal of trees from the Environment Division, Thimphu Thromde. Replant the area with at least double the number of trees cut during landscaping as compensatory measure. 	PMU Operating cost (permit) Contractor's cost (removal and replanting)	PIU (permit) Contractor (tree removal and replanting)	PMU
Aesthetics	Change in aesthetics at the site due to new infrastructures that could obstruct views.	<ul style="list-style-type: none"> Consider requisite development controls (such as building height, ground coverage and minimum setbacks from roads and adjacent plots), as per the allowable local area plan. Comply with the Bhutanese Architecture Guidelines⁵⁶ as a reference to ensure that the buildings blend in with the surrounding while maintaining certain elements of traditional Bhutanese architectural designs. Undertake landscaping and revegetation will further improve site conditions once activities are completed. 	PMU Operating cost	PIU	PMU

⁵⁶ MOWHS, 2014. The Bhutanese Architecture Guidelines.

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Compliance with ADB Loan Agreement and SPS	Lack of technical capacity on environmental safeguards	Conduct briefing/orientation for designated staff to be aware of ADB safeguard policies and RGOB regulations relevant for the subproject, including EMP, and compliance monitoring and reporting requirements.	PMU Operating cost	PIU / PMU	PMU
	Lack of awareness by the Contractor on ADB environmental safeguard policies and EMP requirements and therefore mitigation measures not budgeted	<ul style="list-style-type: none"> • Incorporate the cost of OHS and the EMP as well as any specific provisions into the bidding documents requiring contractors to comply with all other conditions required by ADB into the bidding and contract documents • Conduct pre-bid meeting to inform contractors of the need to strictly incorporate OHS and EMP into the contract cost • Once contract is selected, conduct awareness for contractors on their responsibilities in EMP implementation, compliance with ADB and RGOB requirements, self -monitoring and reporting procedures. 	PMU Operating cost	PIU / PMU	PMU
Project disclosure and Community awareness	Lack of awareness by the Public and Community on project activities or GRM	<ul style="list-style-type: none"> • Disclose project information/brief on NHDCL website, along with GRM mechanism and contact numbers, and one available at the site office • Design and install project signboards as per design standards and specifications of the Thromde and include relevant contact numbers for GRM 	PMU Operating cost	PIU / PMU	PMU
Construction phase					
Award of Construction work	Positive multiplier effect for goods and services	The subproject will generate employment and business opportunities for local suppliers of construction materials as well as material transporters and machine operators.	PMU Operating cost	PIU / PMU	PMU
Site preparation and Construction of site office,	Encroachment on government or private land due to lack of space	<ul style="list-style-type: none"> • If required, land will be leased from government or private landowners to set up 	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
worker camps and material storage sheds	for accommodating worker camps and storage	<p>worker camps, material storage and to park machinery.</p> <ul style="list-style-type: none"> Set aside a secure enclosure/shed for the storage of cement, lubricants, solvents, paint, electrical and other breakable material. Fuel and other petroleum products must be stored at storage areas away from water drainage and protected by impermeable lining and bunded 110%. 			
Recruitment and management of workers	Non-compliance with National recruitment regulations and risk of employing underage children.	<ul style="list-style-type: none"> Strictly follow the "Handbook on Recruitment and Employment of Foreign Workers in Bhutan"⁵⁷ with respect to screening recruitment, worker permits, road passes, management, and repatriation Process for worker permits and entry as per prevailing health restrictions and screening requirements. Follow restriction on employment of children below 18 years. Employ trained and skilled national workers wherever possible. If Contractor has more than 12 workers, it must submit a Notification of Construction Work (in writing and as per the information required) within 7 days after the commencement of the work, to the Chief Labour Administrator, and also repeat the same within 7 days of completion of the work. 	Contractor's cost	Contractor	PIU
	Risk of conflict and disturbance with neighboring community	Brief all workers on required social behavior and impose sanctions for inappropriate conduct. Record number of complaints received from neighboring residents	Contractor's cost	Contractor	PIU

⁵⁷RGOB. Regulations on Working Conditions, 2012

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	Requirement for housing and resources (drinking water and electricity and sanitation facilities)	<ul style="list-style-type: none"> • Provide workers with temporary accommodation, drinking water and sanitation facilities, with separate toilets for males and females. • Maintain cleanliness of the residential areas. • Ensure adequate water is available for sanitation and require workers to maintain toilets. • Follow the standards for workers accommodation per guidance note by the International Finance Corporation and European Bank for Reconstruction and Development entitled "Workers' accommodation: processes and standards: A guidance note by IFC and the EBRD". 	Contractor's cost	Contractor	PIU
Occupational health and safety	Health and safety risks for construction workers	<ul style="list-style-type: none"> • Prepare site-specific health and safety management plan including COVID 19 H&S measures. • Nominate a Health and Safety Officer with specific responsibilities to ensure the OHS of all workers, report on accidents and to follow national health protocols. • 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;⁵⁸ • Screen workers at their point of origin for the more virulent and contagious diseases, including HIV/AIDS, TB and malaria and COVID 19. • Follow COVID 19 protocols as per the prevailing requirements of the Ministry of Health and the COVID Taskforce. 	Contractor's cost	Contractor	PIU

⁵⁸ IFC World Bank Group. 2007. [Environmental, Health, and Safety \(EHS\) Guidelines – General EHS Guidelines: Construction and Decommissioning](#).

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		<ul style="list-style-type: none"> • Identification of workplace and process hazards (with machines, vehicles, demolition, excavation, and construction activities including electrical work) and outline procedures and responsibilities for preventing, eliminating, and minimizing the effects of identified work hazards and risk. • Install adequate support structures for temporary structures. • Prepare emergency management procedures. • Determine types of trainings/ orientations/ briefings required for each group of workers and who will give the required briefings. • Institute protocols to deal with accidents and emergencies including compensation for treatment and recovery, loss of ability to work, and loss of life • Provide medical assistance for cases of workplace related injury. • Provide adequate payment and facilities (lighting) for overtime work. • Post/Display emergency contact numbers of the staff as well as Police/Hospital/Fire at a visible location. • Provide workers with Personal Protective Equipment (PPE) such as safety helmets, gloves, glasses, and boots (as required) and enforce their use at the workplace. • Brief workers on work risks during toolbox talks. • Restrict drinking or consumption of intoxicants at the work site. • Post warning signs at risky/hazardous areas • Maintain accident register with incidents and actions taken. 			

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		<ul style="list-style-type: none"> • Maintain First aid box at site for minor injuries. • Install fire extinguishers • Provide a safe means of access and egress to and from every workplace • If gas cylinders are used, then store these in an upright position, protected against heat and cover the control valves with protective caps screwed to proper positions. 			
Demolition of existing structures	Generation of waste, and air and dust pollution.	<ul style="list-style-type: none"> • Do not throw debris from any height. • Spray debris to keep it moist. • Segregate and recover reusable materials. • Do not accumulate debris by disposing off as soon as possible in designated disposal site. • Seek approval/permit for disposal of demolition waste from Thromde. • Segregate waste into recyclable, non-recyclable parts and hazardous waste 	Contractor's cost	Contractor	PIU
	Risks to worker safety	Prepare demolition plan with OHS requirements for workers.	Contractor's cost	Contractor	PIU
Excavation work	Mismanaged spoils from loose excavated soils.	<ul style="list-style-type: none"> • Reuse excavated soil for filling in the building foundations and for levelling the parking and recreational areas • Remove excess excavated soil within 2 weeks of excavation and dispose at designated site 	Contractor's cost	Contractor	PIU
	Dust generation on windy days	<ul style="list-style-type: none"> • Enclose excavated areas to contain dust. • Spray water over loose soil piles especially on windy days. 	Contractor's cost	Contractor	PIU
Raw materials sourcing and storage	Haphazard and inefficient material purchase and sourcing	<ul style="list-style-type: none"> • Prepare and plan material requirement and delivery as required during each phase of construction depending on what is available locally • Outsource manufacture of doors and windows 	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	Lack of storage space and Loss of materials	<ul style="list-style-type: none"> Schedule material procurement to prevent both shortage and storage issues. Construct material storage shed, maintain inventory, and keep valuable items locked. Appoint security guard if necessary Stacked material in a safe and orderly manner 	Contractor's cost	Contractor	PIU
Water Requirements	Water supply shortage due to additional demand for drinking, cooking, washing as well as construction and its associated activities (sprinkling/spraying and cleaning).	<ul style="list-style-type: none"> Ensure adequate water for domestic (drinking, cooking, washing and sanitation) and construction purpose. Install adequate water tanks or mobilize water tankers during periods of shortage. To conserve water, all water supply pipes will be checked, repaired and maintained regularly to prevent leakages or blockages. 	Contractor's cost	Contractor	PIU
Electrical requirements	Delay in subproject implementation at the site due to lack of electrical power supply.	<ul style="list-style-type: none"> Request from Bhutan Power Corporation for service on the handling of existing electricity lines before, during and after the demolition works as temporary dismantling and reinstallation of electrical lines will be necessary. 	Contractor's cost	Contractor	PIU
Sewerage requirement	Without any adequate sewerage system at the site, discharge of greywater and blackwater from the site and workers' camp could pollute the receiving bodies of water in the area.	<ul style="list-style-type: none"> The workers' camp will be connected to septic tanks which will be used until the end of the construction period, after which these will be decommissioned, cleared out and filled in with soil. 	Contractor's cost	Contractor	PIU
Mobilization and operation of construction equipment	Risk of accidents and injuries to workers	<ul style="list-style-type: none"> Train machine operators Ensure machine operators to use the horn when backing, be assigned a signal person to guide him when reversing Workers must be restricted from working in close proximity of equipment in operation, unless it is essential for assisting the use of the machine or for the intended work. In 	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		such cases, a supervisor should alert the worker of potential risks.			
Erosion and sedimentation	Siltation of receiving body of water (Olarongchhu)	<ul style="list-style-type: none"> Complete all excavation works before the onset of the monsoon season to reduce the runoff. Construct drains to divert clean stormwater away from areas where soil is exposed by constructing drains with silt traps that is connected to this main stormwater drain. 	Contractor's cost	Contractor	PIU
Ambient Air Quality	<p>The use of fuelwood for heating in winter will result in air pollution from fires.</p> <p>Exhaust emission from operation of machinery and vehicles will contribute to the air pollutant load (primarily particulate matter (PM), NOx, SOx, CO etc.) in the ambient air</p> <p>Dust from demolition, excavation, and other construction activities.</p>	<ul style="list-style-type: none"> Provide alternative fuel (electricity or LPG) at workers' camp and restrict use of firewood for cooking (but may be allowed for heating as this is permitted in the city). Restrict open burning of wastes. Ensure that construction equipment and vehicles are maintained in good condition and have passed the RSTA emission test. Provide tarpaulin covers to vehicles transporting soil, sand and other construction materials and waste. Provide cover to stockpiles of soil, sand and other construction materials, especially during windy days. Spray water over bare or newly excavated areas especially on windy days and wherever possible excavated soil will be reused for leveling the site and for green belt development. Remove excess excavated soil from the site within 2 weeks of excavation and dispose at the designated disposal site. 	Contractor's cost	Contractor	PIU
Noise and disturbance to the neighboring community	Construction activities will result to high level of noise that could impact the workers and	<ul style="list-style-type: none"> Restrict construction work between 9PM - 8AM.⁵⁹ Brief workers on their obligations regarding proper management of work and behavior 	Contractor's cost	Contractor	PIU

⁵⁹ As per Development Control Regulations 2016.

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	communities around the site.	<p>with sanctions for inappropriate behavior or repeated complaints from the residents.</p> <ul style="list-style-type: none"> • Implement a preventive maintenance schedule for all heavy construction equipment and machinery to minimize noise and vibration. • Do not allow woodworks such as the use of sawing machines at the site. Doors and windows must be fabricated offsite or outsourced. 			
Solid waste generation and management	Improper disposal of solid wastes could lead to contamination of lands, proliferation of vectors of diseases, foul odor and other nuisance to nearby communities.	<ul style="list-style-type: none"> • Provide appropriate bins for waste storage and safe collection, segregate hazardous wastes within the site. • Maintain cleanliness of the site premises or surroundings. • Ensure that workers are briefed on proper waste management and good housekeeping at worker camps. • Allocate waste storage areas where wastes can be stored and then collected by the municipal trucks. • Ensure to remove demolition wastes and bring to designated disposal sites. 	Contractor's cost	Contractor	PIU
Community health and safety	<p>Safety risk to public safety during transport of materials.</p> <p>Safety risk to pedestrians.</p>	<ul style="list-style-type: none"> • Provide cordon or barricades around the construction site to restrict public from the site and controlling access to the site. • Install signboards to notify passers-by of ongoing work, install warning signs near access road and entry points. • Restrict unloading or storing of construction material along access road, on top of drains and footpaths. • Designate personnel to warn passers-by and guide trucks during material delivery. • Schedule materials delivery times to avoid peak traffic hours. 	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		<ul style="list-style-type: none"> Impose speed limits for trucks near the construction site. 			
	Air pollution due to emissions and dust	<ul style="list-style-type: none"> Provide alternative fuel (electricity or LPG) at workers' camp and restrict use of firewood for cooking (but may be allowed for heating as this is permitted in the city). Restrict open burning of wastes. Ensure that construction equipment and vehicles are maintained in good condition and have passed the RSTA emission test. Provide tarpaulin covers to vehicles transporting soil, sand and other construction materials and waste. Provide cover to stockpiles of soil, sand and other construction materials, especially during windy days. Spray water over bare or newly excavated areas especially on windy days and wherever possible excavated soil will be reused for leveling the site and for green belt development. Remove excess excavated soil from the site within 2 weeks of excavation and dispose at the designated disposal site. 	Contractor's cost	Contractor	PIU
	Congestion and blockages/obstructions	<ul style="list-style-type: none"> Restrict material drop off by trucks during peak traffic hours (8-9.30Am and 4-6PM) Brief drivers on restriction of spillage or storing of construction material along access road, on top of drains and footpaths blocking access. 	Contractor's cost	Contractor	PIU
Chance finds	Potential chance finds	<p>Follow chance finds procedure:</p> <ul style="list-style-type: none"> In case of suspected chance finds, the Contractor shall immediately stop all works Contract to report immediately within the same day to the PMU regarding the suspected chance finds. 	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		<ul style="list-style-type: none"> PMU to advise Contractor to strictly follow the full stoppage of works. PMU to report the potential chance finds to the Department of Culture, Ministry of Home and Cultural Affairs, and the latter to investigate. No works shall resume until clearance is provided by the Department of Culture, Ministry of Home and Cultural Affairs. 			
Emergencies such as earthquakes, Fire hazards	Risk of injury and losing lives due to natural hazards and fire	<ul style="list-style-type: none"> Develop an emergency action plan to handle emergencies such as earthquakes, fires, breakdown in machinery, collapse of structures, electrical mishaps. These are as follow: Identify procedures to follow during emergencies. Display and maintain suitable warning signs at conspicuous places in Dzongkha and English. Identify a meeting point for all workers in case of earthquakes. Brief workers on protocols to follow during earthquakes. Provide transportation to the nearest hospital in case of accidents and emergencies. Install fire extinguishers or ensure adequate storage of water supply, water hoses and pipes Train staff to operate the fire extinguishing equipment. Conduct quarterly checks on fire extinguishers. <p>Collapse of structures.</p> <ul style="list-style-type: none"> Stabilize all temporary structures to prevent them from collapse. 	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		<ul style="list-style-type: none"> Electrical mishaps. Hire only certified electricians. Provide all temporary electrical installations with earth-leakage circuit breakers. Require workers to check safety of electrical wiring before commencement of work Operation of machines Restrict operation of machines to trained and competent operators, or under the supervision of one 			
Post construction –camp closure	<ul style="list-style-type: none"> Positive impact resulting to restoration of pleasant aesthetics at site. 	Implement camp and site closure plan that includes the following <ul style="list-style-type: none"> Dismantle all worker camps, fill in sanitation areas/temporary toilets with soil Remove all machines, equipment and debris from construction site and worker camps Restore any damage to government or private projects Hand over site back to PMU Carry out repair and maintenance during liability period as per contract Ensure that foreign workers exit the country on completion of work Plan and undertake revegetation and landscape development 	Contractor's cost	Contractor	PIU
Post-construction – greening and landscaping	<ul style="list-style-type: none"> Positive impact resulting to enhancement of surrounding environment. 	<ul style="list-style-type: none"> Improve aesthetic view by landscaping Development of green belt around the housing complex 	Contractor's cost	Contractor	PIU
Operation phase					
Building occupancy and utilization	Wear and tear of buildings	<ul style="list-style-type: none"> Follow NHDCL maintenance processes to address complaints by tenants Undertake regular inspections to assess the risks, hazards or defects with the buildings and rectify these 	Housing Management Cost	Housing Management	PIU / PMU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	Fire safety	<ul style="list-style-type: none"> • Train the focal resident person on use of fire extinguishers and its maintenance • Regularly check and maintain the fire extinguisher • Post emergency numbers of Fire, Police near the fire extinguisher or at a visible location. 	Housing Management Cost	PIU	PIU / PMU
	Accidents and emergencies and natural disaster	<ul style="list-style-type: none"> • Follow instructions from the Thimphu Thromde Disaster Management Committee (DMC) on procedures to follow in case of emergencies. • Post emergency numbers for Police, Ambulance and Fire should be prominently posted at a visible spot. • Maintain emergency lighting system in the premises. • Conduct of periodic fire drills. • Posting of emergency exit plans, designating evacuation areas, dissemination of other emergency plan information. • Other training to raise awareness on how to properly behave and respond in times of fires or natural disasters. 	Housing Management Cost	PIU	PIU / PMU
	Buildup of sewage that could impact surface water (Olarongchhu) and groundwater	<ul style="list-style-type: none"> • Coordinate with Thromde for desludging and vacuum cleaning of septic tank annually 	Housing Management Cost	PIU	PIU / PMU
	Solid waste generation that could impact the environment	<ul style="list-style-type: none"> • Follow Thromde waste management guidelines and garbage collection and disposal times and ensure that garbage is not allowed to accumulate on the premises 	Housing Management Cost	PIU	PIU / PMU

X. MONITORING AND REPORTING

294. 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.

295. 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.

296. The PMU with support from PIU, 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 subproject activities with PIU and Contractor to ensure timely implementation of subproject activities.

297. The Contractor will submit monthly reports to the PIU with jurisdiction over the subproject. 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 9. This monitoring sheet is indicative which can be further enhanced depending on the actual situations at subproject construction site.

298. The PIU will submit quarterly environmental monitoring reports to PMU, which will include summary of daily monitoring activities of Contractor and results of any independent monitoring or inspection activities of the PIU. A sample inspection checklist is in Appendix 10. This checklist is indicative which can be further enhanced depending on the actual situations at subproject construction site.

299. PMU shall consolidate quarterly reports from the PIUs, which include reports from the PIU for the Thimphu subproject, and results of 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. The template for the SEMR is attached as Appendix 11.

300. Monitoring and reporting will be undertaken during subproject 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 subproject 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 32: Environmental Monitoring Plan

Table 02: Environmental Monitoring Plan					
No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
Pre-Construction					
1	Land use approval	<ul style="list-style-type: none">Land Use certificate received from National Land Commission	PMU	PMU	PMU
2	Subproject design and approvals	<ul style="list-style-type: none">Infrastructure design and construction approval,Demolition approval	One time	NHDCL	PMU
3	Roles and responsibilities and awareness of subproject site supervision team	<ul style="list-style-type: none">Office orderTOR for Site supervision teamTraining materialsParticipant list	One time	NHDCL	PMU
4	Awareness and training of Contractor	<ul style="list-style-type: none">Pre-bid meeting to inform contractorsNo. of trainings and datesContractor's attendance sheet	One time	NHDCL	PMU
5	Incorporating of EMP into bid documents	<ul style="list-style-type: none">EMP included in bid document	One time	NHDCL	PMU
6	Incorporating of OHS requirements into contract	<ul style="list-style-type: none">OHS component included in Contract	One time	NHDCL	PMU
7	Project disclosure and information	<ul style="list-style-type: none">Project information/brief on NHDCL website,Project contact number on signboardsMinutes of Meeting/Consultation with Affected people and community	One time	NHDCL	PMU
8	Removal of existing structures/demolition	<ul style="list-style-type: none">No. of structures removed.Report on removal/demolition of structures	One time	NHDCL	PMU
Construction phase					
9	Consents and Permits	<ul style="list-style-type: none">Tree removalWaste disposal	One time	Contractor	PIU
10	Recruitment of workers	<ul style="list-style-type: none">No. of workers (nationals/foreign-gender) byNo. of skilled and unskilled workersNo. of workers below age 18	During recruitment	Contractor	PIU
11	Workers' welfare (health and safety)	<ul style="list-style-type: none">No. of worker campsAvailability of safe drinking water, electricity and sanitation facilities (with	Monthly	Contractor	PIU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
		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 kit • 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)			
12	If to be needed, temporary land requirement for worker camps and storage	• Land lease agreement between Contractor and landowner/government	One time	Contractor	PIU
13	Air pollution	• Ambient air quality measurement • Use of electrical appliances • Ocular observation of vehicles and site conditions • Use of reconditioned machines and vehicles. • Maintenance of machines	Semi-annually (ambient air quality measurement) Monthly or as necessary (ocular)	Contractor	PIU
14	Dust pollution/minimization	• Ambient air quality measurement • Ocular observation of dust and dust suppression measures undertaken as per EMP	Semi-annually (ambient air quality measurement) Monthly or as necessary (ocular)	Contractor	PIU
15	Water supply and conservation	• No. of water storage tanks. • Measures taken during periods of shortage.	Monthly or as necessary	Contractor	PIU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
		<ul style="list-style-type: none"> No. of water supply repair and maintenance works 			
16	Waste management of worker camps, construction sites	<ul style="list-style-type: none"> No. and types of waste bins installed No. of truckloads of construction waste disposed Types of demolition waste segregated and reused Ocular inspection of camps and construction site Segregation, storage of hazardous waste 	Monthly or as necessary	Contractor	PIU
17	Generation of excavated soil	<ul style="list-style-type: none"> % soil reused for construction % soil disposed Ocular observation of soil pileup at site 	One time	Contractor	PIU
18	Site drainage	<ul style="list-style-type: none"> Site drainage Connection to storm water drainage Repair and maintenance of drains Ocular observation of site drainage 	Monthly or as necessary	Contractor	PIU
19	Surface water quality	<ul style="list-style-type: none"> Sampling at the downstream Olarongchhu Ocular observation of Olarongchhu 	Semi-annually Monthly or as necessary (ocular)	Contractor	PIU
20	Noise pollution and disturbance	<ul style="list-style-type: none"> Ambient noise level measurement No. of complaints received from neighboring residents/community 	Semi-annually (ambient noise level measurement) Monthly or as necessary (monitoring of complaints)	Contractor	PIU
21	Congestion and blockages/obstructions	<ul style="list-style-type: none"> No. of complaints on congestion caused by Construction traffic Ocular observation of road conditions (spillage of construction material along 	Monthly	Contractor	PIU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
		access road, blockage of drains and footpaths)			
22	Material storage	<ul style="list-style-type: none"> No. of material storage sheds Ocular observation on material storage at site Material inventory 	Monthly	Contractor	PIU
23	Community health and safety	<ul style="list-style-type: none"> 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	PIU
24	Camp closure	<ul style="list-style-type: none"> Ocular observation of site conditions and compliance to EMP 	One time	Contractor	PIU
Operation phase					
25	Operation phase (e.g. building management)	<ul style="list-style-type: none"> Maintenance records 	Every quarter	NHDCL estate management	PMU
26	Fire hazard	<ul style="list-style-type: none"> No. of fire extinguishers, and maintenance record 	Once a year	NHDCL estate management	PMU
27	Sewage and sanitation	<ul style="list-style-type: none"> Maintenance record 	Once a year	NHDCL estate management	PMU
28	Waste management	<ul style="list-style-type: none"> Maintenance record 	Monthly	NHDCL estate management	PMU

301. ADB will carry out the following monitoring actions to supervise implementation of the overall project:

- (i) On a need basis, conduct site visits for subprojects with potential adverse environmental or social impact;
- (ii) Conduct supervision missions with detailed review by ADB's environment/social safeguard specialists and/or officers and/or consultants for subprojects with adverse environmental and social impacts;
- (iii) Review the SEMRs submitted by PMU to ensure that adverse impacts and risks are mitigated as planned in the EMP;
- (iv) Work with NHDCL to rectify to the extent possible any failures to comply with its environmental safeguard commitments, as covenanted in the loan agreement and elaborated in all environmental safeguard documents; and formulate and implement a corrective action plan to re-establish compliance as appropriate; and
- (v) Prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

302. ADB's monitoring and supervision activities must be carried out on an on-going basis until the project completion report is issued. ADB normally issues a project completion report within 1-2 years after the Project is physically completed and in operation.

A. Capacity Building

303. The implementing agency, NHDCL, does not have any prior experience of implementing any ADB-funded projects. Understandably, NHDCL needs a capacity building exercise in order to implement ADB SPS requirements for the Project. Therefore, capacity building interventions are recommended for NHDCL, PMU, PIU and the Contractors.

304. When the PMU and PIU staff are assigned, it will be vital to train all these relevant personnel who will implement and monitor environment and social safeguards measures developed under the Project. A consultant support (e.g., an Environment Specialist Consultant) will be provided to the PMU who will assist in conducting capacity building and training for the implementing stakeholders, including contractors. The capacity building and training program shall include, among others, the following:

- (i) Training on ADB SPS requirements, EARF, IEE with EMP, and other national government laws, rules and regulations on environmental safeguards, including identification of roles and responsibilities for each stakeholder in the Project;
- (ii) Subproject compliance monitoring, and preparation and submission of environmental monitoring reports; and
- (iii) Preparation of Corrective Action Plan, if required.

305. Specific to environmental safeguards, the Environment Specialist Consultant of the PMU will provide targeted basic training required for environmental awareness followed by specific aspects of infrastructure improvement projects along with environmental implications for projects. Specific modules customized for the available skill set will be devised after assessing the capabilities of the members of the Training Program and the requirements of the Project. The entire training would cover basic principles of environmental assessment and management mitigation plans and programs, implementation techniques, monitoring methods and tools. The proposed indicative training program along with the frequency of sessions is presented in the following table.

Table 33: Training Modules for Environmental Management

Module	Frequency of Sessions	Target participants	Conducting Personnel
1. Introduction and Sensitization to Environmental Issues (One-day workshop): <ul style="list-style-type: none"> • 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 environmental concerns, environmental impacts of urban infrastructure improvement projects. 	Once during Pre-construction	NHDCL engineers / management team, officials responsible for implementing the Project, PMU staff, PIU staff, Contractor/s.	Environmental Specialist Consultant

Module	Frequency of Sessions	Target participants	Conducting Personnel
2. Project training on hazards, health, safety and environmental issues pertaining to the project (two-day workshop and site visits): <ul style="list-style-type: none"> • EMP mitigation and monitoring measures; • Roles and responsibilities; • Public relations, • Consultations; • Grievance redress; • Monitoring and corrective action planning; • Reporting and disclosure; • Construction site standard operating procedures (SOP); • Chance finds (archaeological) protocol; • Health and safety plan; • Traffic management plan; • Waste management plan; • Site clean-up and restoration. 	Once before and during construction	NHDCL engineers and management professionals, to be involved in on-site execution and operation of the proposed facilities, PMU staff, PIU staff, Contractor/s	Environmental Specialist Consultant
3. EMP implementation (two-day session and site visit): <ul style="list-style-type: none"> • Implementation of EMP • Identification of environment impacts • Monitoring and reporting for EMP • Public interactions and consultations • Coordination for consents with various departments • Monitoring formats filling and review of impacts. 	Once during construction stage	NHDCL Engineers, Officials responsible for implementing the Project, PMU staff, PIU staff, Contractor/s.	Environmental Specialist Consultant

B. Cost of EMP Implementation and Monitoring

306. 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. Costs associated with activities that are borne by the PMU, PIAC or any other stakeholders other than the Contractor are not included in the estimates. Moreover, costs integral to the Contractor's BOQ costs (during construction phase), and operational cost of maintaining the housing complex (during the operation phase) are not included as well.

Table 34: 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 hard barricade during trench excavation in the construction site.(Type of	set	10	100.00	1,000.00

	Activities or Items	Unit of Measure	No. of Units	Unit Cost (\$)	Total (\$)
	hard barricading with type of materials, specifications to be mentioned).				
A.2	Providing safety signage boards, caution tapes and green nets during construction works in site.(With information to submit posters sample with size and type of material on which it will be displayed).	Lump Sum (LS)			500.00
A.3	Providing water sprinkling three times a day during construction works at site.(Daily reports with photographs to be submitted).	LS			100.00
A.4	Regular health check-ups in two equal time interval (type of tests and check ups that should be done to be mentioned to Contractor and records to be submitted to client).	person	50 X 2	25.00	2,500.00
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	200.00	600.00
A.6	Provide personal protective equipments, 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. Mention the types of PPEs with specifications that should be provided to workers and staffs like safety helmet, goggles, nose mask, hand gloves, safety shoes, ear plug, face guard, etc.).	LS			5,000.00
A.7	Placement of a dedicated Safety Officer throughout contract period for maintaining safety and protection against accidents including traffic control and EMP safeguard compliances with one standby emergency vehicle. (CV/Resume of safety engineer/officers should be submitted for approval and should be as per the required qualifications).	months	18	2,000.00	36,000.00
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 4 locations. (At site, eastern and western sides near residential areas, southern side near RIM)	Samples	16 (4 locations x 4 times during implementation period)	250.00	4,000.00
B.2	Monitoring of Noise Level at 4 locations.	Site	16	20.00	320.00

	Activities or Items	Unit of Measure	No. of Units	Unit Cost (\$)	Total (\$)
	(At site, eastern and western sides near residential areas, southern side near RIM)		(4 locations x 4 times during implementation period)		
B.3	Monitoring of Surface Water Quality at 1 location (Downstream Olarongchhu relative to site location).	Samples	4 time during implementation period	100.00	400.00
C.	Enhancement Measures				
C.1	Landscaping after the construction period	m ²	Cost included in Contractor's BOQ cost.		
D	Compensatory Afforestation Activities				
D.1	Compensatory tree plantation - Total loss of 25 nos. of trees (2:1 replacement ratio), including maintenance for 5 Years	Mature trees	25 x 2 = 50	10.00	500.00
E.	COVID-19 HEALTH AND SAFETY PLAN				
E.1	Thermal scanners. All persons at the worksite should have their temperature screened with Infrared Thermometer (handheld non-contact). [Dr. Trust(USA) Non Contact Forehead Temporal Artery Infrared Thermometer]	scanner	2	60.00	120.00
E.2	Contactless attendance system. (This is biometric attendance system unit. Prices for contactless system are not available)	unit	1	110.00	110.00
E.3	Liquid Soap & Hand washing arrangement at site	LS			100.00
E.4	Contactless, sensor-based/ pedal operated sanitizer [Metal foot sanitizer dispenser]	unit	3	30.00	90.00
E.5	Additional rest areas at sites and dining spaces in camp site	LS	Cost included in Contractor's BOQ cost.		
E.6	Ensure availability (even tie-up) of Ambulance equipped with all necessary items like nose masks, first aid kits, aprons, disinfect solutions etc.	No additional cost required, but should be monitored.			
E.7	First aid kits with hand sanitizers and hand wash liquids shall be mandatory available in all the vehicle without any lapses.	LS			200.00
E.8	Regular notification by local government, district authority should be adhered to, and all the staff should be compulsorily made aware of such notification.	No additional cost required, but should be monitored.			

	Activities or Items	Unit of Measure	No. of Units	Unit Cost (\$)	Total (\$)
E.9	Job protection of workers during crisis period of COVID 19 pandemic needs to be ensured.	No additional cost required, but should be monitored.			
F.	Contingency (10%)				5,154.00
	Total				56,694.00

XI. RECOMMENDATION AND CONCLUSION

307. The IEE process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed for Thimphu under the Bhutan Affordable Housing Sector Project. Potential negative impacts were identified in relation to design, construction and operation of the proposed infrastructure and it is anticipated that the subproject will not have any significant negative impacts due to the subproject design or location.

308. The NHDCL will construct 8 residential buildings, a service block and associated facilities on 1.93 acres of land within the Thimphu city boundaries within the Langjphakha Local Area Plan. The subproject does not require land acquisition but a resettlement plan in compliance with ADB SPS requirements has been prepared to 78 persons who are currently living and/or making livelihood at the proposed subproject site.

309. There is no impact on ecologically sensitive areas per definition of ADB SPS. The subproject design will take into consideration required building design regulations and guidelines to ensure disaster resilience, adapted to climatic conditions and in line with Bhutanese architectural designs.

310. All necessary environmental approvals and permits required have been identified and will be processed.

311. Impacts identified in this IEE will occur during the construction and operation phases, for which mitigation measures have been developed and incorporated in the EMP. To ensure that all anticipated environmental impacts are addressed, NHDCL must ensure that all mitigation measures in the EMP proposed are implemented in full, as described in this document. Regular reporting by the Contractor to the PIU 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 safeguards conditions in the loan agreement, ADB SPS, national environmental regulations and the EMP.

312. Based on the findings of the IEE, impacts identified have been found to be predictable, manageable and temporary. The overall conclusion of this process is that providing the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental or social impacts as a result of location, design, construction or operation of the subproject. No further special study or detailed environmental assessment needs to be undertaken to comply with ADB SPS or national regulations.

313. During operation phase (or when the housing facilities are occupied), the subproject is expected to demonstrate its positive impact in terms of improving the quality of life of the beneficiary low-income support staff and their families.

314. This IEE has been prepared based on preliminary designs of the subproject. If the design is revised or modified, the PMU shall update this draft IEE based on final detailed design and

submit to ADB for review and disclosure. The approved updated IEE shall be treated as the final IEE and shall be attached in the bid and contract documents. No works can commence until (i) the final IEE approved by ADB is provided to the Contractor, and (ii) the SEMP prepared by the Contractor is approved by PIU 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:	Proposed Affordable Housing Developing Project
Sector Division:	Urban Development

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area			
▪ Densely populated?	✓		The site is located within the city boundary but is not as densely populated as the city center. The total population of Thimphu Thromde was 114,551 in 2017.
▪ Heavy with development activities?	✓		The site is located 5-6 km from the city center within the Lungtenphu Local Area Plan that stretches over 243.53 hectares. In comparison to the city centre, developmental activities at the site location are less. The major landmark is the Royal Institute of Management (opposite the site). The site is bounded on two sides (Northwest and South) by the Thimphu-Wangduephodrang Highway
▪ Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site		✓	The closest religious site is the Semtokha Dzong that is about 226 m away from the site and separated by two roads, a stream and settlement in between.
• Protected Area		✓	The closest protected area is more than 10km away.

Screening Questions	Yes	No	Remarks
• Wetland		✓	The closest wetland (bird habitat) is more than 5km away. A sewerage pond where birds are sighted is more than 2km away.
• Mangrove		✓	Thimphu is in the highlands. There are no coastal areas in Bhutan
• Estuarine		✓	Thimphu is in the highlands. There are no coastal areas in Bhutan
• Buffer zone of protected area		✓	The closest buffer of a protected area is more than 10km away
• Special area for protecting biodiversity		✓	There is no special area for protecting biodiversity in the vicinity of the site.
• 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 subproject involves construction of 8 residential buildings comprising of 110 units, with internal access road, parking, creation of a green space and a service center block. Once built, the housing subproject will require additional Thromde resources to expand the coverage of the existing sanitation and sewerage infrastructures and waste disposal management systems so as to reach the subproject area in Semtokha.
▪ 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 construction phase of the project will add to generation of wastes in Thimphu city, and therefore will also add burden to the existing services in the city, such as sanitation, sewerage, and waste disposal. During operation phase (or when the housing units are already occupied by existing residents in Thimphu), it is expected that project will provide benefits to the various services in the city, such as reduced energy consumption due to energy-efficient design of the housing units and reduced impacts to the environment due to a better-managed wastes at the housing facility. For example, solid wastes will be efficiently collected by the service providers and wastewaters will be directed to a properly designed central septic tank and soak pit, and therefore no pollutants is likely to be discharged to any receiving body of water.

Screening Questions	Yes	No	Remarks
▪ 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?	✓		21 families will be located elsewhere during the construction period based on the resettlement plan. . A resettlement plan has been prepared.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable group?		✓	Not anticipated as per social safeguards report. The project is a pro-poor and gender-inclusive undertaking as it aims to provide affordable housing to the less privileged (low-income) population of Thimphu city. This project provides a positive impact.
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?		✓	The site was and will continue to be used for housing purposes. The project site is not within or near (at distances that could not impact or influence) any of the environmentally sensitive areas or cultural properties. The land use in the area is for residential purposes and will not conflict with tourism activities in the city.
▪ 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 area is currently being used for housing. It has four permanent buildings, temporary structures and some area are being used as kitchen garden by some tenants.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?) 	✓		<p>This is a potential impact during construction phase. The construction activities may cause pollution and siltation of the nearby receiving body of water (Olarongchhu). The EMP will ensure this impact will be avoided or minimized.</p> <p>During operation phase (or when the housing units are already occupied and used), this potential impact is not highly likely to occur. There will be no influx of people in Thimphu due to this project. The future occupants of the housing units will be the selected low-income residents of Thimphu who are already residing in the city. Also, water will be sourced from existing community water supply source that has already been connected to the site and is being used in the existing buildings and neighborhood. Therefore, no added burden to water availability is expected. Overall, this project will also help improve water resource issues in Thimphu, if there is any, because the housing project will provide environment-friendly, resource efficient (e.g. rainwater harvesting) and energy-efficient facilities, which lead to lesser consumption of resources.</p>
<ul style="list-style-type: none"> air pollution due to urban emissions? 	✓		<p>This is anticipated during construction phase. The sources of air pollution will be from trucks transporting materials to the site and machinery use, but these are required to undergo emission tests annually in compliance with the Road Safety Transport Authority. The environmental management plan (EMP) of the project will provide measures to mitigate this impact.</p>
<ul style="list-style-type: none"> risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation? 	✓		<p>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.</p>

Screening Questions	Yes	No	Remarks
▪ road blocking and temporary flooding due to land excavation during rainy season?		✓	The site is wide enough to accommodate all construction works, heavy equipments and raw materials. Excavation works are limited to foundation works within the site boundary, so it is not expected to cause any road blocks. The EMP of the project will provide measures to avoid or minimize temporary flooding, such as for example, avoiding or minimizing excavation works during monsoon season.
▪ noise and dust from construction activities?	✓		Yes, anticipated but will be temporary during construction phase and limited to the project site. The EMP of the project will provide measures to mitigate this impact.
▪ traffic disturbances due to construction material transport and wastes?	✓		The access road for the housing complex is through the National highway from Thimphu to Wangduephodrang. However, these impacts will be temporary during construction phase only. The EMP of the project will provide measures to mitigate this impact, such as for example, scheduling of the transport of materials and wastes during non-peak hours of the day.
▪ 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, providing silt traps or canals around the site, etc.
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		✓	Not anticipated for a housing development project. The construction activities will be carried out within the site boundaries only.

Screening Questions	Yes	No	Remarks
▪ 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. Once the project is in operation (or when the housing units are already occupied and used), there should be no issue with water supply depletion as the same existing Thimphu residents will occupy the facility. Besides, the design includes rainwater harvesting that will reduce water dependence from the city's piped water services.
▪ overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?		✓	Underground water will not be extracted at all. This is not a practice in Thimphu.
▪ contamination of surface and ground waters due to improper waste disposal?	✓		This is anticipated during the construction and operation phases of the project. The EMP of the project will provide measures to avoid or minimize this impact, such as following the mandatory waste disposal through Thimphu city's garbage collection services.
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?		✓	This is not anticipated. The project site is not near receiving bodies of water 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 not require significant number of people who will move to Thimphu. Engaging local labor will be a priority under the project. Although the project may recruit foreign workers (if COVID restrictions are lifted), the number will not be as many (few experts). Therefore, this project will not cause significant burden to the infrastructure such as the water supply and sanitation during construction phase.
▪ social conflicts if workers from other regions or countries are hired?		✓	Not anticipated. Most workers will be Bhutanese as COVID 19 restrictions do not encourage large number of foreign workers. Or if ever there is an intention, these are only few people (experts) and will not cause social conflicts with local workers.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> 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 used for housing development 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.
<ul style="list-style-type: none"> 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? 	✓		Anticipated during construction phase. 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.

A Checklist for Preliminary Climate Risk Screening

Country/ Project Title : Green and Resilient Affordable Housing Sector Project
(Site: Semthokha, Thimphu)
Sector : Water and Other Urban Infrastructure and Services
Subsector : Urban Housing
Division/Department : SAUW

Screening Questions		Score	Remarks ⁶⁰
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	The site ⁶¹ is located on gentle slope of hill, imposing low or moderate exposure to landslide. The site is not vulnerable to flood. However, it is located on earthquake vulnerable area.
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Landslide protection measures should be in place.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	No such effect envisaged.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	No such effect envisaged.
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g., annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	No such effect envisaged.
Cumulative score		2	

Options for answers and corresponding score are provided below:

⁶⁰ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

⁶¹<https://www.google.com/maps/place/27%C2%B026'26.4%22N+89%C2%B040'18.4%22E/@27.4344645,89.6752316,241a,35y,330.98h,68.9t/data=!3m1!1e3!4m9!1m3!11m2!2sLV4lZUe43MeUSvdEtHryOks8K9hqbwl3e3!3m4!1s0x0:0x0!8m2!3d27.4406537!4d89.6717848>

Response	Score
Not Likely	0
Likely	1
Very Likely	2

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

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

Other Comments: Although the site is flood free, sufficient drainage facility should be in place to drain out storm water.

Prepared by: NHDCL

Appendix 2: No Mitigation Measures Scenario Checklist

SAUW No Mitigation Scenario (Scoping Checklist)

Instructions: Answer the questions based on subproject/package information. Discuss/consult design engineers, social safeguards team and other technical experts to ensure most recent information is used. The answers will be used in the preparation of EIA/IEE and EMP. If subproject/package will involve rehabilitation/expansion of existing facility, specify in the checklist (audit is required as part of the EIA/IEE).

PART 1: Project Characteristics

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc)?				
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes	Land cover and aesthetics; due to new residential structures at the site. This will increase the carrying capacity in the area.	Not significant because the effect will not be unusual in the area which is already a residential zone.
1.2	Clearance of existing land, vegetation and buildings?	Yes	Land cover and aesthetics; due to removal of existing vegetations.	Not significant because the clearance of vegetation and buildings will not cause large change in environmental conditions. . Currently there are four concrete buildings and 3 temporary structures that will be demolished, but these will be replaced with better infrastructures. Only 25 trees will be removed, and this will not have any effect to the ecology in the area. Trees are abundant in the area.
1.3	Creation of new land uses?	No		The area is already for residential use.
1.4	Pre-construction investigations e.g. boreholes, soil testing?	Yes	Noise, due to potential drilling.	Not significant because the activity is temporary and any impacts are short term and can be readily mitigated through standard measures.
1.5	Construction works?	Yes	Ambient air quality, noise level and surface water quality; due to impacts of construction works.	Not significant because the activity is temporary and any impacts are short term and can be readily mitigated through standard measures.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
1.6	Demolition works?	Yes	Ambient air quality, noise level, surface water quality, and aesthetics; due to potential dust generation, elevated noise level and runoff during demolition works.	Not significant because the activity is temporary and any impacts are short term and can be readily mitigated through standard measures.
1.7	Temporary sites used for construction works or housing of construction workers?	No		There is ample land within the project site, and there is no need to acquire or rent private land for this purpose.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes	Ambient air quality, noise level and surface water quality; due to potential dust generation, elevated noise level and runoff during demolition works.	Not significant because the activity is temporary and any impacts are short term and can be readily mitigated through standard measures.
1.9	Underground works including mining or tunnelling?	N/A		
1.10	Reclamation works?	N/A		
1.11	Dredging?	N/A		
1.12	Coastal structures e.g. seawalls, piers?	N/A		
1.13	Offshore structures?	N/A		
1.14	Production and manufacturing processes?	N/A		
1.15	Facilities for storage of goods or materials?	Yes	None.	Not significant. Construction materials that will be used are to be delivered to the site on programmed and scheduled basis. Materials that are needed day-to-day during construction period will be stored at a dedicated storage area at site. This storage will have a small footprint.
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes	Aesthetics, odor and surface water quality; due to potential release of untreated effluents and indiscriminate	Not significant because the impact can be mitigated through efficient functioning of the facilities as per design.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
			disposal of solid wastes	
1.17	Facilities for long term housing of operational workers?	N/A		
1.18	New road, rail or sea traffic during construction or operation?	No		The project site is already adjacent an existing main road.
1.19	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No		The project site is already adjacent an existing main road.
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No		The construction phase of the project is not expected to cause any closure or diversion of routes on the adjacent road. The site is wide enough to accommodate all construction activities, equipment, etc. without disturbing the traffic flow on such adjacent road (Thimphu – Punakha/ Wangduephrodang Road).
1.21	New or diverted transmission lines or pipelines?	No		One electrical distribution line exists at the site. In consultation with the Bhutan Power Corporation (BPC), this distribution line may not be diverted anymore. However, if the existence of the electric line will cause risk of electrocution during construction, the Contractor will be required to coordinate with BPC to temporarily divert the electric distribution line.
1.22	Impoundment, damning, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	N/A		
1.23	Stream crossings?	No		There is no stream crossing. The closest stream is about 90m away

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
1.24	Abstraction or transfers of water from ground or surface waters?	No		The site is already connected to the local community water supply from Chamgang.
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	Yes	Surface water quality, due to siltation	Not significant because measures are readily available to mitigate the impact.
1.26	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Noise, due to potential elevated noise during delivery of construction materials at the site.	Not significant because the activity is temporary and any impacts are short term and can be readily mitigated through standard measures.
1.27	Long term dismantling or decommissioning or restoration works?	N/A		
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	N/A		
1.29	Influx of people to an area in either temporarily or permanently?	Yes	Noise, Surface water quality; due to workforce at the site during construction phase.	Not significant because the activity is temporary and any impacts are short term and can be readily mitigated through standard measures.
1.30	Introduction of alien species?	No		Landscaping will be carried out with local species
1.31	Loss of native species or genetic diversity?	No		Only 25 trees will be removed.
1.32	Any other actions?	No		
2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?				
2.1	Land especially undeveloped or agricultural land?	No		The subproject will be carried out on 1.93 acres of developed land considered as residential lot.
2.2	Water?	Yes	Water supply availability, due to additional users.	Not significant because the water users for the housing facility are already existing users in Thimphu.
2.3	Minerals?	Yes	Land cover and stability, due to potential quarrying or mining activities relative to the production of raw materials to be used for construction.	Not significant. Although minerals such as fuel and other earth-based resources (sand, stones, marble) will be required during construction, the amount will not be high to cause significant impact to natural resources.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
2.4	Aggregates?	Yes	Land cover and stability, due to potential quarrying or mining activities relative to the production of raw materials to be used for construction.	Not significant. Will be required for construction purposes, but the amount will not be high to cause significant impact to natural resources.
2.5	Forests and timber?	Yes	Forest cover, due to potential cutting of trees.	Not significant. Timber will be required for making doors and windows and other woodworks, but the amount will not be high to cause significant impact to natural resources.
2.6	Energy including electricity and fuels?	Yes	Climate, due to potential additional power generation from fossil fuel.	Not significant. The increase in power demand brought about by the new housing facility is marginal/negligible as compared with the demand of the entire locality. Future occupants of the housing facility are already existing electricity users in Thimphu.
2.7	Any other resources?	No		
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?	Yes	Human health, surface water quality; groundwater quality; Ambient air quality, including odor. Releases of these substances can potentially pollute the different environmental media.	Solvents, primers, adhesives, paint will be utilized. However, not significant because the activity is temporary and any impacts are short term and can be readily mitigated through standard measures.
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)?	Yes	Human health, Surface water quality; groundwater quality; Ambient air quality, including odor. Sanitation quality at the site	Not significant because standard measures are available to mitigate the impacts.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
			(including Contractor's camp) could affect the quality of surface water due to wastewater releases, and hygiene due to solid waste generation. These are potential sources of disease vectors.	
3.3	Will the project affect the welfare of people e.g. by changing living conditions?	Yes	Better welfare of the housing beneficiaries, due to improved facilities.	Significant but on positive aspect. The project will significantly improve the living conditions of the new tenants/beneficiaries.
3.4	Are there especially vulnerable groups of people who could be affected by the project e.g. hospital patients, the elderly? (check this with the Social Safeguards Team)	Yes	Vulnerable stakeholders, due to potential displacement of existing users of land at the site.	Existing users of the land will be relocated. A resettlement plan has been prepared for the project.
3.5	Any other causes?			
4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes	Aesthetic, Surface water quality, Ambient air quality, due to potential indiscriminate handling or disposal of spoils that could pollute the environment.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
4.2	Municipal waste (household and or commercial wastes)?	Yes	Aesthetic, Surface water quality, Odor; due to potential dumping and mismanagement of solid wastes that could pollute the environment.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
4.3	Hazardous or toxic wastes (including radioactive wastes)?	Yes	Surface water quality; Ambient air quality, including Odor; due to potential releases	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
			that could pollute the environment.	
4.4	Other industrial process wastes?	N/A		
4.5	Surplus product?	N/A		
4.6	Sewage sludge or other sludge from effluent treatment?	Yes	Surface water quality, groundwater quality, odor due to potential release of untreated effluents the could pollute the environment.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
4.7	Construction or demolition wastes?	Yes	Aesthetics, community safety, due to potential unmanaged bulky construction and demolition wastes.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
4.8	Redundant machinery or equipment?	No		
4.9	Contaminated soils or other material?	No		
4.10	Agricultural wastes?	No		
4.11	Any other solid wastes?	No		
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources (vehicles and/or heavy equipment)?	Yes	Ambient air quality, due to emissions from heavy equipment, service vehicles, generator sets, and other vehicles, such as those transporting materials at construction sites.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
5.2	Emissions from production processes?	N/A		
5.3	Emissions from materials handling including storage or transport?	Yes	Ambient air quality, due to emissions from stored materials at site.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
5.4	Emissions from construction activities including plant and equipment?	Yes	Ambient air quality, due to emissions from heavy equipment, service vehicles, generator sets, and other	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
			vehicles, such as those transporting materials at construction sites.	
5.5	Dust or odors from handling of materials including construction materials, sewage and waste?	Yes	Ambient air quality, due to emissions from unmanaged liquid and solid wastes at construction sites.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
5.6	Emissions from incineration of waste?	N/A		
5.7	Emissions from burning of waste in open air (eg slash material, construction debris)?	No		
5.8	Emissions from any other sources?	No		
6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
6.1	From operation of equipment eg engines, ventilation plant, crushers?	Yes	Noise level, due to noisy operation of heavy equipment (including drills, concrete mixers, tile cutters, chain saw during tree cutting), excavation work, and other construction activities at the site.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
6.2	From industrial or similar processes?	N/A		
6.3	From construction or demolition?	Yes	Noise level, due to noisy operation of heavy equipment (including drills, concrete mixers, tile cutters, chain saw during tree cutting), excavation work, and other construction activities at the site.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
6.4	From blasting or piling?	N/A		
6.5	From construction or operational traffic?	Yes	Noise level, due to noisy operation of heavy equipment (including drills,	Not significant because the impacts are short term and localized. Standard measures

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
			concrete mixers, tile cutters, chain saw during tree cutting), excavation work, and other construction activities at the site. Additional noise can also be generated due to increase in vehicular movement for material drop off to the site.	are available to mitigate the impacts.
6.6	From lighting or cooling systems?	N/A		
6.7	From sources of electromagnetic radiation (consider effects on nearby sensitive equipment as well as people)?	N/A		
6.8	From any other sources?	No		
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	Yes	Surface water quality and ground water quality, due to potential unwanted release of fuels, solvents, primers, adhesives, paint.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
7.2	From discharge of sewage or other effluents (whether treated or untreated) to water or the land?	Yes	Surface water quality and ground water quality, due to potential unwanted release of untreated wastewater	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
7.3	By deposition of pollutants emitted to air, onto the land or into water?	Yes.	Land quality and surface water quality, due to deposition of emissions from heavy equipment and other machines used during construction activities.	Not significant. The deposition, if any, is very negligible to affect the quality of surface water or land/soil in the area.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
7.4	From any other sources?	No		
7.5	Is there a risk of long-term build-up of pollutants in the environment from these sources?	No		
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous or toxic substances?	Yes	Humans/people, due to potential release of these substances that could affect the workers at site and nearby human receptors (residential areas, institutions)	Not significant because the impacts are short term and localized. Standard community and occupational health and safety measures are available to mitigate the impacts.
8.2	From events beyond the limits of normal environmental protection e.g. failure of pollution control systems?	N/A		
8.3	From any other causes?	No		
8.4	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslide, etc)?	Yes	Humans/people, due to risk of natural disasters that could lead to injuries or death.	Not significant because there are designs available that could mitigate the impacts.
9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, structure, social groups etc?	Yes	Humans/people, due to change in lifestyles of future occupants of the housing facility.	Positively significant during operation phase due to improved living conditions. Not significant in terms of demography. The project will not increase the local population because residents or occupants of the housing facility will come from existing residents of Thimphu.
9.2	By resettlement of people or demolition of homes or communities or community facilities e.g. schools, hospitals, social facilities?	Yes		21 affected families will be resettled and compensated as per the Resettlement Plan.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
9.3	Through in-migration of new residents or creation of new communities?	Yes	Humans/people, due to new communities that will be created at the location of housing facility resulting to new dynamics within the community.	Not significant. A new community will be created at the site. However, no in-migration is expected since residents of the 110 units will be the residents of Thimphu, who will move out of their existing apartments in various parts of the city and the suburbs.
9.4	By placing increased demands on local facilities or services eg housing, education, health?	Yes	Humans/people, due to increased demand for these services in the locality resulting to stress on availability to accommodate such demand.	Not significant. Although the new residents will increase the demand for school admission in Lungtenphu and Olakkha area and for health facilities in the Army hospital, the site is near or accessible to the city center where more available services can be utilized by the residents in the future.
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes	Humans/people, due to creation of employment opportunities.	Positive significant impact. The project will generate employment for foreign workers and nationals during construction phase.
9.6	Any other causes?			
10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment e.g. more housing, new roads, new supporting industries or utilities, etc?	No		The site already has access and is adjacent to the main access road. Consequential development will only be permitted as long as it is within the Local Area Plan.
10.2	Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g. supporting infrastructure (roads, power supply,	No		Development of supporting facilities will only occur if it is within the planned five year plan of the Thromde.

No.	Questions to be considered in Scoping	Yes No n/a Not Sure	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why? (See last page for Questions to Guide Assessing Significance of Impacts)
	waste or wastewater treatment, etc) housing development extractive industries supply industries other?			
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	No		
10.4	Will the project set a precedent for later developments?	Yes	Humans/people, due to potential future developments that could improve the living conditions of more citizens.	Positively significant. If carried out well, the housing complex could be model for all future housing complexes in the country.
10.5	Will the project have cumulative effects due to proximity to other existing or planned projects with similar effects?	No		

Part 2 - Characteristics of the Project Environment (Environmental Sensitivity)

Question	Remarks
<p>Are there features of the local environment on or around the Project location which could be affected by the Project?</p> <ul style="list-style-type: none"> • Areas which are protected under international or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the project? • Other areas which are important or sensitive for reasons of their ecology e.g. <ul style="list-style-type: none"> ○ Wetlands, ○ Watercourses or other waterbodies, ○ the coastal zone, ○ mountains, ○ forests or woodlands • Areas used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project? • Inland, coastal, marine or underground waters? 	<p>The closest protected area is more than 10km away. The closest forest is about 115m away towards the northern boundary but is separated/buffered from the site by two roads (the national highway and the Local Area Plan road). These roads and the busy traffic deter wildlife from coming into the settlement areas. Also the site will be bound with fencing, to keep any wildlife that may accidentally wander onto the site (which is not anticipated)</p> <p>The site falls under zone 3 of the Lungtenphu Local Area Plan as it is more than 1km from the helipad. The Local Area Plan does not contain any heritage precinct</p> <p>The site falls under the UV-1 Urban Village Core area where the allowable usage is for construction of houses/buildings, shops and businesses (not industry).</p>

Question	Remarks
<ul style="list-style-type: none"> • Areas or features of high landscape or scenic value? • Routes or facilities used by the public for access to recreation or other facilities? • Transport routes which are susceptible to congestion or which cause environmental problems? • Areas or features of historic or cultural importance? 	
Is the Project in a location where it is likely to be highly visible to many people?	Yes, it is located along Lungten Lam, where it will be visible to commuters using the Thimphu-Babesa highway, Thimphu-Wangduephodrang highway and the Chamgang Road.
Is the Project located in a previously undeveloped area where there will be loss of greenfield land?	No
Are there existing land uses on or around the Project location which could be affected by the Project? For example: <ul style="list-style-type: none"> • homes, gardens, other private property, • industry, • commerce, • recreation, • public open space, • community facilities, • agriculture, • forestry, • tourism, • mining or quarrying 	No, the site is bounded by roads on the north and south, private land to the west and a stormwater drain on the eastern side. There will be no changes to the land use around the project site.
Are there any plans for future land uses on or around the location which could be affected by the Project?	No
Are there any areas on or around the location which are densely populated or built-up, which could be affected by the Project?	No
Are there any areas on or around the location which are occupied by sensitive land uses which could be affected by the Project? <ul style="list-style-type: none"> • hospitals, • schools, • places of worship, • community facilities 	<p>No. The closest religious and historic site is the Semtokha Dzong is directly across the site but at a distance of about 226m from the site. A number of houses, the old Thimphu Highway and the Chamgang access road lie in between the Dzong and the proposed site.</p> <p>The nearest school is the Olakha school which is more than 1.5km away</p>
Are there any areas on or around the location which contain important, high quality or scarce resources which could be affected by the Project? For example: <ul style="list-style-type: none"> • groundwater resources, • surface waters, • forestry, 	No

Question	Remarks
<ul style="list-style-type: none"> • agriculture, • fisheries, • tourism, • minerals. 	
<p>Are there any areas on or around the location of the Project which are already subject to pollution or environmental damage? For example:</p> <ul style="list-style-type: none"> • where existing legal environmental standards are exceeded, which could be affected by the Project 	No
<p>Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions? For example:</p> <ul style="list-style-type: none"> • temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems? 	Yes, earthquakes and possible landslide Mitigation measures for these are included in project design (seismic considerations for building design and choice of construction materials) and construction retaining wall for landslides
<p>Is the Project likely to affect the physical condition of any environmental media?</p> <ul style="list-style-type: none"> • The atmospheric environment including microclimate and local and larger scale climatic conditions? • Water – e.g. quantities, flows or levels of rivers, lakes, groundwater. Estuaries, coastal waters or the sea? • Soils – e.g. quantities, depths, humidity, stability or erodibility of soils? • Geological and ground conditions? 	No
<p>Are releases from the Project likely to have effects on the <u>quality</u> of any environmental media?</p> <ul style="list-style-type: none"> • local air quality • global air quality including climate change and ozone depletion • water quality – rivers, lakes, groundwater. estuaries, coastal waters or the sea • nutrient status and eutrophication of waters • acidification of soils or waters • soils • noise • temperature, light or electromagnetic radiation including electrical interference • productivity of natural or agricultural systems 	Yes, Increase in dust levels during excavation and air emissions from use of heavy machines. Effects will be temporary and restricted to the construction period
<p>Is the Project likely to affect the availability or scarcity of any resources either locally or globally?</p> <ul style="list-style-type: none"> • fossil fuels • water • minerals and aggregates • timber 	Water is becoming more scarce in Thimphu City due to increasing demand from construction activities

Question	Remarks
<ul style="list-style-type: none"> • other non-renewable resources • infrastructure capacity in the locality - water, sewerage, power generation and transmission, telecommunications • waste disposal roads, rail 	
<p>Is the Project likely to affect human or community health or welfare?</p> <ul style="list-style-type: none"> • The quality or toxicity of air, water, foodstuffs and other products consumed by humans? • Morbidity or mortality of individuals, communities or populations by exposure to pollution? • Occurrence or distribution of disease vectors including insects? • Vulnerability of individuals, communities or populations to disease? • Individuals' sense of personal security? • Community cohesion and identity? • Cultural identity and associations? • Minority rights? • Housing conditions? • Employment and quality of employment? • Economic conditions? • Social institutions? 	<p>The project is expected to greatly improving the existing housing crunch in Thimphu City especially for low income group</p>

Questions to Guide Significance of Impacts

1. Will there be a large change in environmental conditions?
2. Will new features be out-of-scale with the existing environment?
3. Will the effect be unusual in the area or particularly complex?
4. Will the effect extend over a large area?
5. Will there be any potential for trans boundary impact?
6. Will many people be affected?
7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?
8. Will valuable or scarce features or resources be affected?
9. Is there a risk that environmental standards will be breached?
10. Is there a risk that protected sites, areas, features will be affected?
11. Is there a high probability of the effect occurring?
12. Will the effect continue for a long time?
13. Will the effect be permanent rather than temporary?
14. Will the impact be continuous rather than intermittent?
15. If it is intermittent, will it be frequent rather than rare?
16. Will the impact be irreversible?
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?

Appendix 3: General COVID 19 Health and Safety Guidance for Contractor

CONTRACTOR GUIDELINES ON RESPONDING TO THREAT OF CORONA VIRUS DISEASE (COVID-19)

1. This set of guidelines has been formulated based on common practices in many countries worldwide on the fight against COVID-19, and in consonance with WHO guidance on COVID-19,⁶² the ILO Workplace Response to the Coronavirus Disease outbreak,⁶³ and the IFC-WB Environmental, Health, and Safety (EHS) General Guidelines (April 2007). It aims to assist Contractors during construction works in response to the COVID-19 pandemic.

2. The Contractor will be required to comply with the requirements and recommendations from the national policies and guidelines on COVID-19, which may change from time to time.

3. The Contractor will employ an EHS Engineer/Officer who shall oversee compliance to the occupational health and safety (OHS) requirements particularly on prevention of COVID-19 transmission in the workplace. This shall include but not limited to the following:

- (i) Orientation of workers on OHS, disaster and emergency response procedures, and COVID-19;
- (ii) Provision and use of personal protective equipment (PPE), fire suppression system and appropriate medical emergency response logistics;
- (iii) Placement of safety signs, posters (e.g., WHO posters on COVID-19), information and warning signs within the worksite and adjacent areas;
- (iv) Implementation and maintenance of good housekeeping;
- (v) Monitoring of occupational health and environmental controls (e.g., airborne contaminants, noise, illumination, ventilation, temperature and humidity); and
- (vi) Conduct of regular safety inspection and incident reporting/ recording.

4. The Contractor will provide all subcontractors, if any, with compulsory site induction on COVID-19 response prior to start of any works. The EHS Officer will keep a record of the contact details of all workers and staff: mobile telephone number, alternate telephone, email, and address where they are staying.

5. The Contractor will maintain regular housekeeping practices, including routine cleaning and disinfecting of surfaces, equipment, and other elements of the work environment. Make sure workplaces are clean and hygienic. Surfaces (e.g. desks and tables) and objects (e.g. telephones, keyboards) need to be wiped with disinfectant regularly.

6. The Contractor will ensure that all persons reporting to work are healthy and in a fit state. Any person showing signs of cough and colds will not be allowed to enter the work sites and will be advised to stay at home, or follow the isolation procedure, if any, by the government.

7. The Contractor will ensure that staff, subcontractors (if any), and workers have access to places where they can wash their hands with soap and water. Wash stations at strategic locations within the work areas that are equipped with adequate soap and water will be provided for workers to

⁶² WHO. Coronavirus disease (COVID-19) technical guidance: Guidance for schools, workplaces & institutions. 19 March 2020. <https://www.who.int/docs/default-source/coronaviruse/advice-for-workplace-clean-19-03-2020.pdf>

⁶³ ILO. ILO Standards and COVID-19 (coronavirus) 23 March 2020 - Version 1.2 https://www.ilo.org/global/topics/safety-and-health-at-work/areasofwork/occupational-health/WCMS_738178/lang--en/index.htm.

wash their hands. Put sanitizing hand rub dispensers in prominent places around the workplace. Make sure these dispensers are regularly refilled. All workers will be required to practice basic hygiene such as hand washing before eating, drinking, and after using the toilet.

8. The Contractor will display posters promoting hand-washing, and social distancing – ask local public health authority for these or consult www.WHO.int. Combine posters with other communication measures like offering guidance from EHS Officer, briefings at meetings, and information on intranet sites to promote handwashing.

9. The Contractor will not allow any person on medication for a specific medical condition that will impair their performance to work at the sites.

10. The Contractor and all subcontractors, if any, will provide the appropriate PPE for all its workers. All tools and PPE must be in good condition, fit for purpose, and receive all the mandatory and statutory inspections, checks and calibrations, as and when required. Proof that they are in good condition may be required, if needed. Workers will be responsible to wear PPE appropriately, take good care of equipment and report any defects. Have surgical masks and disposable gloves available to provide anyone who develops respiratory symptoms. All tools and equipment must be sanitized after every use.

11. The Contractor will actively monitor where COVID-19 infection is high. In the event COVID-19 is known in the community, the Contractor will brief and/or orient workers, staff and subcontractors, if any, that anyone with mild cough or low-grade fever (37.3°C or more) will stay at home. A work from home arrangement for office workers, if possible, can be arranged.

12. The Contractor will keep promoting the message that people need to stay at home even if they have only mild symptoms of COVID-19 by displaying posters with this message in the workplace, combined with other channels of communications commonly used in the workplace.

13. The Contractor will develop a preparedness and response plan to prevent COVID-19 infection in the workplace. The preparedness plan will be submitted to PMU for approval.

Appendix 4: Result of IBAT Screening



Integrated Biodiversity Assessment Tool

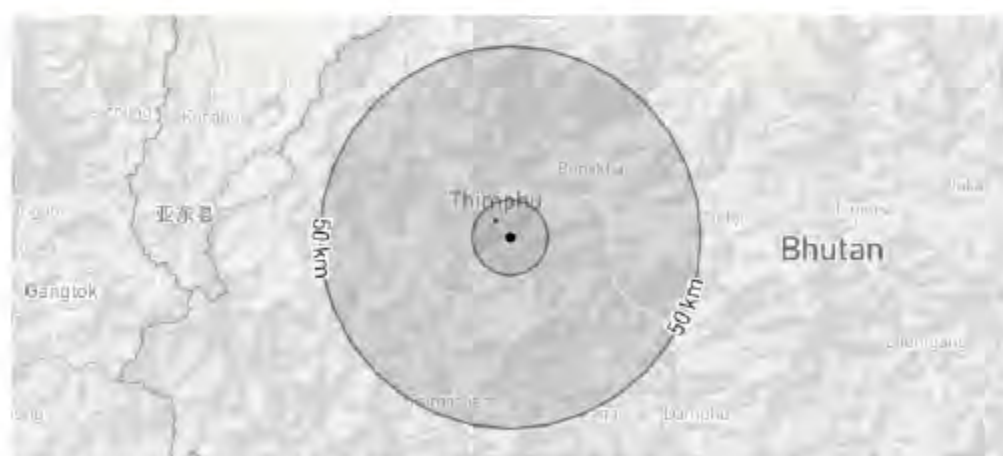
WORLD BANK GROUP BIODIVERSITY RISK SCREEN

BHU-AHDP_THIMPHU

- Country: Bhutan
- Location: [27.4, 89.7]
- Create: [REDACTED]

Overlaps with:

Protected Areas	50 km: 8	10 km: 2	1 km: 0	10
World Heritage (WH)	50 km: 0	10 km: 0	1 km: 0	0
Key Biodiversity Areas	50 km: 7	10 km: 1	1 km: 1	9
Alliance for Zero Extinction (AZE)	50 km: 0	10 km: 0	1 km: 0	0
IUCN Red List	26			
Critical Habitat	Likely			



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





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



About this report

IBAT provides initial screening for critical habitat values. Performance Standard 6 (PS6) defines these values for critical habitat (PS6: para. 16) and legally protected and internationally recognized areas (PS6: para. 20). PS6 will be triggered when IFC client activities are located in modified habitats containing "significant biodiversity value," natural habitats, critical habitats, legally protected areas, or areas that are internationally recognized for biodiversity. References to PS6 and Guidance Note 6 (GN6) are provided to guide further assessment and detailed definitions where necessary. Please see <https://www.ifc.org/ps6> for full details on PS6 and GN6.

The report screens for known risks within a standard 50km buffer of the coordinates used for analysis. This buffer is not intended to indicate the area of impact. The report can be used to:

- Scope risks to include within an assessment of risks and impacts
- Identify gaps within an existing assessment of risks and impacts
- Prioritize between sites in a portfolio for further assessment of risks and impacts
- Inform a preliminary determination of critical habitat
- Assess the need for engaging a biodiversity specialist
- Identify additional conservation experts or organizations to inform further assessment or planning

WARNING: IBAT aims to provide the most up-to-date and accurate information available at the time of analysis. There is however a possibility of incomplete, incorrect or out-of-date information. All findings in this report must be supported by further desktop review, consultation with experts and/or on-the-ground field assessment as described in PS6 and GN6. Please consult IBAT for any additional disclaimers or recommendations applicable to the information used to generate this report.

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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 the 50km 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 project 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 project 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 50km of the area of interest.
For the full IUCN Red List please refer to the associated csv in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Manis pentadactyla</i>	Chinese Pangolin	MAMMALIA	CR	Decreasing	Terrestrial
<i>Aythya baeri</i>	Baer's Pochard	AVES	CR	Decreasing	Freshwater
<i>Gyps bengalensis</i>	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
<i>Sarcogyps calvus</i>	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Ardea insignis</i>	White-bellied Heron	AVES	CR	Decreasing	Terrestrial, Freshwater
<i>Gyps tenuirostris</i>	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Cheirostylis sheriffii</i>		LILIOPSIDA	CR	Unknown	Terrestrial
<i>Oreorchis sanguinea</i>		LILIOPSIDA	CR	Unknown	Terrestrial





Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Onosma griersonii</i>		MAGNOLIOPSIDA	CR	Unknown	Terrestrial
<i>Meconopsis bhutanica</i>		MAGNOLIOPSIDA	CR	Decreasing	Terrestrial
<i>Astragalus paroensis</i>		MAGNOLIOPSIDA	CR	Unknown	Terrestrial
<i>Ailurus fulgens</i>	Red Panda	MAMMALIA	EN	Decreasing	Terrestrial
<i>Canis lupus</i>	Dhole	MAMMALIA	EN	Decreasing	Terrestrial
<i>Moschus chrysogaster</i>	Alpine Musk Deer	MAMMALIA	EN	Decreasing	Terrestrial
<i>Moschus fuscus</i>	Black Musk Deer	MAMMALIA	EN	Decreasing	Terrestrial
<i>Moschus leucogaster</i>	Himalayan Muskdeer	MAMMALIA	EN	Decreasing	Terrestrial
<i>Panthera tigris</i>	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Aquila nipalensis</i>	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
<i>Ceropegia bhutanica</i>		MAGNOLIOPSIDA	EN	Unknown	Terrestrial
<i>Isodon atroruber</i>		MAGNOLIOPSIDA	EN	Unknown	Terrestrial
<i>Meconopsis superba</i>		MAGNOLIOPSIDA	EN	Stable	Terrestrial
<i>Carex nigra</i> subsp. <i>drumkii</i>		LILIOPSIDA	EN	Unknown	Terrestrial



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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Strobilanthes accrescens</i> subsp. <i>accrescens</i>		MAGNOLIOPSIDA	EN	Unknown	Terrestrial
<i>Tor putitora</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Trillium govanianum</i>	Himalayan Trillium	LILIOPSIDA	EN	Decreasing	Terrestrial

Restricted Range Species

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Trochalopteron imbricatum</i>	Bhutan Laughingthrush	AVES	LC OR LR/LC	Stable	Terrestrial
<i>Zoothera salimalii</i>	Himalayan Forest Thrush	AVES	LC OR LR/LC	Stable	Terrestrial
<i>Anourosorex schmidi</i>	Giant Mole Shrew	MAMMALIA	DD	Unknown	Terrestrial



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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
Biological Corridor 2	10 km	VI	Established	Biological Corridor 2 (JDNP - JSWNP)	Assess for biodiversity risk
Royal Botanical Park	10 km	III	Designated	Royal Botanical park	Assess for biodiversity risk
Biological Corridor 1	50 km	VI	Established	Biological Corridor 1 (JKSNR-JDNP)	Assess for biodiversity risk
Biological Corridor 8	50 km	VI	Established	Biological Corridor 8 (Noth Corridor JSWNP-JDNP-WCNP)	Assess for biodiversity risk
Gangtey-Phobji	50 km	Not Reported	Designated	Ramsar Site, Wetland of International Importance	Assess for biodiversity risk
Jigme Dorji National Park	50 km	II	Designated	Jigme Dorji Wildlife Sanctuary	Assess for critical habitat
Jigme Khesar Strict Nature Reserve	50 km	Ia	Designated	Torsa Strict Nature Reserve	Assess for critical habitat



Area name	Distance	IUCN Category	Status	Designation	Recommendation
Jigme Singye Wangchuck National Park	50 km	II	Designated	Jigme Singye Wangchuck National Park	Assess for critical habitat
Khotokha	50 km	Not Reported	Designated	Ramsar Site, Wetland of International Importance	Assess for biodiversity risk
Wangchuck Centennial National Park	50 km	II	Designated	Wangchuck Centennial Park	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	IBA	AZE	Recommendation
Thimphu wetlands	1 km	Yes	No	Assess for critical habitat
Dochu La	10 km	No	No	Assess for critical habitat
Ada lake / Puna Tsangchu	50 km	Yes	No	Assess for critical habitat
Chele La	50 km	Yes	No	Assess for critical habitat
Jigme Dorji National Park	50 km	Yes	No	Assess for critical habitat
Jigme Singye Wangchuk National Park	50 km	Yes	No	Assess for critical habitat



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Area name	Distance	IBA	AZE	Recommendation
Paro wetlands	50 km	Yes	No	Assess for critical habitat
Phopjika and Khatekha valleys	50 km	Yes	No	Assess for critical habitat
Toorsa Strict Nature Reserve	50 km	Yes	No	Assess for critical habitat

Species with potential to occur

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
MAMMALIA	110	17	1	6	10	12	78	3
AVES	526	15	5	2	8	17	494	0
LILIOPSIDA	77	7	2	2	3	2	63	5
MAGNOLIOPSIDA	126	13	3	4	6	3	100	10
ACTINOPTERYGII	70	1	0	1	0	6	57	6
AMPHIBIA	13	1	0	0	1	1	11	0
REPTILIA	18	3	0	0	3	1	13	1
SORDARIOMYCETES	1	1	0	0	1	0	0	0
MALACOSTRACA	23	0	0	0	0	3	15	5
GASTROPODA	74	0	0	0	0	0	61	13
INSECTA	98	0	0	0	0	0	94	4



Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
BIVALVIA	46	0	0	0	0	0	39	7
POLYPODIOPSIDA	4	0	0	0	0	0	4	0
AGARICOMYCETES	1	0	0	0	0	0	1	0
ARACHNIDA	3	0	0	0	0	0	3	0



Recommended citation

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Recommended Experts and Organizations

For projects located in critical habitat, clients must ensure that external experts with regional expertise are involved in further assessment (GN6: GN22). Clients are encouraged to develop partnerships with recognized and credible conservation organizations and/or academic institutes, especially with respect to potential developments in natural or critical habitat (GN6: GN23). Where critical habitats are triggered by priority species, species specialists must be involved. IBAT provides data originally collected by a large network of national partners, while species information is sourced via the IUCN Red List and affiliated Species Specialist Groups. These experts and organizations are listed below. **Please note that this is not intended as a comprehensive list of organizations and experts. These organizations and experts are under no obligation to support any further assessment and do so entirely at their discretion and under their terms. Any views expressed or recommendations made by these stakeholders should not be attributed to the IFC or IBAT for IFC partners.**

Birdlife Partners

URL: <https://www.birdlife.org/worldwide/partnership/birdlife-partners>

Directory for Species Survival Commission (SSC) Specialist Groups and Red List Authorities

URL: <https://www.iucn.org/commissions/ssc-groups>

Appendix 5: COVID-19 Safety Guidelines for Field-Based Consultation Activities

A. Introduction

1. The Green and Resilient Affordable Housing Sector Project (GRAHSP) will assist the Royal Government of Bhutan (RGOB) establish infrastructures (i.e., shelters and recycled waste livelihood facilities) and provide services [i.e., business development, child care centers (crèches), integrated services for survivors of gender based violence (GBV)] for vulnerable women (victims/survivors of violence, poor working mothers caring for children and marginalized informal sector workers) in Thimphu and Phuentsholing municipalities (*thromde*) while also adopting climate adaptation and disaster risk reduction in housing projects. The Project is in line with ADB's Strategy 2030, the Country Partnership Strategy (2019-2023) and the 12th Five-Year Plan's national key result area (NKRA) of gender equality and sustainable human settlements. NKRA aims to remove barriers (including GBV) that limit the opportunities and potentials of women and girls by creating enabling policies and providing adequate support services.⁶⁴ The Project is also aligned with the Disaster Management Act (2013) and supports a systematic approach to disaster risk management.

2. As an integral part of administering this project and to comply with ADB Safeguard Policy Statement, continuing meaningful consultations will be undertaken with stakeholders. This activity may be undertaken through a combination of online, virtual and in-face consultations. However, as COVID-19 still prevails, travel to sites for in-face consultations shall need to be undertaken with due regard to compliance with appropriate safety protocol as discussed in detail in this document.

B. About the Corona Virus Disease

3. Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Precautions can be implemented to prevent and slow down the transmission of the virus⁶⁵.

C. Common Symptoms of Corona Virus Disease⁶⁶

4. COVID-19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalization.

Most common symptoms:

- fever.
- dry cough.
- tiredness.

Less common symptoms:

- aches and pains.

⁶⁴ Gross National Happiness Commission. 2019. Twelfth Five-Year plan. 2018-2023. Thimphu.

⁶⁵ World Health Organization. https://www.who.int/health-topics/coronavirus#tab=tab_1

⁶⁶ World Health Organization. https://www.who.int/health-topics/coronavirus#tab=tab_3

- sore throat.
- diarrhea
- conjunctivitis.
- headache.
- loss of taste or smell.
- a rash on the skin, or discoloration of fingers or toes.

Serious symptoms:

- difficulty breathing or shortness of breath.
- chest pain or pressure.
- loss of speech or movement.

D. Personal Protective Equipment that should be worn by field team

5. While in the field, all the members of the consultation team shall use or wear proper personal protective equipment (PPE) at all times. These PPEs may be removed on certain circumstances only, such as, but not limited to, eating, drinking, and any other task or activity that the PPE may inhibit the action. However, during these times, strict observance of social distancing is required.

6. The most common type of PPEs that should be worn by the field team are the following:
- Reusable mask or surgical mask. Reusable masks should be maintained clean per the manufacturer's instruction. Surgical masks should not be reused.
 - Face shield. This PPE is especially useful for the field workers when talking to various people in a relatively confined space or indoors.
 - Gloves. This is especially useful in situations in the field where items are being passed around from one hand to another, and no available hand sanitizers, or water and soap for handwashing after the activity.

E. Safety Protocol for Field Work

▪ Field Team Composition

7. Strictly comply and observe with the condition that field team composition, including assistants, drivers, helpers, etc., should be pre-identified. These team members should only be the ones going to the field.

▪ The field team should ensure the following:

8. Before undertaking the field visits, ensure that the local/district administration of a target site for consultation has been informed about the visit. Obtain necessary permits, if required.
9. Never carry out activities in areas under lockdown, if any, and undertake consultations in such areas after restrictions are lifted and necessary approvals are obtained for field activity.
10. Maintain adequate stock of face masks and hand sanitiser for field team; including single-use surgical masks for participants.
11. The team should have handheld contactless temperature scanner and pulse oximeter (minimum 2-sets).

- a) Test all members of the field team every morning before starting of field visit or activity to ensure no member is having a fever (above 100 F or 38 C) and ensure oxygen saturation level is normal (above 95).
 - b) Once in the field or venue of consultations, the team should test the temperature of every participant.
 - i. The temperature of a participant should likewise be below 100 F or 38 C.
 - ii. If the temperature is high, advise such participant to immediately go home, take a rest and consult a doctor.
12. Community consultation should be held only if allowed by local or district administration and if situation permits. Otherwise, avoid consultations.
- a) If consultations are conducted, ensure it is held in the open and that participants are seated at least 1-meter apart (or as per local rules on social distancing).
 - b) Ensure there is no handshaking or any physical contact among the team members and participants.
13. Check daily the latest information on areas where COVID-19 is spreading and ensure no field activity is undertaken in any area declared under lockdown.
14. Ensure that no member of the field team belongs to the high-risk category, or those with medical conditions such as diabetes, heart disease, lung disease, etc.
15. Mobile phones of the field team, laptop, etc need to be wiped with disinfectant daily on return from the field.
16. If a big group of participants or a wide venue is expected for a consultation activity, ensure to bring portable microphones and audio system to avoid shouting or avoid drawing participants close to the speaker or discussant.
- **Each field team member should strictly adhere to the following safety measures:**
17. Use facemasks with reliable and known quality in every field consultation activity. At the end of each day of consultation activity and upon reaching home/place of stay, cut the mask into two pieces (to prevent recycling) and safely dispose following local or national guidelines. Wash hands with soap afterwards.
18. Use a shoulder bag for carrying hand sanitiser, single-use surgical masks, hand towel, identity card, water bottle, etc.
19. Wear mask before setting out to the field location and the mask should be worn throughout the day until return to place of stay or residence, unless in special or unavoidable circumstances as discussed in the use of PPE above.
- a) Before putting on the mask, clean hands with alcohol-based hand sanitise or soap and water.
 - b) Cover mouth and nose with mask and make sure there are no gaps between the face and the mask.

- c) Avoid touching the mask while using it; if it is touched, clean hands with alcohol-based hand sanitise immediately after touching the mask.
 - d) To handle a reusable mask: remove it from behind (do not touch the front of the mask); clean hands with alcohol-based hand rub or soap and water; and wash the mask with washing soap and dry it in sunlight.
20. When multiple small group consultations are undertaken, ensure to clean hands thoroughly with an alcohol-based hand sanitiser at every end of each consultation.
- a) Avoid touching eyes, mouth, and nose after using the hand sanitiser. Spare a few minutes for the hands to dry up. The hand sanitizer can cause irritation.
 - b) Store the hand sanitizers in safe places and out of reach of children. Hand sanitizers can be poisonous when swallowed.
 - c) Recommended hand sanitizers are alcohol-based. Ensure to handle them with care as these can be flammable.
21. Carry a freshly washed hand towel every day to dry your hands after washing.
22. Maintain at least 1 meter distance (or as per local rules on social distancing) the participants and any others during the consultation activities.
- a) If the place of consultation is deemed congested and may be difficult to maintain the minimum distance, ensure that the participants wear masks throughout the discussion.
 - b) Ensure that single-use surgical masks are available for participants who do not have their own.
 - c) Request participants to maintain distance and avoid congregating too close when the discussion is in progress.
23. As much as possible, avoid touching eyes, nose, and mouth until reaching home. Once at home or place of stay, take a bath immediately and observe all necessary actions to protect members of the household from possible COVID-19 infection.
- a) Use shampoo and wash hair thoroughly.
 - b) Wash clothes and dry them in sunlight.
 - c) All gadgets and materials used during field work should be disinfected, put in one bag and keep away from any family member.
 - d) Dispose of used face masks properly as described above. Face shields should be properly washed or disinfected as well.
24. Avoid public transport for local travel, if possible, and use dedicated vehicle/motorcycle (owned or rented by the project) to reach project sites.
- a) Where possible, the team shall only use dedicated vehicles to and from the sites.
 - b) If motorcycle or taxi is used, ensure to abide by the passenger limit imposed by the local or national government on the use of these transportations.
25. When feeling or suffering from any minor symptoms such as cough, headache, mild fever, stay at home and do not participate in the consultation activity.
- a) At home, be isolated from others.

- b) Call the nearest government COVID-19 health care contact person and give details of symptoms. Provide any other relevant information as may be needed by the health care contact person.

F. Important

26. The project will facilitate testing of the team members for COVID-19 prior to deployment. Only members with negative results will participate in consultation activities. If a team member is tested positive, then such team member should immediately contact the appropriate local authority and follow all local/national guidelines governing patients of COVID-19.

Appendix 6: Copies of Minutes of Consultation Meetings

Appendix 7: SAMPLE GRIEVANCE REGISTRATION FORM*(To be available in the local language)*

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

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

Date		Place of registration			
Contact Information/Personal Details					
Name		Gender	<ul style="list-style-type: none"> • Male • Female 	Age	
Home Address					
Village / Town					
District					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below: If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance? 					

FOR OFFICIAL USE ONLY

Registered by: (Name of Official registering grievance)	
Mode of communication: <ul style="list-style-type: none"> • Note/Letter • E-mail • Verbal/Telephonic 	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	<ul style="list-style-type: none"> • Yes • No
Means of Disclosure:	

Appendix 8: Suggested Template for Record-Keeping of Grievances

[illegible]

Appendix 9: Sample Environmental Site Inspection Checklist for Contractor

DAILY MONITORING SHEET FOR CONTRACTOR

GREEN AND RESILIENT AFFORDABLE HOUSING SECTOR PROJECT

Contractor Monitoring Sheet

Name of Subproject: _____

Location of Subproject: _____

Supervising PIU: _____

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)	
<i>Location/zoning permits</i>		
<i>Permit to construct</i>		
<i>Building permit</i>		
<i>Transport / hauling permits</i>		
2. Compliance with IEE Requirements	(Approved / Under Preparation / Submitted to PIU for Approval)	
<i>Site-specific EMP (SEMP)</i>		
<i>Corrective Action Plan, if any</i>		
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		

Monitoring Item	Status	Remarks
Construction Workers' Camp Site	(Available / Needs Improvement / Not Available)	
- Quarters for male and female workers		
- 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)	
<i>Complaints</i>		
<i>Complaints resolution</i>		
5. Environmental Quality Measurement	(Passed / Failed / Not Applicable)	
<i>Ambient air quality sampling</i>		
<i>Noise level measurement</i>		
<i>Receiving water quality sampling</i>		

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 10: Sample Environmental Site Inspection Checklist for PMU/PIU

INSPECTION CHECKLIST FOR PMU AND PIUs

GREEN AND RESILIENT AFFORDABLE HOUSING SECTOR PROJECT SITE INSPECTION CHECKLIST

Subproject: _____

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?				

Monitoring/Inspection Questions		Findings			Comments / Clarifications
6.	Wastewater Management	Yes	No	NA	
	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?				

Monitoring/Inspection Questions		Findings			Comments / Clarifications
10.	Recording System	Yes	No	NA	
	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

Appendix 11: Semi-annual Environmental Monitoring Report Template

I. INTRODUCTION

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

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

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

Package Number	Components/List of Works	Contract Status (specify if under bidding or contract awarded)	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M) ⁶⁷	If On-going Construction	
				%Physical Progress	Expected Completion Date

⁶⁷ If on-going construction, include %physical progress and expected date of completion

• **COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS⁶⁸**

Package No.	Subproject Name	Statutory Environmental Requirements ⁶⁹	Status of Compliance ⁷⁰	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish ⁷¹

• **COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS**

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

• **COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)**

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

Package-wise IEE Documentation Status

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

⁶⁸ All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

⁶⁹ Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

⁷⁰ Specify if obtained, submitted and awaiting approval, application not yet submitted

⁷¹ Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

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

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

Package Name	Contractor	Nodal Person	Email Address	Contact Number

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

Summary of Environmental Monitoring Activities (for the Reporting Period)⁷²

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

⁷² Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/ EMP

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

- **APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT**
 - Briefly describe the approach and methodology used for environmental monitoring of each sub-project.
- **MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)**
 - Discuss the general condition of surroundings at the project site, with consideration of the following, whichever are applicable:
 - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
 - Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
 - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these are intact following heavy rain;
 - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
 - Confirm spill kits on site and site procedure for handling emergencies.
 - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
 - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
 - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
 - Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
 - Indicate if there are any activities being under taken out of working hours and how that is being managed.
 - Briefly discuss the basis for environmental parameters monitoring.
 - Indicate type of environmental parameters to be monitored and identify the location.
 - Indicate the method of monitoring and equipment used.
 - Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements.

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

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³

Water Quality Results

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

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

Noise Quality Results

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

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

• GRIEVANCE REDRESS MECHANISM

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

- **COMPLAINTS RECEIVED DURING THE REPORTING PERIOD**
 - Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).
- **SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS**
 - Summary of follow up time-bound actions to be taken within a set timeframe.
- **APPENDIXES**
 - Photos
 - Summary of consultations
 - Copies of environmental clearances and permits
 - Sample of environmental site inspection report
 - All supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors
 - Others

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name _____
 Contract Number _____

NAME: _____ DATE: _____
 TITLE: _____ DMA: _____
 LOCATION: _____ GROUP: _____

WEATHER CONDITION: _____

INITIAL SITE CONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____ Unresolved _____

INCIDENT:
 Nature of incident: _____

Intervention Steps: _____

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

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

Site Restored to Original Condition Yes ☐ No ☐

Signature _____

Sign off

Name
Position

Name
Position