Initial Environmental Examination

PUBLIC

Document Stage: Updated Draft
Project Number: 54355-001
September 2023

Bhutan: Green and Resilient Affordable Housing Sector Project – Nganglam, Pema Gatshel

Prepared by the National Housing Development Corporation Limited of the Kingdom of Bhutanfor the Asian Development Bank (ADB). This is an updated version of the draft originally posted in November 2022 available on https://www.adb.org/projects/documents/bhu-54355-001-iee-9.

CURRENCY EQUIVALENTS

(as of 30 June 2022)

Currency unit	–	Bhutanese Ngultrum (Nu.)
Nu. 1.00	=	$ 0.01265
$1.00	=	Nu. 79.0754

ABBREVIATIONS

ADB	-	Asian Development Bank
AIDS	-	Acquired immunodeficiency syndrome
BBR	-	Bhutan Building Regulation
BOQ	-	Bill of Quantities
BPC	-	Bhutan Power Corporation
CA	-	Competent Authority
COVID-19	-	Coronavirus disease
DCR	-	Development Control Regulation
DDMC	-	Dzongkhag Disaster Management Committee
DEC	-	District Environment Committee
DOFPS	-	Department of Forest and Park Services
DYT	-	Dzongkhag Yargay Tshogdu
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
HEMC	-	Health Emergency Management Committee
HIV	-	Human immunodeficiency virus
IEE	-	Initial environmental examination
MOAF	-	Ministry of Agriculture and Forest
MOF	-	Ministry of Finance
MOLHR	-	Ministry of Labor and Human Resources
MOWHS	-	Ministry of Works and Human Settlement
NC19TF	-	National COVID-19 Task Force
NDMA	-	National Disaster Management Authority
NEC	-	National Environment Commission
NECS	-	National Environment Commission Secretariat
NEPA	-	National Environment Protection Act
NGO	-	Non-government organization
NHDCL	-	National Housing Development Corporation Limited
NKRA	-	National Key Result Area
NIOSH	-	National Institute of Occupational Safety and Health
NLCS	-	National Land Commission Secretariat
NMC	-	National Mushroom Center
NRDCL	-	Natural Resources Development Corporation Limited
NSB	-	National Statistical Bureau

NCWC	-	National Commission for Women and Children
OHS	-	Occupational health and safety
O&M	-	Operation and maintenance
PAVA	-	Property Assessment and Evaluation Agency
PIC	-	Project implementation 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.

CONTENTS

APPENDICES

EXECUTIVE SUMMARY

The Green and Resilient Affordable Housing Sector Project (GRAH SP) 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] for vulnerable women (victims/survivors of violence, poor working mothers caring for children and marginalized informal sector workers) in target municipalities and Dungkhags while also incorporating climate adaption 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 collaboration between RGOB, 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 the Nganglam Subproject, which is one of the 9 subprojects to be financed under the project. This subproject involves construction of 8 two-storey residential buildings comprising 32 units, with internal access road and parking. Expectedly, 32 families will benefit from this subproject, and this translates to an estimated 160 beneficiary citizens (i.e., approximately 5 members per family). This housing complex will be constructed within 2.45 acres.

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 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 ADB 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 within Nganglam town, on government land within the proposed Nganglam Township. The site is alongside the Nganglam to Panbang highway, thus allowing 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 project 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 project site (default area of analysis of 50 km radius). Screening results show there is no key biodiversity area (KBA) within 1 km from the subproject site, and that 57 IUCN Red List species of concern are identified within the default area of analysis. The IUCN Red List species of concern were assessed to determine the likelihood of them being found at the subproject site. Since the subproject site is already within the center of the city, the likelihood of these species being found at the site is very low. Nevertheless, the assessment included necessary written confirmation from 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 in the denser forest further and further up the slope of the site.

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). 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 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. NHDCL has established a project management unit (PMU) comprising officials including an Environmental Safeguard Officer who is a permanent employeeof NHDCL. The PMU is strengthened with external experts or consultants in environmental and social safeguards, including experts on finance, procurement, technical areas, and contract management. Project Implementation Units (PIUs) have been established at the local level or municipalities where the subprojects under the project are located. For this subproject, NHDCL Nganglam will serve as the PIU. The PMU and PIUs will have responsibility for overseeing subproject management, including overseeing EMP implementation.

The Contractor will be required to (i) obtain all 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 preventive 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 consultations[1] 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

[1] Per ADB 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.

for the public and providing a mechanism for the receipt of comments and making suchdocuments 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.

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. Contractors will submit monthly reports to PMU. Consistent with reporting requirements set out in the Project Administration Manual, PMU will prepare and submit reports to ADB on a semi-annual basis. The submission of semi-annual environmental monitoring reports to ADB will continue until project completion

Conclusion. The overall finding of this IEE is that the subproject will result in significant environmental benefits because of improved living conditions of selected recipient citizens of Nganglam township. 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 updated IEE has been prepared based on the revised designs of the subproject. If the design is further revised or modified, the PMU shall update this IEE based on the 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 work 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.

[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."

In the event of any design change during the 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 a 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) lack 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 towns as they are unable to afford decent housing elsewhere.[3]

2. Affordable housing is provided by the National Housing Development Corporation, an agency that was delinked from the Ministry of Works and Human Settlements (MOWHS). As 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 (GRAH SP) 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 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 overcrowding 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) (footnote 10).[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 (footnote 10). The subprogram 3 under the PBL is planned for approval in 2021 and 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 (footnote 1). 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 will be aligned with the following developmental impact: livability, safety, and sustainability of human settlements ensured. The project will have the following outcome: housing affordability for low-income individuals in designated communities improved.[13] The outputs are:

---

[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] The design and monitoring framework is in Appendix 1.

8. **Output 1**. Climate- and disaster-resilient, and affordable housing units and public facilities for low-income individuals constructed.[14] This project component will leverage NHDCL's access to developable, serviced land to build an estimated 1,026 – 1,062 units for rent (with the opportunity for home ownership) and three integrated community service centers, serviced with roads, electricity, municipal water and sewerage connections in support of the SDG 1.[15] This output promotes mixed-use development and includes components under the Asian Development Fund (ADF) Thematic Pool grant to provide decent accommodation for families of urban workers, integrated service centers,[16] and livelihood support for women within the neighborhood unit. It is expected that the increase in supply of affordable houses will provide immediate relief for the rental shortage and pave the way to close the housing gap. The mid-rise multi-unit buildings will incorporate gender-inclusive features and innovations in universal design, construction methodology, and O&M including the application of resilient and smart technology to improve energy and resource-efficiency and greater use of locally available materials to boost local economic development. Climate- and disaster-resilient design features will be identified through a site risk assessment and take a multi-hazard approach while striving for sustainability through design. Bhutan cultural values and traditional architecture, aimed at improved public amenity, and green features will be reflected in the project.[17] Additionally, the site plans for each area will be designed following urban planning guidelines to incorporate green space, social amenities, and public space to promote social mix and avoid segregation. The subprojects will be integrated with the surrounding community to the greatest extent possible given the constraints.[18]

9. **Output 2**. Institutional capacities, policy, and regulatory framework of the housing sector strengthened. This project component will (i) strengthen the NHDCL's housing management and construction capacity by assessing its current policies and procedures, and develop targeted housing for low-income groups, particularly women and youth, and revamp the rent-to-own scheme;[19] (ii) develop climate- and disaster-resilient designs and related technologies, as a means to also improve safety, resource-efficiency (leading to lower price to income); (iii) review and update the building code and regulations; (iv) conduct awareness trainings and a capacity building program for key project stakeholders on (a) climate- and disaster-resilient designs; and (b) the building code, to effectively implement the designs for enhanced seismic resilience; (v) enhance NHDCL operating business model and pilot a public-private partnership (PPP) focused

[14] Resilient housing is housing design that has incorporated climate change and disaster risk reduction measures to avoid, minimize and or recover from the effects of a hazard event in a timely and efficient manner.

[15] Priority investment sites include Phuentsholing, Thimphu, Nganglam (Pemagatshel), Samtse, Samdrup Jongkhar, and Trashiyangtse, however these locations are subject to further analysis. The project beneficiaries comprise 70% low-income civil servants and 30% low-income noncivil servants (including urban workers residing in informal settlements) that fall in the bottom first and second income distribution quintiles.

[16] The centers will be established within the housing sites and provided with crèches, health services, counseling, legal assistance, court representation, police protection, temporary shelter, livelihood and skills development, and community reintegration, and operated with the support of National Commission for Women and Children.

[17] Government of Bhutan, MOWHS. 2014. *Bhutanese Architectural Guidelines.* Thimphu.

[18] NHDCL has experienced full time engineers, architects, and design staff.

[19] NHDCL will give preference to women-headed households in the rating criteria to provide rental subsidies, and may explore explicitly recording dual (both spouses) names on rental lease or home purchase agreements, if warranted.

on O&M and delivery of housing units;[20] (vi) develop sector-wide housing management information system; (vii) create a medium- to long-term road map to identify further interventions in the sector; and (viii) provide project implementation support services, including design and supervision, and set up of a safeguards unit. This output is critical to ensure that all assets developed under the project are efficiently and sustainably managed.

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 as per PAM

	Location	District	Area (Acres)	Typology	Housing blocks	No. of Units	Service Centers
1	Tading	Samtse	9.00	G+2	37/34	444/408	
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**	**2.45**	**G+1**	**8**	**32**	**Yes**
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

[20] There are significant barriers to creating a PPP with full risk-sharing for housing development in Bhutan, not least of which is the limited development finance available to private sector developers. NHDCL has previous experience with private sector entities to implement construction projects. A partnership for O&M would be of value to NHDCL.

11. The purpose of this IEE is to describe the assessment of environmental impacts due to the proposed 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 SPS2009 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 project;
(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 mitigation 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 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 project is likely to have environmental impacts and risks to the physical, biological, socioeconomic, and/or physical cultural resources in the project's area of influence.[21] 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 environmentalimpacts 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 managementplan (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.

[21] ADB. 2009. *Safeguard Policy Statement*. Manila.

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.

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 advertisements 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	Gender (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 the 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 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 practicality, 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 Legislations

Table 3: Summary of National Environmental Assessment Act and Related 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			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
	project level. It defines specific activities of projects where competent authorities can issue an environmental clearance (EC) and those requiring NEC 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,	Sets minimum standards for i) ambient water			The subproject is expected to emit pollutants during		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
and Drinking Water Quality Standards 2016	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.			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 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	Waste disposal permit	Dungkhag	The subproject is a potential generator of solid wastes during construction and	Design Phase / Pre-construction Phase / Construction Phase / Operation	PMU, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	segregation, reuse, and recycling, storage, transportation, environmentally-sound treatment and disposal of waste, and monitoring procedures and coordination at every organizational level			operation phases. The subproject will comply with this Act and ensure waste segregation, collection, storage and disposal as per Dungkhag requirements.	Phase	
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 equitable, and	No specific permit required, but any development project needs to comply with the provisions of this Act and	National Environment Commission	The subproject is expected to generate wastewater that could potentially impact the environment during	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
	environmentally sustainable manner.	regulation.		construction and operation phases. PMU will ensure compliance with the requirements of this Act.		
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.					
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 defines activities that are prohibited in forested areas,	Tree felling permit, if applicable to the site.	Forest Range Office	The subproject will not impact any protected areas, critical habitats or endangered species. However, the	Design Phase / Pre-construction Phase	PMU, PIU, Contractor

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	outlines procedures for sourcing sand and gravel, peat, stone, and surface soil from forested areas.			subproject is expected to cut 20 trees at the site, which 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			The subproject will not impact any protected areas, critical habitats or endangered species. However, the subproject is expected to cut 20 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
	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.					
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	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),	Design Phase / Pre-construction Phase	PMU

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	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.			if ever found at the site or vicinity in the future, will be affected.		
Occupational Health and Safety						
Bhutan Constitution 2008	The following are relevant provisions on protection of workers: ● Article 5 (2.d) ensures a safe and healthy environment. ● Article 9 (12) endeavors to	No specific permit required, but any development project needs to comply with the relevant provisions of the constitution.	N/A	The subproject will involve workers. These provisions of the constitution on workers' occupational health and safety will be complied by the subproject.	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
	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					

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	eliminate all forms of discrimination and exploitation against women including trafficking, prostitution, abuse, violence, harassment and intimidation at work in both public and private spheres. • 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					

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	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 working conditions, including occupational health and safety, labor protection and relations as well as setting of occupational standards and certification. The Act aims to	Foreign worker permit	Ministry of Labor and Human Resources	The subproject will involve contractors and workers. PMU will ensure that Contractor(s) comply with the relevant provisions of this Act	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
	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.					
Regulation on Occupational Health, Safety and Welfare, March 2012 (supersedes the General Rules and Regulations on Occupational Health and Safety in Construction, Manufacturing, Mining and Service Industries 2006)	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 as well as other persons at workplaces from work-related risks to	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, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	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	These regulations set the occupational health and safety standards, and procedures on construction safety. It aims to ensure safety	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	Construction Phase / Operation Phase	PMU, PIU, Contractor, NHDCL

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
2009)	and health for employees, as well as other persons at the construction sites, from work related 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.			healthy working conditions during construction. Workers will be provided with 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 / Transporter
Disaster	Establishes and	No specific	Dungkhag	The subproject is	Construction	PMU, PIU,

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
Management Act of Bhutan 2013	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 respond to emergencies.	permit required, but any development project needs to comply with the provisions of this Act.		a housing project requiring designs to ensure disaster resiliency. Provisions for disaster resilience will be included in the infrastructure designs.	Phase / Operation Phase	Contractor, NHDCL
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:	Building construction approval / permit	Dungkhag	The subproject involves building construction. The subproject will need to strictly comply with this set of rules and will be adhered to during the design phase.	Design Phase / Pre-construction Phase	PMU

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	(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, construction methods, designs, components and systems connected with building work, and (v) prescribe qualifications and provide for other matters relating to registration of					

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	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 the design phase.		
Bhutan Green Building Guidelines, 2013	This Guidelines was issued by the Ministry of Works and Human Settlements to introduce the basic			The subproject involves building construction. Although not mandatory, the subproject may		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
	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.			use this set of guidelines as reference during the design phase.		

Regulation	Brief Description	Applicable Consent / Permit Requirement	Governing Agency	Remarks / Relevance to Subproject	Implementation Phase	Responsibility
Bhutanese Architecture Guidelines 2014	The Guidelines were issued by the Ministry of Works and Human Settlements to be used as a reference to understand the various elements of Bhutanese 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.			The subproject involves building construction. Although not mandatory, the subproject may use this set of guidelines as reference during the design phase.		

C. COVID-19 Pandemic Measures and Protocols

36. The first patient tested positive for COVID 19 was in March 2020. 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 surveillance, quarantine and testing based on scientific evidence. The Ministry of Health (MOH) also has a Media and Risk Communication team responsible for communication and information dissemination to the general public.[22] Measures that 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) COVID 19 Infection Control and Prevention Containment Protocol for import and export of good, Protocols for testing, lockdown, movement with pass, containment of outbreak, containment, decontamination and disinfection, management of dead bodies; [23]
(v) 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;
(vi) Temporary closure of schools and introduction of online classes;
(vii) Compulsory pre-registration online for all inter-district travel on the Check Post Management System, and quarantine for travelers; and
(viii) Three vaccinations of all eligible persons so far (with some already undertaking the fourth vaccination)

37. 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.

[22] 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

[23] MOH, 2020a. SOP for decontamination and disinfection of COVID-19 contaminated area. March 2020; MOH, 2020b. SOP for Safe and Dignified Management of Dead body of Suspected or Confirmed COVID-19, March 2020; MOH, 2020c. Containment of COVID-19 outbreak in Cluster Surveillance2nd-Sept-2020; MOH, 2020d. Additional Measures to prevent and contain local transmission in high-risk areas. May 2020; MOH, 2020e. Strategy for Engaging High-Risk Communities for COVID Prevention & Control, April 2020; MOH, 2020f.National COVID 19 Testing Protocols, December 2020.

D. Relevant International Conventions and Treaties

38. 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 project 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.
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	26 August	Management	The IEE process takes into

	International Environmental Agreement	Ratified	Relevance	Remarks
	Control of Tran boundary Movements of Hazardous Wastes and their Disposal	2002 (accession)	hazardous waste in an environmentally sound manner and to follow a system for trans boundary waste movement	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 project follow NEC requirements, including use of ozone-depleting substances.
8	United Nations Convention to Combat Desertification	Aug 2003	Specifically focuses on arid, semi-arid and dry sub-humid areas	Not relevant for the project.
9	The Cartagena Protocol on Biosafety to the UN Convention on Biological Diversity	September 2002	Focus is on the safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity	Not relevant to the project.
10	The Nagoya Protocol	September 2013	Focus is on access to genetic resources and benefit-and incentives to conserve and sustainably use genetic resources	Not relevant to the project.
11	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 project avoid planting invasive and non-native species.

E. Gaps in Legal and Guiding Instruments

39. 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.

40. 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.

41. 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 National Regulations and ADB Safeguard Requirements

	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	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). 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. 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". 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."	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.	Forest and Nature Conservation Act, 1995; Forest and nature Conservation Rules, Sections 62, 70 and EAA and RECOP relate to this issue. 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.	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 The Vehicle fitness test must be done annually by the vehicle owner. The agency responsible for this is The Road Safety and	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.	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 beimmediately reported to the Department of Culture, Ministry ofHome 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

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

43. **Project Category/Type** - Blue. The development of housing estates and colonies (#40) is listed in the Blue Category and therefore requires an IEE to be submitted to the Competent Authority, in this case the Ministry of Works and Human Settlement. However, as the MOWHS does not have an environmental officer to review the IEE, the IEE will be reviewed by the NEC.[24]

44. **Subproject Location**- The subproject is located within the Dzongkhag, so the following approvals must be sought from the Dzongkhag administration before and during project construction:

(i) Design/development consent/construction approval;
(ii) Approval for any changes in design or structure;
(iii) Approval for location selection (to ensure that buffers are maintained and there are no environmental sensitivity);
(iv) Forest clearance and removal of trees, if applicable to the site; and
(v) Waste disposal (excavation and construction waste).

Table 6: Summary of Relevant Permit Requirements

Act or Regulation	Government Agency/ Competent Authority	Clearance / Permit	Action required
Land Act	National Land Commission Secretariat	Land User Certificate	Request/ Process for Land User Certificate
Environmental Assessment Act 2000 National Environment Protection Act 2007 Regulation for the Environmental Clearance of Projects 2016	National Environment Commission	Environment Clearance	Submission of IEE
Bhutan Building Rules 2017,2018	District Regulatory Officer, Dzongkhag Administration	Construction Permit	Submission of Building application
Forest and Nature Conservation Act, 1995 Forest and Nature Conservation Regulations 2000	Forest Range Office, Nganglam	Tree felling permit, if applicable	Submit application for tree felling
Labour and Employment Act 2007	Ministry of Labour and Human Resources	Foreign worker permit, if applicable	Process for import of foreign workers

[24] NEC website. http://www.nec.gov.bt/necs/wp-content/uploads/2021/03/Project-Categorisation.pdf

Act or Regulation	Government Agency/ Competent Authority	Clearance / Permit	Action required
Waste Prevention and Management Act of Bhutan 2009 Waste Prevention and Management Regulation 2012, 2016	District Environment Officer	Waste disposal permit	Process for approval to dispose waste

45. **Compliance Requirement During Construction and Operation.** The project is located within the Dzongkhag, so the project must comply with the following:

(i) Dzongkhag Yargay Tshogchung (DYT) Chathrim (Act) and Geog Yargay Tshogchung (GYT) Chathrim 2002;
(ii) Standard Operating Procedures which cover procedures to be followed for construction approvals, annual renewal of building occupancy certificate (at a nominal fee), water supply, sewerage connection, and request for sewage vacuum tanker service, (one free service per year for those who have paid all water and sewer charges on time), new road (if any), widening or alignment of existing roads (if any) and land services, taxes and tariffs;
(iii) Disaster and emergency procedures and protocols (such as COVID 19 protocols) as and when issued by the Dzongkhag or relevant ministry; and
(iv) The Applicable regulations and required approvals are as shown in table below.

46. **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

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

48. 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.

49. 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.

50. Following the 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 7, Table 8, Table 9 and Table 10 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 providedin Table 10, Table 11, and Table 12.

Table 7: **Ambient Air Quality Standards**

Parameter	**Averaging Period***	**Bhutan's Ambient Air Quality Standard, 2020**(µg/m^3)**			**WHO Air Quality Guidelines (µg/m^3)**	
					Global Update^ 2021	
		Industrial Area	Mixed Area***	Sensitive Area****		
TSP	Annual	360	140	70	-	
	24-hour	500	200	100	-	
PM_{10}	Annual	120	60	50	15	
	24-hour	200	100	75	45	
$PM_{2.5}$	1-year	40	40	40	5	
	24-hour	60	60	60	15	
SO_2	Annual	80	60	15	-	
	24-hour	120	80	30	40	
	10-minute	-	-	-	-	
NO_2	Annual	80	60	15	10	
	24-hour	120	80	30	25	
	1-hour	-	-	-	-	
O_3	8-hour	100	100	100	100	
CO	8-hour	5,000	2,000	1,000	-	
	1-hour	10,000	4,000	2,000	-	
	24-hour		-		4000	

* 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, June 2020.
*** 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: 2021 WHO Global Air Quality Guidelines

Table 8: 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 9: 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.

51. Table 9 provides the standards for effluent for sewage treatment plant which may be the one applicable standards for any potential discharges (overflows) from septic systems (septictanks 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 10: National Drinking Water Quality Standards, 2016

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

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

Table 11: Workplace emissions standards

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

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

Table 12: 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 13: 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

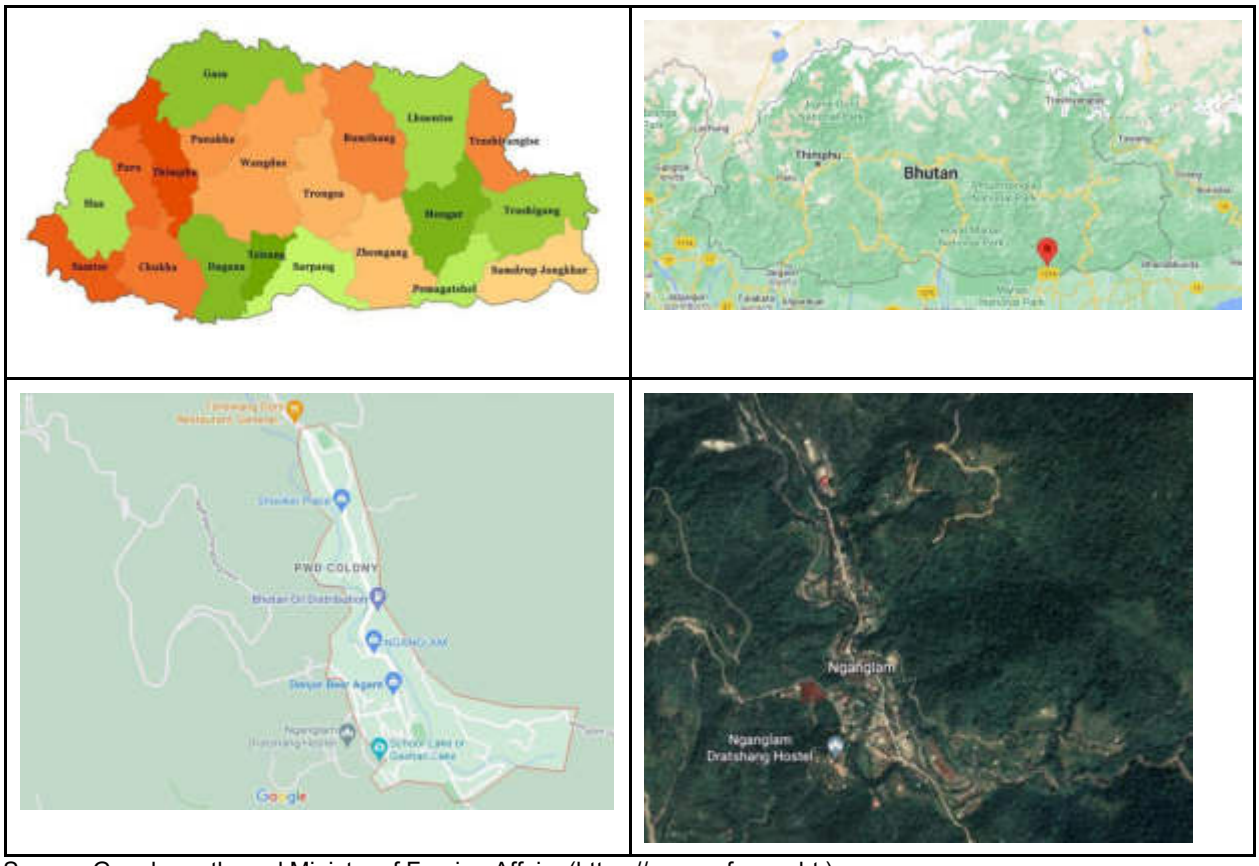
Source: Environmental Standards, National Environment Commission, Royal Government of Bhutan, November 2010.

III. DESCRIPTION OF THE PROJECT

A. Subproject Location and Area

52. The proposed site is located in Nganglam, under Pema Gatshel Dzongkhag (District). See Figure 1. The site is located at the city center (**26°50'19.77"N; 91°14'48.57"E**) at an elevation of 590m. The total site area allocated for the infrastructure work is 2.45 acres (approximately 1.14 hectares) and the Land User Certificate has been issued for the three plots combined (NGI-505; NGI 506; NGI-507) to the NHDCL by the National land Commission (Appendix 4).

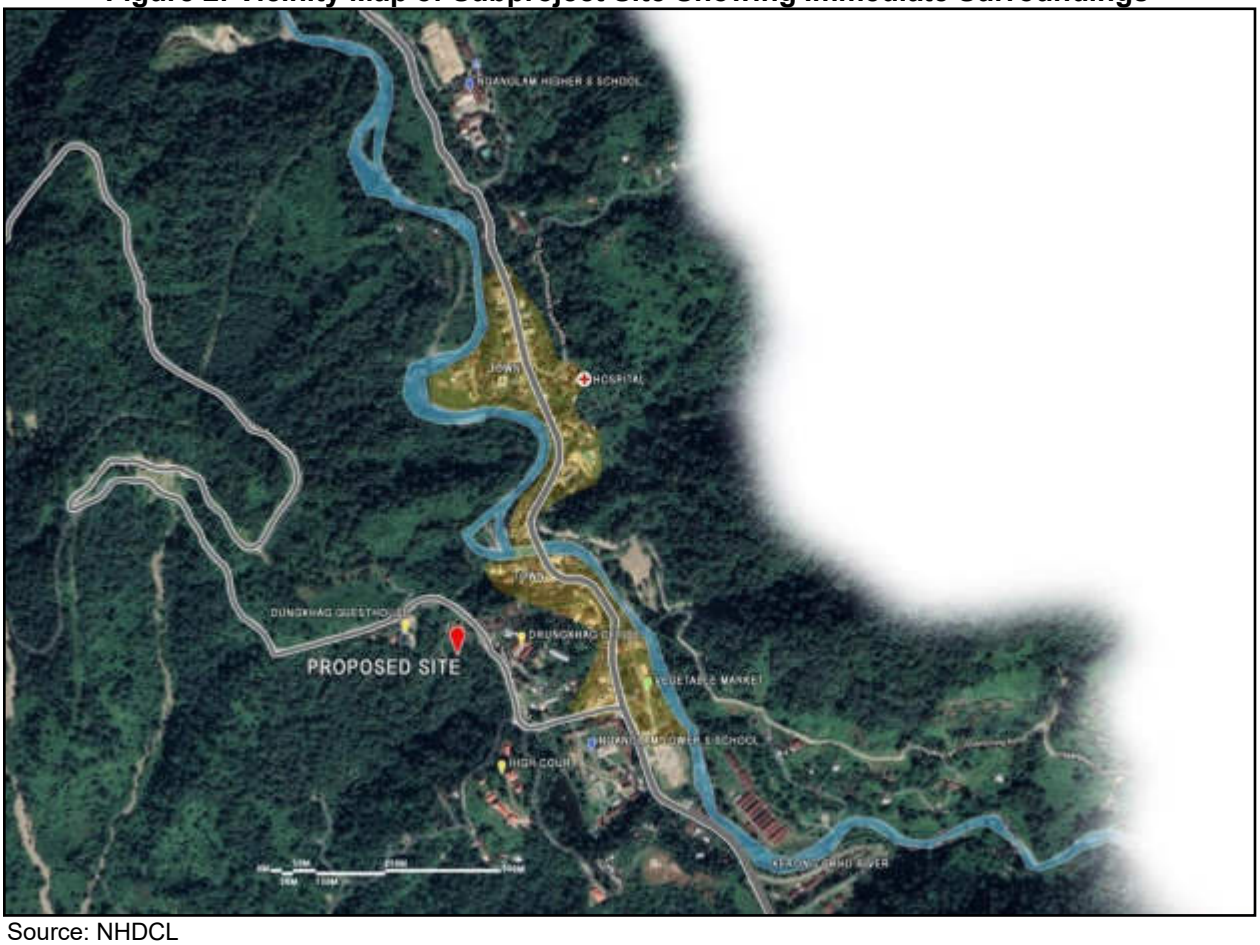
Figure 1: Map of Bhutan with Subproject Location



Source: Google earth, and Ministry of Foreign Affairs (https://www.mfa.gov.bt)

53. The site is accessible from the road which runs to Motanga Industrial Estate via Gypsum Yardand is within 150m of the main street.

Figure 2: Vicinity Map of Subproject Site Showing Immediate Surroundings



Source: NHDCL

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. 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. In Nganglam, there is 249 civil servants, 14 privates and 44 SoE employees. Due to lack of housing facilities in Nganglam, government and corporate employees have been either living in hotel rooms with entire families or paying rents that are comparable to Thimphu rental rates.[25]

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

[25] Public consultation Nganglam 19 May 2022.

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. Within the Municipality, this site has been chosen in addition to one other site, which together are still inadequate to sufficiently provide affordable housing for the target beneficiaries. There are no project alternatives because of the shortage of housing in the municipality. 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 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
(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;[26]

(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 the target number of occupants;

(xi) Avoids areas 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, compliant with land use regulations, and any urban development plans or master plans of the national or local government;

(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 the 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 providers 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. This subproject 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 this subproject, development works involve the construction of 8 blocks of 4 units each totaling 32 units housing apartments with a Service Center on government land. Table 13 provides the details.

[26] US EPA: Questions and Answers About Electric and Magnetic Fields (EMFs).

Table 14: Details of the housing complex

S. No	Sub-project Components	Quantity of Structure	Land coverage in (sq. meters) required by each structure
1	Housing Blocks (Category III & Category IV)	Construction of 8 blocks of 4 units each totaling 32 units housing apartments with a Service Center on government land. The building is of the dimensions: 19.5m x 8.8m for Category III, and 16.9m x 7.13m for Category IV.	1434.25
2	Parking lot	Parking for 27 light vehicles and 10 2-wheelers	397.1
3.	Approach and internal road	Road of total length 0.1866 km with off-take from government road (assured right-of-way) and aligned all within the plot allotted by ADB to NHDC	936.2
4.	Septic tank and soak pit	Septic tank of (6.75m x 2.5) and soak pit (2.5m dia) are located within the demarcated plot registered in NHDC's name.	79.8
5.	Pedestrian footpath	Footpath of total length 0.270 km located within the demarcated plot registered in NHDC's name	290.3
6.	Nature based drainage (bio-swale)	Drainage of a total length of 0.145 km located within the demarcated plot registered in NHDC's name	66.41
7.	Rainwater harvesting tank	Tank of capacity 1000L for each building.	1 tank per building. Total 8 no.
8.	Drinking water tank	Tank of dimensions 4m dia located within the demarcated plot registered in NHDC's name	59.3 (Water Tank Area)
9.	Substation	Substation of dimensions (6m x 6m) located within the demarcated plot registered in NHDC's name	36

Source: NHDCL

1. Building Design

60. The buildings are designed keeping in mind the location within the Local Area Plan and Development control regulation 2016, Building Regulation, 2018 and the Bhutan Building Code, 2018. These set out the requirements which apply to the construction of buildings. These regulations and codes 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:

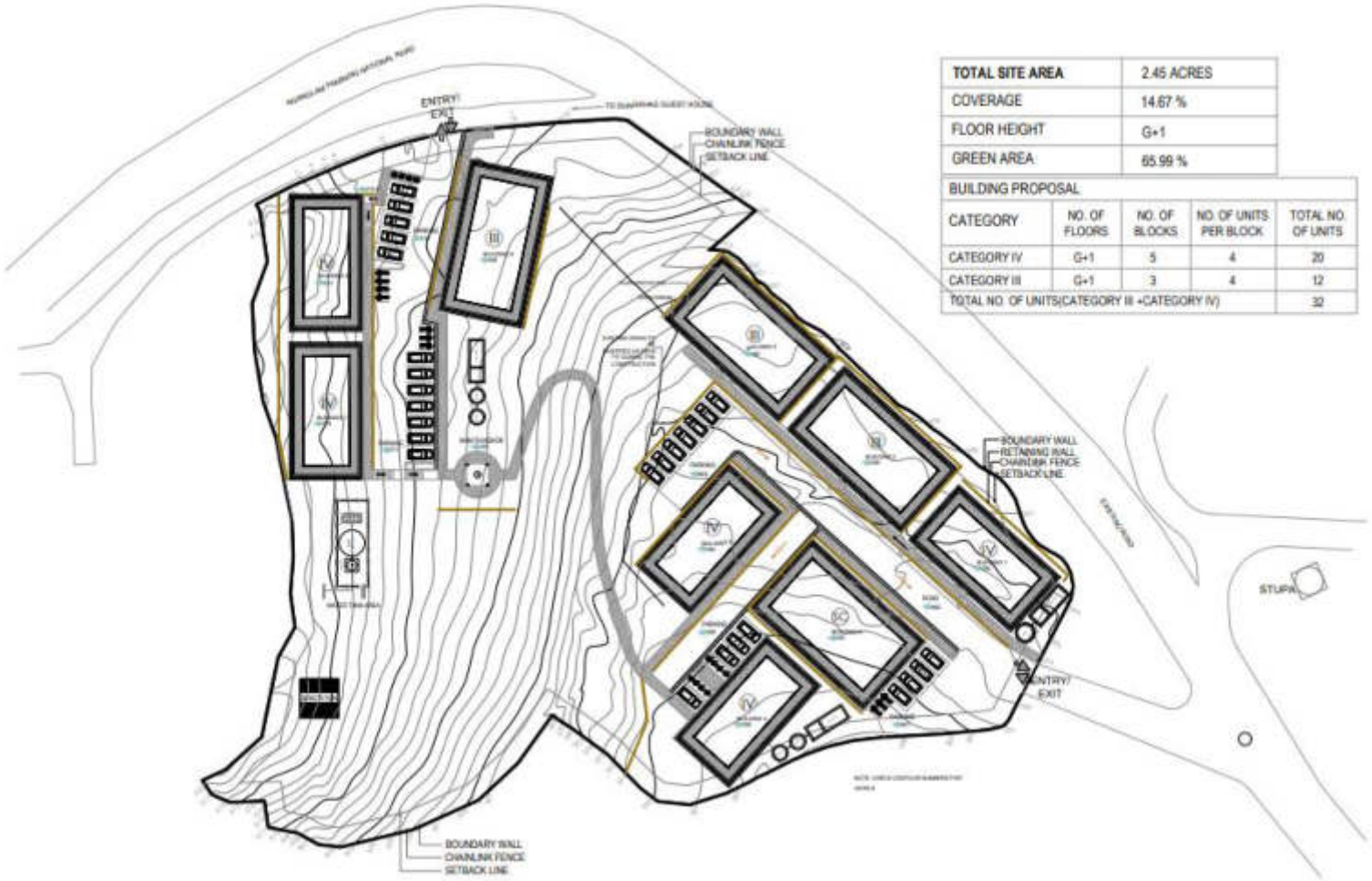
(i) IS 13920_2016 (Ductile Design of Reinforced Concrete Structures);
(ii) SP16 (Design Aids for Reinforced Concrete to IS 456);
(iii) IS 1893 Part 1 - 2016 (Criteria for Earthquake Resistant Design of Structures);
(iv) IS 4326-2013 (Earthquake Resistant Design and Construction of Buildings);
(v) IS 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. 3 units of Category III (Type I) and 5 units of Category IV (Type I) buildings will be constructed. The Category III (Type I) buildings will include 1 Living room, 2 Bedrooms, 2 Toilets, 1 Kitchen and 2 Balconies. Each Unit area will have a Plinth Area(1Floor): 194.18 sq.m (2089.38 sq.ft) and a Unit Area of 85.46 Sq.m (919.60 sq.ft)

64. The Category IV (Type II) building will include 1 Living room, 2 Bedrooms, 2 Toilets, 1 Kitchen and 1 Balcony. Each unit area will have a Plinth Area(1Floor): 129.11 Sq.m (1389.22 Sq.ft), and a Unit Area of 55.08 sq.m (592.70 sq.ft).

Figure 3: The Proposed Layout of the Buildings, Access and Parking

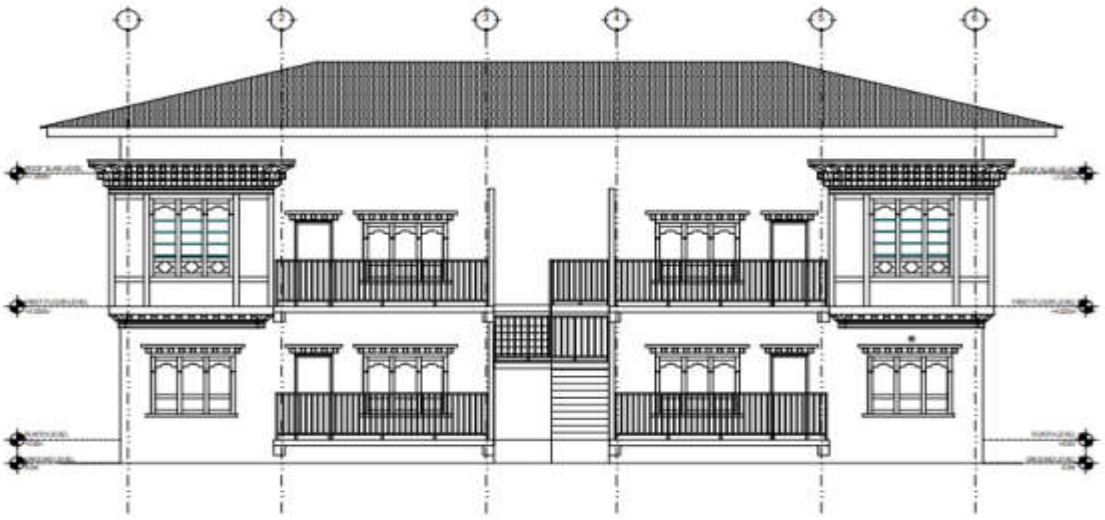


TOTAL SITE AREA	2.45 ACRES
COVERAGE	14.67 %
FLOOR HEIGHT	G+1
GREEN AREA	65.99 %

BUILDING PROPOSAL				
CATEGORY	NO. OF FLOORS	NO. OF BLOCKS	NO. OF UNITS PER BLOCK	TOTAL NO. OF UNITS
CATEGORY IV	G+1	5	4	20
CATEGORY III	G+1	3	4	12
TOTAL NO. OF UNITS(CATEGORY III +CATEGORY IV)				32

Figure 4: External Façade or Building Sections

Category III (Type I) building



Category IV (Type I) building

Figure 5a: Layout Plan

Features:
- 1 Living room
- 2 Bedrooms
- 2 Toilets
- 1 Kitchen
- 2 Balcony

Plinth Area(1Floor): 194.18 sq.m (2089.38 sq.ft)
Unit Area: 85.46 Sq.m (919.60 sq.ft)
Rent: 919.60 x 5.14 = Nu. 4,727/-
12units

Figure 5b: Layout Plan

CATEGORY IV- TYPE-1

Features:
- 1 Living room
- 2 Bedrooms
- 2 Toilets
- 1 Kitchen
- 1 Balcony

Plinth Area(1Floor): 129.11 Sq.m (1389.22 Sq.ft)
Unit Area: 55.08 sq.m (592.70 sq.ft)
Rent: 592.70x 5.14 = Nu. 3,047/-
20 units

65. **Site preparation works**. This will include site clearance, tree felling and handing over of the site to the Contractor.

66. **Design Capacity**. For this housing development, the design assumes five persons to reside in each unit, which translates to about 160 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.

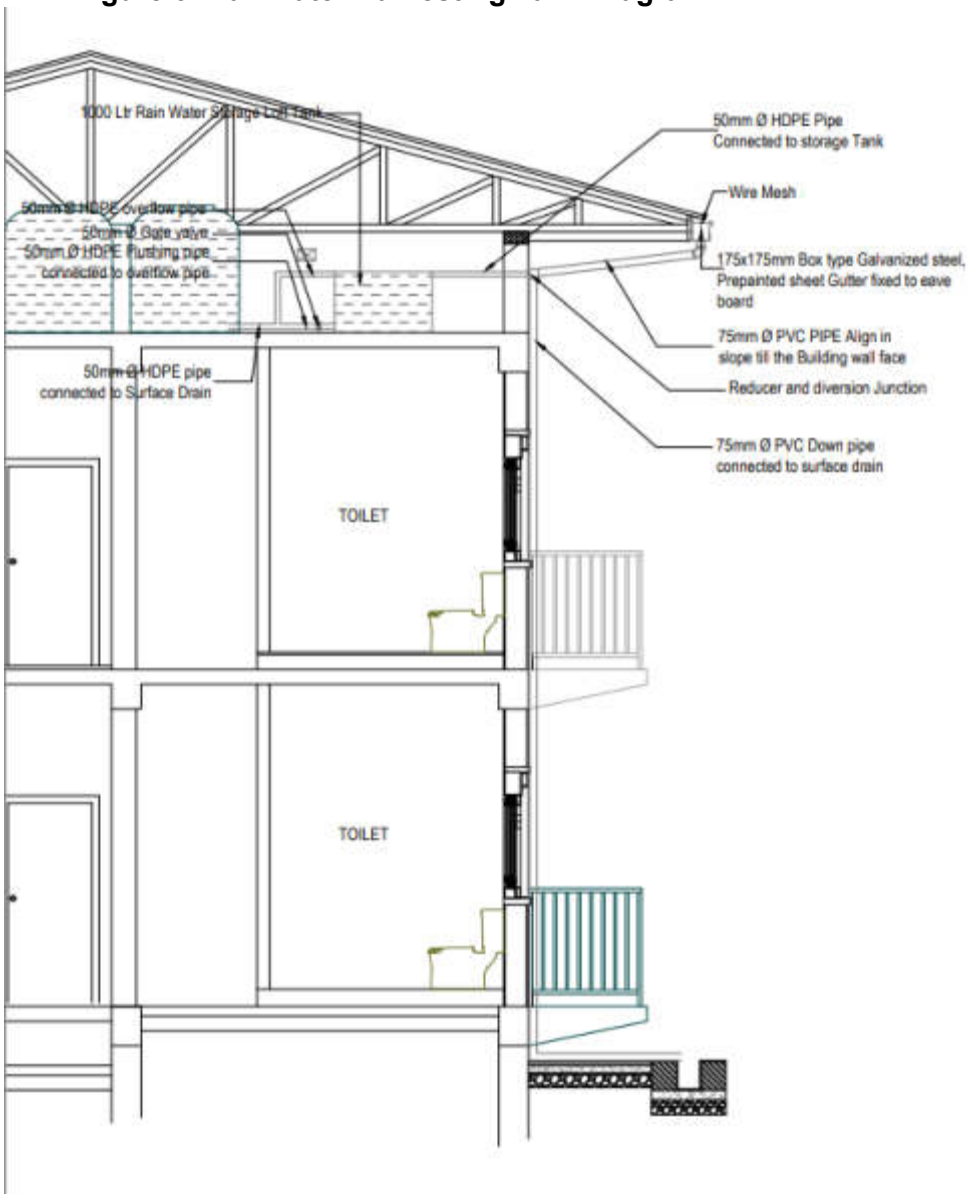
67. **Water supply details**. The supply of water for the housing complex will be from municipality through the existing water supply line in the area. The municipality is responsible for ensuring regular supply of water to all buildings within the locality. The design assumes five persons to reside in each unit in the larger category apartments, and three to reside in the single bedroom apartment, which translates to about 160 total residents in this housing complex. Estimating that on average each person will consume about 100 liters of water per day, the daily water requirement is calculated at 16,000 liters per day. To provide for this, 59.3 sq.m water storage tank will be built at the western side of the site, and each building will be provided with 2 no. of 1000L storage tank, which will ensure sufficient water for the entire housing colony.

Table 15: Daily Water Requirement Calculation

Building	Total Number of Units	Number of Persons	Water Consumption
Category III (Type 1) Category IV (Type 1)	32	32 units x 5 persons/unit = 160 persons	160 persons x 100 liters/person = 16,000 liters
Total for Residential Buildings			16,000 liters

68. **Rainwater harvesting**. To further supplement the water storage tanks, a 1,000-liter rainwater storage tank will also be installed on the roof slab level of each building. The Figure below shows the rainwater harvesting tank details.

Figure 6: Rainwater Harvesting Tank Diagram



69. **Electrical power supply**. Although the existing buildings adjacent the site are already connected to the power supply, due to the substantial increase in number of apartments, this will not suffice. The NDHCL will outsource the design and technical requirements for this to the Bhutan Power Corporation that will assess the electrical requirements, provide the technical specifications and install the substation and required distribution lines. The cost of this will be borne by NHDCL.

70. **Septic tank and soak pits**. The **Dungkhag** does not have a central sewerage system. Therefore, 3 septic tanks have been included in the design that will serve the whole facility. Each tank will have dimension of 6.75m length x 2.5m width x 1.8m depth. Each tank will be connected to a corresponding soak pit with diameter of 2.5m.

71. 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.

Figure 7: Schematic Diagram (Top Section and Cross Section) of Septic Tank and Soak Pit

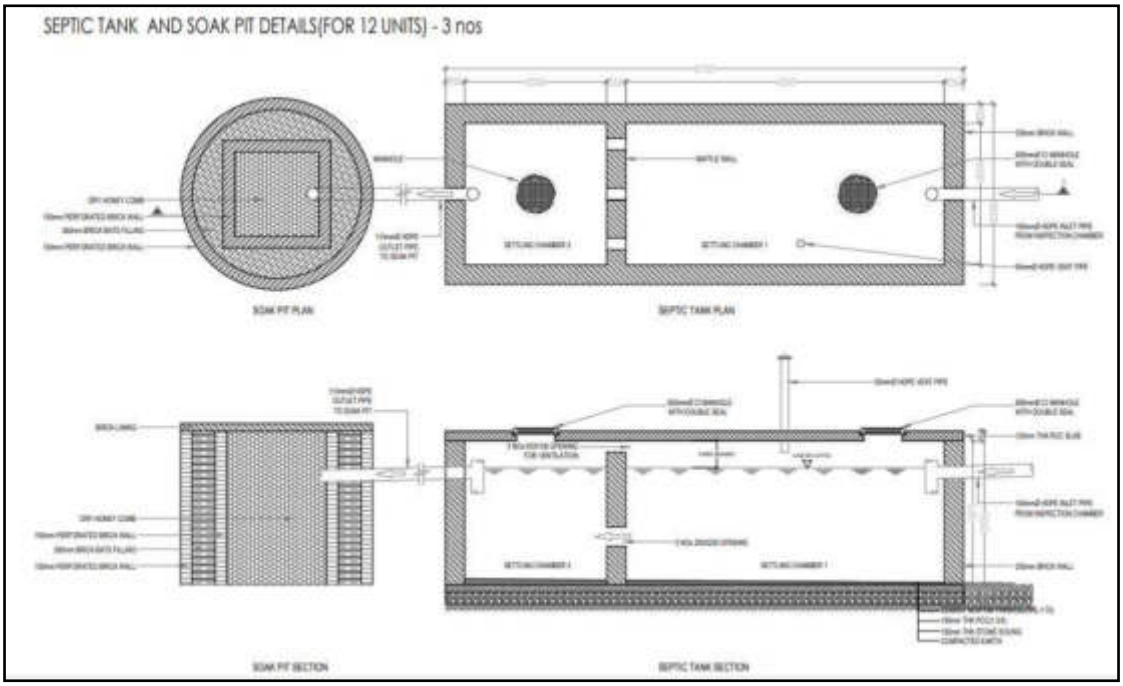


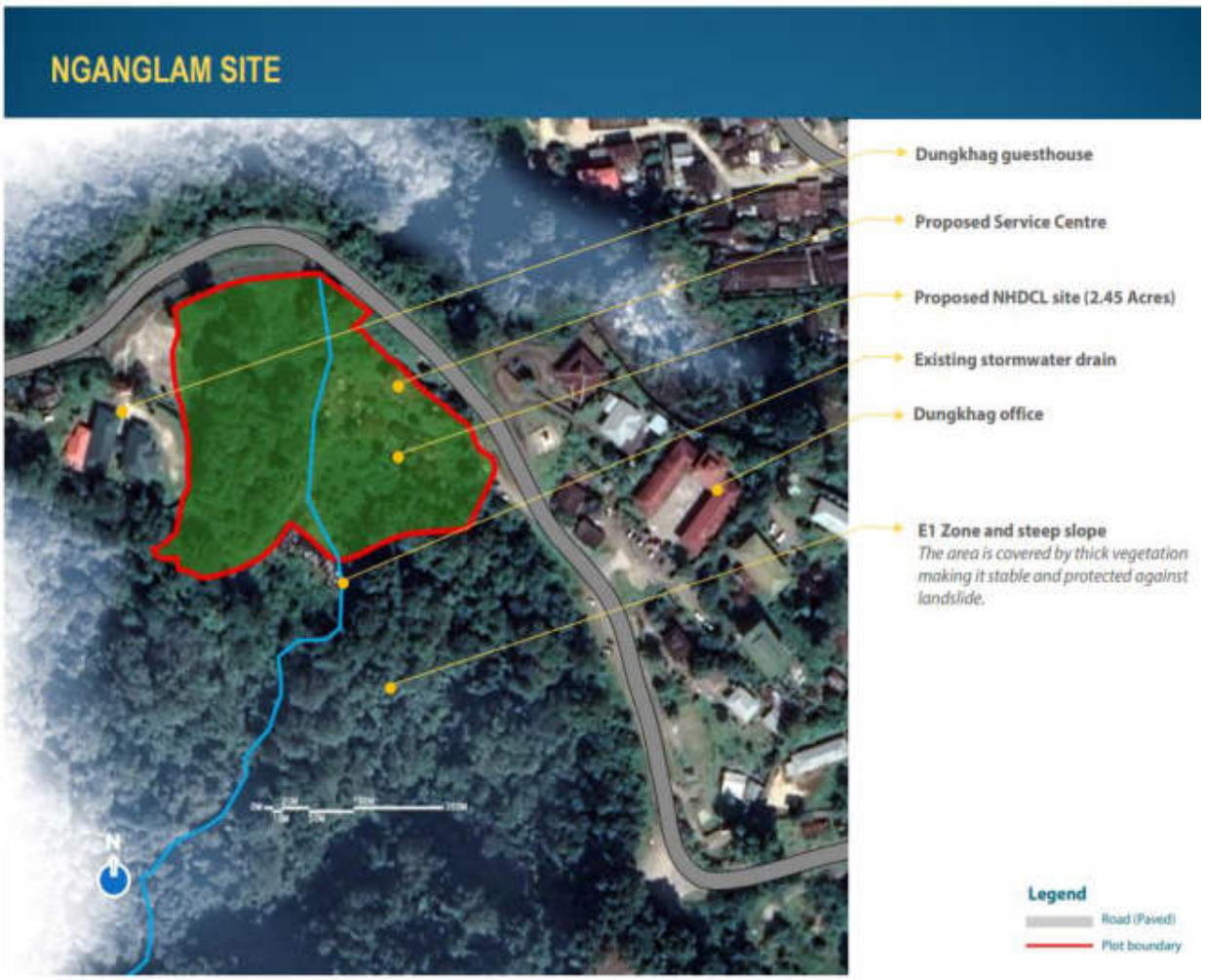
Table 16: Design Data for Septic Tank

Design Data / Parameters	Remarks
Average number of persons per unit	5 for 2 bedroom
Total number of persons	160
Septic tank will receive both WC waste and Sullage	Yes
Volume of sewage entering the tank daily	13 608 liters
Ambient temperature in water	20 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	121.5 liters
Sizing factor	1.15

Design Data / Parameters	Remarks
Sludge and scum accumulation rate/person/year	40 liters
Volume of sludge and scum	10,304 liters
Required tank volume	23,912 Liter
Plan area of tank	11.96 m^2

72. **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 WC outlets; manholes; and 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 secondary storm water drain of 450mm wide and the secondary storm water drain runs N-S through the site. The facility design will ensure that this natural drainagewill not be obstructed or throughput reduced. Instead, this drainage will be reinforced as part of the subproject design, and ensure no flooding occurs during the operation phase (or when the housing facility is occupied and used).

Figure 8: Natural Storm Water Canal/Drainage at the Site



73. **Site accessibility, entry, exit and internal roads**. The proposed main access to the site is from the existing road to the RBP colony. There will be only one entry and exit for the site. On the site, the parking is designed to accommodate 27 light vehicles and 10 two-wheelers. From the main parking lot, internal roads to connect each building will also be accessible through the pedestrian staircase from the Parking. The housing complex will have a boundary wall with chain link fencing.

Figure 9a: Road, Footpath and Drain Crossing Details

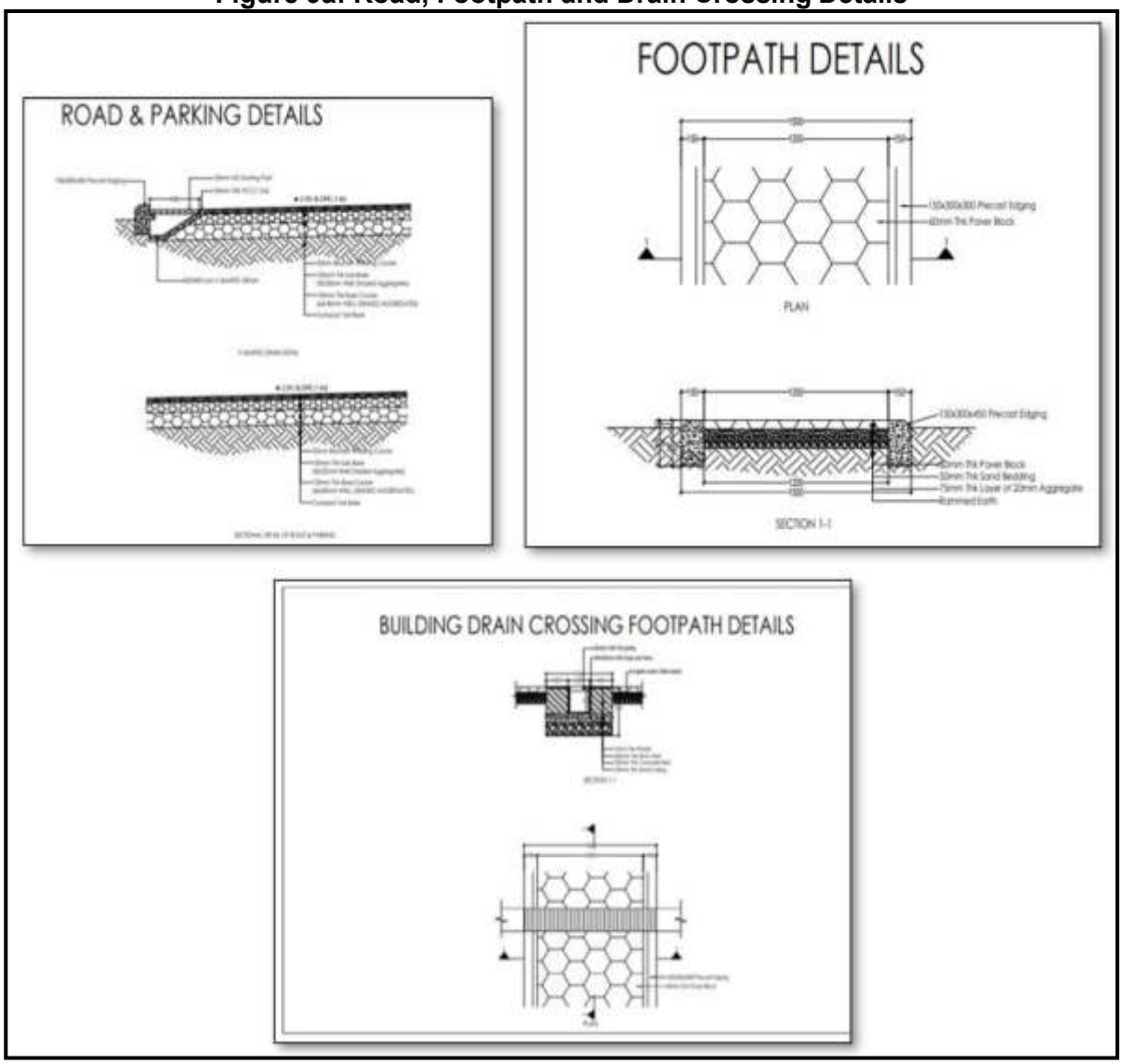
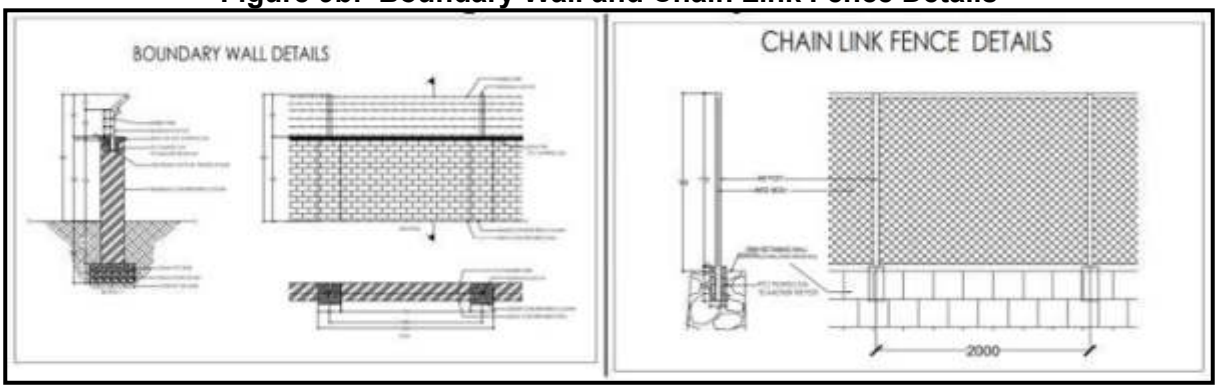


Figure 9b: Boundary Wall and Chain Link Fence Details



Building Construction Materials and Construction Technology

74. **Building construction materials.** Building materials to be used include (i) steel for footing, columns, beams and slab; (ii) Random Rubble Masonry (RRM) wall for foundation; (iii) hard stones for stone filling; (iv) cement, sand, and graded crushed rock for concrete works; (v) Aerated Autoclaved Concrete blocks (AAC) for walls; (vi) timbers for door and window frames; (vii) tiles for flooring; (viii) Unplasticized Polyvinyl Chloride (UPVC) for windows; (ix) mild steel for railings; (x) steel tubular truss; and (xi) Pre-Painted Galvanized Iron (PPGI) sheet for roofing. For toilets and drainage, materials to be used include (i) Chlorinated Polyvinyl Chloride (CPVC) pipes; (ii) HDPE Pipe; (iii) Indian-type vitreous water closet squatting pan; and (iv) European-type vitreous water closet pedestal for plumbing and sanitary works.

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

76. **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.

77. **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%). As the site is on far from the river and at a higher elevation there is no flood risk. However, the western side of the site is on a slope and therefore has some landslide risk. A hazard assessment/geotechnical study by a geotechnical consulting firm has been conducted as part of project preparation and design. The study assessed geohazards including soil liquefaction, flood and landslide hazards and the findings of the study are presented in this report, and the recommendations incorporated in the preliminary design (See Chapter V and Appendix 14).

78. **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 is 22.5m.

79. Each building will be provided with a fire dry hydrant that will be utilized when the fire engines are mobilized from the Dungkhag during a fire emergency. A Hose pipe will be stored in the staircase landing area of the selected building.

80. **Solid Waste Management**. Waste is collected by a municipality twice a week (Monday and Thurdsay). There will be no need for additional structures for waste management. Individual residential units will keep and hold their wastes within their respective households using

appropriate waste bags or bins, until waste collection comes on two designated days as mentioned. All waste is transported to the landfill site, which is located at Yangkholom about 10km away. This landfill site will also be used to dispose construction waste (after segregation of recyclable, reusable and hazardous waste), as per the discussion with the Dungkhag[27]unless otherwise instructed by the Dungkhag. Also, mass cleaning is carried out within the dungkhag on the 2nd and 9th of each month within the town area and the industrial area respectively.

81. **Green area and landscaping**. 66% of the land will be left as a green area. 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 the periphery of the site will be planted with local species.

82. **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

83. Site surveys and preliminary designs have been completed and once the final approvals are 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				
		1-2	3-4	4-6	6-32	33-39
1	Approval of architectural drawings					
2	Preparation of BOQ					
3	Advertisement, selection and contract award					
4	Establishment of PIU and supervision team					
5	Site development works (3 months)					
6	Construction (24 months)					
7	Post development works (6 months)					

F. Resource Utilization

84. The construction of the buildings will require a significant number of resources. With the design process still ongoing, the total required amount of each resource is yet to be quantified. In

[27] Meeting with Dungkhag Authorities on 20th May, 2022

general, however, the major construction materials required include boulders, aggregates, sand, cement, aerated autoclaved concrete blocks, TMT bars, brick, glass, tubular steel and timber. Most of the materials will be sourced from local authorized suppliers within the country wherever possible.

Table 18: Material quantities

	Description	Unit	Quantity
1	Concrete brick block	Tonne	5.92
2	Boulder	Cum	1418.24
3	Aggregates 40-20mm	Cum	43.55
4	Aggregates 20- 6mm	Cum	64.35
5	Cement	Tonne	878.22
6	Sand	Cum	1362.38
7	100mm KerbStone	Sqm	0.85
8	Angles, Flats & Plates	Kg	16098.56
9	Paver Block	Sqm	102.10
10	TMT Bars	kg	166166.39
11	Red Brick	No.	11.76
12	Ballis	Mtr.	13142.49
13	Timber	Cum	98.31
14	CGI Sheet	Tonne	7.16
15	Cement Bonded Particle board	Sqm	27.69
16	40mm & 50mm Tubular Steel	Mtr.	3469.32
17	Crushed rock	Cum	1583.76
18	Aerated autoclaved concrete blocks	No.	744.00
19	fiber-reinforced plastic for window frames and cornices	Mtr.	266.96
20	Checkered Tiles -25mm in Sqm	No.	-
21	Tiles	kg	3792.00
22	Chlorinated Polyvinyl Chloride (CPVC)	Mtr.	1617.20

	pipelines - 25mm		
23	H.D.P.E Pipe (160mm)	Mtr.	81.33
24	G.I barbed Wire in Mtr.	Mtr.	808.30
25	G.I chain-link mesh in Sqm	Mtr.	199.54

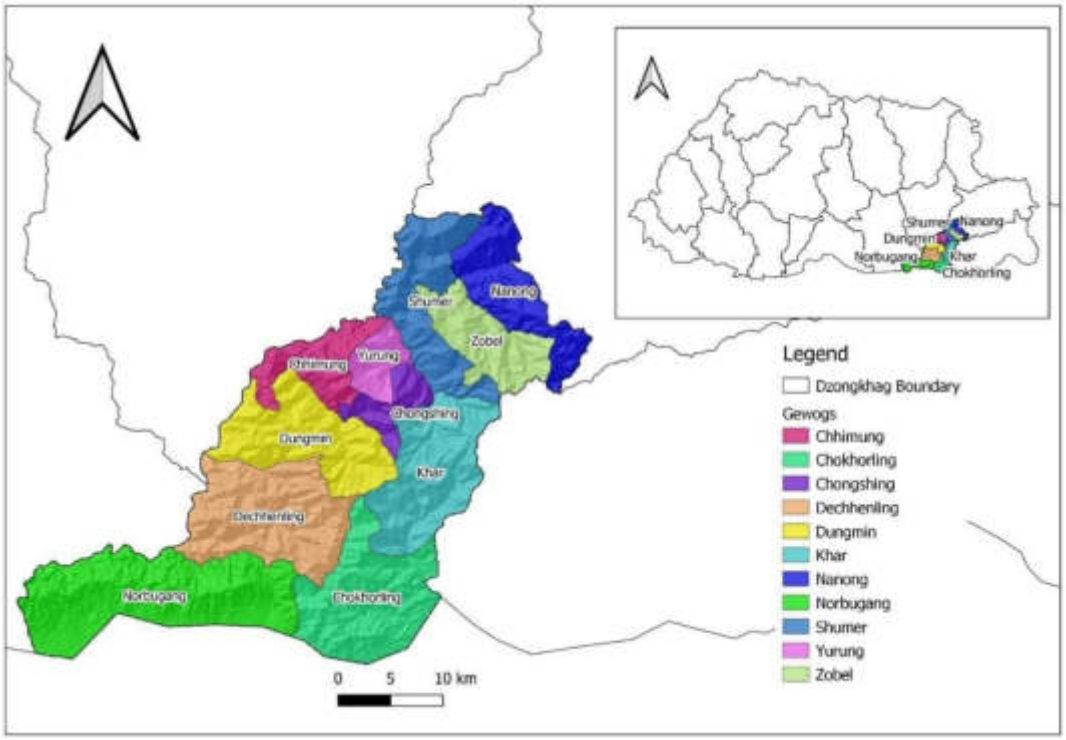
85. Approved construction materials will be sourced from local Bhutanese manufacturers and suppliers.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Baseline information

86. The subproject will be implemented in Norbugang gewog under Ngalam Dungkhag ni Pema Gatshel Dzongkhag. The Dzongkhag is 1023 km^2 in size with an elevations ranging from 1000 to 3500 meters above sea level (masl). The district is bordered on the north and northeast by the dzongkhag of Trashigang, on the north and north-west by Mongar, on the south by Zhemgang and the Indian state of Assam, and on the east by Samdrup Jongkhar[28]. The district is made up of 11 gewogs: Chongshing, Chimung, Choekhorling, Dechheling, Dungmin, Khar, Nanong, Norbugang, Shumar, Zobel, and Yurung, as well as one dungkhag, the Nganglam, which assists the Dzongkhag administration[29].

Figure 10: Map Showing Project Dzongkhag and its Gewogs



Source: Google and NHDCL office and Samdrup Jongkhar Dzongkhag website http://www.samdrupjongkhar.gov.bt

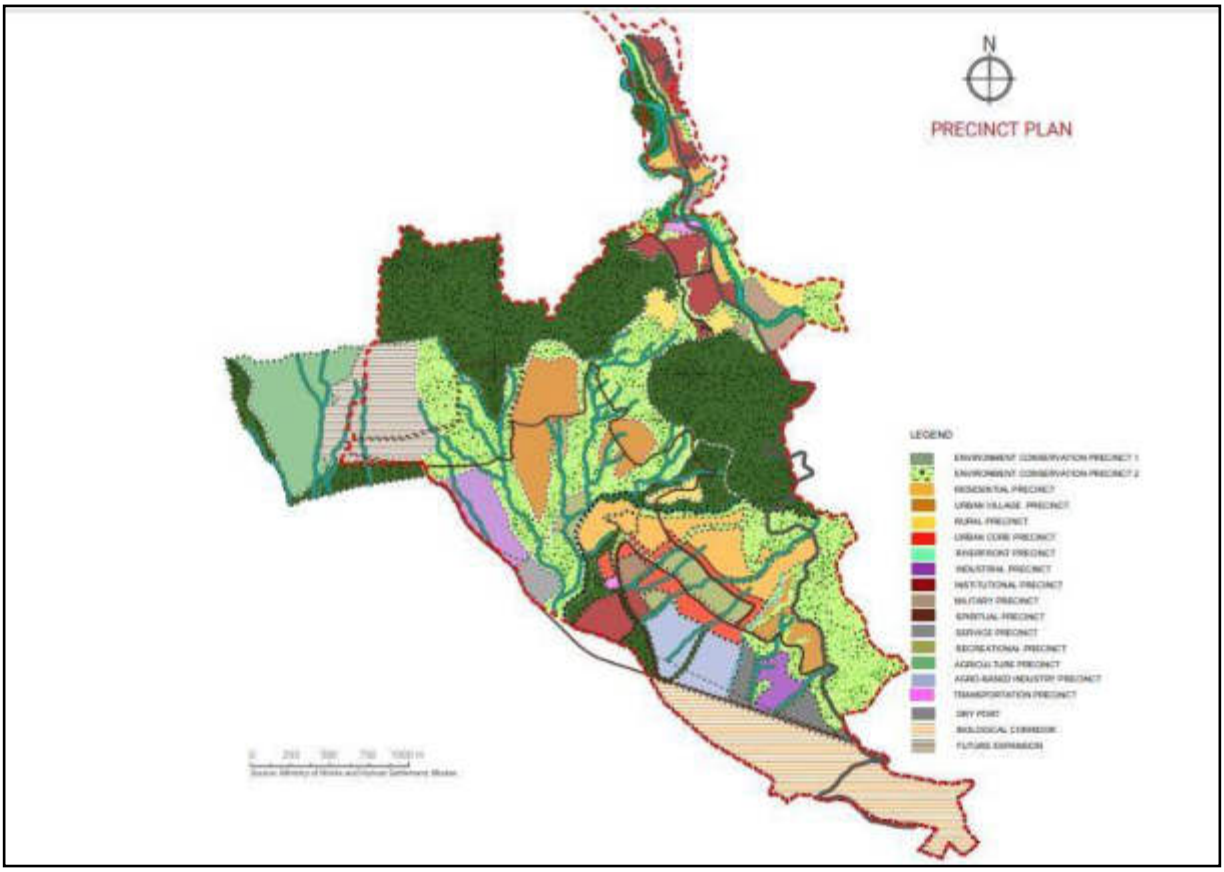
[28] http://www.mowhs.gov.bt/wp-content/uploads/2018/01/Report-on-Nganglam-Regional-Hub-Development-Plan-2.pdf

[29] https://www.gnhc.gov.bt/en/wp-content/uploads/2017/05/Pemagatshel.pdf

87. The site lies within the Nganglam Urban Area in areas designated as Urban Village Core High Density Residential precinct (UV-2) wherein residential structures such as the subproject could be built and wherein other permissible non-residential uses are also allowed.

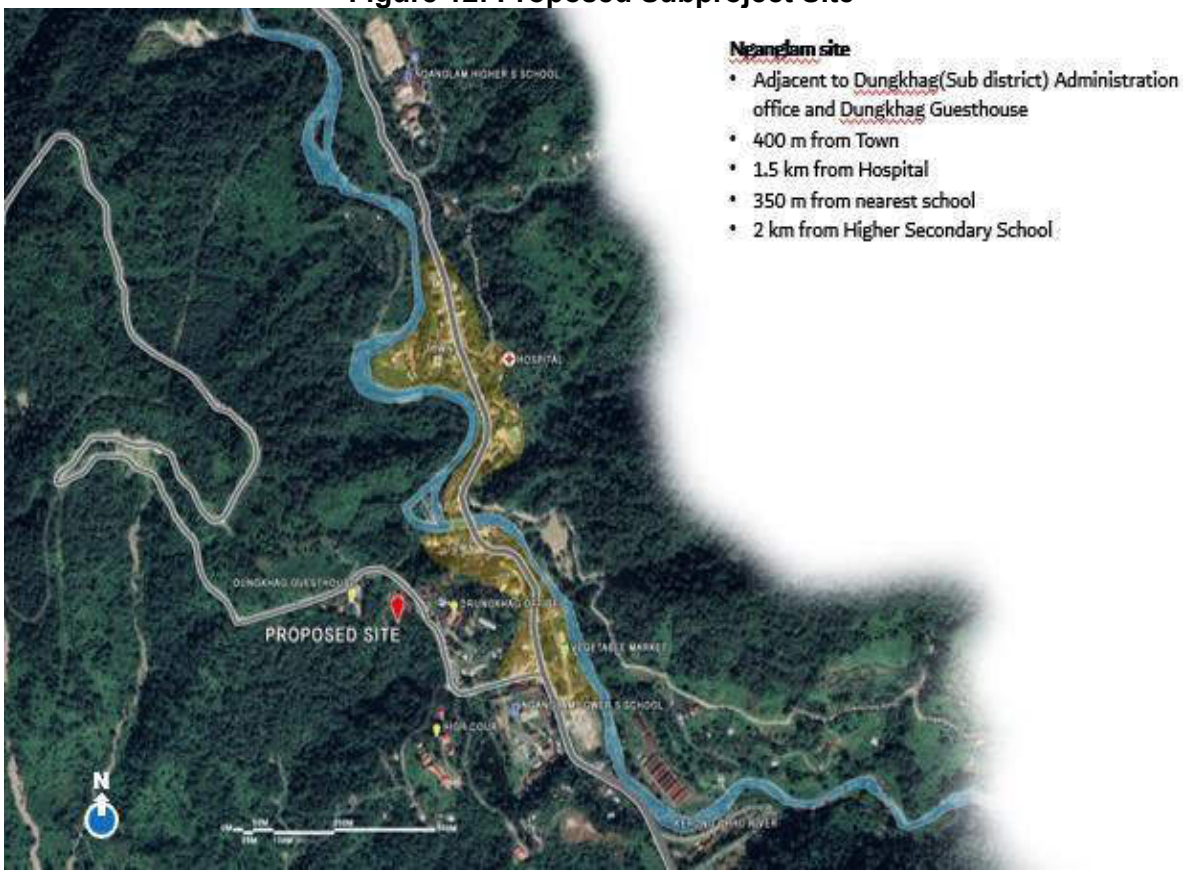
88. The center plot of the site falls on Environment-1 precinct and therefore has been left as green space. An Environment-1 precinct is any area under natural streams, waterways and hillsides with more than 30% (i.e., 1 in 3) slopes where existing structures can be retained and further development shall not be permitted. The subproject design ensures that this requirement is complied with.

Figure 11: Delineation of the Local Area boundary



89. The site is accessible from the Nganglam to Panbang highway.

Figure 12: Proposed Subproject Site



Source: NHDCL

B. Subproject Influence Area

90. 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 13: Access to the Site

Figure 14: Nganglam town

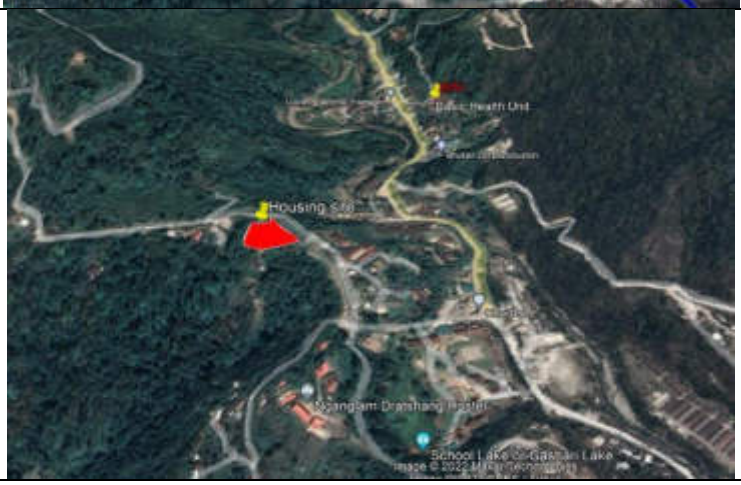
91. The photos below show immediate receptors on the four boundaries (North, South, East and West).

Figure 15: Visualization of Boundaries

North	East
	
South	**West**
	

92. The hospital is located about 400m from town, 1.5km away and the nearest school is about 300m away from the site. The site is also at an aerial distance to Dungkhag Chorten (0.03Km), Troema Lhakhang (0.30. Km), and Nganglam Dratshang (0.301 Km). The closest river is the Kerong river that lies on the other side of the hill about 200m downslope.

Table 19: Distances of Receptors Around the Subproject Site

Physical Cultural Resource-100m	
Closest river- 200m	
Location of Hospital from the site- 0.5km	

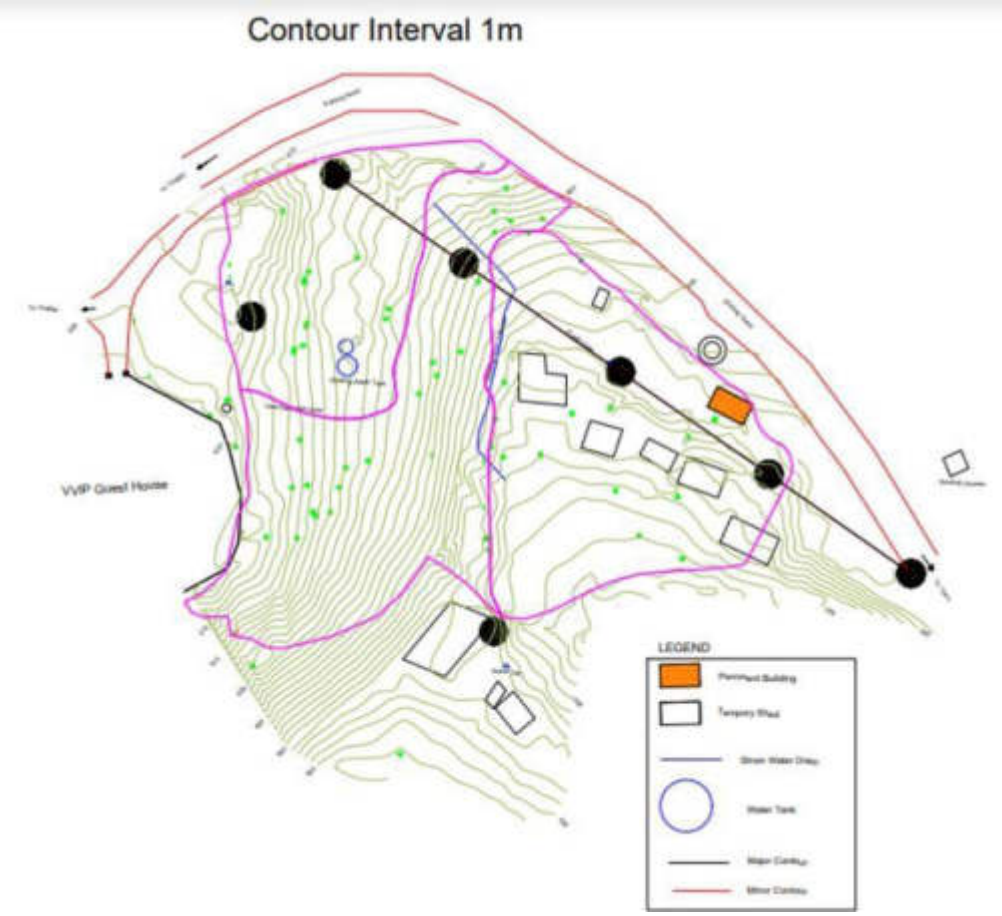
Location of the school from the site - Nganglam Lower Secondary School (0.32 Km) and Nganglam Higher Secondary School (1.1 Km)	

C. Land Environment

93. **Land Use, Topography and soil.** The elevation of Pema Gatshel Dzongkhag extends from 1000 to 3,500 masl, while Nganglam Dungkhag is between 200 and 1,600 masl. Around 87.65% of the district's total area is covered by forest, which is primarily made up of coniferous and broadleaf species. The geology and soil characteristics of the Pema Gatshel district are naturally unstable[1], with sleep slopes and narrow valleys that limit the district's future growth due to natural constraints[30]. At the subproject location, the site is covered with natural vegetations (shrubs, small- and medium-size trees, grasses) and bounded by varying slopes. The site has varying slopes – gradual gradients on some sections and relatively steeper on some other sections due to natural land formations like small ridges or drainages. Figure below shows the contour map at the site.

[30] Report on Community level Water Resources Pema Gtashel Dzongkhag NECS. www.nec.gov.bt

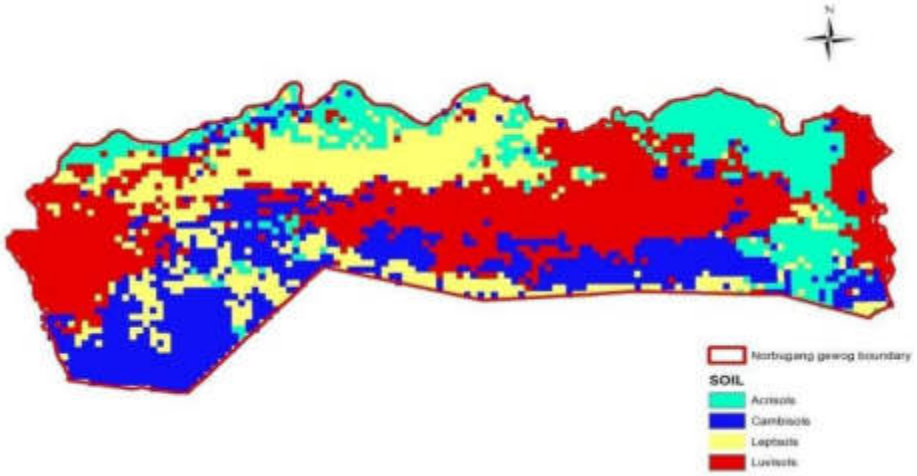
Figure 16: Contour Map of Site



Source: Subproject Document (PMU)

94. The soil map of Bhutan prepared by FAO and ISRIC (International Soil Reference and Information Centre) at the scale of 250m grid is shown in the Figure below. There are four types of soil found in Pema Gatshel Dzongkhag; Leptosols, Cambisols, Luvisols and Fluvisols. The primary soil found at the Cambisols.

Figure 17. Soils Map of Norbugang Gewog



Source: National Soils Services Center, DOA

95. **Geology.** Pema Gatshel is separated into two geological zones: I the sub Himalayan zone, which has loose Siwalik foothills material that erodes readily, resulting in soil that is rocky and sand-like in texture, and (ii) the lesser Himalayan zone, which has well-developed soils[31]. Pema Gatshel dzongkhag is covered by two geological formations: the Lower member of the Siwalik Group (Miocene-Pliocene) and the Manas Formation (Neoproterozoic-Cambrian [?]) of Buxa Group, which are described as follows:

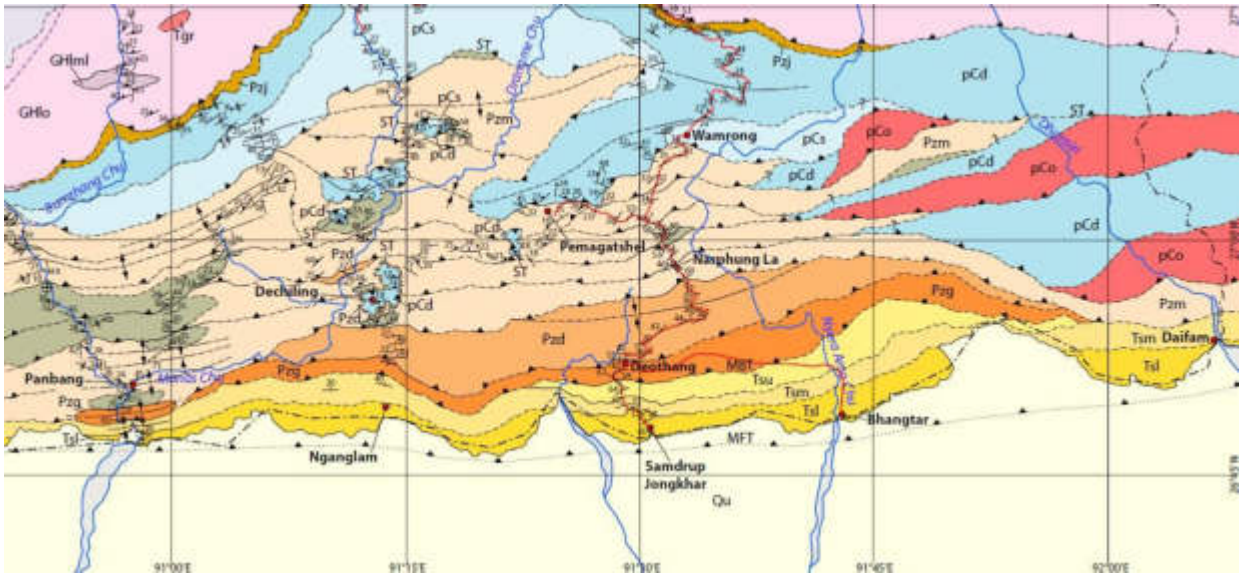
a. Lower member (Tsl) – Gray to green, massive-weathering siltstone and shale, interbedded with tan to gray, fine-grained, lithic-rich sandstone. 2,900 m-thick near Samdrup Jongkhar (Long et al., 2011A).

b. Manas Formation*** (Neoproterozoic-Cambrian [?]) (Pzm & dolo)- Gray to white, medium- to thick-bedded, medium- to coarse-grained, locally conglomeratic quartzite exhibiting common trough cross-bedding, interbedded with dark-gray to dark-green, thin bedded to thinly-laminated phyllite, and medium-gray dolo stone (locally divided out) (Bhargava, 1995; Tangri, 1995a; Long et al., 2011A). Intra formational thrust faults indicate structural repetition of multiple, 1.5 to 2.8 km-thick thrust sheets (Long et al., 2011B). Lower green schist facies (Gansser, 1983)[32].

[31] Geological & Subsoil Investigation Report: SASEC Road Connectivity Project, https://edepot.wur.nl/481432

[32] http://www.pitt.edu/~nmcq/Long_etal_2011_JOM_Bhutan_Map_1-500k.pdf

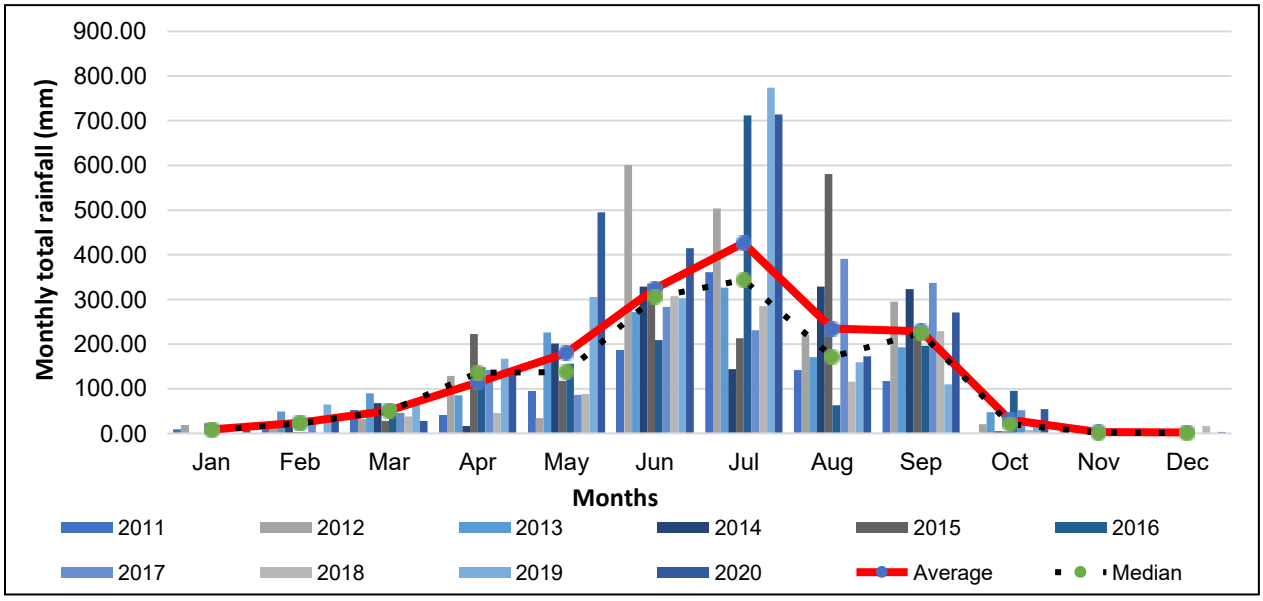
Figure 18. Geological Map



D. Climate

96. Pema Gatshel has a moderate and temperate climate. Summers get significantly more rainfall than winters. This climate is classified as Subtropical highland climate or Monsoon-influenced temperate oceanic climate (Cwb) according to Köppen and Geiger[33]. The agro meteorology station of Pema Gatshel is located at an altitude of 1618 masl and at latitude: 27.03, and longitude: 91.42[34]. The rainfall pattern of the district is shown in 8; it shows the monthly total rainfall from 2011 to 2020. The month of July in the year 2019 received the highest monthly total rainfall, a rainfall of 774.50 mm whereas some winter months such as November, December and January received little to no rainfall. The highest daily rainfall recorded in Pema Gatshel, from 2014 – 2020, was on 21st May 2020, a rainfall of 187 mm.

Figure 19: Monthly total rainfall in Pema Gatshel (2011 – 2020)

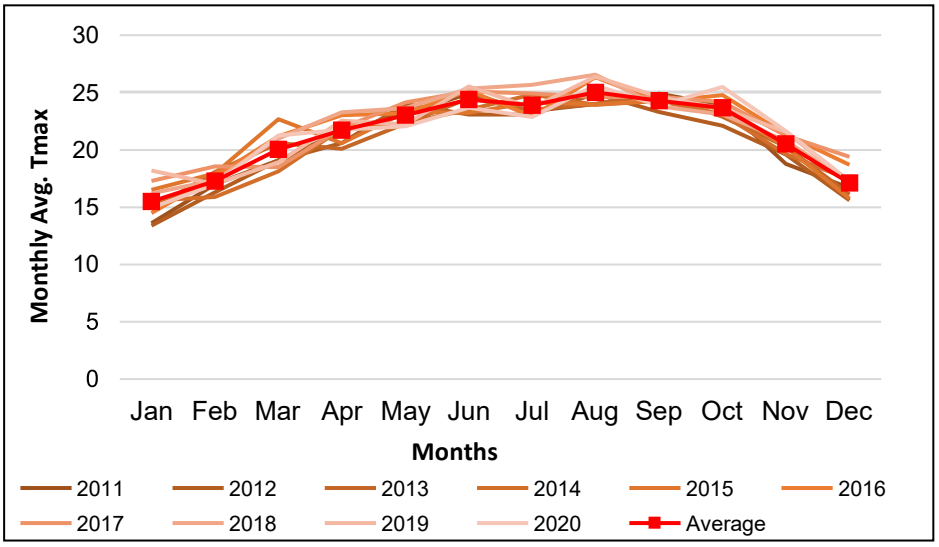


Source for Rainfall Data: National Center of Hydrology and Meteorology (NCHM)

97. Figure 20 shows the monthly average maximum temperature in Pema Gatshel from 2011 - 2020. The hottest month is July and August all across the country, while the cold months are January, February, November, and December. The highest monthly average temperature was noted in the month of August, a temperature of 25°C while the lowest monthly average maximum temperature was noted in January, a temperature of 15.5°C. The highest daily maximum temperature in Pema Gatshel was recorded on 18th August 2018 with 32°C.

[33] Climate–data.org, https://en.climate-data.org/asia/bhutan/pema gatshel-district/pemagatsel-970074/
[34] Climate Data Book 2018, https://www.nchm.gov.bt/

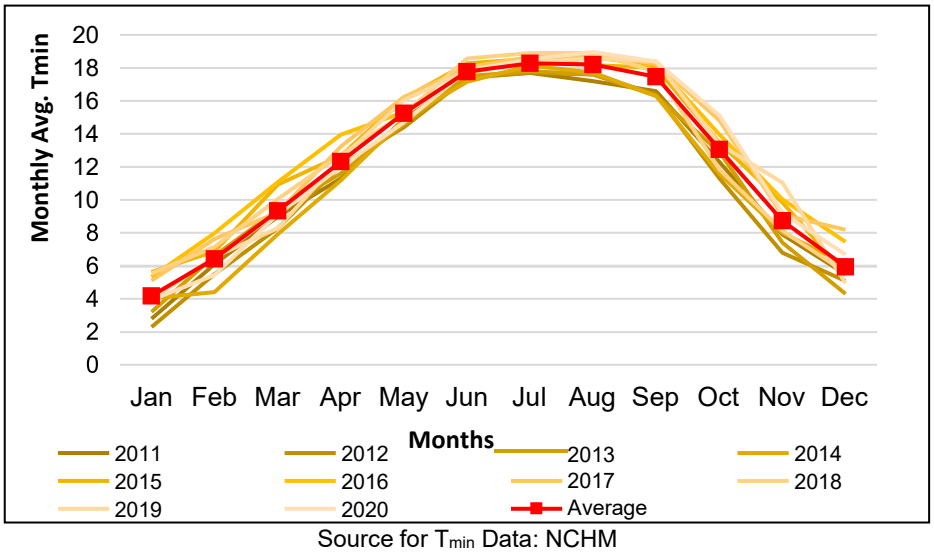
Figure 20: Monthly average maximum temperature in Pema Gatshel



Source for T_{max} Data: NCHM

98. The monthly average minimum temperature of Pema Gatshel from 2011 to 2020 is shown in 10. The monthly average minimum temperature of Pema Gatshel was recorded in January, a temperature of 4.2◦C while the highest average minimum temperature was noted in July with an average temperature of 18.3◦C. The lowest daily temperature experienced in PemaGatshel was a temperature of 1◦C.

Figure 21: Monthly average minimum temperature in Pema Gatshel



Source for T_{min} Data: NCHM

99. **Ambient Air Quality**. With its high level of forest cover, the air quality in general is expected to be good for most of Pema Gatshel. At the national level, apart from Thimphu, Phuentsholing and Deothang, there are no air quality monitoring stations in other parts of the country. The air quality of Nganglam is reported to be compromised/affected by the industrial activity and the heavy traffic. Nearly 200 trucks ply back and forth to the factories and mines and

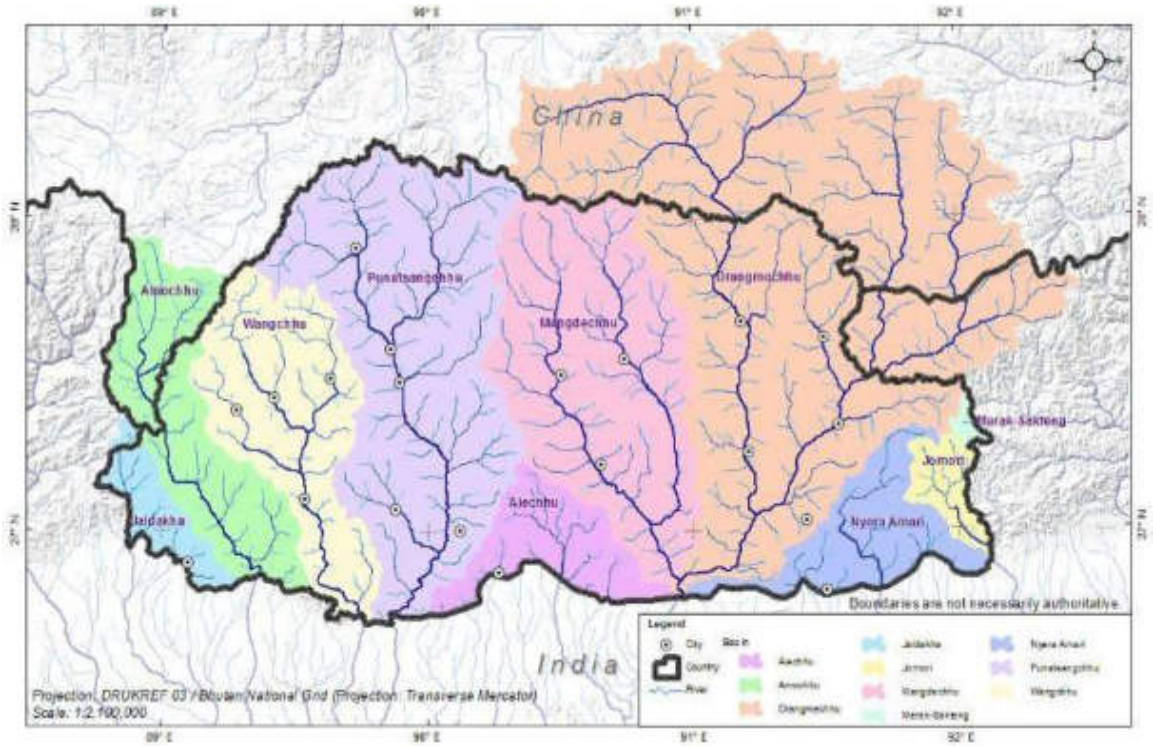
this has reported to be contributing to crop failure and respiratory diseases. The latter is one of the highest diseases reported in the BHU [35]

100. Site-specific ambient air quality will be obtained by the contractor prior to the construction phase to provide baseline data for reference during the monitoring activities.

E. Water Environment

101. Bhutan has an extensive river system that is generally distinguished by main rivers flowing north to south, with tributaries flowing in an east-westerly direction. There are four major river basin management systems: Wangchhu, Punatshangchhu, Mangdechhu, and the Drangmechhu. Pema Gatshel falls under the Drangmechhu basin.

Figure 22: Hydrological basins of Bhutan, 2016

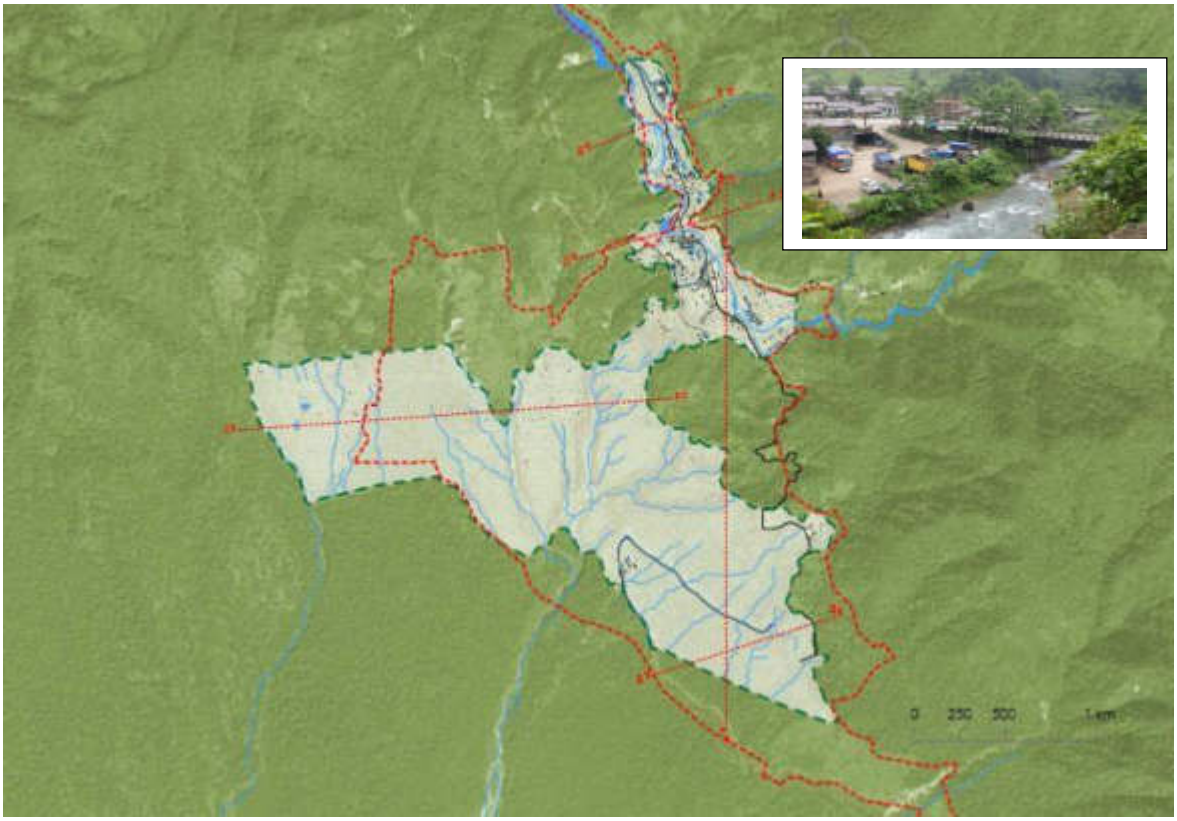


Source: NEC, 2016. National IWRM Plan 2016

[35] MOWHS, 2019,

102. The project site is located at a higher elevation (590m) and is more than 200m West fromthe Kerong River flowing south-east. See Figure below.

Figure 23: The Kerong river in Nganglam town



Source: MOWHS, 2019.

F. Acoustic Environment

103. Secondary information on noise levels was considered under this study. Information on noise levels is taken from noise level sampling that was carried out using the SOUND LEVEL METER at the site. The average noise level recorded was 55.7dB(A) during the day.[36]

[36] DOR.2020. Initial Environmental Examination Report, 2020. BHU: South Asia Subregional Economic Cooperation Transport, Trade Facilitation and Logistics Project. Prepared by Department of Roads

G. Ecological Environment

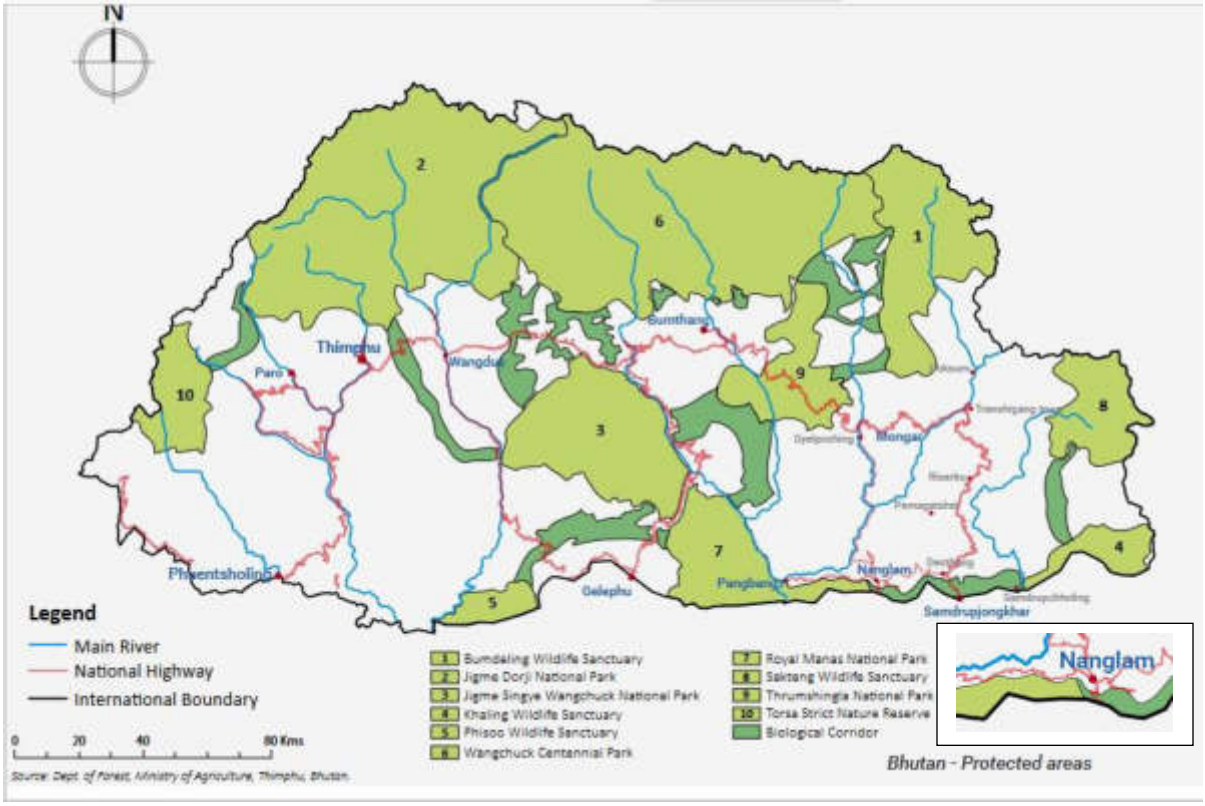
1. Forest cover and biodiversity

104. Broadly speaking, the country can be divided into three distinct Eco floristic zones (alpine zone, temperate zone and subtropical zone). According to the Department of Forest and Park Services, 83%[37] of the district is covered with forest. Within the project site, the common trees species include *Castanopsis spp, Schima wallachii, Ficus semicordata, Duabanga grandiflora, Erythrina sp., Artocarpus heterophyllus (Jackfruit), Macaranga spp., Carpinus ssp.,*and clumps of Banana and Bamboo. Other ground vegetation include *Boehmeria spp.Solanum viarum, Ageratina Adenophora, Athyrium spp., Piper spp., Colocasia spp, Ricinus communis, Thysanolaena latifolia, Ageratum conyzoides, Eupatorium Adenophora, Bidens spp.,Girardinia diversifolia, Debregeasia spp., Triumfetta rhomboidei., Asclepias spp., Pteris spp.,* and *Cyperus spp.*

2. Protected Areas and Critical Habitats

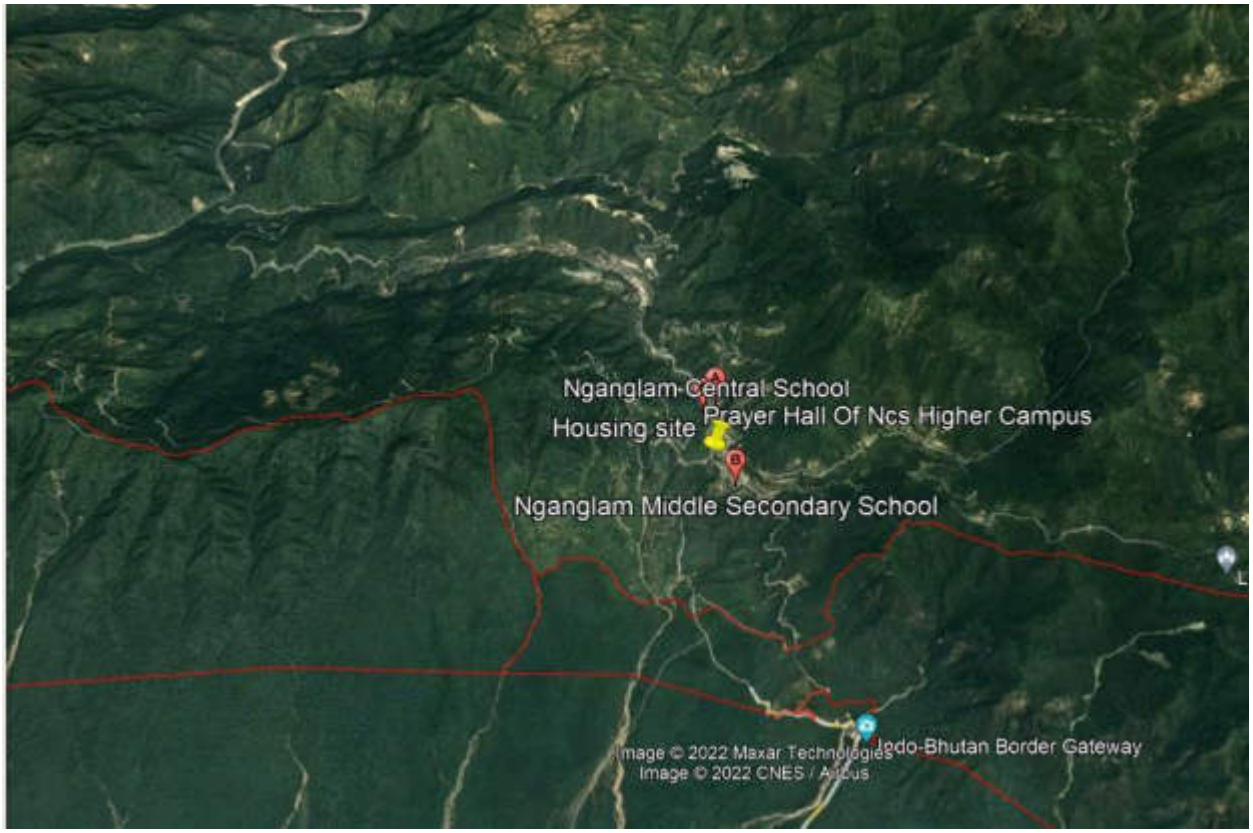
105. Nganglam lies outside the Biological corridor #5. The distance of the site to the corridor is about 2km. The closest Protected area is the Jomotsangkha Wildlife Sanctuary which is about 30km away. There are no wetlands or critical habitats within the project area of influence.

Figure 24: Project location in context to the nearest Biological Corridor (red line)



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

Figure 25: Project location in context to the nearest Biological Corridor (red line)



Source: NCD, DOFPS, MOA for the PA map

106. **Critical Habitats**. 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 project site (default area of analysis of 50 km radius). Screening results show that there is no key biodiversity area (KBA) within 1 km from the subproject site, and that 57 IUCN Red List species of concern are identified within the default area of analysis. See Appendix 5 for the complete results. The IUCN Red List species of concernwere assessed to determine the likelihood of them being found at the subproject site. Since the subproject site is already within the center of the city, the likelihood of these species being found at the site is very low. Nevertheless, the assessment included necessary written confirmation from 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 in the denser forest.

H. Socio-economic Environment

107. **Demography**. The total population of Pema Gatshel Dzongkhag is 23,632 persons (11,922 males and 11,710 females)[38]. Within Nganglam town the total population in 2015 was

[38] Population and Housing census of Bhutan, Pema Gatshel Dzongkhag, 2017, NSB, https://www.nsb.gov.bt/publications/census-report/

3907. Although this number is very low, it increased 3.5 times since 2005 when the population was only 768.[39]

108. **Educational and health facilities**. The town has a higher secondary school (central school) and a Middle Secondary School. There is a Basic Health Unit which has been upgraded to a hospital.

109. **Municipal Services and Amenities**. Much of the town development is along the Kerong river with limited room for expansion due to the steep slopes on. In the past settlers lived in temporary sheds as they did not own the land.

Photo 1: The Older settlements

110. Recently, upon receipt of 'Kidu' (free) land from his Majesty, many beneficiaries have begun constructing buildings along the main street.

Photo 2: Newly developed parts of the town

111. Drinking water supply infrastructure is ongoing from the Kerong Chhu (3.5MLD). Currently, the residents each tap their own source of water from the river and neighboring streams. There is no central sewerage system and most buildings have individual septic tanks. As the municipality has no vacuum tanker, this has to be leased from Samdrup Jongkhar.

112. The district has a total road network of 1239 km, of which only 110 is considered as primary national highway, 121 as secondary national highway, 150.5km is considered as Dzongkhag Road and 816 km as farm road and 42.26km is considered as access road. [40].

[39] MOWHS Report-on-Nganglam-Regional-Hub-Development-Plan-1.pdf. www.mowhs.gov.bt

[40] NSB, 2021.Statistical Yearbook of Bhutan 2021. National Statistical Bureau

Economic activities

113. Due to its location at the international border to India, Nganglam has become an industrial and mining town with the Dungsam Cement Plant and the Dungsam Polymers Limited Factory. Pema Gatshel is well known as a gypsum mining dzongkhag and the Dungsum Cement Corporation also owns gypsum and dolomite mines in Nganglam. Dungsam Cement Plant is about 4.2 km aerial distance northwest of the subproject site, while Dungsam Polymers Limited Factory is about 4.8 km aerial distance northwest of the subproject site.

114. At the same time, it is also the entry and exit town for Pema Gatshel and Gyelpozhing (through the Gyelpozhing-Nganglam highway) from India. The town is also connected to Panbang town and the road to Dewathang is planned to commence soon. The Dungkhag is also well connected to other southern towns of Samdrup Jongkhar, Gelephu and Phuentsholing, via the Indian Highway. As a result of this, the MOWHS has proposed Nganglam as the Regional Growth Hub in the future, to promote balanced economic growth with the western and central parts of the country. Nganglam town is recognized as a major nerve centre for socio-economic growth especially with its proximity to the Indian Highway at Pathshala.

Physical and Cultural Resources

115. In terms of religious and cultural sites, apart from the Chortern near the Dungkhag office, there is a Trema Lhakhang and the Dratsang in the municipality. The closest physical cultural resources (PCR) are the Dungkhag Chorten (0.03 Km), Troema Lhakhang (0.30. Km), and Nganglam Dratshang (0.301 Km). All these are traditional worship places of the locals and none of them is nationally or internationally protected sites.

G. Natural hazards

116. **Seismic hazard**. Geo-physically, Bhutan is located in the young Himalayan Mountains and considered to be one of most seismically active zones in the world, along the boundary between the Indian and the Eurasian tectonic plates. there is no detailed and comprehensive seismic microzonation of Bhutan, it is assumed that the continent-to-continent collision resulting in a stress build-up in the Himalayan region places the country either in Zone IV or V due to its contiguity and proximity to the north-eastern part of India, which falls under the same seismic zonation according to the Bureau of Indian Standards. The earthquake in 2009 which affected the eastern Dzongkhags including Pema Gatshel. damaged a number of households, schools, Lhakhangs and other government infrastructures.

117. **Windstorms and landslides.** Additionally, the Dzongkhag also faces windstorms which destroys houses and crops. The risk of landslides is also rated as high, given the mountainous terrain[41]

118. **Flood risks**. The Kerong Chhu flowing through the Nganglam Town is a flood risk to settlements, especially those along the river banks. Flood Hazard Assessment for Pema Gatshel Dzongkhag was conducted by the MOWHS, based on which the vulnerable areas were identified[42].

[41] Pema Gatshel Dzongkhag. Disaster Management Plan

[42] MOWHS. 2019. Flood Hazard Assessment for Pema Gatshel Dzongkhag . Flood risk areas are awayfrom the site (Royal Bhutan Army camp, Workshop Area (upstream) near the bridge in town, Houses downstream of the bridge, Dungsam Cement Corporation Limited (DCCL) factory area, DoR office areaand Private land opposite to DoR office area)

River protection structures such as RCC walls and Gabion Revetments were constructed at the automobile workshop and around the downstream of bridge area. The figure below shows the flood vulnerability map for Kerongchhu.

Figure 26: Flood vulnerability map for Kerongchhu (MOWHS, 2019)

V. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

A. Introduction

119. ADB SPS requires that all project activities need to be carefully assessed and considered to avoid and/or minimize negative social, religious, and cultural, and environmental impacts.

B. Impact assessment

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

(i) Review of baseline information on the project 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, Dungkhag and current residents.

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

(i) Type/nature of activities proposed;
(ii) Project footprint/spatial scale of the proposed infrastructure work/magnitude of impact;
(iii) Likelihood of the impacts from occurrence;
(iv) Existing baseline conditions at the project site and within the project zone of influence, which in this case is up to 200m;
(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 20: 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 21: Parameters for Determining Magnitude

Parameter	Major	Medium/ Moderate	Minor	Negligible
Duration of potential impact	Long term (more than 35 years)	Medium Term Lifespan of the project (5 to 15 years	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of potential impact	Widespread far beyond project boundaries	Beyond immediate Project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries with no detectable potential impact
Reversibility of potential impact	Potential impact is effectively permanent, requiring considerable intervention to returnto 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

122. **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 22: Parameters for Determining Significance

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

123. **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 in the table below.

Table 23: Significance of Impact Criteria

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

C. Summary of Impacts Rating for the Subproject

124. 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 24: 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	No	Minor	Low	Negligible	Negligible
Disruption of utilities and services	Short term	Local	Yes	No	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]	Major	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
Excavation	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Water supply	Will be provided through municipal water supply							
Electrical connections	Substation will be installed by BPC							
Traffic and congestion from mobilization of construction equipment and materials	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Air pollution	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Dust generation	Short term	Local	Yes	Certain	Minor	Mild	Low	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	Minor	Mild	Low	Negligible
Soil erosion and Sediment mobilization	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Ground water quality	Short term	Local	Yes	Likely	Minor	Mild	Low	Negligible
Drainage congestion	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Impact on critical habitat	Short term	Local	No	Unlikely	Minor	Mild	Low	Negligible
Impact on endangered species	Short term	Local	No	Unlikely	Minor	Mild	Low	Negligible
Impact on Physical Cultural Resources	Short term	Local	No	Unlikely	Minor	Mild	Low	Negligible
Socio-economic status/livelihood	Short term	Local	Yes	Certain	Minor	Mild	Positive	Positive
Community Health and Safety	Short term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Aesthetic impacts	Short term	Local	Yes	Unlikely	Minor	Mild	Low	Negligible
Operation Phase								
Maintenance and operation of the housing complex	Long term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Disaster and natural hazards	Long term	Local	Yes	Likely[a]	Minor	Mild	Low	Negligible
Resident health and safety	Long term	Local	Yes	Certain	Minor	Mild	Low	Negligible
Socio-economic status/livelihood	Short term	Local	Yes	Certain	Moderate	Mild	Positive	Positive

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

125. 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.

D. Anticipated Impacts and Mitigation Measures during Pre-construction Phase

126. 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 Project Location

(i) Protected areas, critical habitats and endangered species

127. **Impact**. The site is located more than 4km from the Biological corridor #5, which is closer towards the Indo-Bhutan border. There are no critical habitats or wetlands within the project area of influence.

128. As presented in Chapter IV of this IEE, 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 project site (default area of analysis of 50 km radius). Screening results show that there is no key biodiversity area (KBA) within 1 km from the subproject site, and that 57 IUCN Red List species of concern are identified within the default area of analysis. The IUCN Red List species of concern were assessed to determine the likelihood of them being found at the subproject site. Since the subproject site is already within the center of the city, the likelihood of these species being found at the site is very low. Nevertheless, the assessment included necessary written confirmation from the Department of Forest, which confirmed that none of these species were found or sighted at the subproject site. Accordingly, these species are found or dwell in the dense forest.

129. **Mitigation.** No mitigation is required.

(ii) Physical Cultural Resources

130. **Impact.** The closest physical cultural resources (PCR) are the Dungkhag Chorten (0.03 Km), Troema Lhakhang (0.30. Km), and Nganglam Dratshang (0.301 Km). These are separated by buildings, roads, and other establishments. All these are traditional worship places of the localsand none of them is nationally or internationally protected sites. Field assessment confirmed that there is no way that the subproject activities will impact these PCRs.

131. **Mitigation**. No mitigation required. The upfront site selection criteria used under the project 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

132. **Impact and Mitigation Measures.** The project site was assessed in terms of earthquake, flooding and landslide risks. Due to its location (proximity to the north- eastern parts of India, which are in the 'most active' seismic Zone V), the projects site is at High risk of earthquakes. A hazard assessment/geotechnical study (Appendix 14) has been conducted as part of project preparation and design. The following are its findings and recommendations.

i. There is no geohazard that will preclude the construction of housing colony at the proposed site in Nganglam. Some minor geohazards that could impact the construction of housing colony are discussed below.

ii. **Landslide.** The proposed housing colony at Nganglam comprises of 2 (two) flat areas separated by a slope of about 30 degrees. Although this slope is dormant at present, it could be activated, and minor landslides could occur during site development. Therefore, it is recommended to stabilize this slope with construction of RCC retaining walls or slope benching. This slope has a height of only about 12m and it could be easily stabilized through structure mitigation.

iii. **Flood Hazard.** The proposed housing colony at Nganglam is basically on a hilltop. So, it is not susceptible to any floods.

iv. **Soil Liquefaction.** The current project site at Nganglam is not susceptible to soil liquefaction during earthquake since the site is on a hilltop overlain with compacted residual soil and there is no groundwater table close to ground surface. Below the soil cover of about 3m, there is bedrock of sandstone. This is visible at outcrops nearby.

133. The recommendations of the hazard assessment will be followed and is integrated in the EMP. The design of the proposed housing colony already incorporates the following measures:

134. **Mitigation.** As the project site is on higher ground on the upper slopes (almost 200m above), there is no need for any flood mitigation work. The facility design ensures that the natural drainage will not be obstructed, or throughput is not reduced. The natural drainage will be reinforced as part of the subproject design, and ensure no flooding occurs during the operation phase (or when the housing facility is occupied and used).

Figure 27: Location of project site in context the river

135. **Mitigation of landslide risk.** In terms of design, to minimize the risk to tenants, the buildings are located towards the northeastern corner of the plot and the area towards the slope has been left as it is. To further mitigate this risk, 0.9 acre of the site in the E1 zone has been left as open space, with only a footpath.

Figure 28: Photo and site layout indicating the landslide risk area (western boundary)

136. **Mitigation for earthquakes and climate change events.** The design process has taken into consideration the requirements of Bhutan Building Regulations 2018 and other relevant rules

or regulation as discussed in Chapter II of this IEE. The proposed project will also be guided by the Development Control Regulations 2016. Compliance with these rules, regulations and plans implies that the structural design will have considered and incorporated measures to minimize the risks from earthquakes.

137. Climate considerations will also be taken care of through choice of building materials, which must be suitable for monsoon rains. The approval process ensures that natural hazards, climatic conditions, and local areas plans are duly considered. Any changes to approved plans will be resubmitted to the Dungkhag Office.

138. The NHDCL has accumulated much experience in planning, designing and executing the construction of affordable housing projects around the country. The NHDCL has three primary Divisions: the Design and Planning Services Division that plans and prepares engineering drawings and designs and administers tendering protocols, the Construction Management Services Division oversees construction works, and the Real Estate Management Services Division is responsible for maintenance of existing housing units across the country.

(iv) Risk to the buildings from the highway traffic

139. **Impact.** The buildings below the highway on the eastern side could be at risk from falling vehicles from the highway.

140. **Mitigation.** The housing design has incorporated provision for retaining wall as well as boundary wall behind the buildings below the highway, so the risk to tenants is minimized.

(v) Disruption of existing utilities and services

141. **Impact.** There are two utilities and supply lines passing through the site, which could pose a hindrance and safety risk to material transporters.

Figure 29: Power lines passing through the site

142. **Mitigation. In consultation with the BPC, these lines will be** moved/shifted prior to construction. Also, the beneficiaries/users will be given prior information regarding the shift and possible power outage.

2. Consents, Permits and Clearances

143. All developments within the city are controlled by the Municipality, which is responsible for ensuring that development activities are aligned with the local area plan. Without approval of the subproject plan by the Municipality, subproject implementation may not be able to proceed.

144. **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 Dungkhag. 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 Dunkhag, this will be communicated back to the design team for rectification and revision of drawings.

3. Tree removal

145. **Impact.** The housing design and layout requires 20 trees to be removed at the site.

146. **Mitigation**. The forest clearance has been sought (Appendix 13) and the trees, if any, will be marked and cut as per regulations. For every tree cut, double the number will be planted, preferably along the western boundaries to mitigate landslide risk and slope stabilization works.

4. Construction schedule, cost estimation and bidding process

147. **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.

148. **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.

5. Compliance to ADB Loan Agreements and Safeguard Policies

149. **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.

150. **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.

151. 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.

152. 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 for each contract.[43] Inclusion of the Cost of OHS is the minimum mandatory requirement 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.

6. Project Disclosure and Community Awareness

153. **Community awareness and project disclosure**. The neighboring community must be informed of the project activities and schedule so that they are well informed and aware of the project 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 project, the design of proposed project components; potential environmental and social impacts (positive and negative) of the project, and proposed mitigation measures for the perceived negative impacts; and the Grievance Redress Mechanismand contact details of the project. Project signboards must be designed and constructed accordingto the design standards and specifications of Dungkhag. The signboards must disclose project contact information for easy contact for any issues or clarification.

E. Anticipated Impacts and Mitigation Measures during Construction Phase

1. Socio-economic impacts

154. **Impact.** The project will generate employment and business opportunities for local suppliers of construction materials as well as material transporters and machine operators. The socio-economic benefits of obtaining temporary employment in construction workforces can be significant for low-income people.

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

155. **Impact.** Once the contract is awarded, the site will be handed over to the contractor by the PIU. No additional space will be required to park machinery, build worker camps, storage sheds or for other purposes as there is ample space at the site which 2.45 acres.

156. **Mitigation**. If additional space is required to park machinery, build storage sheds or for other purposes, the PIU will assist the contractor (if required) to lease land, but the responsibility of finalization of land agreement and payments to the landowner or to the Dungkhag 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

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

products must be stored at storage areas away from water drainage and protected by impermeable lining and bunded.

3. Recruitment and management of workers

157. **Impact.** The 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.

158. **Mitigation**. The contractor will be required to follow the rules and regulations for foreign and local worker recruitment 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.

159. 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”.*

160. 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.

161. 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 Labor Administrator, and also repeat the same within 7 days of completion of the work.

4. Occupational Health and Safety

162. **Impact.** The construction industry entails working at height, excavation, use of machineryand 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 toensure worker health and safety and lack of general safety awareness.

163. **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;[44] 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 ofinjured persons 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 be carried 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 2-3km from the hospital, so easy access to health facilities is not a concern but the contractor must provide transportation during emergencies for workers.

164. The contractor will be required to institute minimum COVID 19 measures (if required) 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. Excavation work

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

166. **Mitigation**. Most of the excavated material will be reused for filling in the building foundations and for leveling the parking and recreational areas, especially as the area is on a slope. The remaining soil, if any, will be disposed at the Dungkhag approved site. As per the discussion with the Dungkhag, the secondary school has requested the Dungkhag for soil for filling their football ground.

6. Raw Materials Sourcing and Storage

167. **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 concreteblocks for walls, fiber-reinforced plastic for window frames and cornices, wood plastic compositefor 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 anddrainage, 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 toimplementation delays and loss of materials.

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

168. **Mitigation**. The quantity of material required will be estimated based on the final detaileddesign and preparation of the Bill of Quantities. Most raw materials will be imported but whereverpossible, locally available building materials will be used.

169. Aggregate, sand and stone will be sourced from local authorized suppliers from within or from neighboring Districts. 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 requirements and delivery as required during each phase of the construction.

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

7. Water requirements

171. **Impact.** The construction work and the influx of a large number of workers is expected tocreate an additional demand for water for drinking, cooking, washing as well as construction andits associated activities (sprinkling/spraying and cleaning).

172. **Mitigation**. The Contractor will be required to ensure adequate water for domestic (drinking, cooking, washing and sanitation) and construction purposes. The existing water supply line will be utilized for this project so there is no need to install new water pipelines. 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 to prevent leakages or blockages.

8. Electrical requirements

173. **Impact.** Electricity for the construction will be required for lighting and cooking in the worker camps, site offices and use of construction tools, equipment and machinery. Without an electrical power supply will delay project implementation at the site.

174. **Mitigation.** The Dungkhag is responsible for the provision of such services. During the construction period, the required electrical supply will be utilized from the existing power line, withthe approval of the BPC.

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

9. Sewerage Requirement

176. **Impact**. 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.

177. **Mitigation**. Any workers' camp and sanitation facilities to be temporarily built at the 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.

10. Mobilization of Construction Equipment

178. **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 struckor crushed by moving equipment or its load when being lifted or moved or due to mechanical failure or when machines tip over.

179. **Mitigation.** To minimize the risk to workers working nearby, the machine operators mustbe trained and competent and use the horn when backing, be assigned a signal person to guidehim when reversing and workers must be restricted from working in close proximity during these periods, 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.

11. Erosion and Sedimentation

180. **Impact.** The monsoon months are the periods of heavy rainfall between June and September. If excavation work is carried out during the summer months, the heavy downpour will wash away the exposed parts of the site.

181. **Mitigation.** All excavation work should be mostly completed before the onset of the incessant rain or after the rains, to reduce the runoff. If this plan is not completely possible, any excavation work during the rainy or monsoon season should be minimized. The site drainage will be planned to ensure that rainwater from excavated areas, worker camps and material storage areas do not cause erosion and sedimentation. The Contractor must construct temporary drains with silt traps to divert clean stormwater away from areas where loose excavated soil is exposed.

12. Ambient Air Quality

182. **Impact.** The infrastructure works will further diminish the air quality due to the cumulative increase in air emissions from operation of machinery and vehicles that will contribute to the air pollutant load (primarily particulate matter (PM), NO_x, SOx, CO etc.). However, much of the impacts on air quality will occur during the construction period.

183. **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 constructionmaterials will be covered to prevent it from being carried off on windy days.

184. **Workers' Camp**. The Contractor will provide alternative fuel (electricity or LPG) at workers' camp and restrict use of firewood for cooking. Burning of waste will be restricted and enforced strictly.

13. Dust Generation

185. **Impact**. Dust will be generated mostly during excavation, transportation and unloading of sand and other construction materials especially on windy days. Dust generated will potentially elevate the level of air pollution in the area in terms of particulate matter.

186. **Mitigation.** To prevent too much dust during excavation works, the area will be enclosed/cordoned with construction fabric. Water will be sprayed over bare or newly excavated areas especially on windy days. The excess excavated soil will be removed from the site within 2 weeks of excavation at disposed at the approved disposal site. Material transporters will be instructed to cover dust generating materials to prevent dust and spillage along transport routes.

14. Noise and Disturbance to the Neighboring Community

187. **Impact.** The construction site has residential buildings towards the north and further towards the south. During the construction period, the main sources of noise will be from construction activities 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.

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

189. **Mitigation**. Measures to minimize disturbance to the community include restricting construction work between 9PM -8AM,[45] 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 implementa preventive maintenance schedule for all heavy construction equipment and machinery to minimize noise and vibration.

15. Solid Waste Generation and Management

190. **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.

191. **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 wastestorage and safe collection, segregate hazardous wastes within the premises, maintain cleanliness of the respective premises or surroundings.

192. The contractor will ensure that workers are briefed on proper waste management and good housekeeping at worker camps is enforced. Separate bins for “biodegradable” 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 of with the guidance of Dungkhag.

[45] As per Development Control Regulations 2016.

193. During the consultation between NHDCL and Dungkhag on May 16, 2022, Dungkhag has informed the meeting that to accommodate the requirements for waste disposal, the Environment Officer will identify specific sites within the Dungkhag to dispose a) Excavation waste and b) Construction waste, and the area and capacity of the sites will be communicated to NHDCL. In the meantime, the NHDCL will share with the Dungkhag the estimated quantities of waste and soil to be disposed of.

194. If required by the Dungkhag, the construction waste will be transported along the designated route, and during specific times if specified in the waste disposal permit without any spillage along the route (and the route will be cleaned if spillage occurs). Again, if required by Dungkhag, the waste dumped will be leveled and compacted, and the Dungkhag Officer will be updated on quantities disposed.

16. Community Health and Safety

195. **Impact.** The main risks to public health are if the construction workers (both foreign and nationals) are sick and transmit these by mingling with the public and local community. The public may also be at risk if they walk into the site when work is ongoing or from materials falling from the building site.

196. **Mitigation**. Measures to minimize risks to community health and safety include cordoningthe construction site to exclude 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 spilling or storing of construction material along access road, on top of drainsand footpaths.

17. Congestion and Traffic Management

197. **Impact.** The risks to human safety are the risk of accidents during material transportationespecially if drivers are not careful and if construction material is stored along the access road.

198. **Mitigation**. The material transporters will be briefed to adhere to speed limits to reduce the risk of accidents. To reduce congestion, the contractor will coordinate with material transporters to schedule materials drop times and avoid peak traffic hours (e.g., 8.30-9.30AM and4-6PM).

18. Aesthetic Impacts

199. **Impact.** The housing project will be located within the property allocated to NHDCL, specifically for housing. If not properly designed, the buildings can have negative aesthetic impacts.

200. **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. A major part of the land will be retained as parking and as green space. The building designs will also utilize the Bhutanese Architecture Guidelines[46] as areference to ensure that the buildings blend in with the surrounding while maintaining certain elements of traditional Bhutanese architectural designs.

[46] MOWHS, 2014. The Bhutanese Architecture Guidelines.

19. Chance Finds

201. **Impact.** Given that the locations and areas where earthmoving works will be required areknown, 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.

202. **Mitigation**. Contractor(s) needs to be made aware of a chance find procedure. In case underground assets or archaeological artifacts are encountered during excavation, construction activities 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:

a. In case of suspected chance finds, the Contractor shall immediately stop all works;
b. Contractor to report immediately within the same day to the PMU or PIU regarding the suspected chance finds;
c. PMU or PIU to advise Contractor to strictly follow the full stoppage of works;
d. PMU to report the potential chance finds to the Department of Culture, Ministry of Home and Cultural Affairs, and the latter to investigate; and
e. No works shall resume until clearance is provided by the Department of Culture, Ministry of Home and Cultural Affairs.

20. Natural Hazards and Accidents

203. **Impact.** The risk of earthquakes is high for the entire district, and windstorms are quite common in the project area.

204. **Mitigation.** During the construction period, the Contractor will be required to develop an emergency action plan to handle emergencies such as earthquakes, fires, breakdown in machinery, collapse of structures, electrical mishaps etc. These include identifying procedures to follow during emergencies, briefing workers on these protocols, displaying emergency numbers at conspicuous places in Dzongkha and English and identifying a meeting point for all workers incase of emergencies. Also, the contractor will provide transportation to the nearest hospital in case of accidents and emergencies.

21. Completion of construction work

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

206. **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 (if not connected to the central sewer) will be emptied out and covered with an adequate amount of soil. All construction materials and debris will be removed before handing the site to the PIU. Any damaged property (government or private)

will be repaired and/compensated before finally leaving the site. The site will then be replanted with appropriate species during landscaping and creation of green spaces.

207. 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.[47]

F. Anticipated Impacts and Mitigation Measures During Operation Phase

1. Impacts

208. 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 are the wear and tear on the building, breakdown of electrical and plumbing fixtures/systems, and risk of natural hazards and fire and windstorms.

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

2. Mitigation Measures

210. **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. The Liaison Office for Samdrup Jongkhar 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 hired sweepers.

211. **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.

212. The Liaison Office must immediately intimate the Dungkhag Disaster Management Committee and follow their instructions in case of a disaster. According to the design, the building roofs are enclosed which negates the uplift pressure caused by the wind load, thus protecting the roofs from windstorms. To further mitigate the effect of windstorms, the management will consider planting sturdy trees along the edges of the housing colony, at a safe distance from the building structure.

213. **Water shortage.** The infrastructural design has incorporated rainwater harvesting, whichwill significantly reduce the demand for water during the operation phase and adequate water tanks will be installed onsite.

214. **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 Dungkhag collection requirements and procedures and ensure that garbage is not allowed to accumulate on the premises.

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

The new buildings will be connected to septic tanks with soak pits to be desludged/emptied by vacuum tanker services provided by the Dzongkhag or private entities duly authorized by the Dzongkhag.In the future, when the area is connected to a sewerage treatment plant, the buildings will then be connected to the sewer pipeline network.

215. The Dungkhag during the consultative meeting informed that the housing designers refer to the sewerage network plan so that the complex can be connected accordingly and that there would be no need for septic tanks.

G. Cumulative Impacts and Mitigation

216. Due to its strategic location as a border town between Bhutan and India, the town is the is being promoted as a regional hub for the future. More travelers are using Nganglam as the entry point to travel to Gyelpozhing and Pema Gatshel resulting in increasing traffic.

217. Also, with the provision of the Kidu Land to more than 100 residents, there is a surge in the number of buildings being constructed within the town. The housing project will require resources such as water, timber, construction material and extension of existing municipal services such as waste management.

218. The construction impacts will be visible and have social and environmental impacts duringthe construction period of 24 months but most of these will be limited to the construction period and it is unlikely that any of the project impacts will go beyond the site boundary.

H. Environmental Benefits and Enhancement Measures

219. Despite the transient negative environmental and social impacts, the project will generate substantial environmental benefits and enhancements. The project will significantly alleviate the housing crunch being faced by Dungkhag. Overall, the subproject will provide about 32 decent affordable accommodations for low-income government and corporate staff.

220. The overall 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 among both NHDCL and the private contractors/sector on safe construction practices.

221. The overall project will also enhance the capacity of local contractors through constant supervision and guidance on safe construction practices.

I. Summary of Impacts and Mitigation

222. This subproject involves the construction of Construction of 8 blocks of 4 units each totaling 32 units housing apartments with a Service Center on government land.

a. Design and Pre-construction

223. Given that all the site is located within the Dungkhag area, the project activities will have no impact on any protected area, critical habitats or endangered, rare or vulnerable species.

224. Approximately 20 trees will be removed prior to construction. For every tree that is cut, double the number of trees will be replanted within the housing complex during landscaping works, or for slope stabilization along the western end of the site.

225. There are no Physical Cultural Resources that will be impacted by the project so no mitigation is required.

226. The receptors that lie within the zone of influence (within 200m of the proposed infrastructure development work) are the residential buildings, shops, offices, and businesses (including ongoing construction work). Measures to minimize impacts from air, dust, noise and health and safety risks to the public and the resident communities have been incorporated during the construction phase.

227. The disaster risks with the site may arise from earthquakes, landslides and windstorms. These have been taken into consideration during the layout of the housing complex, keeping the buildings away the slope and provisioning for tree plantation (as wind barriers)

228. The project has no impacts on private land so there is no need for land acquisition. Also,the site is easily accessible from the highway (Nganglam-Panbang) so there is no need to construct an approach road. Also, drinking water supply schemes and electricity are already available at the existing house, which will be utilized during construction.

2. Construction phase

229. In general, the implementation of construction work is not expected to cause major negative impacts spatially or temporarily because the site is within the designated urban areas and has been specifically allocated by the Dungkhag for construction of housing units.

230. Construction impacts will be limited to the immediate area and its surrounding and therefore the zone of impact (mostly for noise and air and dust pollution) is less than 200m. The excavation work will be confined to the existing structure and building footprint and will not last more than two months.

231. Excavation works will be planned so that it can be carried out and all excess soil removedfrom the site before the onset of the monsoons.

232. NHDCL will ensure that the contractor (s) selected have adequate experience in such infrastructure works. The construction work will be contracted out as per prevailing government procedures wherein the contractor will be accountable for managing the construction sites responsibly and delivering quality structures within the stipulated period.

233. As part of their responsibility to prevent unwanted/unsafe development, the Dungkhag will monitor all building construction through regular site visits during various stages of the construction process (foundation, completion of each floor, and roofing). Upon completion of the project, the issuance of an occupancy certificate 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.

234. The construction team will comprise of small teams of 30-40 workers 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.).

235. Potential environmental and social impacts before, during and post construction have been identified along with appropriate mitigation measures that are included in the Environmental Management Plan which be included in the bid document

236. The PIU will conduct an orientation for both its staff as well as selected contractor(s) on ADB safeguard policies, national regulations and EMP requirements, and COVID 19 safeguard requirements and procedures

237. The construction will be monitored by the supervision staff and the PIU, and accordingly corrective actions will be undertaken and reported to the PMU and to ADB.

3. Post construction

238. The necessary areas of concern during the operation phase are natural hazards, buildingwear and tear, water shortage and waste management. Again, mitigation measures for these areincorporated in the EMP to be implemented by the NHDCL, who will ensure regular repair and maintenance of its newly constructed structure so that its residents can enjoy the benefits of the new housing colony.

239. All in all, the key areas of concern with this site are dust, noise and waste generation anddisturbance to the community during construction.

240. On the social front, the Grievance Redress Mechanism will be instituted and required processes followed to ensure that there are no outstanding grievances due to the project. Any public or private property that is damaged during construction will be promptly repaired and reported. Regular Environmental and Social Monitoring Reports will be submitted to the PMU and ADB on the status of the work and compliance with ADB safeguards, National Regulations and the EMP.

VI. ANALYSIS OF ALTERNATIVES

A. Alternatives relating to Site Location

241. There is an acute shortage of government land within Dungkhag, and yet there is an urgent need to meet the immediate housing demand. This leaves very little room for alternatives. Since the project is geared for urban low-income staff and wage workers, the site location is ideal as it reduces transportation cost as most of the government offices, schools and businesses are located within a radius of 1km from the site.

B. Alternatives relating to Design and Technology

242. The project has departed from the convention housing design by incorporating universal designs features, disaster resilience, fire safety and rainwater harvesting considerations. It is a vast improvement from previous residential housing buildings that NHDCL has designed and built before.

C. Environmental Implications of Alternatives

243. There are many positive implications of the selected alternative. Firstly, the building footprint utilizes only 34% of the 2 acres, while 66 % will be maintained as green space in addition to the space that will be retained as parking.

D. Implication of No-Project Alternative

244. 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 25: Comparison of “With Project” and “No Project” Options

Description	No Project	With Project
Social impacts	Maintain status quo	The Project will assist the Royal Government of Bhutan (RGoB) establish housing infrastructures for those families that really need it the most- the low-income earners.
Physical impacts	None	The planned housing complex will be designed based on what is allowable within the local area plan.
Potential impacts due to seismic risks, environmentally friendly and climate resilience	There is an existing single storey structure which is over four decades old at the site.	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; Development Control Regulation 2016; Bhutan building color code- 2014; The project will integrate innovative approaches to enhance resilience to geophysical events with suitable materials. The design includes parking, rainwater harvesting and installation of storage tanks. 66% will be left as green space.
Environmental impacts Potential impacts to	No impact as the site is located within city	Same as ‘no project’ scenario

Description	No Project	With Project
ecologically sensitive areas, critical habitats, biodiversity and physical cultural structures	boundaries	
Social impacts Potential impacts to indigenous people	There are no indigenous communities at or near the project 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 project will provide employment opportunities for able, skilled and non- skilled workers (both foreign and local)

245. **"No Project" option**: The no project option means that the existing housing crunch, a chronic issue being faced by low-income government and corporate employees will continue.

246. The lack of affordable housing further aggravates already existing urbanization woes suchas increasing temporary huts, overcrowding in existing apartments 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.

247. **"With Project" option**: The new housing complex will be designed to suit the topographyand surrounding land use. It will incorporate universal design features with sufficient parking, pedestrian footpaths and efficient drainage systems. It will be designed for disaster resilience andfitted with fire extinguishers. Environmentally friendly/green features such as use of locally produced materials, improved window designs, waste management units, provision of adequate water storage tanks, open green spaces and parking. Above all, it will provide opportunities for low-income families to save money while living in a healthy, spacious environment, in close proximity to all amenities. The project will also generate employment opportunities for both skilledand non-skilled workers during the construction phase.

VII. INFORMATION, DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Consultation and Participation

248. 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 theanticipated project impacts on the affected communities. NHDCL will inform and consult with theaffected persons on resettlement and compensation options and provide them with project-relatedinformation during resettlement planning and implementation. Disclosing information will precedeconsultation.

B. Approach and Methodology

249. Key stakeholders were identified and consulted during the project planning process. Copies of minutes of consultation meetings are in Appendix 6. The key stakeholders consulted are as follows.

(i) Dungpa and Dungkhag Staff at the Dungkhag office- 20 May 2022;
(ii) Forest Range Office, Nganglam; and
(iii) Future potential residents- Current residents of NHDC housing colony, those in waiting for NHDC housing allotment and private company employees' -19 May 2022.

250. **Consultations during COVID-19 Pandemic.** Meaningful consultations will continue evenas 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 7). 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

251. NHDCL has informed and sought clarification from the Forest Range Office on the proposed activities to confirm the IBAT species list.

252. Consultations were carried out with Dungkhag on 20th May 2022 to discuss the proposed sites and related social (access, affected persons) and environmental concerns (water supply, waste and disaster risks) for each site.

2. Summary of key queries and clarifications regarding the subproject withthe Dungkhag

253. The Objective of the consultation was to inform Dungkhag about the proposed housing project, to discuss critical project requirements such as water supply, waste collection, sewage, and disaster management. The Dungkhag has confirmed that the site falls within the township area.

254. The project team requested Dungkhag for inclusion of the housing colony into the new water supply distribution network that has been initiated. The Dungkhag has agreed to do so, but it was also suggested that in case there are problems during the construction and operation phase, the project can also pump water to the site from the Kerong river, as is the practice by most constructions.

255. The Dungkhag clarified that there is currently no sewerage system and most houses/buildings have their own septic tanks and there are no plans to have a sewerage network anytime in the near future.

256. In terms of waste disposal, the Dungkhag said that there is natural land depression in the Middle Secondary School that formed into an artificial lagoon due to storm water. The principal ofsaid school had requested for soil for filling the area. In its response, and in case this request willbe pursued in the future, Dungkhag will ask the school to submit a request for excavated soil andaccordingly, the excavated material from the housing complex can be transported and utilized for the school site. However, prior to approving this use of excess excavated soil from the subproject,the PIU and Dungkhag are required to ensure that such use of the soil will not result to impedanceof natural flow of water in the area, and/or will not cause any flooding as a result of the soil filling.

257. Notwithstanding any other approved secondary use of the excess excavated soil from the subproject site, the Dungkhag office confirmed that the primary disposal site will be the existing waste disposal site that is 10km away. This disposal site is about one acre and can adequately accept construction wastes. The subproject construction waste will be required to be dumped in the same area but separately from general waste. The Dungkhag said that the project must incorporate the requirement to transport, compact and level the area after waste dumping for both excavated soil and construction waste. Post construction waste from camp closure can also be disposed at the same site as the construction waste.

258. At the moment, there is rubble and demolition waste at the site from previously dismantled structures. The NHDCL and dungkhag informed the meeting that the contractor who dismantled the site has agreed to dispose of the waste prior to the construction.

259. The Dungkhag informed the meeting that there is Disaster Focal Officer who is responsiblefor coordinating all disaster emergencies measures and that the public, whether in the public or private sector are required to abide by the measures lead by the Disaster Focal Officer in coordination with the Dzongkhag.

260. As the selected site lies adjacent to the Nganglam-Panbang Highway and the Dungkhag recommended construction of crash barriers along the road to prevent accidents.

3. Meeting with potential beneficiaries

261. During the meeting on 19th of May 2022, the NHDCL Liaison Officer presented the proposed housing sites, buildings, class of apartments, designs and layout and Feedback from participants on presentation of housing details, experiences living in private and corporate housing, current management of NHDC housing and suggestions for future. Other topics that

were covered include water supply, waste disposal, sewage, drainage, emergencies, safety, environmental clearance and suitability to the climatic conditions. The Minutes of the meeting are attached in Appendix 6.

D. Information Disclosure

262. 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 project contact details will also be posted on the signboard installed at the construction site, so that any person can call the PIU for project related information.

263. 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 project design or location, this IEE will be updated, and likewise disclosed accordingly.

VIII. GRIEVANCE REDRESS MECHANISM

264. 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, environmentalor 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.

265. 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 8 . The three-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identifiedto 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.

266. **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.

267. **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.

268. **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.

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

a. **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. Effortswill be made to resolve all grievances within two days from the date of receipt of acomplaint / grievance. Relevant government representatives from the respective districts and sub-districts, where the subproject will be implemented, can be consulted as and when required.

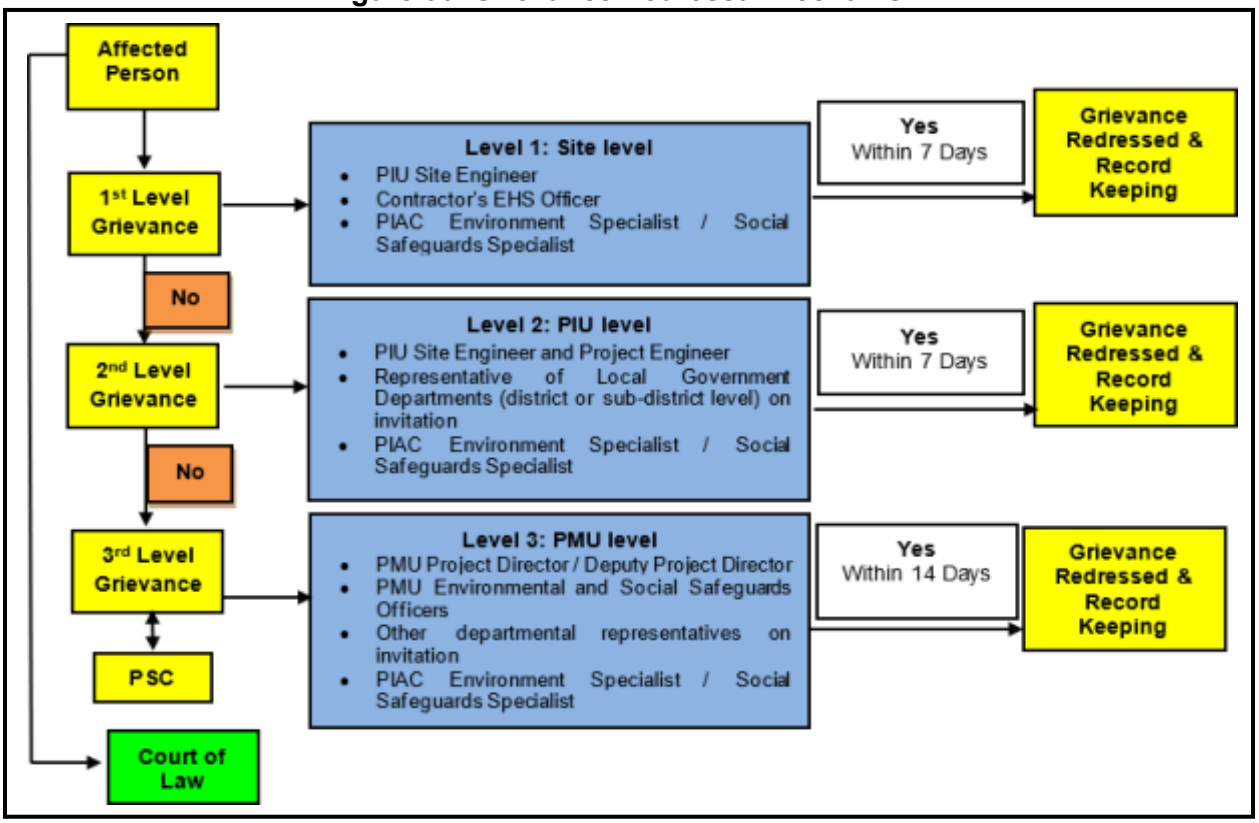
b. **2nd Level Grievance (PIU)**: Grievances that cannot be redressed at first level within two days will be brought to the notice of the Complaint Cell at PIU level. The Project Engineer will try to resolve the grievance/ complaint within a timeframe of 14 days of receiving the complaint from the first 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.
c. **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 matted may be taken to the Project Steering Committee (PSC) for solution.

270. 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.

271. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage, such as Dungkhag/ Dungkhag 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.

272. The process of the project GRM is given in **Figure 30** .

Figure 30. 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

273. 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 periodof interruption during these events and will be decided upon by the PMU.

274. **Information Dissemination Methods about GRM.** Periodic community meetings will beheld 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 processof grievance redress) if required. The above Grievance Redress Process will be discussed with the different stakeholders during stakeholder consultation meetings. These meetings will be heldwith 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.

275. **Consultation Arrangements for GRM.** This will include group meetings and discussionswith 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 withthe Environment/Social Specialist of PMU/PIU for one-on-one consultations. Non-literate affectedpersons/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.

276. **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 semiannual 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 9.

277. **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.

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

279. **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

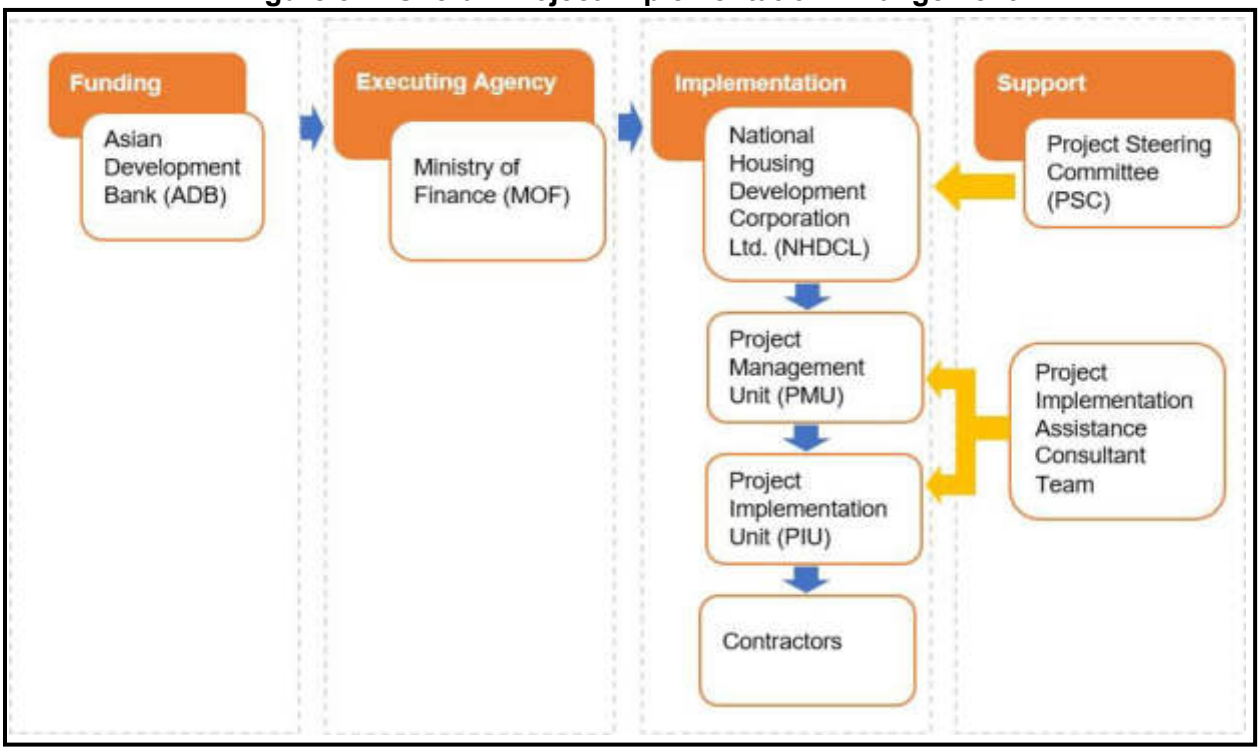
280. **Overall Project Institutional Arrangement**. The Ministry of Finance (MOF) is the executing agency and the National Housing Development Corporation Limited (NHDCL) is the implementing agency of all outputs of the proposed Bhutan Green and Resilient Affordable Housing Sector Project. MOF and NHDCL will engage relevant government agencies[48] 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 PMU and PIUs, as and when required; and (v) ensure that conditions of the Loan Agreement with ADB are met.

281. 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 has been created, which is responsible for implementing the project. The PMU is headed by a Project Director and supported by PIUs at the district and/or sub-district levels.

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

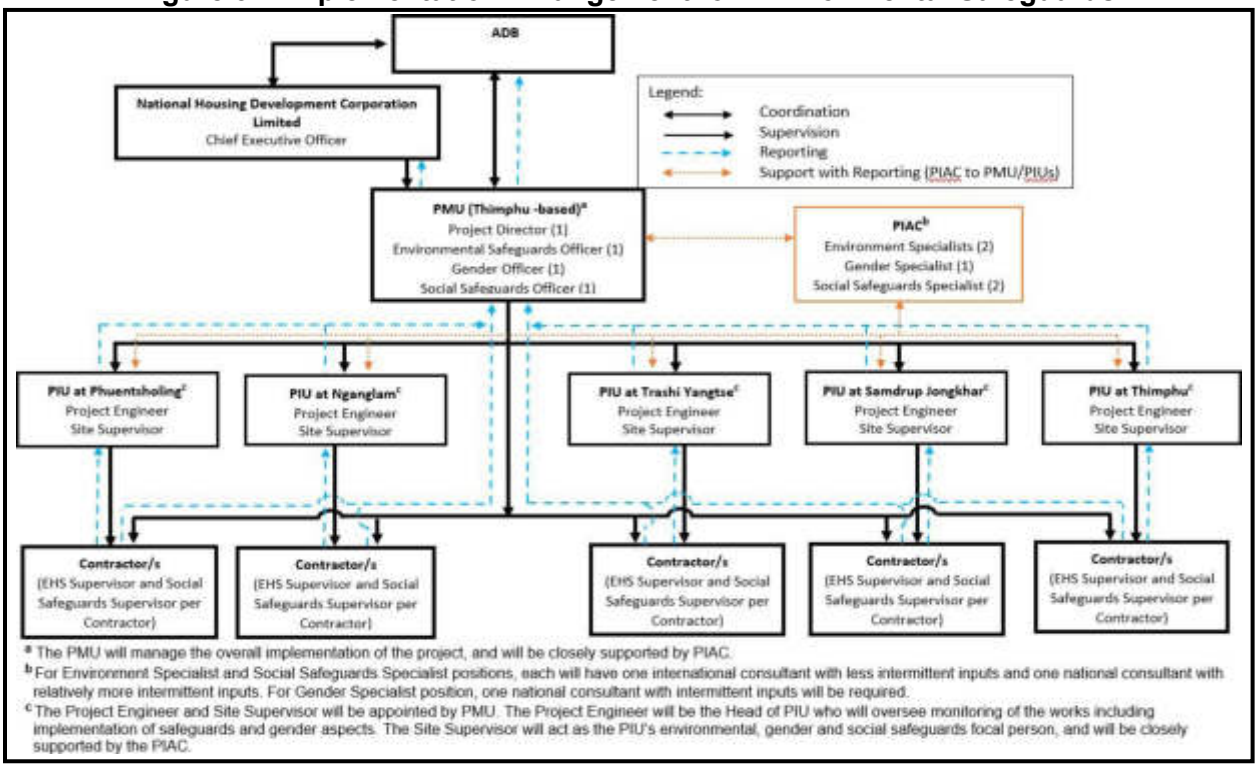
[48] Department of Disaster Management (Ministry of Home and Cultural Affairs); Department of Engineering Services; Department of Geology and Mines; etc.

Figure 31: Overall Project Implementation Arrangement



283. **Specific Institutional Arrangement for Environmental Safeguards**. The Figure belowdepicts the implementation arrangement for environmental safeguards.

Figure 32: 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.

284. **Project Management Unit.** The PMU will work closely with the PIUs in implementing theenvironmental safeguards requirements of the project. The PMU is 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 has 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 SEMPs 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 PAIC, 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.

285. **Project Implementation Unit (PIU)**. The PIU is responsible for the day-to-day activitiesof project implementation in the field and will have direct supervision to the contractors at subproject sites. The PIU is headed by a Project Engineer who will oversee the overall implementation of the project including safeguards. The PIU will also appoint a Site Engineer whowill 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:

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

286. **Environment Specialist Consultant**. The PIAC has an Environment Specialist Consultant who will assist 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. Specific tasks of the consultant are to assist PMU and PIUs to:

a. Conduct consultations/discussions with environmental regulatory agencies and other stakeholders;
b. Identify all applicable and relevant national laws, regulations, policies and guidelines and preparing environmental assessment;
c. Undertake environmental categorization for the proposed future subprojects;
d. 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;
e. Undertake assessment of existing safeguards system under the project, identifying areas for improvement, and development of appropriate safeguardsimplementation arrangement. This assessment will form part of the IEE, and results will be included in the IEE report;
f. 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;
g. Prepare IEE report, environmental management plans (EMPs) as required by country's environmental legal frameworks and ADB SPS;
h. 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;
i. 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;
j. Calculate and provide the indicative cost estimate to implement EMPs, environmental monitoring programs, awareness programs, etc.;
k. Assist with any capacity building activities for stakeholders;
l. Ensure quality and format of IEE reports, and other environmental safeguard documents following ADB Handbook of Styles and Usage;
m. Comply with disclosure requirements per ADB SPS;
n. Implement proposed environmental mitigation measures and ensure the implementation of EMPs during construction phase;
o. Monitor implementation of SEMPs;
p. Monitor required environmental parameters and preparing semi-annual environmental monitoring report (SEMR) per the requirement of ADB; and
q. Prepare all necessary environmental reports per requirement duringimplementation of the civil works contracts.

287. **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) specificmitigation 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 byPMU.

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

a. 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;
b. Consideration of ADB SPS, national regulations and the EMP during bid preparation and cost estimation;
c. 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 clear terms of reference and responsibilities to ensure that all environmental and social concerns are properly managed;
d. Ensure regular reporting to the PIU on work progress and alert management on any potential issues or delays;
e. Strictly follow National COVID 19 protocols and instructions issued by the Ministryof Health and the COVID Task Force, and immediately report to the PIU upon detection of COVID positive cases at the project site;
f. Obtain the necessary permits and clearances as required to implement the project;
g. Ensure that all worker recruitment and OHS requirements are complied;
h. Take necessary corrective action to rectify any non-conformance, including actions related to grievances;
i. Institute an emergency plan for natural calamities/disasters and accidents at the site; and
j. Follow chance finds procedures to discovery of any physical cultural artifact.

289. 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.

290. 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) prohibitionof 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 26: 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 a checklist available from ADB. Based on the REA, categorize the project based on ADB SPS. Submit all categorization forms to ADB.	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 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.	ADB to review the REA checklists and reconfirm the categorization.
Based on its review, PMU will approve the IEE and send it 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 will 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 the 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. The 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 ensures that the total budget for implementing the EMP	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	

Project Management Unit	Environment Specialist Consultant	ADB
is included in the bid and contract documents.	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 semi-annual reports to ADB for review. Corrective actions to be undertaken if needed.	Contractor to conduct environmental monitoring and implement SEMPs/EMPs. The Environment Specialist Consultant will assist the PMU environmental 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.	ADB to review the reports and provide necessary advice/guidance needed to the PMU.
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 reports and disclose them on its website. ADB to prepare Project Completion Report
PMU to continue submission of semi-annual environmental monitoring reports to ADB until project completion.		

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

291. The 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.

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

Table 27: Environmental Management Plan

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Design / Pre- construction phase					
Subproject Location	Impact on protected area, and other environmentally sensitive areas.	The subproject site is located within the municipality limit so no mitigation measure is required with regard to impact on protected area or other environmentally sensitive areas. The closest protected area is about 15km away.	NA	PIU	PMU
	Impact on Physical cultural Resources (PCR)	The nearest PCR is the Dungkhag Chorten , which is 30m away. Potential dust and noise generation during mobilization by Contractor may impact this PCR. Dust prevention measures will include the following: ● 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 at the site. ● Undertake water sprinkling at the site during dry windy days. ● Provide cover to stockpiles of sand and other construction materials, especially during windy days. Nuisance due to noise will be avoided by through the following: ● Restrict mobilization or vehicle movements or construction materials deliveries between 9PM -8AM[49] and during worship days. ● Brief workers on their obligations regarding proper management of work and behavior			

[49] As per Development Control Regulations 2016.

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		with sanctions for inappropriate behavior or repeated complaints from the residents. ● Implement a preventive maintenance schedule for all heavy construction equipment and machinery to minimize noise and vibration.			
	Risk of natural hazards such as earthquakes and climate change considerations	• The subproject will follow the recommendations of the hazard assessment/geotechnical study conducted as part of project preparation and design (Appendix 14). • Design of buildings in line with 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. • Almost one acre has been left as green space near the western slopes to avoid disturbing the slope	Included in Subproject design cost	PIU	PMU
Consents, permits and clearances	Failure to comply with national regulation and procedures can delay project progress	• Seek approval for building design and construction approval from the Dungkhag • Seek approval for environmental clearance from NEC.	PMU Operating cost	PIU	PMU
Removal of existing structures	There are electrical lines that pass through the site that could pose a risk during the construction period	• The project will request the BPC to remove the electrical lines from the site and ensure this is carried out before the construction period.			
Removal of trees	20 trees are required to be removed	• The Forest Clearance for cutting the trees has been sought and included in the Annex. • Replant the area with at least double the number of trees cut during landscaping as compensatory measure in consultation with Dungkhag and local Forest Office	PMU Operating cost	PIU (permit)	PMU
Aesthetics	Change in aesthetics at the site due to new infrastructures that could	• Consider requisite development controls (such as building height, ground coverage and minimum setbacks from roads and	PMU Operating cost	PIU	PMU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
	obstruct views.	adjacent plots), as per the allowable local area plan. • Comply with the Bhutanese Architecture Guidelines[50] 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.			
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 project, 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	• 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 a contractor 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	• Disclose project information/brief on NHDCL website, along with GRM mechanism and contact numbers, and one available at the site office	PMU Operating cost	PIU / PMU	PMU

[50] MOWHS, 2014. The Bhutanese Architecture Guidelines.

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		Design and install project signboards as per design standards and specifications of the district and include relevant contact numbers for GRM			
Construction phase					
Award of Construction work	Positive multiplier effect for goods and services	• The project 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, worker camps and material storage sheds	Encroachment on government or private land due to lack of space for accommodating worker camps and storage	• There is adequate land (2.45 acres) on the site and next to it to construct worker camps. If still required, land will be leased from government or private landowners to set up worker camps, material storage and to park machinery. • 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.	Contractor's cost	Contractor	PIU
Recruitment and management of workers	Non-compliance with National recruitment regulations and risk of employing underage children.	• Strictly follow the "Handbook on Recruitment and Employment of Foreign Workers in Bhutan"[51] 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 restrictions on employment of children below 18 years. • Employ trained and skilled national workers wherever possible.	Contractor's cost	Contractor	PIU

[51] RGOB. Regulations on Working Conditions, 2012

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• If a 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.			
	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
	Requirement for housing and resources (drinking water and electricity and sanitation facilities	• Provide workers with temporary accommodation, drinking water and sanitation facilities, with separate toilets for males and females. • Maintain cleanliness of the residential/worker camp 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	• Prepare a site-specific health and safety management plan including COVID 19 H&S measures (if COVID still prevails) and follow COVID 19 protocols as per the prevailing requirements of the Ministry of Health and the COVID Taskforce (if required). • Nominate a Health and Safety Officer with specific responsibilities to ensure the OHS	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		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;[52] • Screen workers at their point of origin for both virulent and contagious diseases, including COVID-19. • Identify workplace and process hazards (with machines, vehicles, 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 training/ orientations/ briefings required for each group of workers and who will give the required briefings. • Institute protocols to deal with accidentsand 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 (including transportation to the BHU or nearest Hospital). • Provide adequate payment and facilities (lighting) for overtime work. • Post/Display emergency contact numbers			

[52] 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
		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 in the Dzongkha and English languages. • Maintain an accident register with incidentsand actions taken. • Maintain First aid box at site for minor injuries. • Install fire extinguishers, with instruction and training of staff on how to use these. If fire extinguishers are not available, ensure alternative means of firefighting are available (adequate water, sand buckets, hose and pipes) • 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.			
Excavation work	Mismanaged spoils and debris from loose excavated soils	• Reuse excavated soil for filling in the building foundations and for leveling the parking and recreational areas • Seek approval/permit for disposal of soil/spoil from the Dungkhag, and remove unwanted soil / debris from the site within 2 weeks of excavation and dispose of it at a pre-approved disposal site	Contractor's cost	Contractor	PIU
	Dust generation on windy days	• Enclose excavated areas to contain dust.	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Spray water over loose soil piles and debris especially on windy days.			
Raw materials sourcing and storage	Haphazard and inefficient material purchase and sourcing	• 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 if possible	Contractor's cost	Contractor	PIU
	Lack of storage space and Loss of materials	• Schedule material procurement to prevent both shortage and storage issues. • Construct a material storage shed, maintain inventory, and keep valuable items locked. • Appoint security guard if necessary • Stack 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).	• Ensure adequate water for domestic (drinking, cooking, washing and sanitation) and construction purposes. • Install adequate water tanks or mobilize water tankers during periods of shortage. • To conserve water, check, repair and maintain all water supply pipes to prevent leakages or blockages. • Request Dungkhag to provision for water supply	Contractor's cost	Contractor	PIU
Electrical requirements	Delay in project implementation at the site due to lack of electrical power supply.	• Request from Bhutan Power Corporation for service on the handling of electricity connection before, during and after the construction works.	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.	• Connect the workers' camp temporarytoilets to a septic tank which will be used until the end of the construction period, after which the septic tank will be decommissioned and cleared out • Coordinate with Dungkhag for desludging / vacuum cleaning of tanks annually, if required	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• Repair and maintain sanitation facilities.			
Mobilization and operation of construction equipment	Risk of accidents and injuries to workers	• 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 such cases, a supervisor should alert the worker of potential risks.	Contractor's cost	Contractor	PIU
Erosion and sedimentation	Siltation of receiving body of water and canals in the area, resulting to clogging of these canals.	• 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	The use of fuelwood for heating in winter will result in air pollution from fires. 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 Dust from excavation and other construction activities.	• Provide alternative fuel (electricity or LPG) at workers' camp and restrict use offirewood for cooking • 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.	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
Noise and disturbance to the neighboring community	Construction activities will result to high level of noise that could impact the workers and communities around the site.	• Restrict construction work between 9PM - 8AM. • Brief workers on their obligations regarding proper management of work and behavior with sanctions for inappropriate behavior or repeated complaints from the residents. • Implement a preventive maintenance schedule for all heavy construction equipment and machinery to minimize noise and vibration.	Contractor's cost	Contractor	PIU
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.	• Provide appropriate bins for waste storage and safe collection, segregate hazardous wastes within the site. • Allocate waste storage areas where wastes can be stored and then collected by the municipal trucks and ensure that waste does not pile up at site by following waste collection schedule • Ensure that workers are briefed on proper waste management and goodhousekeeping at worker camps and • Conduct weekly cleanliness checks of the worker camps and construction site	Contractor's cost	Contractor	PIU
Community health and safety	Safety risk to public safety during transport of materials. Safety risk to pedestrians.	• Barricade the construction site to restrict the public from the site and control 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	Contractor's cost	Contractor	PIU
	Air pollution due to emissions and dust	• 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.	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		• 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.			
	Congestion and blockages/obstructions	• Brief drivers on restriction of spillage or storing of construction material along access road and highway	Contractor's cost	Contractor	PIU
Chance finds	Potential chance finds	Follow chance finds procedure: • In case of suspected chance finds, the Contractor shall immediately stop all works • Contractor to report immediately within the same day to the PMU or PIU regarding the suspected chance finds. • PMU or PIU to advise the 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.	Contractor's cost	Contractor	PIU
Emergencies	Risk of injury and losing	Develop an emergency action plan to handle	Contractor's	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
such as earthquakes, Fire hazards	lives due to natural hazards and fire	emergencies such as earthquakes, fires, breakdown in machinery, collapse of structures, electrical mishaps. These are as follow: • Inform workers on 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 and other emergencies • 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. • Stabilize all temporary structures to prevent them from collapse. • 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 • Restrict operation of machines to trained and competent operators, or under the supervision of one	cost		
Post construction – camp closure	• Positive impact resulting to restoration of pleasant aesthetics at site.	Implement camp and site closure plan that includes the following • Dismantle all worker camps, fill in sanitation areas/temporary toilets with soil • Remove all machines, equipment and debris from construction site and worker	Contractor's cost	Contractor	PIU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		camps • Reuse and recycle the waste and only dispose what cannot be used after segregation. • Restore any damage to government or private properties • Hand over site back to PMU • Carry out repair and maintenance during liability period as per contract • Ensure that foreign workers exit the country (expatriation) on completion of work • Plan and undertake revegetation and landscape development			
Post-construction – greening and landscaping	• Positive impact resulting from enhancement of the surrounding environment.	• Improve aesthetic view by landscaping • Develop green belt around the housing complex by planting suitable plants	Contractor's cost	Contractor	PIU
Operation phase					
Building occupancy and utilization	Wear and tear of buildings	• 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
	Fire safety	• 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	• Construct Crash barriers along the highway to prevent vehicles from falling onto the buildings • Follow instructions from the Disaster Management Committee (DMC) on	Housing Management Cost	PIU	PIU / PMU

Subproject Activities / Field	Potential Environmental Impacts	Mitigation Measures	Cost	Implementation	Supervision
		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			
	Buildup of sewage that could impact surface water and groundwater	• Coordinate with Dungkhag to ensure connection to the sewage lines when these are constructed	Housing Management Cost	PIU	PIU / PMU
	Solid waste generation that could impact the environment	• Follow Dungkhag waste management guidelines and garbage collection and disposal times • Ensure that garbage is not allowed to accumulate on the premises.	Housing Management Cost	PIU	PIU / PMU

C. Environmental Performance

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

a. Air emission and dust- number of fires being lit, number of electrical appliances being use and measures to contain dust during construction;
b. Water supply –The provision of facilities to ensure adequate water supply for construction as well as domestic needs of staff and workers;
c. Waste disposal- Receipt of waste disposal permit and the number of truckloads of excavated materials and waste segregated, reused, recycled and disposed;
d. Traffic congestion – Number of accidents due to material transportation and drop off;
e. Worker Health and Safety- The number of accidents and emergencies must be recorded with actions taken to prevent repeat of the same mistakes in the future; and
f. Community health and safety- The number of grievances and complaints received by the community during project construction and operation.

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:

a. assess project performance against agreed criteria;
b. identify any environmental harm and non-compliance issues;
c. provide data to support compliance;
d. prepare corrective action plans is required; and
e. 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 project activities with PIU and contractor to ensure timely implementation of project 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 10. This monitoring sheetis 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 11. This checklistis 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 this 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 project completion. The template for the SEMR is attached as Appendix 12.

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

Table 28: Environmental Monitoring Plan

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
Pre-Construction					
1	Land use approval	• Land Use certificate received from National Land • Commission	PMU	PMU	PMU
2	Project design and approvals	• Infrastructure design and • construction approval	One time	NHDCL	PMU
3	Roles and responsibilities and awareness of project site supervision team	• Office order • TOR for Site supervision team • Training materials • Participant list	One time	NHDCL	PMU
4	Awareness and training of contractor	• Pre-bid meeting to inform contractors • No.of trainings and dates • Contractor's attendance • sheet	One time	NHDCL	PMU
5	Incorporating of EMP into bid documents	• EMP included in bid document	One time	NHDCL	PMU
6	Incorporating of OHS requirements into contract	• OHS component included in Contract	One time	NHDCL	PMU
7	Project disclosure and information	• Project information/brief on NHCDL website, • Project contact number on signboards • Minutes of • Meeting/Consultation with • Affected people, potential beneficiaries and • community	One time	NHDCL	PMU
8	Baseline Environmental Monitoring	• Air quality • Noise	One time	Contractor	PIU
Construction phase					
9	Consents and Permits	• Tree removal • Waste disposal	One time	PIU and contractor	PIU
10	Recruitment of workers	• No. of workers (nationals/foreign- by gender) • No. of skilled and unskilled workers • No. of workers below age 18	During recruitment	Contractor	PIU
11	Worker's welfare (health and safety)	• No. of worker camps • Availability of safe drinking water, electricity and • sanitation facilities (with separate toilets for males and females) • PPE distribution list/records	Monthly	Contractor	PIU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
		• Ocular inspection of the cleanliness of workercamps • safety structure installed • Overtime facilities provided • Emergency Contact numbers displayed • Assembly points identified • Emergency protocols • First aid kid • Warning signs at risky/hazardous areas • Records in accident register with incidents and actions taken. • No of fire extinguishers installed at site • Type and no. of trainings • (training record)			
12	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 asper 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. • No. of water supply repair • and maintenance works	Monthly or as necessary	Contractor	PIU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
16	Waste management of worker camps, construction sites	• No. and types of waste bins installed • No. of truckloads of construction waste disposed • Ocular inspection of camps • and construction site • Segregation, storage of • hazardous waste	Monthly or as necessary	Contractor	PIU
17	Generation of excavated soil	• % soil reused for construction • % soil disposed • Ocular observation of soil • pileup at site	One time	Contractor	PIU
18	Site drainage	• Site drainage • Connection to storm water drainage • Repair and maintenance of drains • Ocular observation of site • drainage	Monthly or as necessary	Contractor	PIU
19	Noise pollution and disturbance	• 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
20	Congestion and blockages/obstructions	• No. of complaints on congestion caused by Construction traffic • Ocular observation of road conditions (spillage of construction material along • access road, blockage of drains and footpaths)	Monthly	Contractor	PIU
21	Material storage	• No. of material storage sheds • Ocular observation on material storage at site • Material inventory	Monthly	Contractor	PIU
22	Community health and safety	• Consultation with community (minutes of meeting, participant list) • No. of safety signs • Installation of barricades • Obstruction of access routes/paths • No. of accidents occurred • No. of complaints received	Monthly	Contractor	PIU

23	Camp closure	• Ocular observation of site conditions and compliance • to EMP	One time	Contractor	PIU
Operation phase					
24	Operation phase	• Maintenance records	Every quarter	NHDCL estate management	PMU
25	Fire hazard	• No. of fire extinguishers, • and maintenance record	Once a year	NHDCL estate management	PMU
26	Sewage and Sanitation	• Maintenance record	Once a year	NHDCL estate management	PMU
27	Waste Management	• Maintenance record	Once a year	NHDCL estate management	PMU

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

a. On a need basis, conduct site visits for subprojects with potential adverse environmental or social impact;
b. 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;
c. Review the SEMRs submitted by PMU to ensure that adverse impacts and risks are mitigated as planned in the EMP;
d. 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
e. Prepare a PCR 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 project completion.

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:

a. 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;
b. Project compliance monitoring, and preparation and submission of environmental monitoring reports; and
c. 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 29: Training Modules for Environmental Management

Module	Frequency of Sessions	Target participants	Conducting Personnel
1. Introduction and Sensitization to Environmental Issues (One-day workshop): • ADB Safeguards Policy Statement; • Government of Bhutan applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHS, etc.; • Sensitization on 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
2. Project training on hazards, health, safety and environmental issues pertaining to the project (two-day workshop and site visits): • 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): • Implementation of EMP • Identification of environment impacts • Monitoring and reporting for EMP • Public interactions and consultations • Coordination for consents with various departments • Monitoring format 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, in. Costs associated with activities that are borne by the PMU, PIC 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 30: 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 hard barricading with type of materials, specifications to be mentioned).	set	10	100.00	1,000.00
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).	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 checkups that should be done to be mentioned to Contractorand 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 equipment, first aid kits, fire extinguishers. (PPE extra stock of minimum 10% of total workers should be available with stock and issue register shouldbe available for inspection. Mention the types of PPEs with specifications that should beprovided 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.	months	18	2,000.00	36,000.00
B	**EMP MONITORING (Air quality monitoring, set intervals for monitoring. Reports should be submitted along with the signature of witness from consultant).**				
B.1	Baseline Data Collection of Air quality and Noise Level	Samples	1	250.00	250.00
B.2	Monitoring of Air Quality at downwindlocation.	Samples	4 (1 location x 4)	250.00	1,000.00
B.3	Monitoring of Noise Level at site	Site	4 (1 location x 4)	20.00	80.00
C.	**Enhancement Measures**				
C.1	Landscaping after the construction period	Sqm	Cost included in Contractor's BOQ		

	Activities or Items	Unit of Measure	No. of Units	Unit Cost ($)	Total ($)
			cost.		
D.	**COVID-19 HEALTH AND SAFETY PLAN (if required)**				
D.1	Thermal scanners. All persons at the worksite should have their temperature screened with Infrared Thermometer (handheld non- contact). [Dr. Trust(USA) Non-Contact ForeheadTemporal Artery Infrared Thermometer]	scanner	2	60.00	120.00
D.2	Contactless attendance system. (This is biometric attendance system unit. Prices for contactless system are notavailable)	unit	1	110.00	110.00
D.3	Liquid Soap & Hand washing arrangement at site	L.S.			100.00
D.4	Contactless, sensor-based/ pedal operated sanitizer [Metal foot sanitizer dispenser]	unit	3	30.00	90.00
D.5	Additional rest areas at sites and diningspaces in camp site	L.S.	Cost included in Contractor's BOQcost.		
D.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 bemonitored.			
D.7	First aid kits with hand sanitizers and hand wash liquids shall be mandatory available inall the vehicle without any lapses.	L.S.			200.00
D.8	Regular notification by local government, district authority should be adhered to, and all the staff should be compulsorily made awareof such notification.	No additional cost required but should bemonitored.			
D.9	Job protection of workers during crisis periodof COVID 19 pandemic needs to be ensured.	No additional cost required but should bemonitored.			
F.	**Contingency (10%)**				**4,765.00**
	Total				**52,415.00**

XI. RECOMMENDATION AND CONCLUSION

307. The IEE process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Bhutan Affordable Housing 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 project design or location.

308. The NHDCL will construct 8 residential buildings on 2.45 acres of land in municipal area below the Panbang-Nganglam highway. The land user certificate has been processed from the National Land Commission.

309. There is no need for land acquisition and there are no impacts on ecological habitats and wildlife species in the vicinity. The project design will take into consideration required building design regulations and guidelines to ensure earthquake resilience, climatic conditions and Bhutanese architectural designs.

310. All necessary approvals and permits required have been identified and will be processed with the relevant authorities. Most of the impacts will occur during the construction period 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 to the conditions of the loan agreement, ADB safeguard policies, National regulations and the EMP.

311. Based on the findings of the IEE, most 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 EIA needs to be undertaken to comply with ADB SPS (2009) or national regulations.

312. There should in fact be major benefits in terms of major improvements in quality of life for the lower income support staff and their families once the construction is completed.

313. The draft IEE for this subproject has been prepared based on preliminary designs. The IEE is now updated based on the revised design of the subproject. If the design is further revised or modified, the PMU shall update this IEE based on final detailed design and submit to ADB for review and disclosure. The approved updated IEE shall be treated as the finalIEE, 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:

Sector Division:

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area			
▪ Densely populated?	✓		The site is located within the municipal boundaries, opposite the Dungkhag offices and below the guest house.
▪ Heavy with development activities?	✓		Nganglam is growing as a hub for industries with increasing number of trucks plying with cement and agricultural products and travelers going to Pema Gatshel and Gyelpozhing. The town is rapidly developing in terms of infrastructure with many new commercial and residential buildings being constructed
▪ Adjacent to or within any environmentally sensitive areas?			No, the site is located within the municipal boundaries
● Cultural heritage site		✓	The closest religious site (Trema Lhakhang) is about 3 00m away from the site.
● Protected Area		✓	The closest protected area is the Biological Corridor that is about 2km away

Screening Questions	Yes	No	Remarks
• Wetland		✓	There is no wetland in and around the area.
• Mangrove		✓	There are no coastal areas in Bhutan.
• Estuarine		✓	There are no coastal areas in Bhutan.
• Buffer zone of protected area		✓	The closest biological corridor (Biological Corridor #5) is about 2km away.
• Special area for protecting biodiversity		✓	There is no special area for protecting biodiversity in and around the area.
• Bay		✓	There are no coastal areas in Bhutan.
B. Potential Environmental Impacts Will the Project cause…			
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.			The subproject involves construction of 8 residential buildings comprising 32 units. Once built, the housing subproject will require additional Dungkhag resources to expand the coverage of the existing sanitation and sewerage infrastructures and waste disposal management systems so as to reach the subproject area.
▪ 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 activity is within the permissible development activity and the local area plan.
▪ 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?		✓	There are no affected families
▪ 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
▪ 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 and cultural properties. The land use in the area is for residential purposes and will not conflict with tourism activities in the city.

Screening Questions	Yes	No	Remarks
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		✓	The area was previously used as residential area.
▪ water resource problems (e.g., depletion/degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?		✓	The site already has water supply but will be connected to the municipal water supply (this is ongoing at the moment)
▪ air pollution due to urban emissions?	✓		This is anticipated during the 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.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation?	✓		This is anticipated during the construction phase. Occupational health and safety hazards from construction works will be mitigated through the OHS measures, many of which are mandatory by regulation. The environmental management plan (EMP) of the project will provide measures to mitigate this impact.
▪ road blocking and temporary flooding due to land excavation during rainy season?		✓	Excavation works are limited to foundation works within the site boundary so it is not expected to cause any roadblock. Site drainage will connect to the municipal drain.
▪ noise and dust from construction activities?	✓		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 along the road going towards the RBP Colony. The impact on traffic disturbance will be temporary during the 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.

Screening Questions	Yes	No	Remarks
▪ temporary silt runoff due to construction?	✓		This is anticipated if excavation works are undertaken during the rainy season. The EMP of the project will provide measures to avoid or minimize runoff, such as for example, avoiding or minimizing heavy excavation works during monsoon season, 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.
▪ water depletion and/or degradation?		✓	During the 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 residents within the Dungkhag will move to the new facility (no net increase in residents). Besides, the design includes rainwater harvesting that will reduce water dependence from the city's piped water services.
▪ overpaying of groundwater, leading to land subsidence, lowered ground water table, and salinization?		✓	Underground water will not be extracted at all. Water will be taken from the piped water supply facility in the area.
▪ contamination of surface and ground waters due to improper waste disposal?		✓	Mitigation measures for waste disposal are outlined in the EMP. Also, the area is serviced by the waste disposal trucks.
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?		✓	The site is at least 200m from the river and will be connected to the stormwater drainage on the eastern side
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	At the most, it is anticipated that about 30-40 workers will be at the site at any given time. This will cause a significant population influx. Also, measures are included in the EMP to ensure social integration and provision of adequate accommodation with water supply and sanitation facilities.
▪ social conflicts if workers from other regions or countries are hired?		✓	So far there are no incidents of worker conflict within the Dungkhag, so this is not anticipated. However, mitigation measures to brief and warn workers against social conflicts is reflected in the EMP

Screening Questions	Yes	No	Remarks
▪ 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 the construction phase, but not explosives. The EMP of the project will provide measures to avoid potential impact of fuel or chemical spills during the construction phase.
▪ 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 the 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: Nganglam, Pema Gatshel)
Sector : Water and Other Urban Infrastructure and Services
Subsector : Urban Housing
Division/Department : SAUW

Screening Questions		Score	Remarks[53]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	0	The site is vulnerable to landslide on its western boundary but the design will mitigate this with the placement of the buildings away from the slope No flood risk as the site is on the top of the hill
	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)?	0	No such effect was envisaged.
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 was envisaged.
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	1	There are chances of windy conditions that could damage buildings
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?		
	Cumulative score	1	

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

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	**0**
Likely	**1**
Very Likely	**2**

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

Result of Initial Screening (Low, Medium, High): Medium
Other Comments: Exposure of the site to climate change related hazard is likely
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. The trees cut will be mitigated through compensatory afforestation
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.

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)*
1.5	Construction works?	Yes	Ambient air quality and noise level 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.
1.6	Demolition works?	No		
1.7	Temporary sites used for construction works or housing of construction workers?	No		There is ample land within and adjacent to the project site, and if additional land is required for temporary housing, this will be leased from Dungkhag or a private party.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes	Ambient air quality and noise level due to potential dust generation and elevated noise level during works.	Not significant because the activity is temporary and any impacts are short-term and can be readily mitigated through standard measures. Much of the excavated soil will be reused for filling and leveling works for internal access road and parking
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		

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)*
1.13	Offshore structures?	N/A		
1.14	Production and manufacturing processes?	N/A		
1.15	Facilities for storage of goods or materials?	Yes	None.	Construction materials that will be used are to be delivered to the site on a programmed and scheduled basis. Materials that are needed day-to-day during the construction period will be stored at a dedicated storage area at the site. This storage will have a small footprint.
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	Yes	Aesthetics and odor due to potential release of untreated effluents and indiscriminate disposal of solid wastes	Not significant because the impact can be mitigated through efficient functioning of the facilities as per design. Sewage will be vacuum pumped by use of tankers hired from SJ. The town itself has no sewerage system at the moment.
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 to the existing highway
1.19	New road, rail, air, waterborne or other transport infrastructure including new or altered	No		The project site is already adjacent to the existing highway

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)*
	routes and stations, ports, airports etc.?			
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.
1.21	New or diverted transmission lines or pipelines?	No		
1.22	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	N/A		
1.23	Stream crossings?	No		There are no streams within 100m of the site
1.24	Abstraction or transfers of water from ground or surface waters?	No		The site will be connected to the local municipal water supply
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	Yes	Drainage structures, due to siltation	Not significant because the site will be connected to the stormwater drainage system
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.

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)*
				Construction materials will be transported from neigboring towns and districts, depending on availability.
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 due to workforce at the site during the construction phase.	Not significant because the activity is temporary and any impacts are short-term and can be readily mitigated through standard measures. Both foreign and national workers will be recruited by the contractor for the construction work temporarily (until the duration of the construction period)
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		No because the trees found at the site are commonly found throughout the Dungkhag

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)*
				area
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 2. 452 acre 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 within the area Water will be used from existing water supply
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.
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	Not significant. Timber will be required for making

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)*
			trees.	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 within the Dungkhag
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, 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, groundwater quality; ambient air quality, including odor. Sanitation quality at the site (including Contractor's camp) could affect the	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)*
			hygiene or aesthetic of immediate vicinity due to wastewater releases, 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.	Positively significant. The subproject will provide affordable housing for lower income staff. It will improve their living conditions as they are living in temporary shelters, sharing accommodation or living in hotels at the moment.
3.4	Are there especially vulnerable groups of people who could be affected by the project e.g., hospital patients, the elderly?	No		There are no affected people at the site
3.5	Any other causes?	No		
4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?	Yes	Aesthetic, 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, odor; due to potential dumping and mismanagement	Not significant because the impacts are short term and localized. Standard

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)*
			of solid wastes that could pollute the environment.	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 (from solvents, primers, paints, adhesives, etc.) that could pollute the environment.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts.
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	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 wastes.	Not significant because the impacts are short term and localized. Standard measures are available to mitigate the impacts. Adequate arrangements with the approval by the Dungkhag will be made to segregate and dispose construction waste.
4.8	Redundant machinery or equipment?	No		

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)*
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 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.

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)*
5.5	Dust or odors from handling of materials including construction materials, sewage and waste?	Yes		Dust will be generated during material transportation, loading and unloading and sewage will be generated in the worker camps. OHS requirements and maintenance of workers camps will be followed
5.6	Emissions from incineration of waste?	No		
5.7	Emissions from burning of waste in open air (e.g., slash material, construction debris)?	No		This is not permitted and will be restricted
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 e.g., 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,	Not significant because the impacts are short term and localized. Standard measures are available to

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.	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, 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.	Not significant because the impacts are short term and localized. Standard measures 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	Yes	Land and ground water quality, due to	Not significant because the impacts are short term and

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)*
	toxic materials?		potential unwanted release of fuels, solvents, primers, adhesives, paint.	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	Land 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.
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	N/A		

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)*
	environmental protection e.g., failure of pollution control systems?			
8.3	From any other causes?	No		
8.4	Could the project be affected by natural disasters causing environmental damage (e.g., floods, earthquakes, landslip, 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. The site lies in High Seismic zone and could be affected earthquakes. The buildings are designed for seismic performance (IS 1893:2016, Zone V, Z=0.36, I=1.37, R=5, Damping=5%).
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 subproject will not increase the local population because the new occupants of the housing facility will be moving into the new facilities from the same area
9.2	By resettlement of people or demolition of homes or	No		

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)*
	communities or community facilities e.g., schools, hospitals, social facilities?			
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 housing units will be selected from within the area.
9.4	By placing increased demands on local facilities or services e.g., housing, education, health?	Yes	Humans/people, due to increased demand from workers during the construction phase. These workers will increase the demand for these services in the locality resulting to stress on availability to accommodate such demand.	Not significant. This impact is temporary during the construction phase only. During the operation phase, everything will be back to normal since the future residents of the housing units are existing residents who are already being served by the various services.
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 subproject will generate employment for foreign workers and nationals (skilled and non-skilled) 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	No		The site already has

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)*
	pressure for consequential development which could have significant impact on the environment e.g., more housing, new roads, new supporting industries or utilities, etc.?			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, waste or wastewater treatment, etc.) housing development extractive industries supply industries other?	No		
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	No		

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)*
	proximity to other existing or planned projects with similar effects?			

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

Question	Remarks

Are there features of the local environment on or around the Project location which could be affected by the Project?
 	
• 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.
  o Wetlands,
  o Watercourses or other waterbodies,
  o the coastal zone,
  o mountains,
  o 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?
 	
• Areas or features of high landscape or scenic value?
 	
• Routes or facilities used by the public for
	The project lies outside the Biological Corridor and is about 2km from it.
	
	The closest river is about 200m south of the site.
	
	The area is within the city center and within the urban village, where the existing land use is residential housing.

Question	Remarks
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?	The project will be visible to its immediate neighbors (other residents living in the adjacent buildings.
Is the Project located in a previously undeveloped area where there will be loss of greenfield land?	No, the site was previously used as a temporary housing area
Are there existing land uses on or around the Project location which could be affected by the Project? For example: • homes, gardens, other private property, • industry, • commerce, • recreation, • public open space, • community facilities, • agriculture, • forestry, • tourism, • mining or quarrying	No, the site was previously used as a temporary housing area
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?	The only effect on the residents in the buildings surrounding the site is from dust and noise during construction
Are there any areas on or around the location which are occupied by sensitive land uses which	No. The closest religious site is 200m from the site.

Question	Remarks
could be affected by the Project? • hospitals, • schools, • places of worship, • community facilities	
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: • groundwater resources, • surface waters, • forestry, • agriculture, • fisheries, • tourism, • minerals.	No
Are there any areas on or around the location of the Project which are already subject to pollution or environmental damage? For example: • where existing legal environmental standards are exceeded, which could be affected by the Project	No
Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions? For example: • temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems?	Yes, the project and the town in general fall in High earthquake risk area but this has been considered during design phase
Is the Project likely to affect the physical condition of any environmental media? • The atmospheric environment including microclimate and local and larger scale	No

Question	Remarks
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?	
Are releases from the Project likely to have effects on the quality of any environmental media? • 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
Is the Project likely to affect the availability or scarcity of any resources either locally or globally? • fossil fuels • water • minerals and aggregates • timber • other non-renewable resources • infrastructure capacity in the locality - water, sewerage, power generation and transmission, telecommunications	The demand for water will increase due to the construction activities. Mitigation measures include installation of water storage tanks and provision for rainwater harvesting

Question	Remarks
• waste disposal roads, rail	
Is the Project likely to affect human or community health or welfare? • 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?	No. The project will not affect human or community health. It is expected to provide relief to the residents living in crowded, expensive or hotels, apartments or in temporary houses.

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: Sample COVID 19 Health and Safety Guidance for Contractors

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,[54] the ILO Workplace Response to the Coronavirus Disease outbreak,[55] 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 suppressionsystem 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

[54] 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

[55] 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.

the work areas that are equipped with adequate soap and water will be provided for workers to 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^{o}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: Land User Certificate

Appendix 5: Result of IBAT Screening

Page 1/4

Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Range Office, Nganglam, Pema Gatshel

NTR/07/2021-2022/ 374

8th April, 2022

Liaison Officer
National Housing Development Corporation Limited
Samdrup Jongkhar

Sub: Survey at Project Site

Sir,
In reference to letter no. **NHDCL-SJ/GEN/(04)/2022/61** dated **05/04/2022** from your end, we are pleased to inform your good office that we couldn't find any presence of the list of species submitted to our office at the project site.

(Detail list of the species is enclosed)

Thanking You

Yours faithfully

Forest Range Officer
Nganglam Range
Pema Gatshel

Copy:
1. Office Copy

Species list for Ngangtam

	Species Name	Common Name	Taxonomic Group	IUCN Category	Site
1	Haematopinus oliveri	Pygmy Hog Sucking Louse	INSECTA	Critically endangered	Absent
2	Indotestudo elongata	Elongated Tortoise	REPTILIA	Critically endangered	Absent
3	Batagur dhongoka	Three-striped Roofed Turtle	REPTILIA	Critically endangered	Absent
4	Manis pentadactyla	Chinese Pangolin	MAMMALIA	Critically endangered	Absent
5	Aythya baeri	Baer's Pochard	AVES	Critically endangered	Absent
6	Houbaropsis bengalensis	Bengal Florican	AVES	Critically endangered	Absent
7	Gyps bengalensis	White-rumped Vulture	AVES	Critically endangered	Absent
8	Sarcogyps calvus	Red-headed Vulture	AVES	Critically endangered	Absent
9	Ardea insignis	White-bellied Heron	AVES	Critically endangered	Absent
10	Emberiza aureola	Yellow-breasted Bunting	AVES	Critically endangered	Absent
11	Gyps tenuirostris	Slender-billed Vulture	AVES	Critically endangered	Absent
12	[illegible]		[illegible]	Critically endangered	Absent
13	Ailurus fulgens	Red Panda	MAMMALIA	Critically endangered	Absent
14	Bhutanitis ludlowi	Ludlow's Bhutan Glory	INSECTA	Endangered	Absent
15	Bubalus arnee	Wild Water Buffalo	MAMMALIA	Endangered	Absent
16	Caprolagus hispidus	Hispid Hare	MAMMALIA	Endangered	Absent
17	Cuon alpinus	Dhole	MAMMALIA	Endangered	Absent
18	Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	Endangered	Absent
19	Elephas maximus	Asian Elephant	MAMMALIA	Endangered	Absent
20	Geoclemys hamiltonii	Spotted Pond Turtle	REPTILIA	Endangered	Absent
21	[illegible]	Indian [illegible]	REPTILIA	Endangered	Absent
22	Melanochelys tricarinata	Tricarinate Hill Turtle	REPTILIA	Endangered	Absent
23	Moschus chrysogaster	Alpine Musk Deer	MAMMALIA	Endangered	
24	Panthera tigris	Tiger	MAMMALIA	Endangered	Absent
25	[illegible]		ACTINOPTERYGII	Endangered	Absent
26	Porcula salvania	Pygmy Hog	MAMMALIA	Endangered	Absent

Forest Range Officer
Ngangtam Range
Pemagatshel

27	Trachypithecus geei	Gee's Golden langur	MAMMALIA	Endangered	Absent
28	Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	Endangered	Absent
29	Platanista gangetica	South Asian River Dolphin	MAMMALIA	Endangered	Absent
30	Axis porcinus	Hog Deer	MAMMALIA	Endangered	Absent
31	[illegible]	Keeled Box Turtle	REPTILIA	Endangered	Absent
32	[illegible]		ACTINOPTERYGII	Endangered	Absent
33	Perdicula manipurensis	Manipur Bush-quail	AVES	Endangered	Absent
34	Sterna acuticauda	Black-bellied Tern	AVES	Endangered	Absent
35	Haliaeetus leucoryphus	Pallas's Fish-eagle	AVES	Endangered	Absent
36	Aquila nipalensis	Steppe Eagle	AVES	Endangered	Absent
37	Falco cherrug	Saker Falcon	AVES	Endangered	Absent
38	Leptoptilos dubius	Greater Adjutant	AVES	Endangered	Absent
39	Laticilla cinerascens	Swamp Grass-babbler	AVES	Endangered	Absent
40	[illegible]		MAGNOLIOPSIDA	Endangered	Absent
41	Tor putitora		ACTINOPTERYGII	Endangered	Absent
42	Bubalus arnee	Wild Water Buffalo	MAMMALIA	Endangered	Absent
43	Porcula salvania	Pygmy Hog	MAMMALIA	Endangered	Absent
44	Trachypithecus geei	Gee's Golden Langur	MAMMALIA	Endangered	Absent
45	Rhinoceros unicornis	Greater One-horned Rhino	MAMMALIA	Vulnerable	Absent
46	Tragopan blythii	Blyth's Tragopan	AVES	Vulnerable	Absent
47	Apus acuticauda	Dark-rumped Swift	AVES	Vulnerable	Absent
48	Prinia cinereocapilla	Grey-crowned Prinia	AVES	Vulnerable	Absent
49	Chrysomma altirostre	Jerdon's Babbler	AVES	Vulnerable	Absent
50	[illegible]	Slender-billed Babbler	AVES	Vulnerable	Absent
51	Paradoxornis flavirostris	Black-breasted Parrotbill	AVES	Vulnerable	Absent
52	[illegible]	Assam Asian Treefrog	AMPHIBIA	Least Concern	Absent
53	Kaloula assamensis	Assamese Balloon Frog	AMPHIBIA	Least Concern	Absent

Forest Range Officer
Nganglam Range
PemaGatshel

54					
55					
56					
57					

Forest Range Officer
Ngacglam Range
Pema Gatshel

IBAT SPECIES LIST

IBAT

World Bank Group Biodiversity Risk Screen

BHU-AHDP_NGANGLAM-PEMA_GATSHEL

- Country: Bhutan
- Location: [illegible]
- Created by: [illegible]

Overlaps with:

Protected Areas World Heritage (WH)	32 km: 5 32 km: 1	10 km: 4 10 km: 0	1 km: 0 1 km: 0	9 1
Key Biodiversity Areas Alliance for Zero Extinction (AZE)	32 km: 5 32 km: 0	10 km: 3 10 km: 1	1 km: 0 1 km: 0	7 1
IUCN Red List				47
Critical Habitat				Likely

Displaying project location and buffers: 1 km, 10 km, 32 km

IBAT

About this report

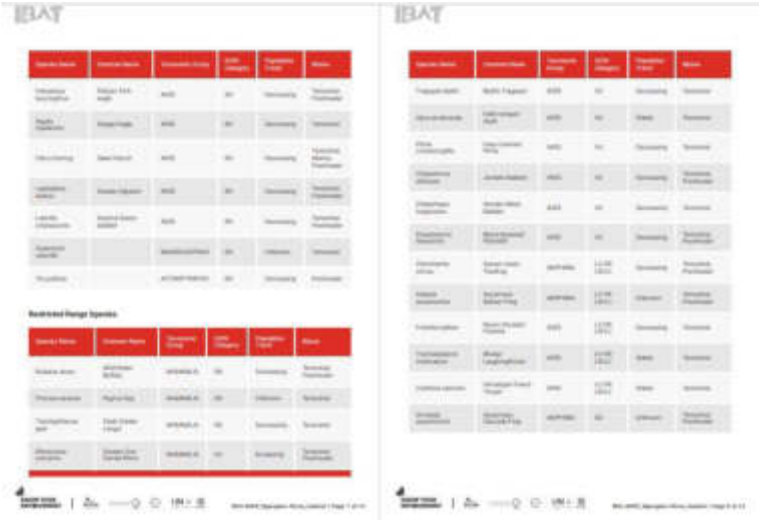
Legal disclaimer

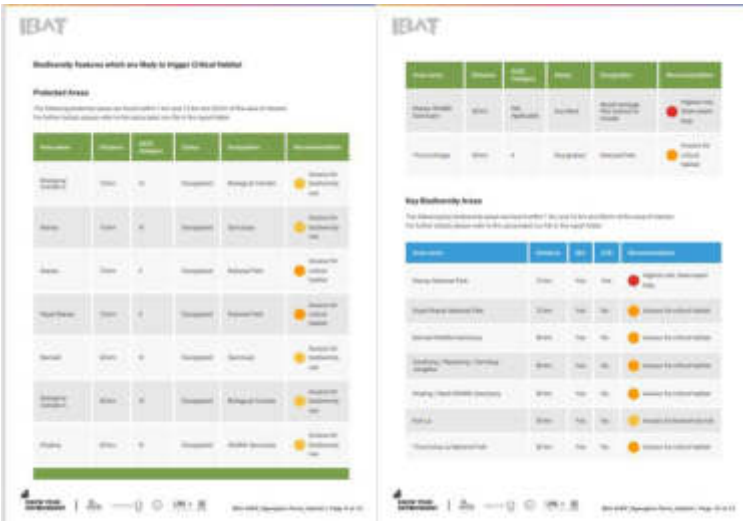
IBAT

IBAT

Priority Species

IUCN Red List of Threatened Species - CR & EN





Appendix 6: Minutes of the Consultations conducted with NHDC housing tenants and staff living in housing provided by corporations employed with and those living in private housing, photographs and participant list

19th May, 2022

The NHDCL Liaison Officer presented the floor plans and designs of the housing units planned as well as the location identified. He also informed that the lowest rent would be Nu. 3047 to 40700 for two-bedroom apartments.

Water supply: Participants were asked to share their views on water supply. Waste management and building designs as adaptations for climatic conditions. Participants expressed that as there is supply from the town/dungkhag, most people tap their own water sources. In summer this is not a problem because of the heavy rains, so people just lay pipes all over the place. In winter water is either pumped from the ground or taken from the larger streams and rivers further away. There is a water supply project that has already been contracted out so this issue is expected to be resolved within a year and will cover the entire Throm. NHDCL said that they will discuss with Dungkhag to request for a distribution line from the new water supply scheme for the Housing complex. The distribution line and the Water Treatment Plant is above the guest house so at a higher elevation compared to the proposed site.

Rainwater harvesting facility. The meeting was informed that a rainwater harvesting facility has been included in the housing complex design. considered for the site while also ensuring that there are adequate water storage facilities to cater to the 32 proposed units.

Sewerage: There is currently no sewerage system and most houses/buildings have their own septic tanks.

Stormwater drainage: Given the heavy monsoon rains, it was pointed out by the participants that the housing complex must ensure adequate stormwater drainage. NHDCL informed the meeting that the layout has included this based on the site terrain.

Waste disposal: There is a waste disposal truck that collects the waste from the town area twice a week, on Monday and Thurdsay. The waste disposal site is located at Yangkholom about 10km away. Also, mass cleaning is carried out within the dungkhag on the 2nd and 9th of each month within the town area and the industrial area respectively. The participants were informed that NHDCL will be requesting Dungkhag to identify sites to dispose of construction waste and it was recommended by the participants that this was a good idea and that maybe the consultants could also highlight the need for private constructions to do the same during the meeting with Dungkhag.

Physical Cultural Resources: The participants were asked whether there are any religious sites The most popular is the Thema Lhakhang and the Chorten towards the center of the town. There is a Lhakhang 500m, southwest of the site.

Emergencies: The participants were asked about the disaster management protocols. The participants informed that there is a firefighting station located within the Police camp and since recent times, Desuups are mobilized to assist the community during emergencies and disasters. The participants were informed that fire hydrants will be included into the design.

Climatic conditions: In terms of adapting to climatic conditions, Nganglam experiences very heavy rain during the summer and also very strong winds. Thus, the NHDCL was requested to

consider this during the design stage. One participant enquired whether it is possible to request for Air conditioning to cope with the heat for some of the apartments.

Safety: Also, in terms of safety, the selected site lies adjacent to the Nganglam-Panbang Highway and therefore, there is a risk of accidents/damage to the buildings. There was much discussion on construction of walls, speed breakers or crash barriers. Also, the NHDCL was also requested to find out whether clearance from the Department of Roads was required for the take off point on the second entrance near the Dungkhag guesthouse area.

Clearance process: The meeting was informed on the forest and NEC clearance process as well as the need to prepare an Initial Examination Report as per the safeguard requirements of the ADB. Participants were informed on the EMP and how measures outlined in the IEE will be part of the contract agreement and required to be complied by the contractor.

Tree felling. The participants were informed that for each tree cut, double the number of trees must be planted by NHDCL in consultation with the Range Office (in terms of selecting suitable trees). Also, the possibility of planting trees as windbreaks on the border (leaving appropriate distance from the buildings) could be explored during landscaping.

The tentative schedule for the project implementation was also detailed by the NHDCL representative.

NGANGLAM

LIST OF PARTICIPANTS FOR CONSULTATIONS, BAHP,

FOCUS GROUP DISCUSSIONS (NGANGLAM)

No	Name	~~CID No.~~ Contact No	Male/Female	Designation	Organization	Signature ~~Contact No.~~
1	Mindu Gyeltshen	17660382	male	Dlm	Dlm	[signature]
2	Pema Rinzin	17678584	Male	Forest	DofPS	[signature]
3	Sonam Wangyel	17988373	Male.	Pvt.	—	[signature]
4	Jamyang Wangchuk	77435834 ~~17393844?0~~	male	Pvt	—	[signature]
5	Tshewang Rigphel Phuentshok	17511995	male	Pvt.	—	[signature]
6.	Ajit Rai	17841401	m	Gvt.	Dzongkhag	[signature]
7	Leki Dorji	17651795	"	"	"	[signature]
8	Cheom Cheki	17920604	Female	"	"	[signature]
9	Sonam Tshomo	17508769	"	"	"	[signature]
10	Bhodha maya	17630002	"	"	"	[signature]
11	Deki P Yonten	77110028	F	Consultant	MB Ltd.	[signature]
12	Saroj k. Nepal	17624568	m	Consultant	ADB	[signature]
13	Buddham Rai	17973760	M	Liaison Officer	NHDCL	[signature]

Date: 13/05/2022

Place: NGANGLAM

Record of Discussion with Dasho Dungpa, Nganglam
20th May,2022.

Page 1 / 3

Consultation with Nganglam Dungkhag on the NHDCL Housing Project at Nganglam

Date : 20th May, 2022
Time : 07:30 PM
Venue : Dungkhag Office

Officials present:

1. Sherab Zangpo, Sr. Dungpa
2. Samten Choeda, Dungkhag Engineer
3. Buddham Rai, Liaison Officer, NHDCL, Samdrup Jongkhar
4. Saroj Nepal, Social Consultant, ADB
5. Deki P. Yonten, Environment Consultant, ADB

Minutes of Meeting

Sl. No.	Agenda Items	Clarification/Response from the Dungkhag
1	Introduction of meeting participants	The Liaison Officer, NHDCL, S/J briefed Dungpa on the purpose of the visit and the Consultants introduced themselves and briefed the meeting on the TOR purpose of the site visit and reports to be prepared for ADB and NEC approval.
2	Site Location The Consultant enquired about the site location and if the NHDCL site falls within the new township area.	The Dungkhag has confirmed that the site falls within the township area
3	Water supply The project team requested the Dungkhag for inclusion of the housing colony into the new water supply distribution network (Water Flagship Program) that has been initiated.	The Dungkhag agreed to do so but it was suggested that in case there are problems during the construction and operation phase, the project can also pump water to the site from the Kerong river, as it has been practiced by the most constructions. The Dungkhag was informed that the housing complex design will also incorporate the rainwater harvesting facility to mitigate the issue of water shortage but the Dungkhag officials felt that this might not be necessary as discussed above.
4	Sewerage The clarification was sought on the sewerage system in the Dungkhag	The Dungkhag clarified that there is currently no sewerage system and most houses/buildings have their own septic tanks and there are no plans to have a sewerage network anytime in the near future. Currently

Page 2/3

Sl. No.	Agenda Items	Clarification/Response from the Dungkhag
		the Dungkhag hires the vacuum tanker from Samdrup Jongkhar Thronde to empty the septic tank whenever required to do so.
5	Waste Clarification was sought on the collection and dumping site of organic waste, construction waste and excavated waste.	With only one Garbage Collection Truck, currently the organic wastes are collected twice a week and the practice might remain same for next few years unless the Dungkhag gets an additional Garbage Collection Truck from the Government. For excavated waste, the Dungkhag informed that there is a lake adjacent to the Middle Secondary School (about 400 meters away from the site) and Principal has requested soil for filling the area. The school will be asked to submit a request and accordingly, the excavated soil from the housing complex site can be transported and utilized for the school site. For construction waste, the Dungkhag informed that the existing waste site, which is 10-km away, is about an acre and this site can adequately accept construction waste. This waste will be required to be dumped in the same area but separately from general waste. The Dungkhag is also in the process of identifying other vacant SRF area for the excavated and construction waste disposal. The Dungkhag informed that the project must incorporate the requirement to transport, compact and level the area after waste dumping for both excavated soil and construction waste. Post construction waste from camp closure can also be disposed at the same site as the construction waste. The NHDCL informed the meeting that the contractor who dismantled the site has agreed to dispose of the rubble and demolition waste at the site from previously dismantled structures.
6	Religious Sites	The Dungkhag informed that there are no special sites of national significance within the Dungkhag apart from the religious sites like the Deatshang, Dungkhag Chorten, Throelma Lhakhang and Chortens at the tri-junction. The Dungkhag Chorten lies just nearby the site across Nganglam-Panbang National Highway while the rest of the religious sites are located more than 500 meters away.

Note: The "lake" being mentioned is a natural land depression which forms into an artificial lagoon due to storm water during monsoon/summer season.

Page 3/3

Sl. No.	Agenda Items	Clarification/Response from the Dungkhag
7	Emergency	The Dungkhag informed that there is Disaster Focal Officer, who is responsible for coordinating all disaster emergencies measures. The public and private sectors are required to abide by the measures led by the Disaster Focal Officer in liaison and coordination with the Dungkhag.
8	Safety	The earmarked site for the housing colony lies just adjacent to Ngangkam-Panbang National Highway and the Dungkhag recommended the construction of crash barriers along the highway to prevent accidents and causing inconvenience to the future residents of the colony and the public in general.
9	Entry points The discussion of the second entry/exit point on the upper slopes near the Dungkhag Guesthouse could cause disturbances to the visitors at the guesthouse due to construction works and whether the proposed entry/exit will cause any obstruction to the Dungkhag Guesthouse access road.	The Dungkhag informed that the second entry/exit road on the upper slope near the guesthouse may be dropped so as to avoid vehicular noise disturbances to the important guests/visitors at the guesthouse. In terms of disturbance during the constructing period, as the guests/visitors will only stay in the Dungkhag for very short periods, there will not be much issue of noise disturbances. However, the Contractor executing the project, should be informed by the NHDCL to abide by the certain rules and regulations stipulated by the Dungkhag during construction period.
10	Any other matters	The Dungkhag informed that they have allotted land to the NHDCL more than three years ago considering the housing was an issue especially as the rent is higher than other larger urban towns. Therefore, in view of relaxation of restrictions by the Government by now, the Dungkhag requested the NDHCL to commence to construction works as soon as possible to address the housing shortage in Ngangkam. The Dungkhag recommended the NHDCL to consider the window lids of the buildings from outside to stop rain water dipping inside and the use of iron rods to the extent possible in lieu of timbers for durability.

Buddhan Rai
LO, S1

Appendix 7: 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.[56] 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 virus[57].

C. Common Symptoms of Corona Virus Disease[58]

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:

[56] Gross National Happiness Commission. 2019. Twelfth Five-Year plan. 2018-2023. Thimphu.
[57] World Health Organization. https://www.who.int/health-topics/coronavirus#tab=tab_1
[58] World Health Organization. https://www.who.int/health-topics/coronavirus#tab=tab_3

- aches and pains.
- 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 8: Sample Grievance Redress Form

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	● 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: ● Note/Letter

<table>
<tr><td colspan="2">

- E-mail
- Verbal/Telephonic

</td></tr>
<tr><td colspan="2">Reviewed by: (Names/Positions of Official(s) reviewing grievance)</td></tr>
<tr><td colspan="2">Action Taken:</td></tr>
<tr><td>Whether Action Taken Disclosed:</td><td>

- Yes
- No

</td></tr>
<tr><td colspan="2">Means of Disclosure:</td></tr>
</table>

Appendix 9: Suggested Template for Record-Keeping of Grievances

S. No.	Date of receipt of grievance	Name and contact details of complainant	Description of complaint	Nature of complaint	Decisions taken	Response given to complainant and date	Whether closed/ resolved

Appendix 10: Sample Environmental Site Inspection Checklist for Contractors
DAILY MONITORING SHEET FOR CONTRACTORS

AFFORDABLE HOUSING DEVELOPMENT SECTOR PROJECT
Contractor Monitoring Sheet

Name of Subproject: _____
Location of Subproject: _____
Chainage covered (for linear works): _____
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)**	
Location/zoning permits		
Permit to construct		
Building permit		
Transport / hauling permits		
2. Compliance with IEE Requirements	**(Approved / Under Preparation / Submitted to PIU for Approval)**	
Site-specific EMP (SEMP)		
Corrective Action Plan if any		
3. Compliance with SEMP		
Construction Site	**(Satisfactory / Needs Improvement / Not Implemented)**	
- **Conduct of toolbox talk**		
- **Use of PPE**		
- **Rest areas for male and female workers**		
- **Toilets for male and female workers**		

Monitoring Item	Status	Remarks
- **Medical kits**		
- **Drinking water supply**		
- **Dust control**		
- **Noise control**		
- **Solid waste management**		
- **Wastewater management**		
- **Chemicals storage (fuel, oil, etc.)**		
- **Siltation or erosion control**		
- **Heavy equipment staging / parking area**		
- **Barricades around excavation sites**		
- **Access to residential houses/shops/businesses**		
- **Traffic routing signages**		
- **Lightings at night**		
- **Trench shoring / landslide protection**		
Construction Workers' Camp Site	**(Available / Needs Improvement / Not Available)**	
- **Quarters for male and female workers**		
- **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**		

Monitoring Item	Status	Remarks
- **Solid waste management**		
- **Wastewater management**		
- **Pest control**		
4. Implementation of GRM	**(Yes / No or None / Under Resolution)**	
Complaints		
Complaints resolution		
5. Environmental Quality Measurement	**(Passed / Failed / Not Applicable)**	
Ambient air quality sampling		
Noise level measurement		
Receiving water quality sampling		

Other Issues: _____

_____

_____

_____

Attachments:
1. Copies of permits obtained, if any.
2. Photos taken at worksites, if any.
(photos attached in previous monitoring sheets should not be used again).
3. Laboratory results of environmental quality measurements, if any.

Prepared by: _____
Name, Designation and Signature

Appendix 11: Sample Environmental Site Inspection Checklist for PMU/PIU

INSPECTION CHECKLIST FOR PMU AND PIUs

AFFORDABLE HOUSING DEVELOPMENT 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?				

Monitoring/Inspection Questions		Findings			Comments / Clarifications
	b. Are excavation trenches provided with shores or protection from landslide?				
	c. Is breaktime for workers provided?				
	d. How many for each type of collection vehicle is in current use?				
4.	Community Safety	Yes	No	NA	
	a) Are excavation areas provided with barricades around them?				
	b) Are safety signages posted around the sites?				
	c) Are temporary and safe walkways for pedestrians available near work sites?				
	d) Is there a record of treated wastewater quality testing/measurement?				
5.	Solid Waste Management	Yes	No	NA	
	a. Are excavated materials placed sufficiently away from water courses?				
	b. Is solid waste segregation and management in place?				
	c. Is there a regular collection for solid wastes from work sites?				
6.	Wastewater Management	Yes	No	NA	
	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?				

Monitoring/Inspection Questions		Findings			Comments / Clarifications
	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, weekdays?				
	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?				

Monitoring/Inspection Questions		Findings			Comments / Clarifications
9.	Traffic Management	Yes	No	NA	
	a) Are traffic signages available around the construction sites and nearby roads?				
	b) Are re-routing signages sufficient to guide motorists?				
	c) Are the excavation sites along roads provided with barricades with reflectors?				
	d) Are the excavation sites provided with sufficient lighting at night?				
10.	Recording System	Yes	No	NA	
	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 12: Semi-annual Environmental Monitoring 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)[59]	If On-going Construction	
				%Physical Progress	Expected Completion Date

[59] If on-going construction, include %physical progress and expected date of completion

II. COMPLIANCE STATUS WITH NATIONAL / STATE / LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS[60]

Package No.	Subproject Name	Statutory Environmental Requirements [61]	Status of Compliance[62]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[63]

III. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

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

[60] 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.

[61] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

[62] Specify if obtained, submitted and awaiting approval, application not yet submitted

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

IV. 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)		

- 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)[64]

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						

[64] 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

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

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

I. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)

- Discuss the general condition of surroundings at the project site, with consideration of the following, whichever are applicable:

    - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
    - Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
    - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these are intact following heavy rain;
    - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
    - Confirm spill kits on site and site procedure for handling emergencies.
    - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
    - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
    - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
    - Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
    - Indicate if there are any activities being under taken out of working hours and how that is being managed.

- Briefly discuss the basis for environmental parameters monitoring.
- Indicate type of environmental parameters to be monitored and identify the location.
- Indicate the method of monitoring and equipment used.
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements.

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

Air Quality Results

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

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

Water Quality Results

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

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

Noise Quality Results

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

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

VI. 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).

VII. 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).

VIII.SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

IX.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

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

Appendix 13: Forest Clearance

Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Divisional Forest Office, Pema Gatshel

PGD/FPES-17/2021-2022/ 627 20 May, 2022

Sub.: Forestry Clearance from the Government Institutional/Corporate Registered Land.

The forestry clearance for removal of forest produce from the Government Institutional/Corporate Registered Land is issued for Plot No. NG1-506 under Thram No. 278 registered in favor of National Housing Development Corporation Limited under Norbugang Gewog, Nganglam Dungkhag, Pema Gatshel Dzongkhag as mentioned below:

Land Category	Area (ac)	Plot No.	Forest Produces					
			Trees >3' girth		Poles <3' girth		Others (specify)	Purpose
			Species	Qty	Species	Qty		
Institutional	0.950	NG1-506	Schima	4				NHDCL Housing development
			Castanopsis	3				
			Daubanga	3				
			Other	2				
			Total	12		Nil	Nil	

This clearance is accorded based on the strength of field report and recommendation submitted by the Range Officer, Nganglam HQ Range vide No. NTR/03/2021-2022/425 dated 09/05/2022 under the following terms and conditions:

1. Trees/Poles proposed for removal from the Government Institutional Registered land shall be marked and handed over to NRDCL for extraction and disposal as per TEDM 2019;
2. The trees/poles should be marked by the forestry official, prior to felling;
3. The applicant shall obtain transit permit prior to transportation of forest produce;
4. The applicant should obtain commercial sawing permit prior to transportation of forest produce to sawmill for sawing;
5. This clearance shall not replace/substitute any other clearance required by other laws;
6. This clearance shall not be liable for any dispute arising during the implementation of activity;
7. The applicant should strictly abide by timber extraction and distribution modality;
8. In case of any illegal felling within the vicinity of timber extraction sites, the applicant shall be held responsible;
9. Further in case of illegal activities, the timber extraction activities shall be suspended and approval will be revoked until the case is compounded;
10. Proper silviculture method should be adopted during felling of trees. The activity should not cause any impacts to the surrounding environment including streams and rivers;

Gamdisa, Khar, Pema Gatshel. Phone No. +975 17612586 (CFO), 17150981 (General), 17150979 (ADM)
Pema Gatshel Range: 07-471105, Nganglam Range: 07-481107, Yurung Range: 17764704

རྒྱལ་ཡོངས་འབྲུག་གཞུང་། ཞིང་ཚན་དང་ནགས་ཚལ་ལྷན་ཐབས།
རྒན་གཞི་ཚོང་དང་ཕྱིའི་ཀུན་འབྲེལ་དཔེ་ཁབ་བྱང་ཁག
ནགས་ཚལ་ཞིང་ཁྱིམ་ཡིག་ཚང་། པདྨ་དཀར་རྫོང་།

Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Divisional Forest Office, Pema Gatshel

11. This clearance is exclusively for removal of forest produce from the Government Institutional Registered land specified under *Thram* and plot number. In case of false information, the applicant shall be liable to be penalized as per FNCRR 2017;
12. Any damage caused to public/private property shall be borne by the holder of this clearance;
13. The clearance shall be revoked without any liability on part of the Government if the holder of this clearance violates any of the above terms and conditions;
14. The concerned Range Office shall monitor the extraction and utilization activities regularly;
15. The forestry clearance shall remain valid until the period of activity;
16. Date of issue: May 20, 2022.

(Tshering Dendup)
Chief Forestry Officer

Copy to:

1) The Hon'ble Director, DoFPS, Thimphu for favor of kind information.
2) The Dasho Dzongdag, Dzongkhag Administration, Pema Gatshel for kind information.
3) Dasho Dungpa, Nganglam Dungkhag Administration for kind information.
4) The Gup, Norbugang Gewog Administration for kind information.
5) The Manager, NHDCL, Nganglam for kind information and follow-up action.
6) Range Officer, Nganglam HQ Range and Norbugang Gewog for strict monitoring.

FC for plot 2 page ½

Royal Government of Bhutan
Ministry of Agriculture and Forests, Department of Forests and Park Services
Divisional Forest Office, Pema Gatshel

PGD/FPES-17/2021-2022/ 635 3 June, 2022

Sub.: Forestry Clearance from the Government Institutional/Corporate Registered Land.

The forestry clearance for removal of forest produce from the **Government Institutional/Corporate Registered Land** is issued for **Plot No. NG1-505** under **Thram No. 278** registered in favor of National Housing Development Corporation Limited under **Norbugang Gewog, Nganglam Dungkhag, Pema Gatshel Dzongkhag** as mentioned below:

Land Category	Area (ac)	Plot No.	Forest Produces				Others (specify)	Purpose
			Trees >3' girth		Poles <3' girth			
			Species	Qty	Species	Qty		
Institutional	0.585	NG1-505	Schima	3	Ficus	1		NHDCL Housing development
			Castanopsis	4				
			Erythrina	2				
			Other	5	MHW	3		
			Total	14		4	Nil	

This clearance is accorded based on the strength of field report and recommendation submitted by the Range Officer, Nganglam HQ Range vide No. NTR/24/2021-2022/451 dated May 30, 2022 under the following terms and conditions:

1. Trees/Poles proposed for removal from the Government Institutional Registered land shall be marked and handed over to NRDCL for extraction and disposal as per TEDM 2019;
2. The trees/poles should be marked by the forestry official, prior to felling;
3. The applicant shall obtain transit permit prior to transportation of forest produce;
4. The applicant should obtain commercial sawing permit prior to transportation of forest produce to sawmill for sawing;
5. This clearance shall not replace/substitute any other clearance required by other laws;
6. This clearance shall not be liable for any dispute arising during the implementation of activity;
7. The applicant should strictly abide by timber extraction and distribution modality;
8. In case of any illegal felling within the vicinity of timber extraction sites, the applicant shall be held responsible;
9. Further in case of illegal activities, the timber extraction activities shall be suspended and approval will be revoked until the case is compounded;
10. Proper silviculture method should be adopted during felling of trees. The activity should not cause any impacts to the surrounding environment including streams and rivers;

FC for plot 2 page 2/2

འབྲུག་རྒྱལ་ཡོངས་གཞུང་། སོ་ནམ་དང་ནགས་ཚོང་ལྷན་ཐག
ནགས་ཚོང་དང་སྐྱོང་ཀ་ཞབས་ཏོག་འཚུལ།
མངའ་ཐེ་ནགས་ཚོས་ཡིག་ཚང་། པདྨ་དགའ་ཚལ།

Royal Government of Bhutan
Ministry of Agriculture and Forests, Department of Forests and Park Services
Divisional Forest Office, Pema Gatshel

11. This clearance is exclusively for removal of forest produce from the Government Institutional Registered land specified under Thram and plot number. In case of false information, the applicant shall be liable to be penalized as per FNCRR 2017;
12. Any damage caused to public/private property shall be borne by the holder of this clearance;
13. The clearance shall be revoked without any liability on part of the Government if the holder of this clearance violates any of the above terms and conditions;
14. The concerned Range Office shall monitor the extraction and utilization activities regularly;
15. The forestry clearance shall remain valid until the period of activity;
16. Date of issue: **June 3rd, 2022.**

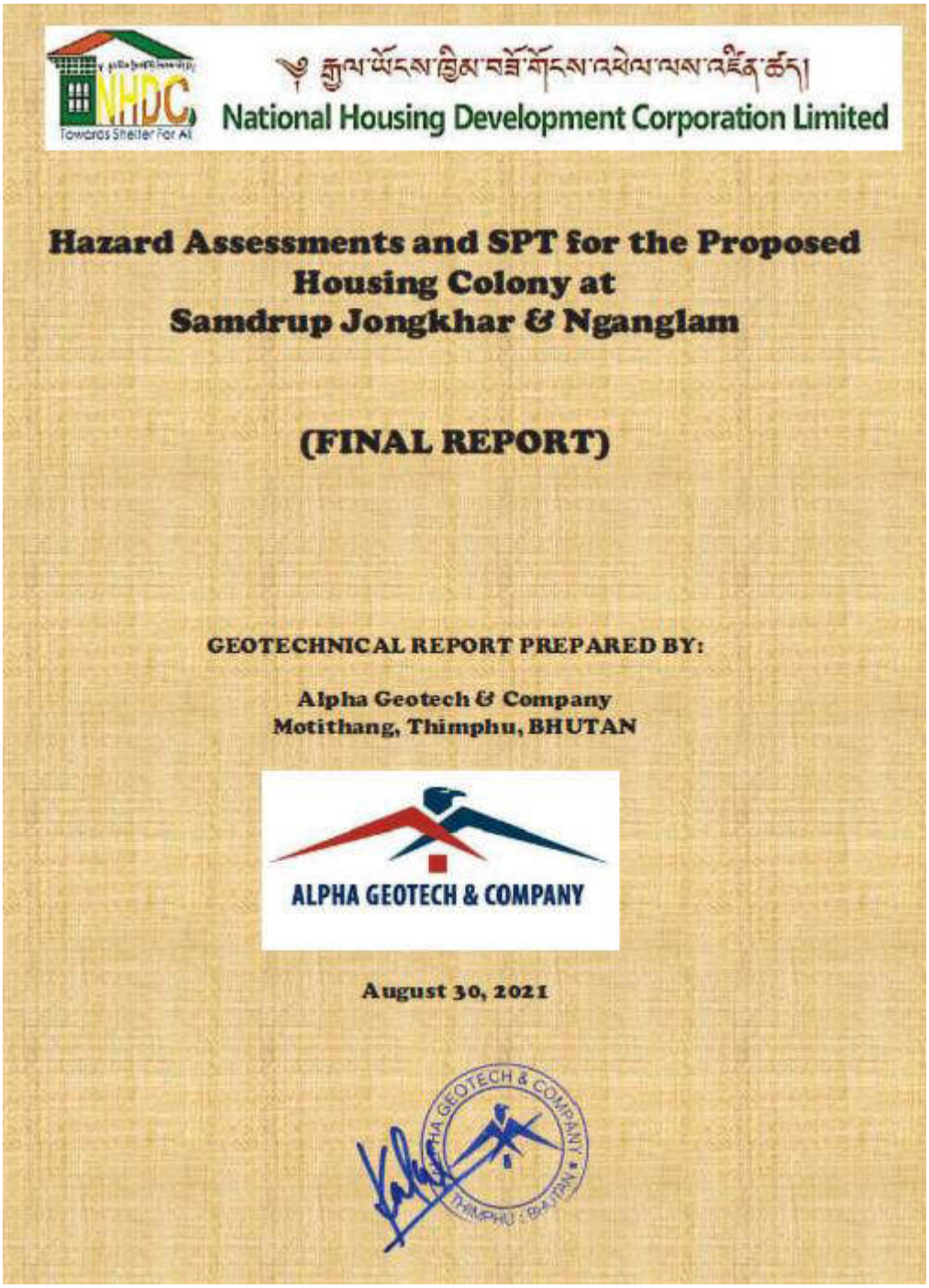
(Tshering Phuntsho)
Offtg. Chief Forestry Officer

Pemagatshel Forest Division * Department of Forests & Park Services *

Copy to;

1) The Hon'ble Director, DoFPS, Thimphu for favor of kind information.
2) The Dasho Dzongdag, Dzongkhag Administration, Pema Gatshel for kind information.
3) Dasho Dungpa, Nganglam Dungkhag Administration for kind information.
4) The Gup, Norbugang Gewog Administration for kind information.
5) The Manager, NHDCL, Nganglam for kind information and follow-up action.
6) Range Officer, Nganglam HQ Range and Norbugang Gewog for strict monitoring.

Appendix 14. GEOTECHNICAL ASSESSMENT FOR PROPOSED HOUSING COLONY AT NGANGLAM



NHDC
Towards Shelter For All

National Housing Development Corporation Limited

Hazard Assessments and SPT for the Proposed Housing Colony at Samdrup Jongkhar & Nganglam

(FINAL REPORT)

GEOTECHNICAL REPORT PREPARED BY:

Alpha Geotech & Company
Motithang, Thimphu, BHUTAN

ALPHA GEOTECH & COMPANY

August 30, 2021

ALPHA GEOTECH & COMPANY
THIMPHU : BHUTAN

GEOTECHNICAL ASSESSMENT FOR PROPOSED HOUSING COLONY AT NGANGLAM

1. Introduction

The National Housing Development Corporation Limited (NHDCL) finalized identifying various locations and sites for the constructions of affordable housing in the country under Asian Development Bank (ADB) ADB funding. After several round of discussions with ADB team, it was agreed that NHDCL would conduct geotechnical investigations and hazard assessments of the project sites since this is the requirement of funding agency. Therefore, NHDCL outsourced the consulting work of Geotechnical Investigation to Alpha Geotech and Company (AGC), a local geotechnical consulting firm. For Nganglam, only 6 (six) numbers of SPT and geotechnical lab tests were conducted as per the consulting contract agreement. However, upon the request of NHDCL, the consulting company prepared all the necessary maps (site map, slope map, geologic map and hazard map) and also provided the following geotechnical assessment.

2. Standard Penetration Tests (SPT) and Lab Tests

The SPT data obtained for Nganglam is given in Annexure C1. The SPT N-values ranged from 13 to 20, corresponding to medium dense soil. The photographs of the soil at each trial pit in **Annexure C2**. The soil at the proposed housing colony is residual soil, formed from weathering of underlying sandstone. The soil is of low plasticity with gravel content in excess of 22% in a matrix of sand. The fines content is less than 3%. The geotechnical lab tests results for Nganglam are given in **Annexure B3**.

3. Hazard Assessment

All types of geohazards at the project site from different sources were studied. The hazard map is attached as **Annexure A7**. There is no geohazard that will preclude the construction of housing colony at the proposed site in Nganglam. Some minor geohazards that could impact the construction of housing colony are discussed in the following sections.

a. Landslide

The proposed housing colony at Nganglam comprises of 2 (two) flat areas separated by a slope of about 30°. Although this slope is dormant at present, it could be activated and minor landslide could occur during site development. Therefore, it is recommended to stabilize this slope with construction of RCC retaining walls or slope benching. This slope has height of only about 12m and it could be easily stabilized through structure mitigation.

b. Flood Hazard

The proposed housing colony at Nganglam is basically on a hilltop. So it is not susceptible to any floods.

c. Soil Liquefaction

The current project site at Nganglam is not susceptible to soil liquefaction during earthquake since the site is on a hilltop overlain with compacted residual soil and there is no groundwater table close to ground surface. Below the soil cover of about 3m, there is bedrock of sandstone. This is visible at outcrops nearby.

Nganglam Sub-project
Updated Draft IEE- October. 2023
(Comment Matrix)

Sl.No	ADB Comments (10 Oct 2023)	PMU Update (10 Oct 2023)	Reference	Remarks
1	Inclusion of Appendix 14 in Appendices list.	Updated and included.	Appendices List under the Table of content	
2	Additional information to be added regarding the hazard assessment/geotechnical study under the " Disaster and emergencies" section.	Updated and included. "A hazard assessment/geotechnical study by a geotechnical consulting firm has been conducted as part of project preparation and design. The study assessed geohazards including soil liquefaction, flood and landslide hazards and the findings of the study are presented in this report, and the recommendations incorporated in the preliminary design (See Chapter V and Appendix 14)."	Refer to paragraph 77, page 60	
3	Inclusion of findings and recommendations from the hazard assessment/ geotechnical study under the "Risk of natural hazards such as earthquakes and climate change considerations" section.	Updated and included.	Refer to paragraph 132, page 89	
4	Inclusion of additional paragraph describing the mitigations.	Updated and included. "The recommendations of the hazard assessment will be followed and is integrated in the EMP. The design of the proposed housing colony already incorporates the following measures: "	Refer to paragraph 133, page 89	
5	Inclusion of additional information under the "Mitigation" section.	Updated and included. "The facility design ensures that the natural drainagewill not be obstructed, or throughput is not reduced. The natural drainage will be reinforced as part of the subproject design, and ensure no flooding occurs during the operation phase (or when the housing facility is occupied and used)."	Refer to paragraph 134, page 89	
6	Removal of the sentence. "Therefore, there is no risk to the buildings"	Updated and removed.	Refer to paragraph 135, page 90	
7	Inclusion of mitigation measures.	Updated and included. "The subproject will follow the recommendations of the hazard	Refer to Table 27, page 123	

		assessment/geotechnical study conducted as part of project preparation and design (Appendix 14)."		
	Additional Updates from PMU			
8	Paragraph number missing for the "Impact" section under the "Physical Cultural Resources" section	Updated and included. Paragraph number "130" included and updated all the paragraph numbers	Refer to paragraph 130, page 88	
9	Insertion of word "for" in the sentence. "The draft IEE this subproject has been prepared based on preliminary designs"	Updated and included. "The draft IEE **for** this subproject has been prepared based on preliminary designs"	Refer to paragraph 313, page 146	
10	Updated appendix number in the headers corresponding to the respective appendix number.	Updated.		
11	Updated the page number in the table of contents.	Updated.		