PROJECT TITLE: Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan

UNDP in collaboration with the Royal Government of Bhutan (RGoB) has developed the project proposal, **Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan**. The project addresses the urgent needs and priorities of the agriculture sector in adapting to climate change whilst promoting broader economic growth.

Project description: The project objective is to increase resilience of the agriculture sector in Bhutan to the impacts of climate change, and is structured across three outputs:

- Promote resilient agricultural practices in the face of changing climate patterns
- Integrate climate change risks into water and land management practices that affect smallholders
- Reduce the risk and impact of climate change induced landslides during extreme events that disrupt market access

Comment on Screening: The project was screened using the UNDP Social and Environmental Screening Checklist. There were a few 'yes' questions (risks) but their probabilities and impacts are low to moderate. There are small risks, which can be minimized and if avoidable, minimization, mitigation and management measures are integrated in the project design. The overall risk categorization is moderate as a number of issues have been identified.

Annex: VI (a) Social and Environmental Screening Template

The completed template, which constitutes the Social and Environmental Screening Report, must be included as an annex to the Project Document. Please refer to the Social and Environmental Screening Procedure and Toolkit for guidance on how to answer the 6 questions.

Project Information

Project Information	
1. Project Title	**Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan**
2. Project Number	5777
3. Location (Global/Region/Country)	Bhutan- Asia and the Pacific

Part A. Integrating Overarching Principles to Strengthen Social and Environmental Sustainability

QUESTION 1: How Does the Project Integrate the Overarching Principles in order to Strengthen Social and Environmental Sustainability?
Briefly, describe in the space below how the Project mainstreams the human-rights based approach
Human rights are protected by the Constitution of the Kingdom of Bhutan. Enjoyment of those rights are considered integral to the achievement of 'gross national happiness' (GNH) – the guiding sustainable development approach which takes a holistic approach towards notions of progress and gives equal importance to non-economic aspects of wellbeing. The project design is in line with the constitutional mandate in regards to human rights and will employ a human-right based approach in its delivery of goods and services. While the overall poverty rate in Bhutan has improved, poverty continues to be a rural phenomenon. Agriculture constitutes approximately 60% of livelihoods, mostly in subsistence farming with low returns. The project interventions sites selection considered this, and was based on higher incidences of poverty and climate vulnerability as well as potential to improve agriculture production. This is consistent with the Rural Economy Advancement Programme (REAP), the Royal Government of Bhutan's Five Year Plan (FYP) targets these vulnerable households to reduce food insecurity, hunger, malnutrition, and poverty. The project will also support vulnerable communities' participation and executive role on Water User's Association (WUA), Sustainable Land Management (SLM) and Road User's Group (RUG), formal and community-based seed production system providing an enabling decision-making environment for improved water and land management. In addition, crop diversification with introduction of stress-tolerant and high-yielding crop varieties (wheat, millet, and minor cereals) will enable the beneficiaries to reduce rice dependency habits and cope with malnutrition and externalities such as climate change. To promote the rule of law and accountability of project interventions, in case of any unforeseen adverse impact on the vulnerable communities, existing formal and informal grievance redress mechanism will be applied.
Briefly, describe in the space below how the Project is likely to improve gender equality and women's empowerment
Gender equality and empowerment is reinforced by the Constitution of the Kingdom of Bhutan, wherein, it charges as "fundamental rights of all Bhutanese citizens to be treated equal and effective protection under the law and shall not be discriminated against on the ground of race, sex, language, religion, politics or another status." Most activities on agricultural production and marketing are done by both men and women. However, vegetable cultivation and marketing were done by women while land ploughing, cardamom cultivation and marketing were done by men. Mostly, women weeded crops and transplanted paddy seedlings. Further, women marketed cereals, vegetables, fruits, livestock products (milk, cheese and butter), and processed home-made products underscoring women's active engagement from production to marketing indicating increasing feminization of agriculture. Women collect drinking water while men sources irrigation water and

collect fuel wood including fodder and graze cattle. Women were overwhelmingly engaged in family health care including food preparation and cooking. Gender Analysis highlights the limited role of women in social political activities. While at the community level the contribution of women is increasing, advancement (eg local government) is difficult due to limited education. Practical gender needs and priorities were identified as; drinking and irrigation water, seeds and seedlings, agricultural equipment and tools, electric / solar fence against wildlife incursions and education and, entrepreneurship skills. The project supports to increase women's representation and decision making role in the Water User's Association (WUA), Sustainable Land Management (SLM) and Road User's Group (RUG) and formal and informal seed production system creating an enabling environment for decision-making and benefit-sharing. GCF project will provide technical support to existing 25 cooperatives and 74 farmers groups in the project area and add value by creating new livelihood groups, where necessary. GCF project also targets capacity building of women, girls, boys and unemployed village youth in the entrepreneurship and business development skills in collaboration with the Bhutan Chamber of Commerce and Industry (BCCI) connecting rural women to domestic and international markets. As exit strategy, capacity building programs will empower women and men in formal and informal institutions (Government, cooperatives and farmers' groups) as knowledge brokers bringing about transformational change in the society ensuring post-project sustainability. The project design also mainstream gender disaggregated indicators and data under project objective and outputs for measuring progress qualifying the project as gender-sensitive (2) in the UNDP Gender Marker.
Briefly, describe in the space below how the Project mainstreams environmental sustainability
The project will support sustainable water and land use, through upscaling of sustainable land management approaches and training to Government staff and communities on wetlands and sustainable water use, to support the water budget in agriculture and irrigation development. The promotion of organic agriculture will help maintain the integrity of soil and water resources, by minimizing the use of chemical pesticides which can contaminate natural resources.

Part B. Identifying and Managing Social and Environmental Risks

QUESTION 2: What are the Potential Social and Environmental Risks? *Note: Describe briefly potential social and environmental risks identified in Attachment 1 – Risk Screening Checklist (based on any "Yes" responses). If no risks have been identified in Attachment 1 then note "No Risks Identified" and skip to Question 4 and Select "Low Risk". Questions 5 and 6 not required for Low-Risk Projects.*	**QUESTION 3: What is the level of significance of the potential social and environmental risks?** *Note: Respond to Questions 4 and 5 below before proceeding to Question 6*			**QUESTION 6: What social and environmental assessment and management measures have been conducted and/or are required to address potential risks (for Risks with Moderate and High Significance)?**
Risk Description	***Impact and Probability (1-5)***	***Significance (Low, Moderate, High)***	***Comments***	***Description of assessment and management measures as reflected in the Project design. If ESIA or SESA is required note that the assessment should consider all potential impacts and risks.***

Principle 3: Environmental Sustainability Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	P-2 I-3	**Moderate**	Water use and related development (i.e. irrigation) must be informed by the water budget to ensure sustainable water use. Similarly development planning must consider fragile wetlands and ecosystem services to avoid fragmentation and ensure continued functionality of ecosystems.	Training to government staff and communities on wetlands and sustainable water use will help ensure that project implementation minimizes impacts to wetlands.
Principle 3: Environmental sustainability Standard 3: Community Health, Safety, and Working Conditions	P-2 I-3	**Moderate**	The natural of construction elements related to roads may involve risks to personal safety (for workers).	Existing Rules and Regulations on Occupational Health and Safety (OHS) in Construction, Manufacturing, Mining and Services Industries will be applied. Increased monitoring is an important part of the project, and will ensure that not only construction is of quality, but also that OHS standards are being met.
Standard 6: Indigenous Peoples	P-1 I-2	**Low**	Project activities, particularly related to SLM, are in sites where ethnic minorities are part of the community.	While an FPIC is not deemed necessary, the project employs a participatory approach, where principles for FPIC will be demonstrated through, among others, providing timely information related to the risks and benefits of the proposed project interventions that will help them to decide whether collective consent will be given or withheld; a feedback mechanism that allows communities to obtain information that will help them in their consideration as well as define the roles they will play during implementation.
Standard 7: Pollution Prevention and Resource Efficiency	P-2 I-3	**Moderate**	There will be non-hazardous waste/debris generated, related to SLM and roadworks (Outputs 2-3).	Risks related to sediment (e.g. SLM and slope stabilization) will be mitigated using appropriate measures. Following environmentally friendly road construction (EFRC) guidelines, debris related to road construction will be collected and disposed of in a designated area.
	QUESTION 4: What is the overall Project risk categorization?			
	Select one (see SESP for guidance)			**Comments**

	Low Risk	☐	
	Moderate Risk	√	The overall risk categorization is moderate. The means of mitigating risks have been identified and integrated into project design.
	High Risk	☐	
	QUESTION 5: Based on the identified risks and risk categorization, what requirements of the SES are relevant?		
	Check all that apply		**Comments**
	Principle 1: Human Rights	☐	
	Principle 2: Gender Equality and Women's Empowerment	☐	
	1. Biodiversity Conservation and Natural Resource Management	√	- Wetlands training to government staff and communities will help to avoid fragmentation of wetlands and ensure sustainable use water resources related to irrigation development - Irrigation and SLM – May involve earth work- measures will be taken to minimize sediment entering waterways - Roads – EFRC road construction guidelines will be applied including proper handling and disposal of construction material and debris
	2. Climate Change Mitigation and Adaptation	☐	
	3. Community Health, Safety and Working Conditions	√	- Bhutan has Occupational Health Safety system in place to ensure safety of workers during construction - Climate proofing of existing road will reduce potential of collapse of road infrastructure – the output builds on best practices
	4. Cultural Heritage	☐	
	5. Displacement and Resettlement	☐	
	6. Indigenous Peoples	√	- The project employs a participatory approach, where principles for FPIC will be demonstrated through, among others, providing timely information related to the risks and benefits of the proposed project interventions that will help them to decide

			whether collective consent will be given or withheld; a feedback mechanism that allows communities to obtain information that will help them in their consideration as well as define the roles they will have during implementation. - Related guidelines are already available to support appropriate consultations and engagement in this regard, if necessary – the Stakeholder Engagement and Consultation Guidelines for REDD+ Programming in Bhutan were developed, based on consultations among key government, civil society and local communities' representatives global and regional IP representatives, and have been endorsed by Government. The guidelines were adapted to Bhutanese context based on a global UN-REDD Programme Guidelines on Free, Prior and Informed Consent (January 2013) that were developed in collaboration with global and regional Indigenous Peoples' representatives. (See Annex XIII of the project proposal)
	7. Pollution Prevention and Resource Efficiency	√	- Following EFRC guidelines construction debris will be disposed in environmentally friendly manner

Final Sign Off

Signature	***Date***	***Description***
QA Assessor		UNDP staff member responsible for the Project, typically a UNDP Programme Officer. Final signature confirms they have "checked" to ensure that the SESP is adequately conducted.
QA Approver		UNDP senior manager, typically the UNDP Deputy Country Director (DCD), Country Director (CD), Deputy Resident Representative (DRR), or Resident Representative (RR). The QA Approver cannot also be the QA Assessor. Final signature confirms they have "cleared" the SESP prior to submittal to the PAC.
PAC Chair		UNDP chair of the PAC. In some cases, PAC Chair may also be the QA Approver. Final signature confirms that the SESP was considered as part of the project appraisal and considered in recommendations of the PAC.

SESP Attachment 1. Social and Environmental Risk Screening Checklist

Checklist Potential Social and Environmental Risks		
Principles 1: Human Rights		**Answer (Yes/No)**
1.	Could the Project lead to adverse impacts on the enjoyment of the human rights (civil, political, economic, social or cultural) of the affected population and particularly of marginalized groups?	No
2.	Is there a likelihood that the Project would have inequitable or discriminatory adverse impacts on affected populations, particularly people living in poverty or marginalized or excluded individuals or groups? [1]	No
3.	Could the Project potentially restrict availability, quality of and access to resources or basic services, in particular to marginalized individuals or groups?	No
4.	Is there a likelihood that the Project would exclude any potentially affected stakeholders, in particularly marginalized groups, from fully participating in decisions that may affect them?	No
5.	Is there a risk that duty-bearers do not have the capacity to meet their obligations in the Project?	No
6.	Is there a risk that rights-holders do not have the capacity to claim their rights?	No
7.	Have local communities or individuals, given the opportunity, raised human rights concerns regarding the Project during the stakeholder engagement process?	No
8.	Is there a risk that the Project would exacerbate conflicts among and/or the risk of violence to project-affected communities and individuals?	No
Principle 2: Gender Equality and Women's Empowerment		
1.	Is there a likelihood that the proposed Project would have adverse impacts on gender equality and/or the situation of women and girls?	No
2.	Would the Project potentially reproduce discriminations against women based on gender, especially regarding participation in the design and implementation or access to opportunities and benefits?	No
3.	Have women's groups/leaders raised gender equality concerns regarding the Project during the stakeholder engagement process and has this been included in the overall Project proposal and in the risk assessment?	No
4.	Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and positions of women and men in accessing environmental goods and services? *For example, activities that could lead to natural resources degradation or depletion in communities who depend on these resources for their livelihoods and well-being*	No
Principle 3: Environmental Sustainability: Screening questions regarding environmental risks are encompassed by the specific Standard-related questions below		
Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management		
1.1	Would the Project potentially cause adverse impacts to habitats (e.g. modified, natural, and critical habitats) and/or ecosystems and ecosystem services? *For example, through habitat loss, conversion or degradation, fragmentation, hydrological changes*	No

[1] Prohibited grounds of discrimination include race, ethnicity, gender, age, language, disability, sexual orientation, religion, political or another opinion, national or social or geographical origin, property, birth or another status including as an indigenous person or as a member of a minority. References to "women and men" or similar are understood to include women and men, boys and girls, and other groups discriminated against based on their gender identities, such as transgender people and transsexuals.

1.2	Are any Project activities proposed within or adjacent to critical habitats and/or environmentally sensitive areas, including legally protected areas (e.g. nature reserve, national park), areas proposed for protection, or recognized as such by authoritative sources and/or indigenous peoples or local communities?	Yes, training to govt staff and to communities will help guide implementation to minimize impacts to wetlands
1.3	Does the Project involve changes to the use of lands and resources that may have adverse impacts on habitats, ecosystems, and/or livelihoods? (Note: if restrictions and/or limitations of access to lands would apply, refer to Standard 5)	No
1.4	Would Project activities pose risks to endangered species?	No
1.5	Would the Project pose a risk of introducing invasive alien species?	No
1.6	Does the Project involve harvesting of natural forests, plantation development, or reforestation?	No
1.7	Does the Project involve the production and/or harvesting of fish populations or other aquatic species?	No
1.8	Does the Project involve significant extraction, diversion or containment of surface or ground water? *For example, construction of dams, reservoirs, river basin developments, groundwater extraction*	No
1.9	Does the Project involve utilization of genetic resources? (e.g. collection and/or harvesting, commercial development)	No
1.10	Would the Project generate potential adverse transboundary or global environmental concerns?	No
1.11	Would the Project result in secondary or consequential development activities which could lead to adverse social and environmental effects, or would it generate cumulative impacts with other known existing or planned activities in the area? *For example, a new road through forested lands will generate direct environmental and social impacts (e.g. felling of trees, earthworks, potential relocation of inhabitants). The new road may also facilitate encroachment on lands by illegal settlers or generate unplanned commercial development along the route, potentially in sensitive areas. These are indirect, secondary, or induced impacts that need to be considered. Also, if similar developments in the same forested area are planned, then cumulative impacts of multiple activities (even if not part of the same Project) need to be considered.*	No
Standard 2: Climate Change Mitigation and Adaptation		
2.1	Will the proposed Project result in significant[2] greenhouse gas emissions or may exacerbate climate change?	No
2.2	Would the potential outcomes of the Project be sensitive or vulnerable to potential impacts of climate change?	No
2.3	Is the proposed Project likely to directly or indirectly increase social and environmental vulnerability to climate change now or in the future (also known as maladaptive practices)? *For example, changes to land use planning may encourage further development of floodplains, potentially increasing the population's vulnerability to climate change, specifically flooding*	No

[2] In regards to CO_2, 'significant emissions' corresponds generally to more than 25,000 tons per year (from both direct and indirect sources). [The Guidance Note on Climate Change Mitigation and Adaptation provides additional information on GHG emissions.]

Standard 3: Community Health, Safety and Working Conditions		
3.1	Would elements of Project construction, operation, or decommissioning pose potential safety risks to local communities?	No
3.2	Would the Project pose potential risks to community health and safety due to the transport, storage, and use and/or disposal of hazardous or dangerous materials (e.g. explosives, fuel, and other chemicals during construction and operation)?	No
3.3	Does the Project involve large-scale infrastructure development (e.g. dams, roads, buildings)?	No, roads work will focus on climate proofing of existing roads
3.4	Would the failure of structural elements of the Project pose risks to communities? (e.g. collapse of buildings or infrastructure)	No
3.5	Would the proposed Project be susceptible to or lead to increased vulnerability to earthquakes, subsidence, landslides, erosion, flooding or extreme climatic conditions?	No
3.6	Would the Project result in potential increased health risks (e.g. from water-borne or other vector-borne diseases or communicable infections such as HIV/AIDS)?	No
3.7	Does the Project pose potential risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during Project construction, operation, or decommissioning?	Yes, but OCHA guidelines will be applied and monitored
3.8	Does the Project involve support for employment or livelihoods that may fail to comply with national and international labor standards (i.e. principles and standards of ILO fundamental conventions)?	No
3.9	Does the Project engage security personnel that may pose a potential risk to health and safety of communities and/or individuals (e.g. due to a lack of adequate training or accountability)?	No
Standard 4: Cultural Heritage		
4.1	Will the proposed Project result in interventions that would potentially adversely impact sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g. knowledge, innovations, practices)? (Note: Projects intended to protect and conserve Cultural Heritage may also have inadvertent adverse impacts)	No
4.2	Does the Project propose utilizing tangible and/or intangible forms of cultural heritage for commercial or other purposes?	No
Standard 5: Displacement and Resettlement		
5.1	Would the Project potentially involve temporary or permanent and full or partial physical displacement?	No
5.2	Would the Project possibly result in economic displacement (e.g. loss of assets or access to resources due to land acquisition or access restrictions – even in the absence of physical relocation)?	No

5.3	Is there a risk that the Project would lead to forced evictions?[3]	No
5.4	Would the proposed Project possibly affect land tenure arrangements and/or community-based property rights/customary rights to land, territories and/or resources?	No
Standard 6: Indigenous Peoples		
6.1	Are indigenous peoples present in the Project area (including Project area of influence)?	Yes. Within the major ethnic groups of Ngalop, Sharchop and Lhotsampa, there are communities that have cultural variations. These communities are considered integrated, and the major ethnic groups themselves are not necessarily distinct or exclusive. While an explicit FPIC is not required, principles for FPIC will be demonstrated through the project's participatory approach.
6.2	Is it likely that the Project or portions of the Project will be located on lands and territories claimed by indigenous peoples?	No
6.3	Would the proposed Project potentially affect the human rights, lands, natural resources, territories, and traditional livelihoods of indigenous peoples (regardless of whether indigenous peoples possess the legal titles to such areas, whether the Project is located within or outside of the lands and territories inhabited by the affected peoples, or whether the indigenous peoples are recognized as indigenous peoples by the country in question)?	No

[3] Forced evictions include acts and/or omissions involving the coerced or involuntary displacement of individuals, groups, or communities from homes and/or lands and common property resources that were occupied or depended upon, thus eliminating the ability of an individual, group, or community to reside or work in a particular dwelling, residence, or location without the provision of, and access to, appropriate forms of legal or other protections.

	If the answer to the screening question 6.3 is "yes" the potential risk impacts are considered potentially severe and/or critical and the Project would be categorized as either Moderate or High Risk.	
6.4	Has there been an absence of culturally appropriate consultations carried out with the objective of achieving FPIC on matters that may affect the rights and interests, lands, resources, territories and traditional livelihoods of the indigenous peoples concerned?	No. Preliminary consultations and ESMF have indicated that an indigenous peoples plan or an explicit FPIC are not needed. That notwithstanding, the project adopts a participatory approach for its stakeholder engagement plan that demonstrates FPIC principles. This will be further monitored during implementation and further attention will be provided to ensure any affected indigenous peoples/ethnic minorities will be able to give or withhold their consent. If the latter occurs, the project will respect that decision and identify alternative sites.
6.5	Does the proposed Project involve the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples?	No

6.6	Is there a potential for forced eviction or the whole or partial physical or economic displacement of indigenous peoples, including through access restrictions to lands, territories, and resources?	No
6.7	Would the Project adversely affect the development priorities of indigenous peoples as defined by them?	No
6.8	Would the Project potentially affect the physical and cultural survival of indigenous peoples?	No
6.9	Would the Project potentially affect the Cultural Heritage of indigenous peoples, including through the commercialization or use of their traditional knowledge and practices?	No
Standard 7: Pollution Prevention and Resource Efficiency		
7.1	Would the Project potentially result in the release of pollutants to the environment due to routine or non-routine circumstances with the potential for adverse local, regional, and/or transboundary impacts?	No
7.2	Would the proposed Project potentially result in the generation of waste (both hazardous and non-hazardous)?	Yes - Following EFRC guidelines construction debris will be disposed in environmentally friendly manner
7.3	Will the proposed Project potentially involve the manufacture, trade, release, and/or use of hazardous chemicals and/or materials? Does the Project propose the use of chemicals or materials subject to international bans or phase-outs? *For example, DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Conventions on Persistent Organic Pollutants or the Montreal Protocol*	No
7.4	Will the proposed Project involve the application of pesticides that may have a negative effect on the environment or human health?	No
7.5	Does the Project include activities that require significant consumption of raw materials, energy, and/or water?	No

Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan

Environmental and Social Management Framework

26 May 2019

CONTENTS

EXECUTIVE SUMMARY

This Environmental and Social Management Framework (ESMF) has been prepared in support of a project proposal entitled "*Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan*" (the project) by the Royal Government of Bhutan to the Green Climate Fund (GCF). As this project is supported by the United Nations Development Programme (UNDP) in its role as a GCF Accredited Entity, the project has been screened against the UNDP's Social and Environmental Standards Procedure and deemed a Moderate Risk (GCF Environmental and Social Policy Category B) project. An ESMF has been preferred for the project over the preparation of an Environmental and Social Assessment Report as while for example, actual catchments are known for the irrigation activities, specific locations and interventions are not currently known and will be defined during project implementation.

The Gross National Happiness Commission (GNHC) as the National Designated Authority and executing agency is mandated to assume a function of "secretariat body to the Government". A Project Management Unit (PMU) for the implementation of the project and compliance with this ESMF.

The project will improve the resilience of the eight provinces, through improved water and soil management to support agriculture production through enhanced water management; scaling up of sustainable land management technologies and promoting sustainable use of water and land resources by communities. Further, the project will provide climate-resilient road infrastructure to improve market accessibility; and thus the long-term growth of the agriculture sector. The project will directly benefit 27,598 agriculture households (118,839 people - 46.5% of the rural population of Bhutan) and 460,000 indirect people in eight selected Dzongkhags (districts) of Bhutan that highly vulnerable to climate change induced extreme events (Dagana, Punakha, Trongsa, Tsirang, Samtse, Sarpang, Wangdue Phodrang and Zhemgang). The population in these eight Dzongkhags constitutes 34.78% of the total population of 766,492 as of 2015. Five Dzongkhags: Dagana (25.1%), Samtse (22.2%), Zhemgang (26.3%), Trongsa (14.9%) and Tsirang (14.8%) in particular, which have poverty rates that exceed the national average of 12%

The project will improve the resilience of the eight provinces, through improved water and soil management to support agriculture production through enhanced water management; scaling up of sustainable land management technologies and promoting sustainable use of water and land resources by communities. Further, the project will provide climate-resilient road infrastructure to improve market accessibility; and thus the long-term growth of the agriculture sector.

The project has the potential to cause moderate environmental and social impacts. Prior to any activity being undertaken, all local government approvals will be obtained. These include impacts to water quality through sediment movement during mechanical water retention ponds restoration, construction of water canals and improvement and road works. This is likely to have a beneficial impact in the medium to longer term by reducing erosion and thus impacts on water quality. There will also be the potential impact of sediment movement during the road works. Noise and air quality may also be impacted during these works. Prior to implementation, additional data will be collected for site specific interventions where there are gaps and the ESMF and ESMP updated. Appropriate actions are proposed to deal with these issues. The project will also result in the development of a seed bank and the project will ensure there are no genetically modified seeds/crops used and moreover, only local provenance will be used.

The project does not require any land acquisition and/or resettlement; however, investments will be undertaken on private land. All activities will be undertaken in full compliance with the *Land Pooling and Readjustment Regulations 2018* and the GCF and UNDP Policies, with the most stringent requirements being complied with. Infrastructures is already being constructed on previously acquired land, and the project will be working on improving the resilience of the existing infrastructures. There will be no restriction on land use. The restriction would be the use of the irrigation channel during the construction phase to avoid damage and ensure quality. These are just temporary, and the project will engage the communities to plan the activities so that there is minimal disruptions. The project will work with individual farming communities, where the land is privately owned. The activities will include seed production and upscaling including installing climate resilient practices such as hydroponics, aeroponic and vertical gardening. During implementation, any private land activities will be identified and GNHC will ensure activities on private land are only undertaken with the full consent of landholders. Any

grievances will the addressed through the developed Grievance Redress Mechanism. An outline of a Livelihood Restoration Plan has been developed for the project.

The project has developed a Grievance Redress Mechanism to deal with any complaints and issues that may arise as a result of the project. This Grievance Redress Mechanism complies with Bhutan and UNDP Safeguard procedures.

Appropriate and relevant avoidance and mitigation options have been proposed in the ESMF, which when implemented, will significantly reduce the potential impacts of the project to an acceptable level. An Erosion, Drainage and Sediment Control Plan has been developed. Moreover, the project will have significant environmental and social benefits that will be achieved more generally.

Budgeting for environmental interventions and the application of mitigation measures to enhance positive impacts for the eight provinces in Bhutan is an investment in the future as it will reduce the environmental and social liability at local, provincial and national levels. The end result of this budget will be that there will be clean water, more productive soils with less chemicals, more resilient crops to the impacts of climate change, healthy ecosystems, knowledgeable communities and overall improvement in the quality of life of the population as an investment in the future of the eight provinces.

1 INTRODUCTION

1. This Environmental and Social Management Framework (ESMF) has been prepared in support of a project proposal entitled "*Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan*" (the project) by the Royal Government of Bhutan to the Green Climate Fund (GCF). As this project is supported by the United Nations Development Programme (UNDP) in its role as a GCF Accredited Entity, the project has been screened against the UNDP's Social and Environmental Standards Procedure and deemed a Moderate Risk (GCF Environmental and Social Policy Category B) project. An ESMF has been preferred for the project over the preparation of an Environmental and Social Assessment Report as while for example, actual catchments are known for the irrigation activities, specific locations and interventions are not currently known and will be defined during project implementation. Reference is made to para 66 of this ESMF.

1.1 BACKGROUND

2. The Royal Government of Bhutan with support from the UNDP, is formulating the project for submission to the GCF. The project will allow Bhutan to improve the resilience of vulnerable communities to climate change impacts.

3. As a mountainous country, Bhutan is particularly vulnerable to climate change. Greater intensity monsoon season have resulted in increased incidence of flash floods and landslides, destroying crops in low lying areas, damaging roads and disrupting market access. The increasing costs of recovery following extreme events impact significantly on the limited public resources, jeopardising fragile development gains. Observations during the field missions demonstrated that many incidents are totally as a result of climate change induced events rather than any anthropogenic factors.

4. Longer dry seasons are challenging water management, with remote areas experiencing scarcity. These increasing climate challenges to agriculture production place at risk the livelihood of 60% of Bhutan. Only 7.8% of total land is arable and 2.93% is cultivated. Apart from a few areas of open valley, physical agriculture land in general is located along steep geographic terrain. More than 31% of agriculture land is on slopes greater than 50% resulting in soil loss of 8.6 tons/hectare from traditional farming practices. These traditional practices do not adequately account for climate risks such as increased runoff during the monsoon season and extended dry periods. As such, there is a significant need in Bhutan to adapt to these events through sustainable land and water management and improved climate resilient road networks.

1.2 DESCRIPTION OF THE PROJECT

5. The agriculture sector is a key driver towards achieving the Royal Government of Bhutan's national goals of food self-sufficiency and inclusive green socio-economic development. The Royal Government of Bhutan is building resilience and initiated some of the changes needed to transition from responsive planning to climate-informed planning, and from subsistence agriculture to sustainable and viable agriculture.

6. Worsening climate change induced impacts on agriculture production place at risk 60% of the Bhutan's livelihoods, predominantly the older farmers, whose subsistence livelihood options are compromised. The increasing costs of recovery following extreme events strain limited public resources of Bhutan, a least developed country, jeopardising its hard-won development gains. With only 7.8% of land arable, it is critical to ensure that Bhutan's limited agriculture potential is resilient to climate change.

7. The Royal Government of Bhutan is also in need to make existing main roads, climate-resilient. Access to markets is a challenge as main roads are often not usable during monsoon when the farmers have to transport their agriculture produce to market due to climate induced landslips. Enhancements are required to make these roads environmentally-friendly with appropriate road construction standards, appropriate asphalt mix and drainage to reflect the latest climate projections, as well as roadside bioengineering to provide erosion control and slope stabilisation. Climate resilient roads not only connect farmers to markets, but they also

provide access by communities to emergencies services during extreme events. Importantly, climate-resilient roads can reduce significant environmental and social damage and loss related to climate change.

8. The proposed project will focus on eight Dzongkhags (districts): Dagana, Punakha, Trongsa, Tsirang, Sarpang, Samtse, Wangdue Phodrang and Zhemgang (Figure 1). These areas were specifically selected given their vulnerability to climate change; and priority for the Government and its Sustainable Development Goals targets, especially given the moderate-to-high poverty incidence rates

9. The population in these eight Dzongkhags constitutes 34.78% of the total population of 766,492 as of 2015. Five Dzongkhags: Dagana (25.1%), Samtse (22.2%), Zhemgang (26.3%), Trongsa (14.9%) and Tsirang (14.8%), in particular, have poverty rates which far exceed the national average of 12%.

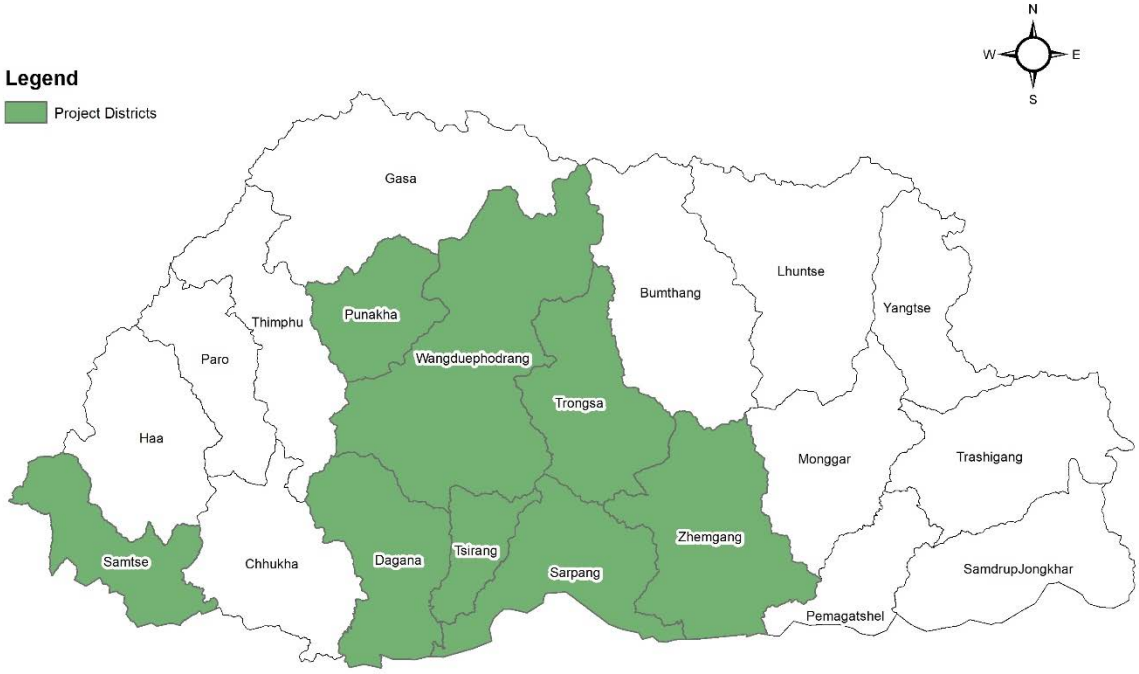


Figure 1 Location of Dzongkhags in Bhutan

1.2.1 Summary of Activities

10. The proposed project will have the following activities under three outputs. Specific details are provided in the relevant sections below.

Output One. Promote resilient agricultural practices in the face of changing climate patterns

Developing and integrating climate risk data into crop and livestock planning at the national and sub-national level, and related training to local government and farmers to interpret and apply climate risk data:

a. Training to 15 NCHM staff to a) combine local, regional/global information, disaster database and data from climate monitoring stations, b) model/forecast climate, flood, drought and water resource information (on daily to seasonal, as well as medium to long term timescales)

b. Review and enhancement of crop and livestock loss methodologies for consistent tracking and measurement of losses against climate change variability and impact, and integration into planning processes

c. Development of 9 tailored climate products, integrating climate change impacts on agriculture and related agriculture losses to inform planning

d. Training to 150 MoAF staff on application of climate impacts and related loss information in agriculture planning

Development of Standard Operating Procedures (SOPs) for effective and timely dissemination climate and climate risk information at the national and sub-national level Tailored climate information and related training to local government and farmers to interpret and apply climate risk data to local and household level agriculture planning

a. Development of tailored climate information, and means of dissemination, for farmers to meet the short-term and long-term agriculture planning needs; and

b. Annual trainings in eight target dzongkhags designed and delivered to farmers, cooperatives and local government officers/ non-government organisations on the application of tailored climate information to improve agriculture household planning.

Scaling up climate-resilient agriculture practices, and training local entities in community seed production and multiplication and cultivation of climate-resilient crop alternatives

a. Training in community seed production and multiplication system to scale up diversified, climate resilient crops (such as cereals, potato, cardamom, ginger, etc.);

b. Investment in climate-resilient practices including cultivating alternatives such as hydroponics, aeroponic, vertical gardening; organic farming; and integrated pest-disease management, covering 161 ha; and

c. Training delivered to farmers (2500 households, ensuring engagement of women and youth), cooperatives, and government/non-government organisations on climate risk management for value-chains and agricultural marketing

Output Two: Scaling up climate-resilient water and land management practices for enhanced smallholder productivity

Enhancing climate-informed wetland and water management to support agriculture

a. Training to 15 Dzongkhag engineers on climate resilient water irrigation designs and water harvesting, for improved oversight of construction and long term maintenance of investments; and

b. Training to 16 Water User Associations on climate change impacts to water availability and means to protect water access and water sources.

Establishment of climate resilient irrigation schemes and water saving technologies

a. Upgrading of 32 existing irrigation schemes for greater climate-resilience, and realignment of four irrigation schemes to a reliable water source given the drying impacts of climate change, covering 6300ha (see section 1.2.2; a Sketch Plan of channel network in Kazhi and Phangyul Gewog in Figure 2 and example pumping options in Figure 3;

b. Installation of water saving technologies, specifically 420 drip irrigation and 200 sprinkler irrigation schemes, covering 1700ha;

c. Building 64 small earthen check dams and ponds, and 100 earthen tanks for water harvesting;

Scaling up of sustainable land management technologies to support soil and slope stabilisation

a. Identification of sustainable land management interventions to better protect agriculture land from the impacts of climate change induced erosion and landslides, following the Participatory Sustainable Land Management Action Planning methodology;

b. Technical assistance and support to communities on the implementation of sustainable land management practices to manage climate change risks, covering 2380 ha of arable land; and

Capacity strengthening to farmers and extension officers on sustainable land management technologies

a. Training to 120 Department of Agriculture extension officers on sustainable land management technologies and practices to manage climate change risks; and

b. Regular monitoring (twice annually) of soil conditions and soil stability to inform planning and policies related to soil management.

Output Three: Reduce the risk of climate induced landslides during extreme events that disrupt market access

Slope stabilisation along key sections of roads, critical for market access, and related technical capacity and knowledge products to support climate resilient road planning and construction going forward

a. Conduct of technical study and design for slope stabilisation interventions needed for three stretches of main road regularly incurring damages due to increased intensity of monsoon and disrupting market access to validate existing specifications that were based on roads work for similar conditions;

b. Slope stabilisation of three sections of main road regularly incurring damages due to increased intensity of monsoon; and

Technical capacity building to support climate-risk informed and cost-effective slope infrastructure including stabilisation, drainage, and road construction and maintenance

a. Technical training to 15 Department of Roads national and sub-national engineers on slope stabilisation studies, and related designs, cost assessments and cost benefit analysis to inform climate-resilient planning;

b. Review and enhancement of road damage collection methodology, and related SOPs for collection and reporting, to ensure consistent collection of road damage data and inclusion in national disaster loss and damage database;

c. Training to Road User Groups and local government bodies on post-monsoon assessment of farm roads, including repair cost estimation; and

1.2.2 Irrigation Activities

11. The proposed agricultural intervention sites under Output Two are detailed below.

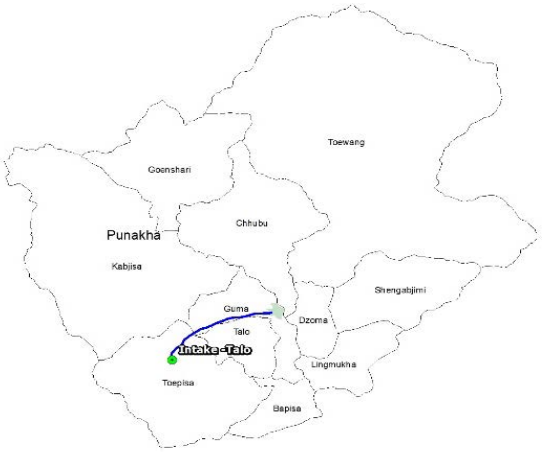
Dagana Dzongkhag	Khebisa – Narikachhu Irrigation Project Poor intake infrastructure, which is frequently blocked by stones and other debris. Along the irrigation canal length, there multiple landslides, affecting water conveyance. Almost 40% of the paddy fields are left fallow as the water is not sufficient owing multiple factors such as poor intake structure, landslides and water loss due to landslide	 

Punakha Dzongkhag

Talo Irrigation Project

Poor intake infrastructure, which is frequently blocked by stones and other debris.

Along the irrigation canal length, there multiple landslides, affecting water conveyance.



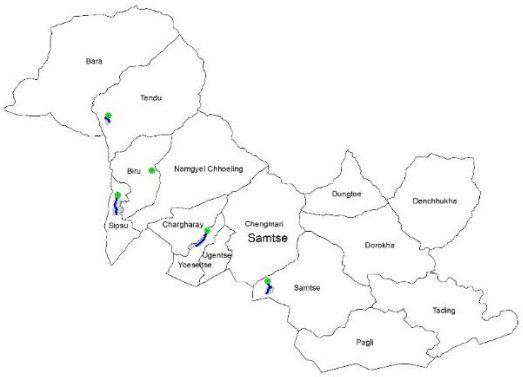
Samtse Dzongkhag

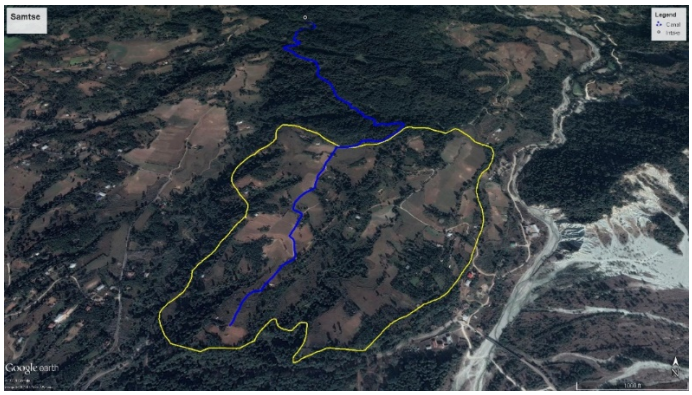
Tashicholing SIpsoo – Biru Irrigation Project

Approximately 40% of paddy fields are left fallow and dependent on rainfed water. Rainfed water is the only source of irrigation for crops like maize and other horticulture crops

The canal itself is open and is prone to frequent blockages during summer monsoon.

Despite having adequate water at source, intake structure is open source and lack proper structure to convey the required amount of water. It also get frequently blocked by stone, mud and vegetation debris.

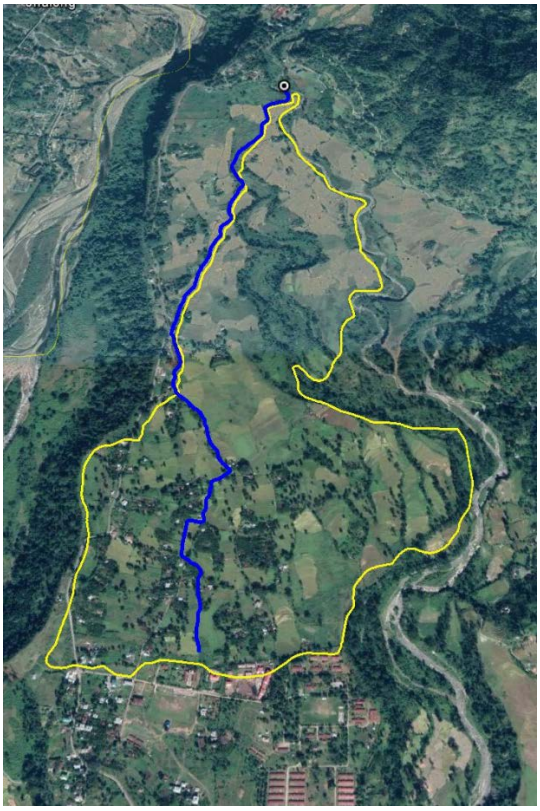


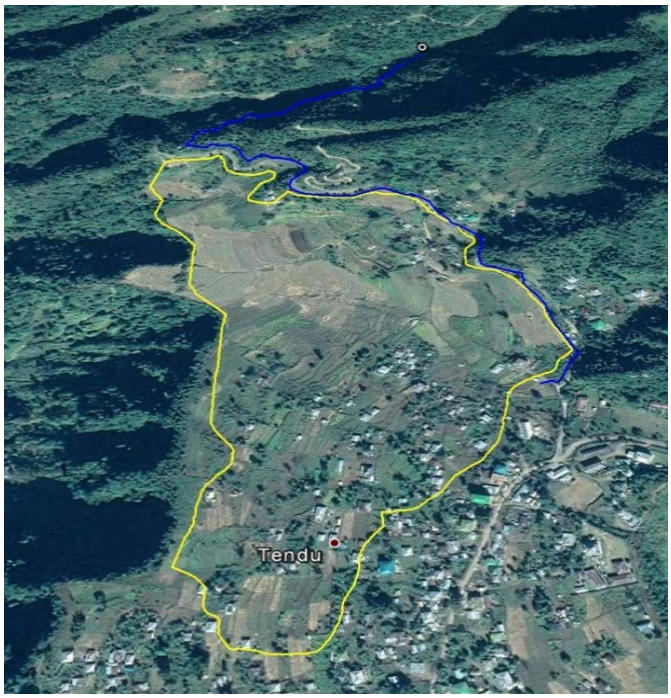
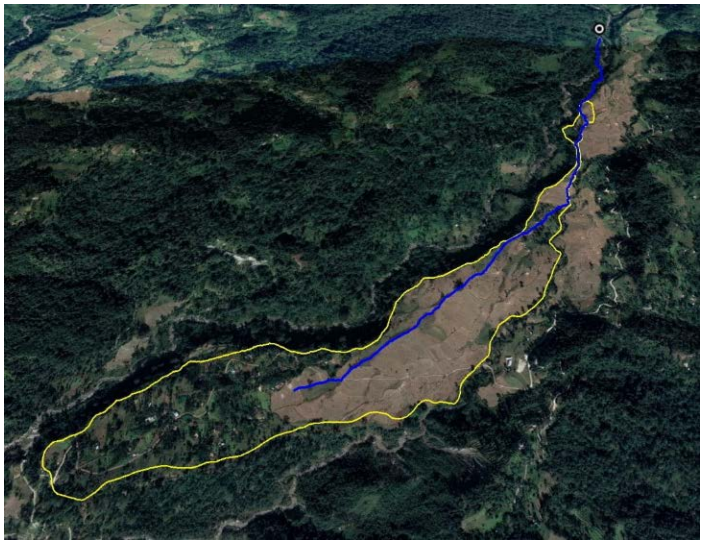


Samtse Dzongkhag

Tashicholing Lower Balbotey Irrigation Project

Almost 50% of the paddy fields are left fallow, and only 50% of the upper paddy fields are irrigated and cultivated. Although, there are adequate water at source, the intake structure is poor and open. The canal is open and there are multiple blockages with debris, affecting water flow and conveyance.

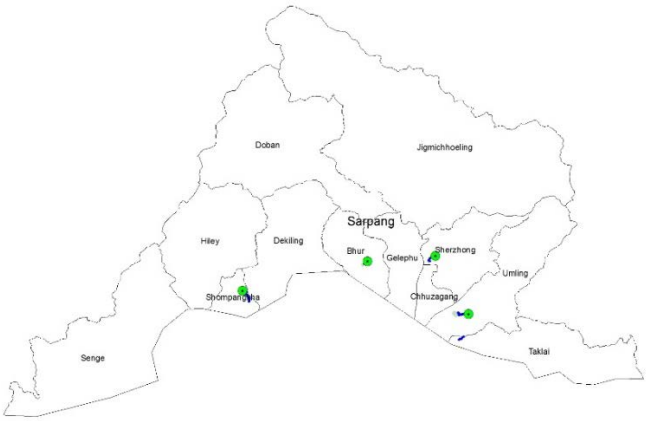


Samtse Dzongkhag	Tendu Tendutar Irrigation Project More than 40% of the paddy fields are left fallow due to inadequate water for irrigation. The water at source are available; however, there are no proper intake structure. It is directly fed to stream leading to continuous blockages. There are multiple seepage areas along the canal length that has triggered landslides, further blocking the canal	
Samtse Dzongkhag	Yoeseltse Lamitar Irrigation Project 35% of the paddy fields at the lower end do not receive water at all to cultivate paddy, even though there are adequate water at the source. There are multiple landslip/slide along the canal, leading to water seepage. The source structure is damaged with boulder blocking the flow of water.	

Sarpang Dzongkhag

Samtenling Juprey Irrigation Project

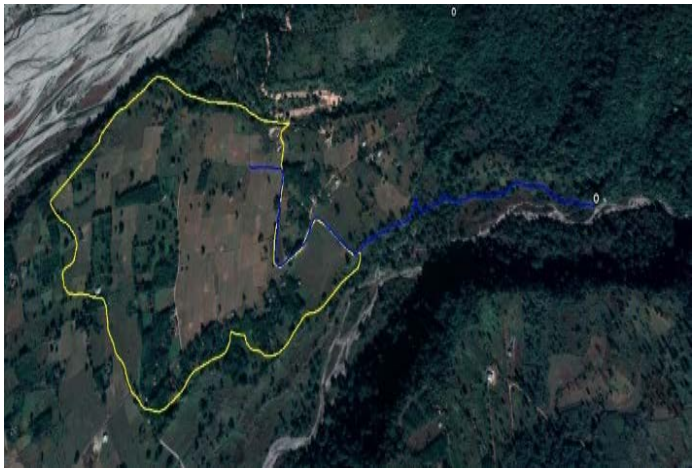
50% of paddy fields are left fallow, over grown with weeds. Water is tapped from the nearby stream which has adequate water source. There are multiple seepage areas, and part of the irrigation canal has been washed away by flood, severely affecting the supply of irrigation water.



Sarpang Dzongkhag

Umling: Rejuk Irrigation Project

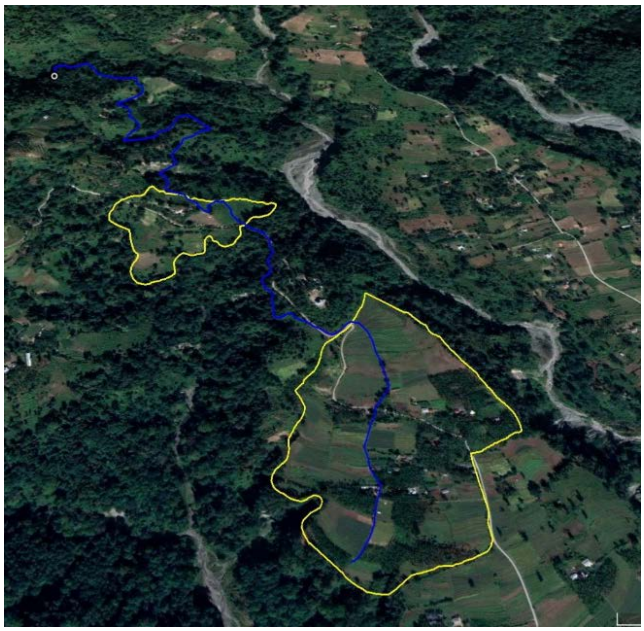
Nearly 50% is left fallow. The water is tapped from the nearby stream, but the canal has multiple landslip/slide. In some areas, communities have used smaller pipes to connect the landslide areas to draw water, delivering less water.



Sarpang Dzongkhag

Shompangkha: Pakhey Irrigation Project

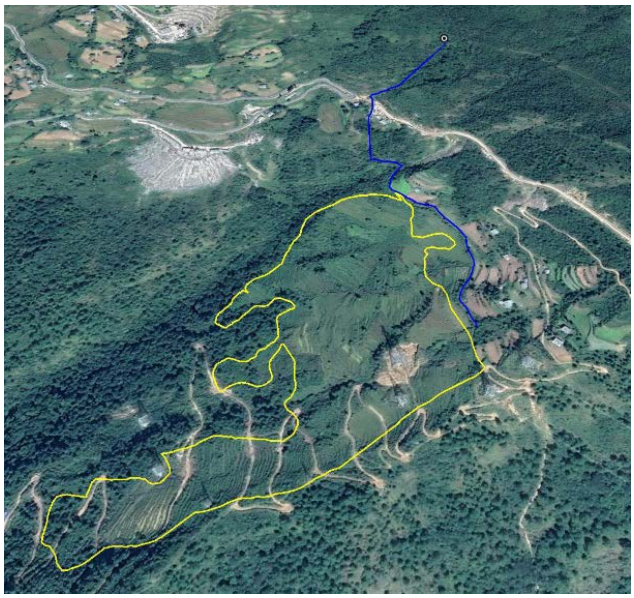
30% of the paddy fields are left fallow. There are multiple blockages along the irrigation canal, which is an open system, delivering much less amount of water. Farmers are also heavily dependent on rainfed irrigation water, which has become less reliable during recent times.



Trongsa Dzongkhag

Langthil: Yurmungtsangchu Irrigation Project

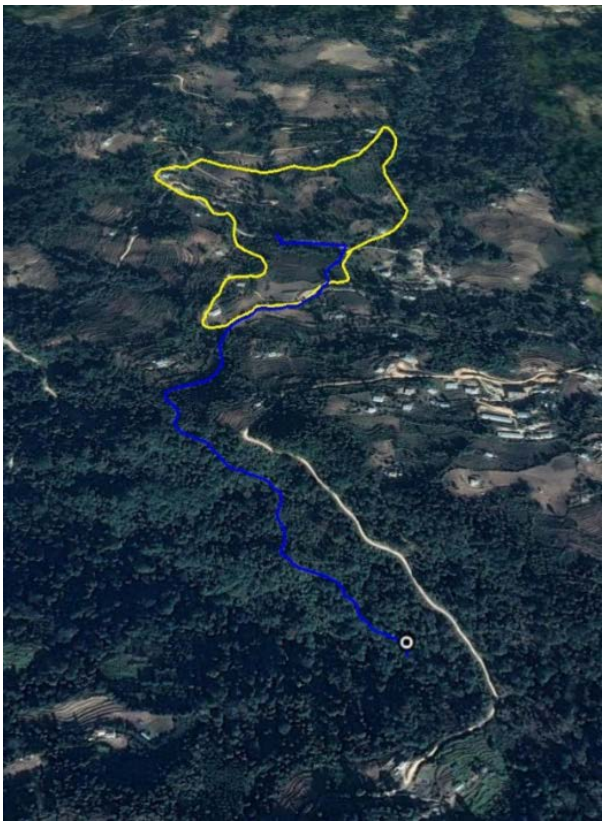
Almost 80% is left fallow, and the paddy fields are overgrown with weeds and grasses. The main problem is that part of the canal was washed away few years and is beyond the capacity of the communities to maintain.



Tsirang Dzongkhag

Mendrelgang: Tashipang and Pemashong Irrigation Project

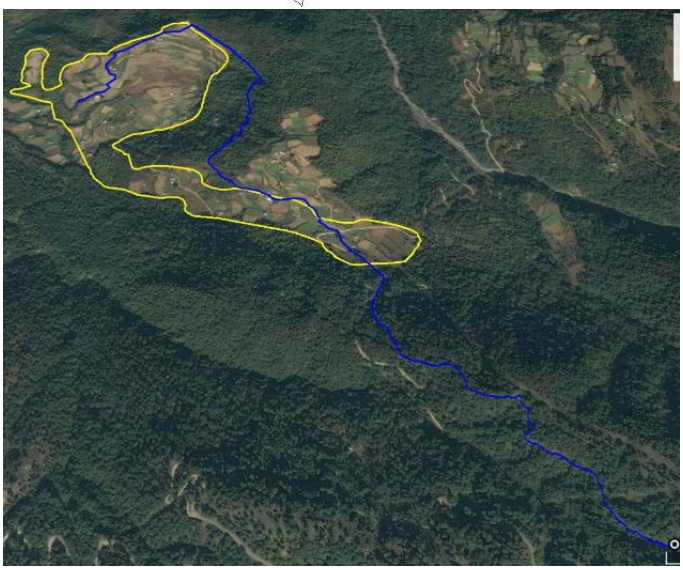
Almost 40% of the paddy fields are left fallow due to multiple landslide/slip and hence water seepage loss. The intake structure is also very poor and is fed directly to stream, which is regularly blocked.

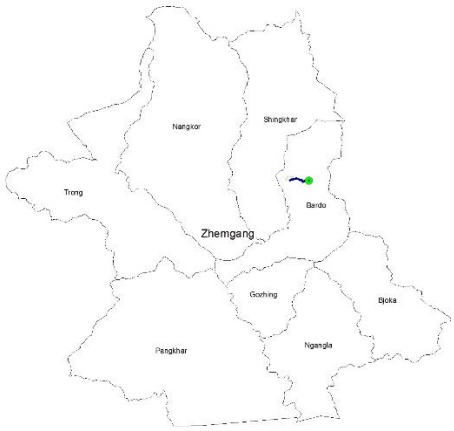


Wangdi Phodrang

Dangchu: Lhachu Yuwa Irrigation Project

25% of the paddy fields are left fallow. The existing canal have multiple landslip/slide with seepage.



Zhemgang Dzongkhag	Bardo_Khomshar: Tashilingtoe, Tashibi and Salapong > 50% of paddy fields are left fallow on annual basis, as the farmers depend on rainfall and smaller stream for irrigation. The irrigation structure is an open earther canal, with poor intake structure. There are seepage and debris blockages on many points. Due to lack of adequate irrigation water, farmers predominantly grow maize as dryland crop, and very less horticulture crops such as fruits and vegetables. Besides benefiting farmers to grow paddy in all the paddy fields, provision of irrigation water offers an opportunity to diversify crops and hence improve the livelihoods.	 

12. Annexure One shows a range of plans for the existing and proposed channel network in Kazhi and Phangyul Gewog. The sketches show various options that have been analysed to allow for the greatest benefit while reducing impacts. Options include a range of pipe sizes and number of pipes to ensure proper distribution and ensure equal access across all areas. Information on the options being considered are included in the Feasibility Study for the project. This demonstrates the rationale for the preparation of an ESMF rather than an ESAR.
13. Annexure Two provides an overview of potential pumping solutions that may be used for the irrigation activities. Specific pumping requirements will be determined during implementation. Where possible, solar will be used to power the pumps. This demonstrates the rationale for the preparation of an ESMF rather than an ESAR.
14. Prior to construction, a full assessment of proposed routes will be undertaken to ensure the least environmental and social impact.
15. To ensure equality and equity of water supply to all users, the project is considering a range of options with respect to the type, size and number of installing multiple pipes within a single trench (for example, three) rather than a single pipe. This option will allow the systems to be more effectively managed, particularly with respect to supply to individual users. This will have important benefits where, if in the unlikely event that one pipe breaks, two thirds (2/3) supply can be maintained and supplied rather than losing total supply. Additional benefits of this include that by using three pipes rather than one, the individual pipes can be smaller in diameter and can therefore be produced locally, thereby increasing employment. Environmentally, by manufacturing the HPE pipe locally, this will reduce the carbon footprint of the manufacturing, thereby providing a small greenhouse gas emission mitigation.

1.2.3 Road Activities

16. With respect to the road climate protection projects, there are three sites; these being
    a. Box Cut (Gelephu-Trongsa Highway - Figure 4);
    b. Khagochen (Sunkosh-Dagana Highway - Figure 5); and
    c. Reotala (Gelephu-Trongsa Highway - Figure 6).
17. Due to the closure of the Gelephu-Trongsa Highway as a result of a very significant landslip that had totally removed the existing road, only the Box Cut was viewed during the site visit for the preparation of this report. Notwithstanding, similar project activities as proposed for the Box Cut will also be undertaken at both the Khagochen and Reotala sites and photographic evidence allowed the author to properly assess the likely environmental and social impacts later described in this report of the two other sites.

Figure 2 Box Cut

Figure 3 Khagochen

Figure 4 Reotala

1.2.4 Box Cut

18. The Box Cut is one of the most problematic area on the Gelephu Trongsa Highway. The Box Cut is 15km from Gelephu. It has a non-blacktopped road surface. The instability of the geological conditions commenced with a land slide in 1990 as a result of significant monsoon rains. The upper section of the hill eroded and washed away the existing road (Figure 7). This had significant economic cost and inconvenience to the general public.

19. Previous repair works have been undertaken at the site. A feasibility assessment of realigning of road was carried out; however, the assessment determined that it was not feasible due to among other things, geological condition. Repairs have been constantly undertaken over the years including for example, in 2013 (Figure 8). Previous activities at the site have been small scale and piece meal and there is a significant need for more appropriate interventions. The previous mitigation measures have included mass plantation, toe wall below the slide and wooden crib walls. The gabion toe wall structures worked effectively to retain the road width for one monsoon only. Vegetation done through bio engineering with mass plantation remains in some locations (Figure 9).

20. The works will stabilise the slopes to reduce future landslips.

Figure 5 Initial Land Slide at the Box Cut

Figure 6 Repairs being undertaken in 2013

Figure 7 Previous Interventions at the Box Cut

1.3 PROJECT ALTERNATIVES

21. As part of the project development, a range of alternatives were considered.

1.3.1 Do Nothing Alternative

22. The GCF project will support the commitment of the Royal Government of Bhutan to avoid losses of lives and to reduce economic and infrastructure losses caused by climate-induced disasters. The interventions as part of the agricultural activities are vital for ensuring food security and the longevity of agricultural communities. Without undertaking the activities, it would not be possible to maintain productive agriculture while increasing environmental stability. Further, without undertaking these interventions, the environment would continue to be degraded as a result of the impacts of climate change. As such, the interventions will provide both positive environmental and social benefits.

23. Without undertaking the road stabilisation interventions, significant erosion, and the potential loss of life and assets would continue to occur. Moreover, without the interventions, Gewogs cannot be accessed in an emergency. Environmentally, the sediment ends up in rivers and causes significant turbidity and potential blockages of the water courses. As such, the interventions will provide both positive environmental and social benefits. Current users would need to travel via India (> eight (8) hours) or via Central Bhutan (> ten (10) hours) for a trip that should take one hour if the interventions were not undertaken.

1.3.2 Alternative Locations

24. The proposed activities could be undertaken in a number of different locations. However, the proposed locations, particularly the road stabilisation interventions have been identified by the Royal Government of Bhutan as those sites that provide the greatest economic, environmental, and social benefit. Alternative sites would not provide the benefits that these sites provide, particularly given the importance of the highways.

2 LEGAL AND INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL AND SOCIAL MATTERS

2.1 LEGISLATION, POLICIES AND REGULATIONS

25. The following legislation is relevant to the project:

    a. *Forest and Nature Conservation Act 1995;*
    b. *National Environmental Protection Act 2007;*
    c. *Land Act of Bhutan 2007;*
    d. *Waste Prevention and Management Act 2009;*
    e. *Road Act of Bhutan 2004;*
    f. *Environmental Assessment Act 2000;*
    g. *Land Pooling and Readjustment Regulation 2018*;
    h. *Regulation on Occupational Health, Safety and Welfare 2012;* and
    i. *The Co-operative Act of Bhutan, 2009.*

2.1.1 Forest and Nature Conservation Act 1995

26. The objective of the *Forest and Nature Conservation Act 1995* is to "provide for the protection and sustainable use of forests, wildlife and related natural resources of Bhutan for the benefit of present and future generations."

27. Chapter VIII of the Act is dedicated to soil and water conservation matters. In addition, the Act covers sustainable forest management, protection of government reserved forests against illegal use, social and community forestry, and establishment and management of protected areas, all of which would contribute to combating land degradation and its impacts.

28. To support the implementation of the F*orest and Nature Conservation Act 1995* and in accordance with the powers and duties conferred under that Act, the Ministry of Agriculture and Forests promulgated the *Forest and Nature Conservation Rules* 2000, which were amended in 2006. The Rules establish regulations for forest management, private and community forestry, establishment and management of protected areas, wildlife protection, prevention of forest fires, land clearance, and other activities potentially impacting soil, water and wildlife resources, among other things.

2.1.2 National Environmental Protection Act 2007

29. The *National Environmental Protection Act 2007* is Bhutan's umbrella piece of legislation for all environmental matters. All other laws and regulations governing the use of land, water, forests, minerals and other natural resources are required to be consistent with this Act. The *National Environmental Protection Act 2007* specifically establishes principles and directives for the protection of environmental quality and the maintenance of forest, biodiversity and ecosystem integrity. Important provisions include the right to environmental information and citizen participation in environmental management, and provision for establishment of an Environmental Tribunal as a quasi-judicial authority with the power to hear, investigate and pass decisions on environmental disputes.

30. The following sections of the *National Environmental Protection Act 2007* are relevant to sustainable land use and management:

    a. Section 7: In order to achieve sustainable, natural resources such as forest, water, air, biodiversity, soil, minerals and the overall integrity of the environment shall not be degraded. In

line with the Government's Middle Path Strategy, economic development and environmental conservation shall receive equal priority;

b. Section 9: A developmental activity shall be strategically planned and executed in harmony with the carrying capacity of Bhutan's sensitive ecological settings and geographical terrains;

c. Section 10: A person taking natural resources from the environment or deriving economic benefits is responsible to ensure sustainable use and management of those resources and their ecology;

d. Section 68: The National Environmental Commission shall ensure that, in order to conserve Bhutan's natural resources and to prevent degradation of the fragile mountain ecosystem, a minimum of 60% of Bhutan's total land shall be maintained under forest cover for all time. Any changes in the present national forest cover and protected areas shall be made only by the Parliament;

e. Section 69: In order to ensure 60% forest cover in perpetuity, the National Environmental Commission shall constitute a high-level committee comprising of relevant stakeholder agencies to: (a) periodically review existing policies, plans and programs and recommend necessary changes in policies, plans and programs, including implementation and enforcement mechanisms; (b) initiate afforestation and reforestation programs in degraded and barren land to enhance forest cover; (c) review policies and programs on forest fire management and measures to curb forest fire in Bhutan;

f. Section 71: The National Environmental Commission in consultation with other relevant agencies, shall ensure conservation and protection of wetlands, alpine regions, watersheds, and other vulnerable ecosystems in addition to the existing protected areas.

2.1.3 Land Act of Bhutan 2007

31. The *Land Act of Bhutan 2007* established a National Land Commission as an independent authority and highest decision-making body in matters related to the implementation of the provisions of the Act. The Act also provides for policy and regulatory, inter-agency coordination, cadastral survey and land registration, and management of national land records among other things. It spells out rights, responsibilities and legal conditions for the management, regulation and administration of the ownership and use of land.

32. To support the implementation of the *Land Act of Bhutan 2007*, the National Land Commission has formulated the *Land Rules and Regulations for the Kingdom of Bhutan 2007*. The rules and regulations define in detail the institutional functions, procedural requirements and regulatory provisions for management of national land records, land ownership entitlements and land rights, land registration, land conveyance, land acquisition and compensation, land grants, allotment of government land, cadastral survey, documentation and mapping, land conversion, land lease, easement, and annulment of land.

2.1.4 Waste Prevention and Management Act 2009

33. The *Waste Prevention and Management Act 2009* covers all types of wastes emanating from residential, agricultural, commercial, medical, and industrial sources. Specific provisions of the legislation pertain to: principles of waste prevention and management; management requirements for various types of wastes; implementation responsibilities and powers of various institutions with National Environmental Commission as the overall regulatory and coordinating body; requirements of implementation mechanisms; and liable offences and penalties.

2.1.5 Road Act of Bhutan 2004

34. This *Roads Act of Bhutan 2004* establishes powers and responsibilities of various agencies for road planning, design, construction and maintenance at the central, dzongkhag, gewog and municipal levels. The Act also provides the framework for setting technical standards and requirements for road

construction and maintenance. Section 4(1)(h) gives the Department of Roads the mandate to adopt and promote environment friendly road construction techniques.

35. Section 7(2) requires that all road construction and maintenance works conform to environmental considerations, geological stability considerations and preservation of agricultural lands. The Department of Roads has formulated Environmental Codes of Practice for road project in keeping with its objective to promote environment-friendly road construction. The Environmental Codes of Practice require that all road projects fully assess all potential adverse environmental impacts from alignment, design and planning through to construction, operation and maintenance of roads, and implement measures to mitigate these impacts.

2.1.6 Environmental Assessment Act 2000

36. The *Environmental Assessment Act 2000* is an all encompassing environmental law. The *Environmental Assessment Act 2000* relates to environment in a holistic manner and applies to a wide range of activities across a number of sectors.

37. The *Environmental Assessment Act 2000* establishes procedures for the assessment of potential effects of strategic plans, policies, programs, and project on the environment, and for the determination of policies and measures to reduce potential adverse effects and to promote environmental benefits. The Act requires the Royal Government of Bhutan to ensure that environmental concerns are fully taken into account when formulating, renewing, modifying and implementing any policy, plan or program as per regulations that may be adopted within the appropriate provision of the Act.

38. The *Environmental Assessment Act 2000* makes the need for an environmental clearance mandatory for any project or activity that may have adverse impact on the environment and is especially applicable to project that concern infrastructure development and natural resource use such as roads, hydropower, mines and industries, where land degradation and pollution concerns are generally considerable.

39. To implement the *Environmental Assessment Act 2000*, regulations were promulgated in 2002 for the environmental clearance of project and for strategic environmental assessment. *The Regulation for the Environmental Clearance of Project 2002 d*efines responsibilities and procedures for the implementation of the *Environmental Assessment Act 2000* concerning the issuance and enforcement of an environmental clearance for individual project and to:

    a. provide meaningful opportunities for public review of potential environmental impacts of project;

    b. ensure that all project are implemented in line with the sustainable development policy of the Royal Government of Bhutan;

    c. ensure that all foreseeable impacts on the environment, including cumulative effects are fully considered prior to any irrevocable commitments of resources or funds;

    d. ensure that all feasible alternatives are fully considered;

    e. ensure that all feasible means to avoid or mitigate damage to the environment are implemented;

    f. encourage the use of renewable resources, clean technologies and methods;

    g. ensure that concerned people benefit from project in terms of social facilities;

    h. help strengthen local institutions in environmental decision making; and

    i. help create a uniform, comprehensive data base on the environmental and cultural conditions and assets in Bhutan.

40. To support the implementation of the *Environmental Assessment Act 2000* and Regulation, sectoral environmental clearance application guidelines have been prepared for highways and roads, forestry, hydropower, industrial project, mines, power transmission and distribution lines, urban development, and tourism project. In addition, Environmental Codes of Practice have been formulated for storm water drainage system, installation of underground and overhead utilities, tourism activities, and roads, and environmental standards have been set to control air and water pollution.

41. A further regulation supporting the EA Act is the *Regulation for Strategic Environmental Assessment 2002,* which was promulgated with the specific purpose to:

    a. ensure that environmental concerns are fully taken into account by all government agencies when formulating, renewing, modifying or implementing any policy, plan or program;

    b. ensure that the cumulative and large scale environmental effects are taken into consideration while formulating, renewing, modifying or implementing any policy, plan or program;

    c. complement project-specific environmental reviews and encourage early identification of environmental objectives and impacts of all government proposals at appropriate planning levels;

    d. promote the design of environmentally sustainable proposals that encourage the use of renewable resources and clean technologies and practices; and

    e. promote and encourage the development of comprehensive natural resource and land use plans at the local, dzongkhag and national levels.

42. Further information on the *Environmental Assessment Act 2000* and its implications for environmental and social impact assessments is contained in Section 2.2.

2.1.7 Land Pooling and Readjustment Regulation 2018

43. The *Land Pooling and Readjustment Regulation 2018* describes the land pooling approach used as a key means to minimise displacement and acquisition.

44. The *Land Pooling and Readjustment Regulation 2018* established an approach based on voluntary agreements with affected landowners. The *Land Pooling and Readjustment Regulation 2018* stipulates that at least two third of landowners in a given area should sign Land Pooling Agreements. This approach places high emphasis on in-situ development which minimises resettlement and enables original landowners to retain title to the majority of their land. In addition, the provision of infrastructure and services results in a substantial increase in the value of the residual land.

2.1.8 Regulation on Occupational Health, Safety and Welfare

45. The Ministry of Labour and Human Resources through the Department of Labour developed the *Regulation on Occupational Health, Safety and Welfare 2012*. Through this Regulation the Ministry has reinforced the priority of promoting of a safe and healthy workplace. Health and safety is a fundamental requirement of a sustainable business and also regarded as an essential part of business management.

2.1.9 The Co-operative Act of Bhutan 2009

46. The *Co-operative Act of Bhutan 2009* provides provision to form farmers group and association to maximise the economic gains through agriculture farming. The *Co-operative Act of Bhutan 2009* also provides provision to govern such group, including an economic sustainability mechanism.

2.2 Environmental Impact Assessment in Bhutan

47. Environmental and social impact assessments in Bhutan are covered by the *National Environmental Protection Act 2007* and *Environmental Assessment Act 2000*. The *National Environmental Protection Act 2007* covers all aspects functions, power, authorities and environmental quality concerning forest and biodiversity protection and environmental rights of the people.

48. The National Environmental Commission was established in 1998 as a high level inter-ministerial policy decision-making body. The National Environmental Commission is chaired by the Prime Minister and relevant Ministries are the members including three members from civil society. The head of National Environmental Commission is Member-Secretary. The National Environmental Commission is responsible for making policy decision, providing guidance on the matters related to environmental

management and sustainable development in Bhutan. The Commission secretariat serves as the focal point for implementing environmental impact assessment in Bhutan.

49. The Ministry of Agriculture, Ministry of Trade and Industry, Ministry of Works and Human Settlement, Department of Revenue and Custom and others each have sections on the environment and serve as Competent Authorities. These sections under each ministry have been given an authority for issuing environmental clearance for the project listed in Annex 2 of the *Regulations for Environmental Clearance of Projects 2002*. Dzongkha also have an Environmental Committee called the Dzongkhag Environmental Committee which is equivalent to Competent Authorities of the Ministries.

50. The Competent Authorities can issue an environmental clearance for the project listed in Annex 2 of *Regulations for Environmental Clearance of Projects 2002*. Competent Authorities review the non-listed projects submitted by the proponent and forward them to the National Environmental Commission for further consideration. As specified in *National Environmental Protection Act 2007,* Competent Authorities conduct compliance monitoring, collect environmental information, monitor environmental quality and report to National Environmental Commission.

51. Sector specific environmental impact assessment guidelines are available in Bhutan and activities listed in Annex 2 of the *Regulations for Environmental Clearance of Projects 2002* required to undergo Environmental Clearance by the respective Competent Authorities and the projects not listed in the Annex 2 should be handled by the National Environmental Commission. In order to begin construction of a project, development consent is required. Development consent is issued by a Competent Authority.

52. The first step in the environmental impact assessment process is to conduct a site survey, followed preparation of pre-feasibility, engineering, environmental and social investigations, including an environmental impact assessment study as outlined in the relevant laws.

53. There are eight guidelines for applications for environmental clearance issued and provide a complete guidance for preparing environmental assessment and an application package for the clearance of the proposed project. The application package includes the application details, objectives and relevance, cost, project description, alternatives, public consultation, details of physical, biological and socio-economic parameters of the project area, anticipated impacts and mitigation measures, monitoring program, no objection certificates and environmental assessment procedures.

54. In addition to these, there are five sector-specific Environmental Code Practices developed for the use. The developers should comply with the prescription given in this environmental code of practices.

55. Annex 2 of the *Regulations for Environmental Clearance of Projects 2002* provides three possibilities with respect to an environmental impact assessment. They are:

    a. The listed projects require an environmental clearance from the Competent Authority, the National Environmental Commission and/or a Dzongkhag Environmental Commission;

    b. The proposed project does not fall within the list provided in Annex 2 of the *Regulations for Environmental Clearance of Projects 2002* and is therefore referred to National Environmental Commission for environmental clearance; or

    c. Projects that do not require an environmental clearance and for which the proponent can apply for a permit directly.

56. After the decision is made, one of the eight sectors specific Environmental Clearance Guidelines should be consulted. As for example, if the proposed project falls within the road sector, application for Environmental Clearance Guideline for Road Sector should be assessed. The completed information and application materials should be submitted to the Competent Authority of the concerned Ministry and/or to the National Environmental Commission and/or a Dzongkhag Environmental Commission. No Objection Certificates should be appended. This is a preparatory stage of the assessment of the environmental impact assessment.

57. The Competent Authority and/or Dzongkhag Environmental Commission will acknowledge receipt within two weeks after submission of application. If the Competent Authority and/or Dzongkhag Environmental Commission finds that the proposed project does not fall within the listed ones,

application materials will be forwarded to the National Environmental Commission for consideration. This stage is referred as the Environmental Impact Assessment Process Entry Point. The final decision of the Competent Authority and/or Dzongkhag Environmental Commission will be the following:

a. Issue an Environmental Clearance Certificate for the proposed project implementation;

b. Forward the application materials to the National Environmental Commission in case of non-listed project;

c. Request the project proponents to undertake further studies to furnish more information; and/or

d. Reject the proposal, if it is not applicable

58. For non-listed projects, the National Environmental Commission receives the application materials either from the Competent Authority and/or Dzongkhag Environmental Commission or directly from the developers. This is then followed by screening process. The National Environmental Commission review team examines all the information provided and identifies the level and scale of likely impacts of project implementation. On the basis of screening, the National Environmental Commission provides one of the following decisions:

    a. Decision to provide an environmental clearance;

    b. Decision to conduct an environmental impact assessment;

    c. Reject if the application if it is not relevant; and/or

    d. For renewing of an environmental clearance certificate, an environmental audit report must be submitted. An Environmental Clearance certificate is valid only up to five years from the date of issue.

59. Assuming an environmental impact assessment is required for obtaining an environmental clearance, the next step of the process in Bhutan is the preparation of a Scoping Document. The Scoping Document includes a brief description of the project and a list of potential impacts on environmental and social resources in the project area.

60. A comprehensive scoping process must be completed prior to preparation of the Terms of Reference for the environmental impact assessment. Based on the results of the Scoping, the developer prepares a Terms of Reference for the environmental impact assessment. In general, the Terms of Reference consists of a description of studies the effects of the project on the environmental and social effects of the project area. The Sectoral Guidelines prepared by the National Environmental Commission will provide guidance for the preparation of Terms of Reference. The Terms of Reference provide a basis for issuing the conditional site permit and contains description of the strategy for involving the public and the Ministries in the planning process. The Terms of Reference includes a description of the consultants and other experts who will conduct the study.

61. The primary lead agency for issuing the Site Permit for a project is the Competent Authority of the relevant Ministry. However, for the environmental clearance, the Lead Agency is the National Environmental Commission. Technical staff of the National Environmental Commission will review the environmental impact assessment report. Based on the technical review of the environmental impact assessment report, recommendations are made regarding approval of the environmental impact assessment and issuance of the environmental clearance. However, prior to issuing the environmental clearance the Secretariat of the National Environmental Commission, may conduct a site visit to verify information contained in the environmental impact assessment and if the environmental and social effects of the project are within acceptable limits and the proposed mitigation and compensation measures are satisfactory a recommendation of issuance of the environmental clearance will be forwarded to the relevant Competent Authority. The Secretariat may forward special conditions that need to be incorporated into the Environmental Clearance certificate.

62. Prior to the construction of the project, obtaining an official environmental clearance is a prerequisite for all listed project as per Annex 2 of the *Regulations for Environmental Clearance of Projects 2002*. The clearance should be obtained either from Competent Authority for listed project or from the Dzongkhag Environmental Commission for Dzongkhag and Village level projects or from the National

Environmental Commission for non-listed project. The public hearing process in Bhutan is embedded in the process of environmental impact assessment through the socio-economic assessment. The National Environmental Commission generally visit the project areas to get feedback from project-affected people and their concerns are integrated into the decision-making process and become an important component of the decision to issue the environmental clearance. The National Environmental Commission or Competent Authority must make a public announcement of the decision regarding issuance of the environmental clearance.

63. For the purposes of the ESMF, all approvals and environmental clearances will be obtained before any work is undertaken from the Competent Authority, Dzongkhag Environmental Commission and/or National Environmental Commission as required.

2.3 Multilateral Agreements and Biodiversity Protocols

64. The Royal Government of Bhutan is a signatory to a number of international and regional agreements and conventions, which are related to the environment. They include:

    a. United Nations Framework Convention on Climate Change and Kyoto Protocol*;*
    b. United Nations Convention on Biological Diversity*;*
    c. United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa*;*
    d. Rio Declaration on Environment and Development*;*
    e. Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat*;*
    f. Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora*;*
    g. Bonn Convention on the Conservation of Migratory Species of Wild Animals*;*
    h. United Nations International Forest Policy*;*
    i. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal*;*
    j. Vienna Convention on Protection of the Ozone layer and the Montreal Protocol on Substances that Deplete the Ozone Layer*;*
    k. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade*;*
    l. Stockholm Convention on Persistent Organic Pollutants*;*
    m. Espoo Convention on Environmental Impact Assessment in a Transboundary Context and Protocol on Strategic Environmental Assessment*;*
    n. Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters*;*
    o. International Plant Protection Convention*;*
    p. UNESCO World Heritage Convention*;*
    q. Cartagena Protocol on Biosafety to the Convention on Biological Diversity*;*
    r. Montreal Protocol on Substances that Deplete the Ozone Layer*;*
    s. Nagoya Protocol on Access and Benefit-sharing*;*
    t. United Nations Law of Sea Convention; *and*
    u. Male Declaration on Control and Prevention of Air Pollution and its likely transboundary effects for South Asia.

3 DESCRIPTION OF EXISTING ENVIRONMENT

65. This section identifies the key environmental and social baseline identified for the project areas. The current information is considered both general and more importantly, adequate for the purposes of the overall project assessment.

66. Prior to the implementation of the outputs and activities, the GNHC and UNDP will assess the need for any additional information and baseline data that may be required on project specific sites based on project activities. This data may include but not be limited to sediment and soil samples, and the collection of biological data, and the collection and modelling as necessary of hydrology and water quality. This information will be used to assess any potential site-specific impacts and then develop site specific ESMPs based on the current ESMP contained in Chapter Eight (8) of this ESMF.

3.1 TOPOGRAPHY, GEOLOGY AND SOILS

67. The topography of Bhutan is characterised by rugged mountains separated by river valleys. Elevations range from just below 200m in the south to 7,570m in the north.

68. Bhutan is divided into five geological zones; these being the Sub-Himalaya; the Lower Himalaya; the High Himalaya; the Tibetan Himalaya, and the Indus-Tsangpo zone. The Himalaya Mountains of Bhutan dominate the north of Bhutan; with the highest point in Bhutan being Gangkhar Puensum at 7,570 metres. Weather is extreme in the mountains: the high peaks are permanent snow-capped, and the lesser mountains and hewn gorges have high winds all year round, making them barren brown wind tunnels in summer, and frozen wastelands in winter. The blizzards generated in the north each winter often drift southward into the central highlands.

69. The highlands are the most populous part of Bhutan; the capital Thimphu lies in the western region. The region is characterised by its many rivers (flowing into India's Brahmaputra), its isolated valleys that house most of the population, and the expansive forests that cover 70% of Bhutan. The highlands have Eastern Himalayan subalpine conifer forests at higher elevations and Eastern Himalayan broadleaf forests at lower elevations. Winters are cold, summer are hot; the rainy season is accompanied with frequented landslides.

70. The valleys of Bhutan are linked by a series of passes ("La" in Dzongkha). Between the Haa Valley and Paro Valley is the Chele La (3,780 metres). The Chele La is the highest pass crossed by a Bhutanese highway. The Lateral Road from Thimphu to Punakha crosses the Dochu La (3,116 metres), which features 108 chortens built to commemorate the expulsion of Assamese guerrillas. East of Wangdue Phodrang is the Pele La (3,390 metres). Continuing to the east along the main highway, other major passes include the Yotang La, Shertang La, Wangthang La, Thrumshing La and Kori La (2,298 metres).

71. The extreme southern strip of Bhutan consists mostly of Himalayan subtropical broadleaf forests that grade into the tropical plains of the Terai-Duar savanna and grasslands, more typical of India. It is largely agricultural land, producing mostly rice. Only 7.8% of Bhutan is arable land, with most of it in this area.

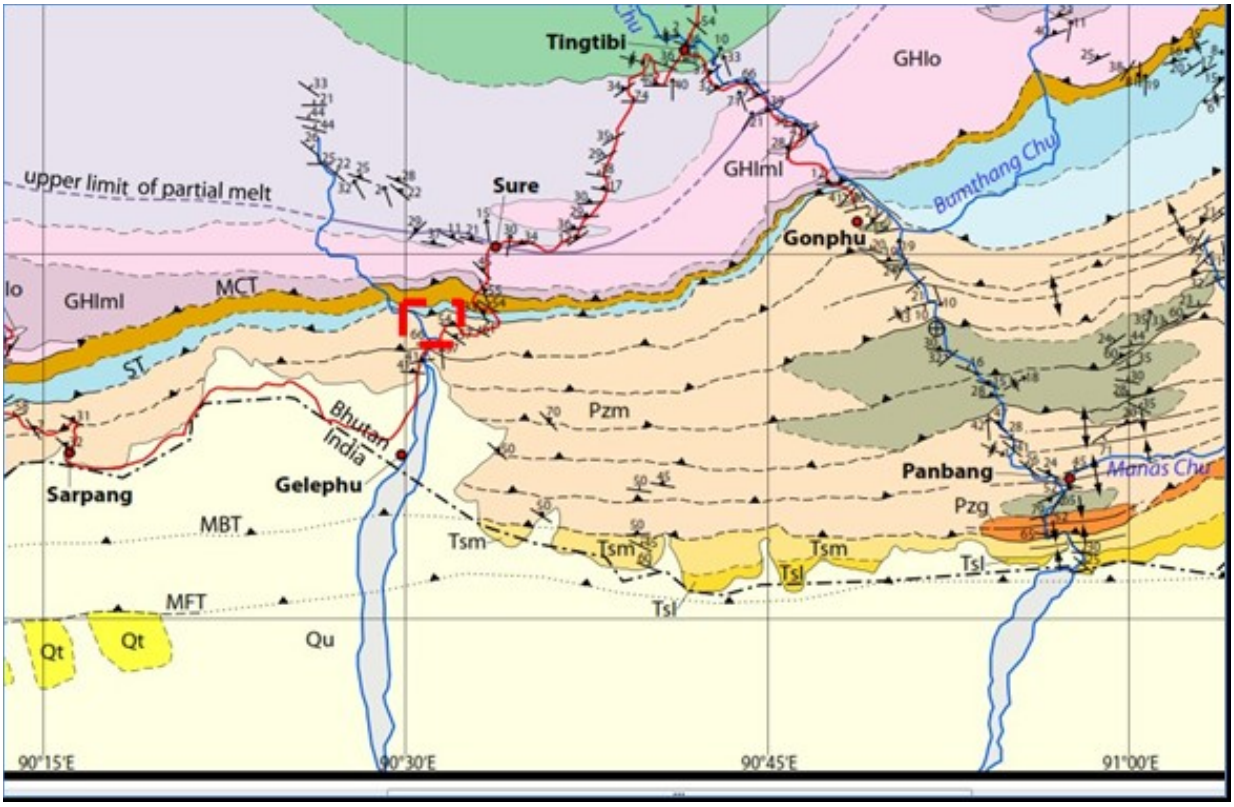
72. The Box Cut is located in the southern parts of the Bhutan. The Box Cutting lies within the Manas Formation (Neoproterozoic-Cambrian) under Baxa Group of Formation. Tectonically the site is lying in the actively tectonised zone. During the subduction of the Indian Sub-continental plate under Eurasian plate, the Himalayan young fold mountains were generated/formed. It is expected to be in the area of highly tectonised area.

73. The litho-units recorded in the Box Cut area mainly consists of dark grey phyllite, greenish grey quartzite intercalated with thinly foliated talcose phylliet. The rocks are thinly foliated with intrusion of quartz veins. The rock in the area has general orientation of 36° dip amount with 40° NW directions. The substrate is highly to completely weathered, fractured and crumpled. At places the rocks have been completely decomposed to clay. The soil is light brown to reddish in colour with angular fragments of phyllite and quartzite with little fines and clay which are highly friable, highly saturated and

permeable in nature. Intra-formation thrust faults indicate structure repetition of multiple 1.5 to 2.8km thick thrust sheet. Highly fractured quartzite and phyllite lithologic contacts and foliation dip approximately 50-60° crossing the slope, and therefore, kinematically, favouring rock slope instability. The gray phyllite which form the cliff above the road are rather highly fractured. The slopes at the Box Cut are approximately 50 degrees. This is characteristic of the other two sites based on existing reports.

74. Figure 10 shows the regional geology of the Box Cut, while Figure 11 shows the tectonics of the Box Cut. Figure 12 provides a map of the release, transit and deposit area. Figure 13 through Figure 15 are photos taken in September 2018 of the current status of the Box Cut land slip both above and below the road.

75. Figure 16 is a photo of where the entire highway was washed away during a land slip in August 2018 which made access to the other two sites impossible.



Baxa Group

Pzph — **Phuentsholing Formation (age range uncertain; Neoproterozoic[?] or younger)** - Dark-gray to black, finely-laminated slate and phyllite, interbedded with thin- to medium-bedded, gray to tan limestone, thin-bedded, tan to dark-brown, fine- to medium-grained quartzite, and creamy gray dolostone (Bhargava, 1995; Tangri, 1995a). Maximum exposed thickness is ca. 2,250 m near Phuentsholing.

Pzm / dolo — **Manas Formation*** (Neoproterozoic-Cambrian[?])** - 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 dolostone (locally divided out) (Bhargava, 1995; Tangri, 1995a; Long et al., 2011A). Intraformational thrust faults indicate structural repetition of multiple, 1.5 to 2.8 km-thick thrust sheets (Long et al., 2011B). Lower greenschist facies (Gansser, 1983).

pCp — **Pangsari Formation (age range uncertain; Mesoproterozoic[?]-Cambrian[?])** - Dark-green to dark-gray, thin-bedded to laminated, locally talcose phyllite interbedded with white, pink, and green, medium- to thick-bedded dolostone and marble, and green, fine- to medium-grained, thin-bedded quartzite (Bhargava, 1995; Tangri, 1995a). Maximum exposed thickness is 2,400 m (Tangri, 1995a).

Figure 8 Regional Geology of the Box Cut area

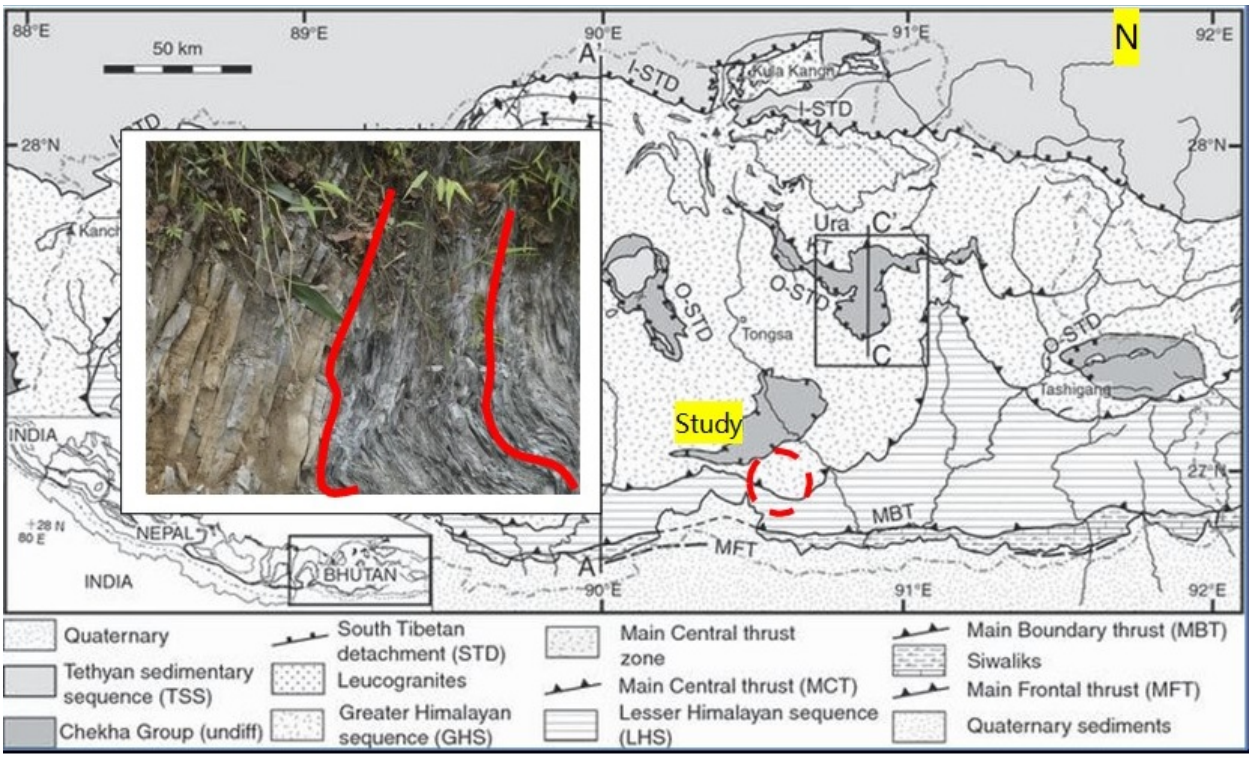


Figure 9 Tectonics in the area of the Box Cut

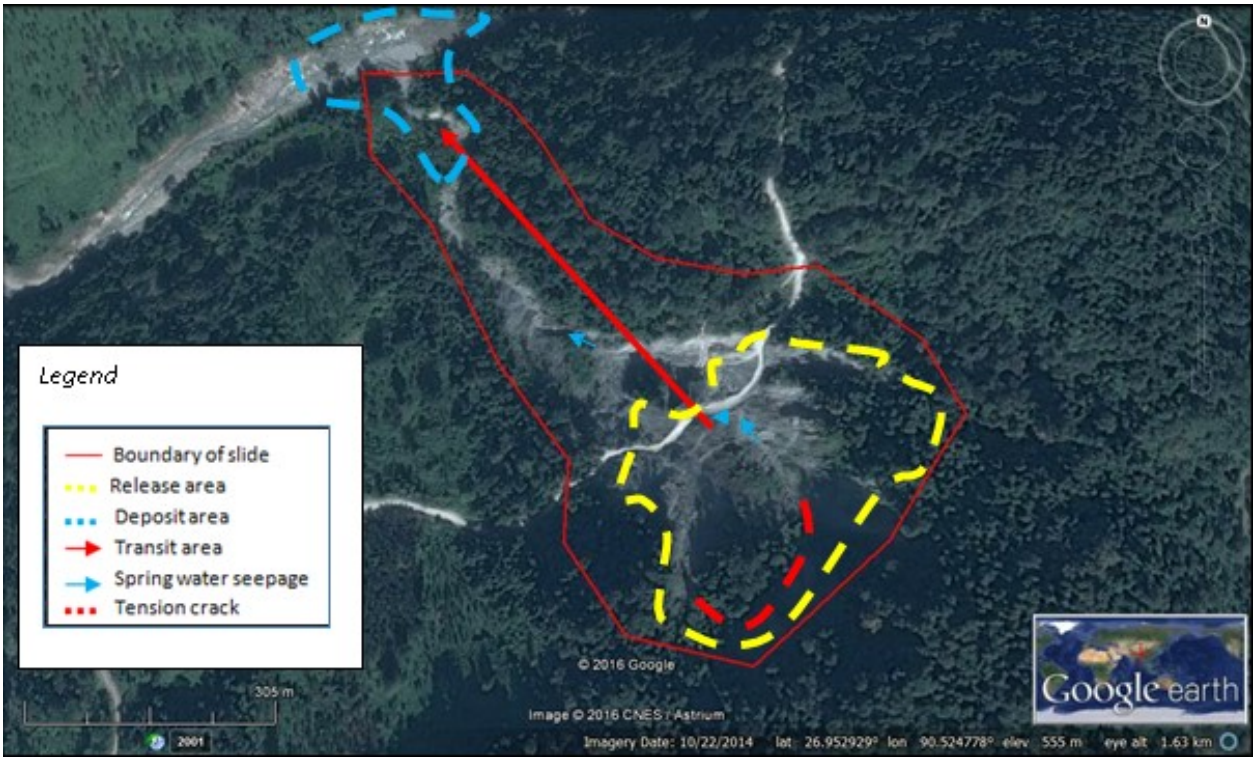


Figure 10 Site map of release area, transit area, deposit area, water seepage, tension crack and boundary of slide

Figure 11 Box Cut land slip above the road

Figure 12 Box Cut land slip below the road

Figure 13 Box Cut land slip below the road

Figure 14 Major land slip totally removing the highway

76. Information on Bhutan's soils is scarce. The FAO/UNESCO classified about 27% of Bhutan as having either cambisols or fluvisols (cambisols are most common in the medium altitude zone, while fluvisols mostly occur in the southern belt). Less fertile acrisols, ferrasols and podzols were estimated to cover 45% of Bhutan. Approximately 21% of the soil-covered area suffers from shallow depth with mostly lithosol occurring on steep slopes. Bhutan's forest soils have five major soil groups (yellow soils, yellow brown forest soils, brown forest soils, podzols and alpine meadow soils). Altitude and precipitation were the main factors used in the classification.

77. Soil erosion depends on several parameters such as type of soil, slope, vegetation, the nature of topography and rainfall intensity. The loss of soil stability and soil erosion can take place due to the removal of vegetation cover, and numerous construction activities. It can cause the loss of soil fertility and induce slope instability. Land preparation for the project could result in blockage or alteration of natural flow paths causing changes in the drainage patterns in the area. Effective and efficient mitigation measures can not only reduce; but could improve the conditions over the existing conditions.

3.2 Seismic Activity

78. Bhutan has experienced only a few earthquakes with a magnitude of about 6 during the past century. On 21 September 2009, the eastern region of Bhutan experienced an earthquake with moment magnitude of 6.1. The epicenter was situated at 180 kilometres east of the capital Thimphu, in Mongar Dzongkhag. At least seven people are reported to have been killed. At least fifteen were wounded. Many of the deaths in Bhutan came about when their houses were destroyed.

3.3 Unexploded Ordinances

79. There are no know unexploded ordinances in the project areas.

3.4 Climate

80. Bhutan can be divided into three distinct climate zones corresponding to three main geographical divisions. Bhutan's climate is as varied as its altitudes and, like most of Asia; it is affected by monsoons.

81. Temperatures vary according to elevation. Temperatures in Thimphu, located at 2,200m above mean sea level in west-central Bhutan range from 15^{O}C to 26^{O}C during the monsoon season of June through September. During the winter, the temperature drops between -4 ^{O}C and 16 ^{O}C in January. The most of the central portion of Bhutan's experiences a cool, temperature climate year round. Bhutan's dry spring starts in early March and lasts until mid-April. General minimum and maximum temperatures are shown in Table 1.

82. Figure 17 graphically represents the monthly average temperature averaged for 17 years for the twenty Dzongkhags. The average temperature for the entire country is shown in dotted yellow line in the figure below. The highest temperature recorded was 28.3°C in the month of August for Chukha and the lowest of 2.7°C for Haa in the month of January. The highest monthly average temperature for the entire country is about 22.22°C for the month of August and lowest of 10.14°C for January. Overall, Chukha Dzongkhag has the highest monthly temperature from the twenty Dzongkhags and Haa Dzongkhag has the lowest temperature.

	Paro	Thimphu	Punakha	Trongsa	Jakar	Mongar	Trashigang
January	9.4 -5.8	12.3 -2.6	17 4.3	13.0 -0.2	10.8 -5.1	15.5 8.2	20.4 10.5
February	13 1.5	14.4 0.6	19 7.8	13.9 0.4	10 -1.4	15.9 8.3	21.7 11.5
March	14.5 0.6	16.4 3.9	22.8 10.4	16.7 4.4	16.2 3.5	20 11.6	24.8 14.4
April	17.6 4.6	20 7.1	26.2 12.9	20.1 6.6	18.7 3.9	22.8 14	28.3 17
May	23.5 10.6	22.5 13.1	29.1 17.7	21 11.6	21.3 9.5	25.1 17.4	302 2.6
June	25.4 14.1	24.4 15.2	29.2 20.1	22.2 13.6	22.5 13.5	26.1 19.5	30.7 22.6
July	26.8 14.9	25.9 15.6	30.4 20.5	25.3 15.3	24.1 13.6	27.1 19.8	31.5 23.1
August	25.3 14.7	25 15.8	29.1 20	23.8 15	231 3.7	25.4 19.6	30.2 22.7
September	23.4 11.7	23.1 15	27.5 19.1	22.6 14.2	21.6 12.1	24.7 19.4	30 21.9
October	18.7 7.4	21.9 10.4	26.1 14.7	21.8 11.7	19.5 5.9	22.7 15.8	29.1 17.7
November	13.9 1.4	17.9 5	22.6 9.6	19.8 6.4	16.1 -0.5	19.9 11.2	26.1 13.6
December	11.2 -1.7	14.5 -1.1	19.1 6.3	18.2 2.5	12.3 -2.3	17.7 9.5	23 11.6

Table 1 Mean Minimum and Maximum Temperatures across Bhutan

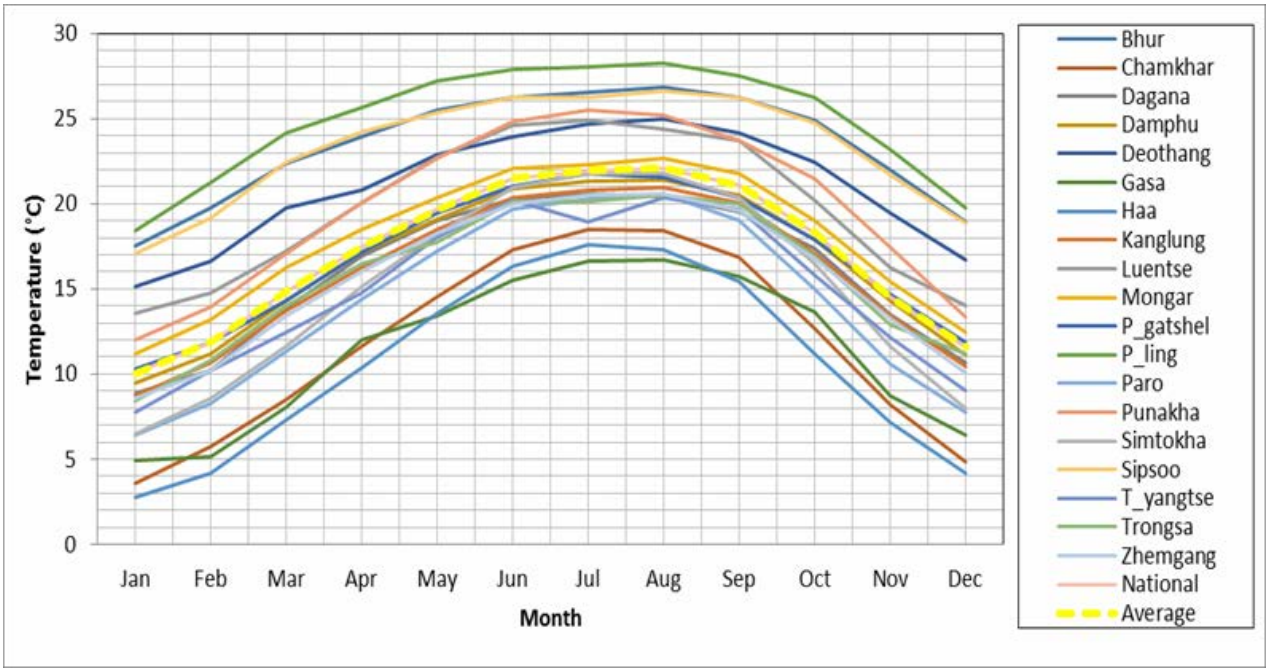


Figure 15 Temperatures across Bhutan

83. Annual precipitation ranges widely in various parts of Bhutan. The total annual rainfall averaged over Bhutan is 1,797.6mm. The lowest total annual rainfall was recorded for Thimphu (602mm), while the highest was recorded for Samtse (5461mm). In the severe climate of the north, there can be only about 40mm of annual precipitation, which falls primarily as snow. In the temperate central regions, the area gets an average yearly rainfall of around 1000mm, while as much as 7800mm/year has been registered in some locations in the humid, subtropical south. Thimphu experiences dry winter months (December through February) and almost no precipitation until March, when rainfall averages 20mm/month and increases steadily thereafter to a high of 220mm in August for an annual rainfall of nearly 650mm. Rainfall across Bhutan is shown in Figure 18. Rainfall trends across five basins is shown in Figure 19.

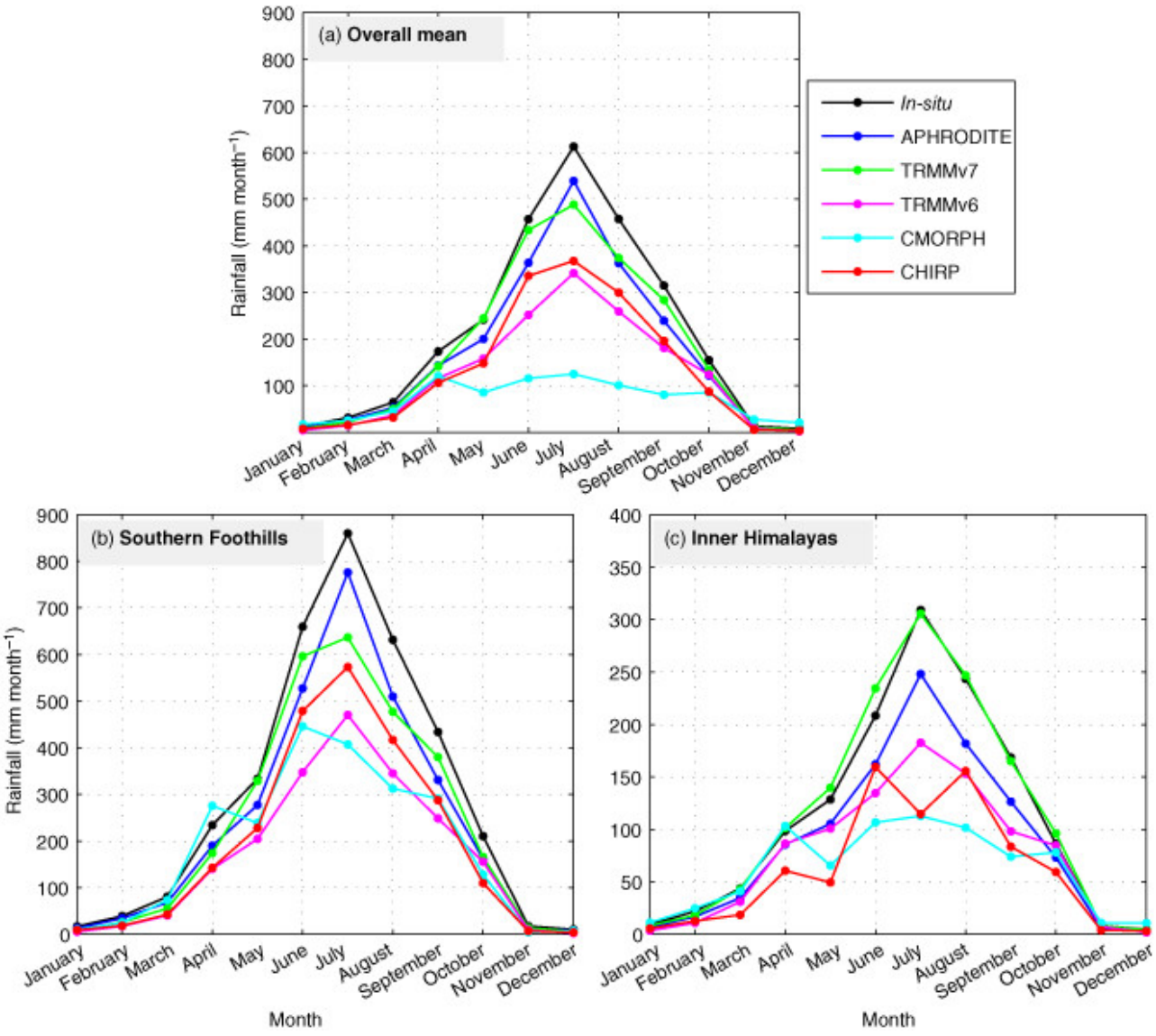


Figure 16 Mean rainfall across Bhutan

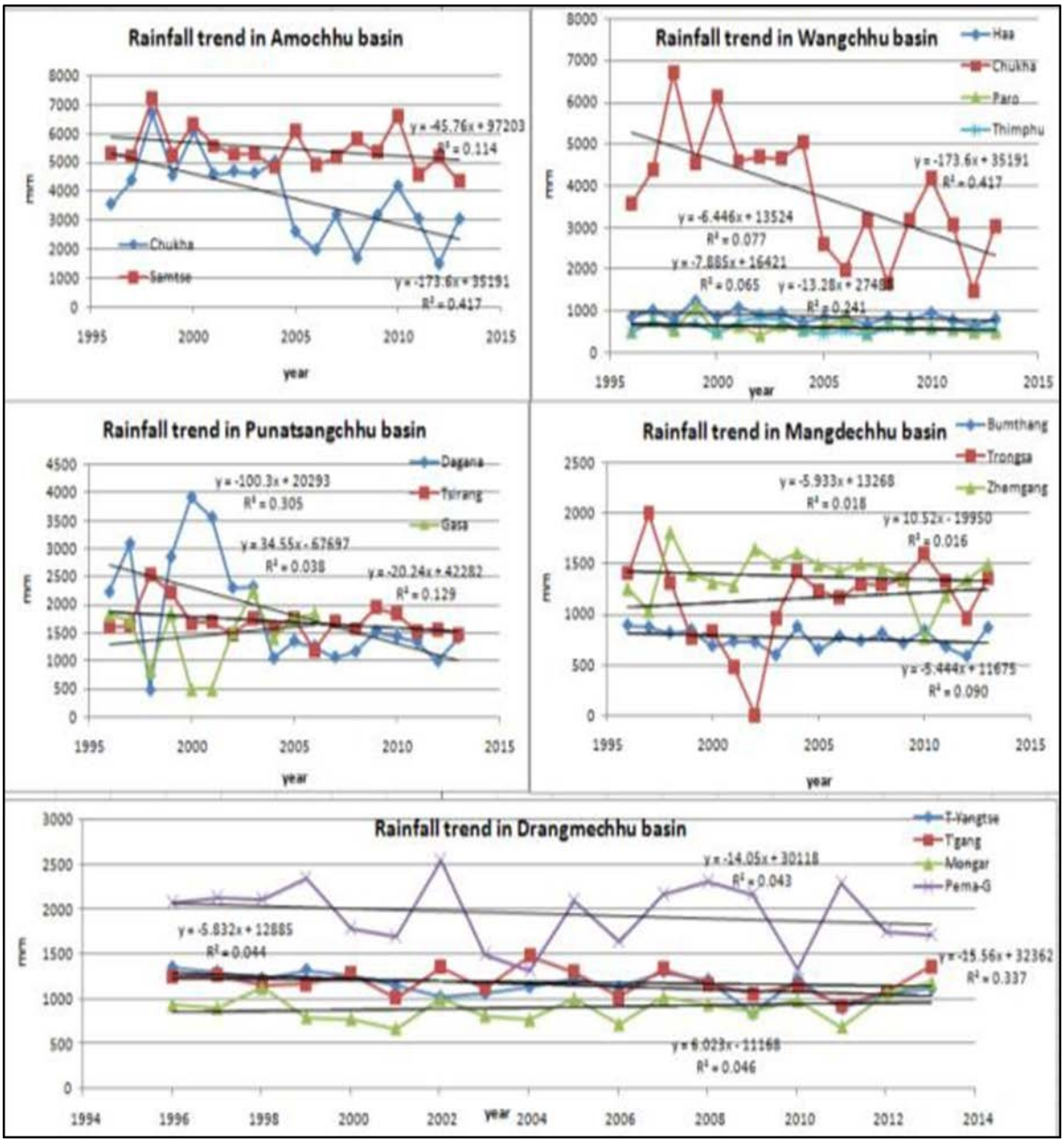


Figure 17 Rainfall Trends for specific basins in Bhutan

84. Rainfall is recognised as one of the triggers of landslides. In the majority of cases, the main trigger of landslides is heavy or prolonged rainfall. Water acts directly to reduce the shearing strength of the soil and rock mass of the area thereby causing instability condition of land mass. Water penetrates through soils and rocks through percolation causing uplift in pore pressure which in turn reduces the normal stress which will then affect its shearing strength considerably. Water also facilitates mass failure through its lubricating action. Apart from these, water also acts as a powerful transportation agent. High moisture levels increase pore-water pressure and decrease the strength of slope material. The monthly rainfall pattern has been analysed from 2015 to 2017 based on the data received from the National Centre for Hydrology and Meteorology.

3.5 Air Quality

85. No specific air quality assessment has been undertaken in the development of this ESMF. Due to the limited urban development or heavy industry, it is assumed that environmental air quality is relatively good. This was confirmed during field investigation.

86. The project areas are predominantly village or rural in character. Existing air quality reflects those environments, with dust being the main air quality nuisance. This is based on site observations during field visits.

3.6 Ambient Light

87. No specific light assessment has been undertaken in the development of this ESMF. The vast majority of where the project activities will be undertaken are rural. With respect to the road component of the project, there is no street lighting.

3.7 Ambient Noise

88. No specific noise assessment has been undertaken in the development of this ESMF. Due to the limited urban development and heavy industry, it is assumed that environmental noise is relatively low. Field investigation confirmed this.

3.8 Visual Amenity

89. Except for major urban centres, the majority of the areas where the projects will be undertaken are rural with stunning mountain scenery. Figure 20 is an example of the surroundings of Wangdue, while Figure 21 is a typical mountain landscape.

Figure 18 Visual Amenity around Wangdue

Figure 19 Mountain view in central Bhutan

3.9 Surface Water and Hydrology

90. Rivers are Bhutan's primary water resource. Most of Bhutan's rivers originate in the frigid alpine regions of the north, including two in the Tibet Autonomous Region and one in India. They are fed by melting glaciers, snow, and rain. Bhutan has five major and five minor river systems that drain through separate basins. A river basin in the context of Bhutan is the entire land area, comprised of mountains and valleys, into which all waters; ice melt, snow, lakes, rainwater and groundwater; flow into, and converge with, a specific river that exits the area.

91. Bhutan has abundant water resources having the highest per capita water availability of 94,500m^3/capita/annum but imbalance in terms of spatial and temporal distributions have led to experience of shortages in local areas which can specifically affect agricultural production. The major challenges and threats Bhutan faces presently on its water resources are due to unpredictable climate, drying up of water resources, increasing population and urbanisation, accelerated glacier melting, accessibility and management issues and stakeholder participation/multi-sectorial coordination issues.

92. The major river systems and their basins are:

    a. The Amochhu River is Bhutanb's smallest river system (358km long). The Amochhu River originates in Chumbi Valley in Tibet Autonomous Region and flows swiftly through western Bhutan. The Amochhu River exits Bhutan at Phuentsholing and then flows into India where it is known as the Torsa. The Amochhu basin covers the Dzongkhags of Haa, Samtse, and Chhukha. Its total catchment area is 2,298km^2, which is about 6% of Bhutan's total land area;

    b. The 370km long Wangchhu River runs southeasterly through the valleys of Haa, Paro, and Thimphu. Its principal tributaries are Haachhu, Parochhu, Tangochhu, Wangchhu, and

Pipingchhu. It flows into the plains of Jalpaiguri district in India where it is known as the Raidak. The Wangchhu River then joins the Brahmaputra and flows into Bangladesh where it is sometimes referred to as the Dudhkumar River. Spread over 11% of Bhutan's total land area, the Wangchhu basin has an area of 4,596km^2, and covers Haa, Paro, Thimphu and Chukha Dzongkhags;

c. The Punatsangchhu River is one of the largest rivers of Bhutan (320km long). Its two main tributaries; the Mochhu and Phochhu Rivers rise in the frigid regions of northwestern Bhutan. Fed by snow and ice melt from the Great Himalayan range, the Mochhu and Phochhu Rivers flow southward toward Punakha where they converge to become the Punatsangchhu River. Further downstream, the river is joined by several other tributaries including the Dangchhu, Basochhu, Kamechhu, Digchhu, Harachhu, Changchechhu, Burichhu, and Dagachhu Rivers. The Punatsangchhu flows southward and enters West Bengal in India., the Punatsangchhu is Bhutan's The largest in Bhutan basin covers 9,645km^2, which represents 25% of Bhutan's total land area. The Dzongkhags of Gasa, Punakha, Wangduephodrang, Tsirang, Dagana, and Sarpang lie within the Punatsangchhu basin;

d. The Mangdechhu River derives its name from the valley of Mangde through which it initially runs. The main tributaries are Nikachhu, Burgangchhu, and Chamkharchhu Rivers including its tributary Tangchhu. The Mangdechhu basin covers the of Bumthang, Trongsa, Zhemgang, and Sarpang. Its catchment area is 7,380km^2, which is roughly 19% of Bhutan's total land area;

e. The Drangmechhu River is made up of several rivers including Kurichhu, Khomachhu, Kholongchhu, Sherichhu, Gongrichhu, Gamri, and Zhongarchhu. This river joins the Mangdechhu at the southern end of Bhutan after which it flows into India where it is known as the Manas.

f. The Drangmechhu basin is the second largest river basin in Bhutan after the Punatsangchhu River basin. It covers 8,457km^2, which represents 22% of Bhutan's total land area. All of the eastern Dzongkhags of Lhuentse, Monggar, Tashi Yangtse, Trashigang, Pemagatshel, and Samdrup Jongkhar lie within this river basin.

93. The smaller river systems and their basins include the Jaldakha River in Samtse; Aiechhu River in Sarpang; the Nyera Amari River in Samdrup Jongkhar; the Jomori River in Samdrup Jongkhar/Trashigang; and the Merak-Sakteng River in Trashigang. The major rivers are shown in Figure 22. River basin area and annual flow is shown in Table 2. Examples of a number of rivers in southern Bhutan and their current flow in September 2018 are shown in Figure 23.

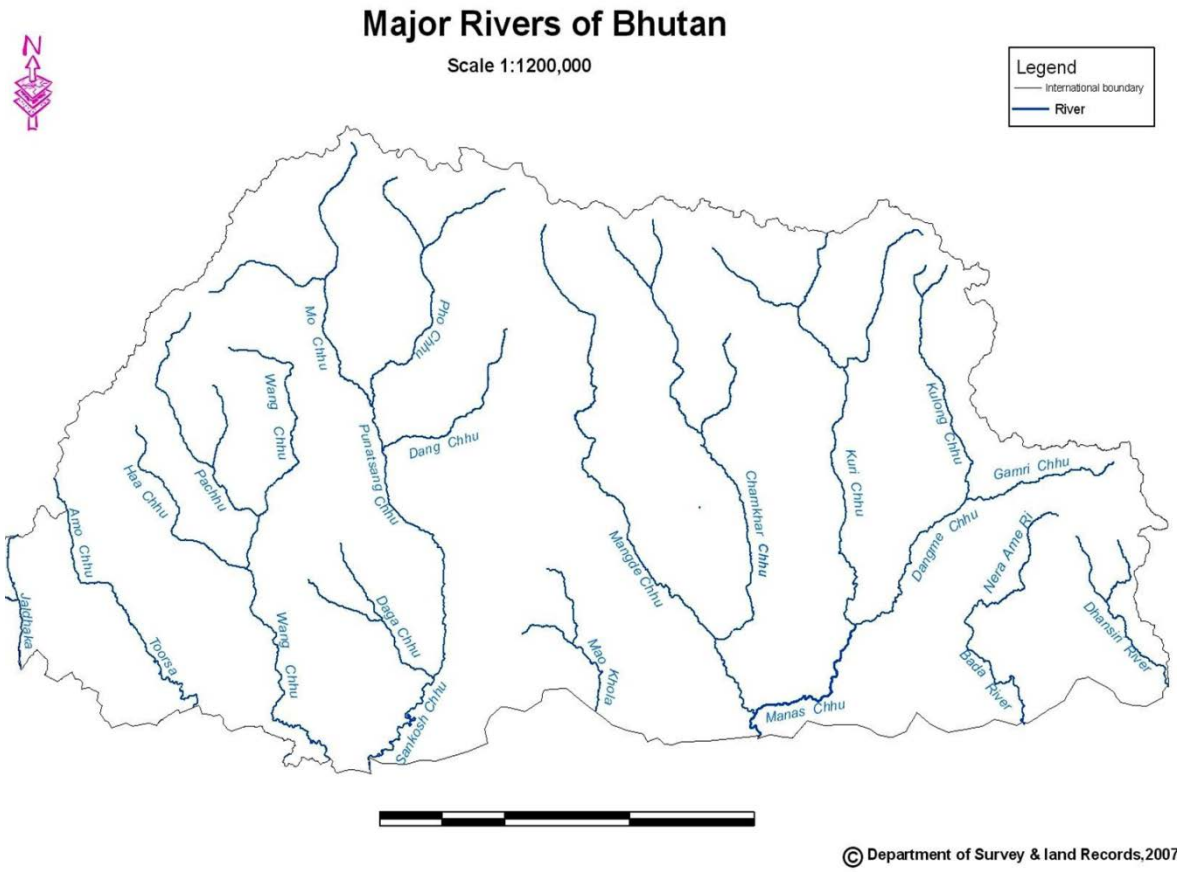


Figure 20 Major Rivers of Bhutan

Management Basin	**Area (km^2)**	**River Basins**	**Area (km^2)**	**Annual flow (MCM)**
Amochhu	3,252	Jaldakha	942	2,715.64
		Amochhu	2,310	6,659.36
Wangchhu	4,596	Wangchhu	4,596	5,209.06
Punatsangchhu	11,582	Punatsangchhu	9,645	19,129.79
		Aiechhu	1,937	6,989.14
Mangdechhu	7,380	Mangdechhu	7,380	11,797.24
Drangmechhu	11,584	Drangmechhu	8,457	13,569.14
		Nyera Amari	2,348	3,383.89
		Jomori	642	925.24
		Merak - Sakteng	137	197.44
Total	38,394	Total	38,394	70,576.01
		Population		746,773
		Per Capita Water Available		94,508.04m^3/annum
		Flow		2,238m^3/second

Table 2 River Basin Area and Annual Flow

Figure 21 Examples of rivers and streams in southern Bhutan

94. The *Water Act of Bhutan 2011* and the *Water Regulation 2014* recognised increasing threats on the quality and quantity of water resources under rapid socio-economic development and also the need for stakeholders' coordination in managing Bhutan's water resources. The Act mandates the National Environment Commission Secretariat in consultation with competent authorities to "*prepare and periodically update a National Integrated Water Resources Management Plan for the management of water resources*."

3.9.1 Glaciers

95. About 1.6% of Bhutan's total land area in the elevation range of 4,050 to 7,230 metres above sea level. is covered in glaciers, snow, and ice. The analysis of recent Landsat satellite images shows that Bhutan had 885 Clean Ice and 50 Debris Covered Glaciers in 2010 covering an area of 642km ± 16.1km which is about 1.6% of Bhutan's total land area.

96. Glacial and freshwater lakes are major natural reservoirs in Bhutan. Glaciers are important renewable sources of fresh water for Bhutan and downstream riparian states. When glaciers melt, the water accumulates in depressions, forming glacial lakes over time. There are some 2,674 glacial lakes in Bhutan. Although they contribute substantially to Bhutan's water resources, the fragility of the Himalayan landscape in which they are located makes glacial lake outburst floods a major threat to downstream communities.

97. As per the Intergovernmental Panel on Climate Change, many glaciers are likely to disappear completely due to an increase in the equilibrium-line altitude. A volume loss of 60% of glaciers is projected by 2050 based on simulations of eleven glaciers in various regions. The glacier area in Bhutan is decreasing and that the changes were rapid. Bhutan is at a high risk of frequent Glacial Lake Outburst Flood in the future. At the time of writing this report, there have been 21 Glacial Lake Outburst Floods in the Bhutan.

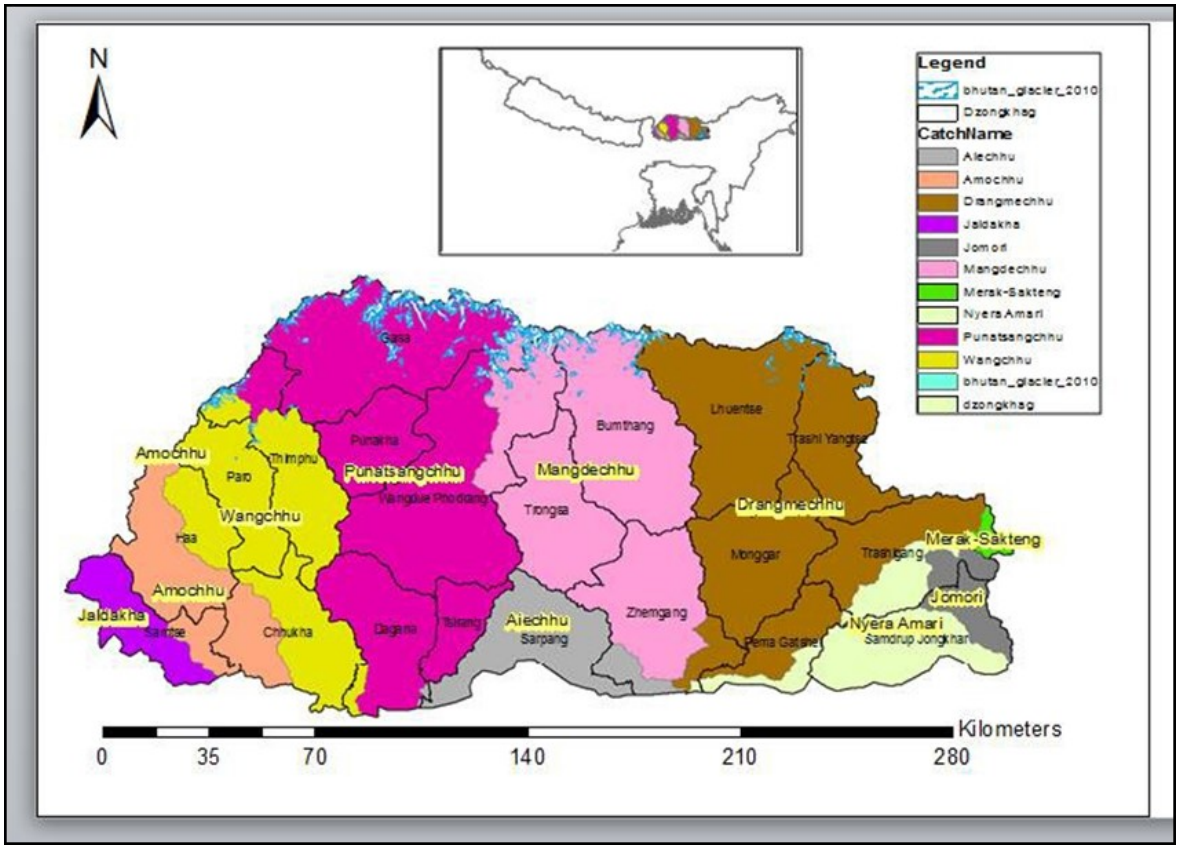


Figure 22 Glaciers in Bhutan

3.9.2 Water Quality

98. Water quality data of river basins from the National Environmental Commission indicates that the state of Bhutan's water resources at the macro level is very healthy. The data indicates that with few exceptions, the main rivers and their major tributaries are of a pristine quality. The natural water quality can be characterised as highly oxygenated, slightly alkaline with low conductivity and no recorded salinities. However, there are localised water pollution problems due to frequent unsanitary conditions along the banks of streams and rivers. This problem is worse in Thimphu, where surface drainage, grey water sullage from domestic households and uncontrolled seepage or overflow from septic tanks and pipes enter into the watercourses.

3.9.3 Hydrology

99. Hydrological modelling was undertaken under the GEF/LDCF through UNDP Bhutan by the National Environment Commission of Bhutan in 2017 for four Dzongkhags, these being Tsirang, Mongar, Pemagatshel and Samtse. Details of the dzongkhags and modelling under a range of scenarios is provided below.

100. Tsirang Dzongkhag is located in southern Bhutan at an average altitude of 1700 metres above sea level. Tsirang has 15 gewogs and a total area of 639km^2 and a population of 21,816 as of 2015. About 87% of Tsirang is under forest cover with agriculture taking up approximately 7%. Tsirang has gentle slopes and a mild climate with an average yearly temperature of 16^{o}C and an average annual rainfall of 1704mm/year.

101. Mongar Dzongkhag has an area of 1944.26km^2 with 17 Gewogs and a total population of 44,259 and an average occupancy rate of 4.5 people/household. Mongar is located in eastern Bhutan at an altitude range of 400 - 4000 metres above sea level. It has a sub-tropical climate in its lower and southern

parts and temperate climatic conditions at higher regions. The average yearly temperature of the Dzongkhag is 18^{O}C and average rainfall is 906mm/year. Mongar has rugged mountain topography with 92% of its area covered in forest with approximately 3% under agriculture land holdings. Mongar falls inside the Drangmechhu Basin which has a total area of 8457km^2.

102. Pemagatshel Dzongkhag has an area of 1022km^2 with eleven Gewogs and a total population of 22,287 consisting of 4,881 households. The Dzongkhag is located in south eastern Bhutan at an altitude range of 1000-3500 metres above sea level. The Dzongkhag has a subtropical climatic condition in its lower regions and temperate climatic conditions in its higher regions. The average yearly temperature of the Dzongkhag is 17^{O}C and average annual rainfall is about 1867mm/year. The maximum land use in the Dzongkhag is forest 87%, while agriculture is only about 7%.

103. Samtse Dzongkhag has an area of 1,305km^2 across 15 Gewogs. Samste has a total population of 68,000 and an average occupancy rate of five people/household. Samtse is located in the sub-tropical monsoon climatic zone of Bhutan with altitudes ranging from 200 – 4400 metres above sea level sharing borders with India to the south and west. The average annual rainfall in the district is about 5461mm/year and the average temperature is about 23°C. The maximum land use in the Dzongkhag is forest at 77% followed by agriculture at 8%. The Dzongkhag falls inside the basins of Jaldhaka and Amochhu which later joins the Wangchhu River after traversing the India Bhutan border.

104. Water demand is anticipated to increase across all four Dzongkhags with an increase in population. Current water requirement demands are not met in numerous areas and some areas in the Dzongkhag face severe water supply shortages. The availability of water in the future under climate change is uncertain which necessitates quantification of the available water resources. This is especially true for agriculture that does not have access to water during the drier times of the year. The project will reduce these periods.

105. As part of the modelling undertaken under the GEF/LDCF project, the impacts of climate change on water resources of the gewogs were assessed from the projected future temperature and precipitation which were used in the HEC HMS models of respective basins. Two scenarios to represent greenhouse gas emission stabilisation, RCP 4.5 and RCP 8.5. The changes in flows were calculated for two future time periods (2016 to 2046) which represents the future climatic conditions for the year 2030 and 2046 to 2075 for the year 2060 with respect to the historical time period (1970-2010).

106. The flows for various stations around Bhutan are shown in Figure 25. The highest flows were recorded in the months of June to September, which contributed to about 76.3% of the total annual flow. The highest flow was recorded for July (21.3%) while the least was recorded for the month of February (1.8%). The main rivers were observed to have higher variations compared to smaller rivers. There is no major flow variation till March starting from January but a gradual increase in the flow can be seen starting from April till July and there after a decrease.

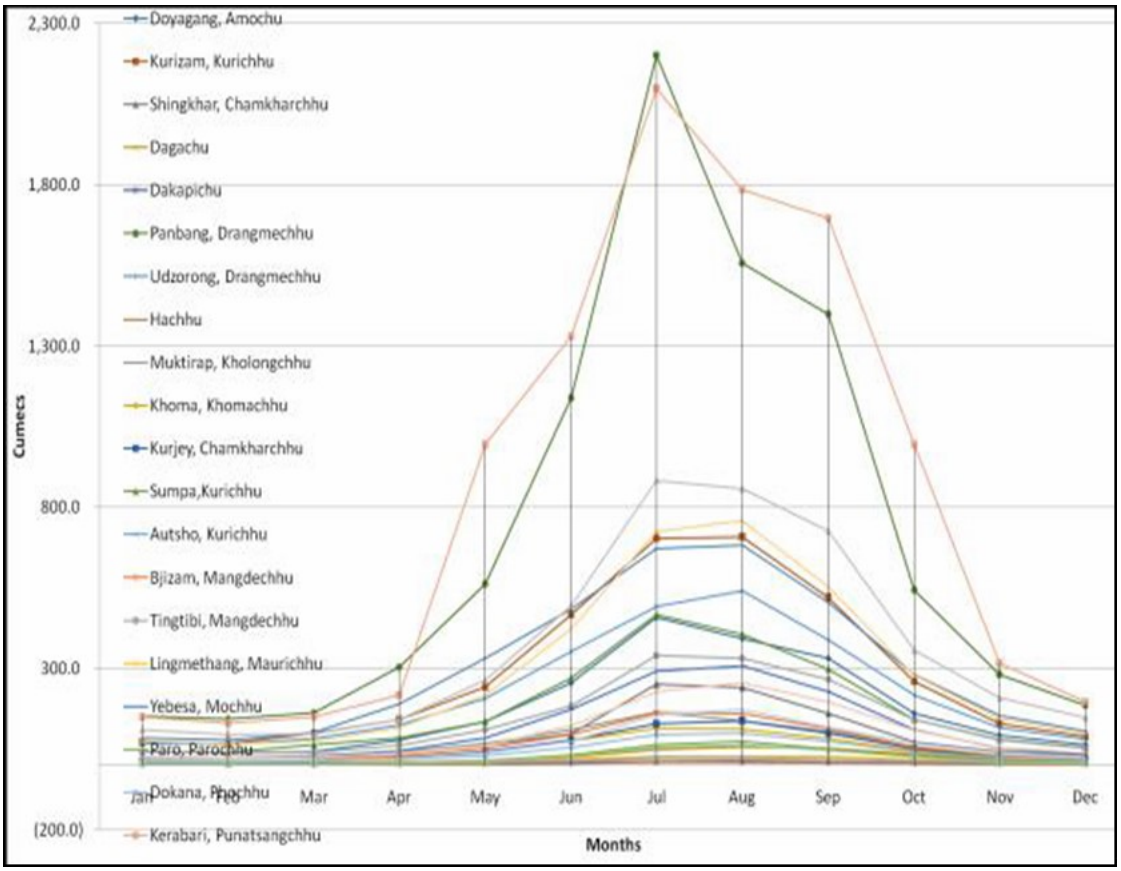
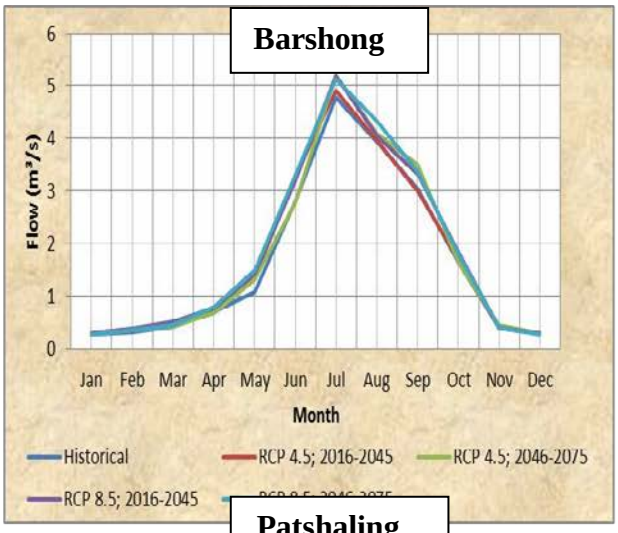


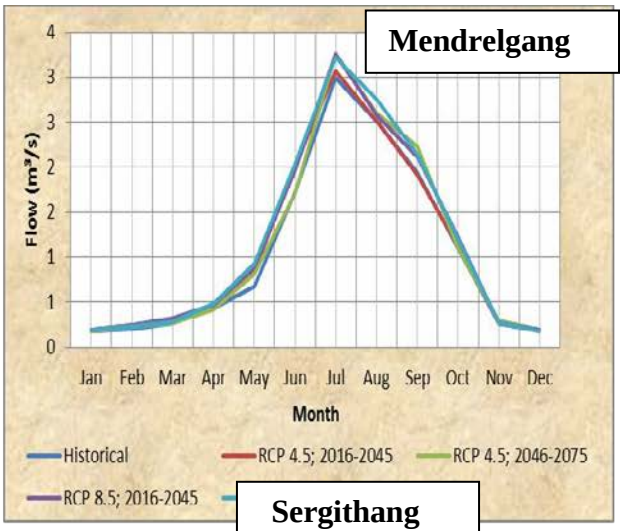
Figure 23 Seasonal Variations in Hydrological Flow at numerous sites in Bhutan

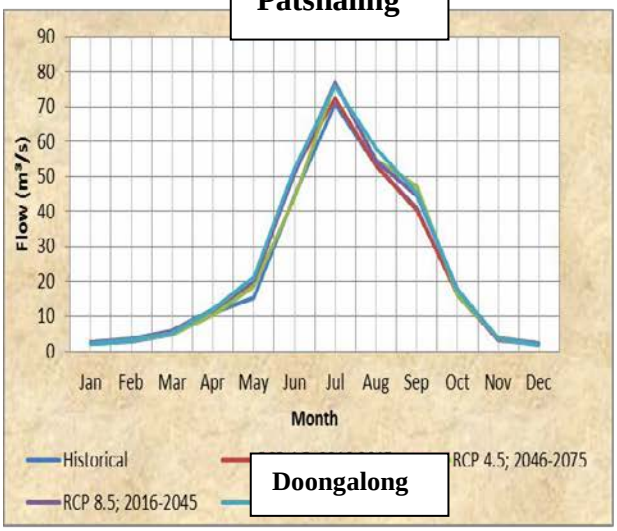
107. The flows for the gewogs show an overall increase in their mean annual flow for both the future scenarios and time periods but it shows a rather inconsistent trend in their monthly flows. An increase in the mean yearly flow may be favourable for the farmers in the Dzongkhag but uneven or high increases in some months may be problematic. A decrease in the month of December is prominent in all of the scenarios and time periods as well as for some of the winter months which may indicate further decrease in flows in the future. This increase in water demand in the gewogs and increasing population coinciding with decrease in flows for some months may cause an imbalance in terms of the demand and supply figures in the future.

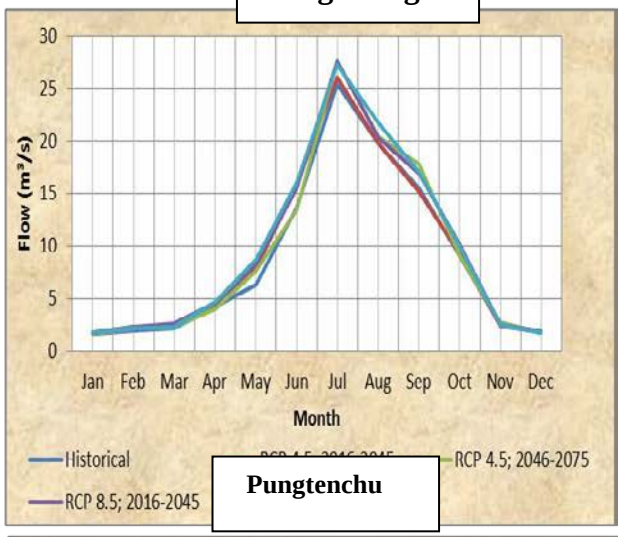
108. The percentage change in the flows obtained under different scenarios was used to calculate the effects on the available water at the gewog level. Consecutively, the flows under each scenario for every gewog was calculated. The comparison of the flows under different scenarios for the Gewog of Tsirang are is presented in Figure 26.

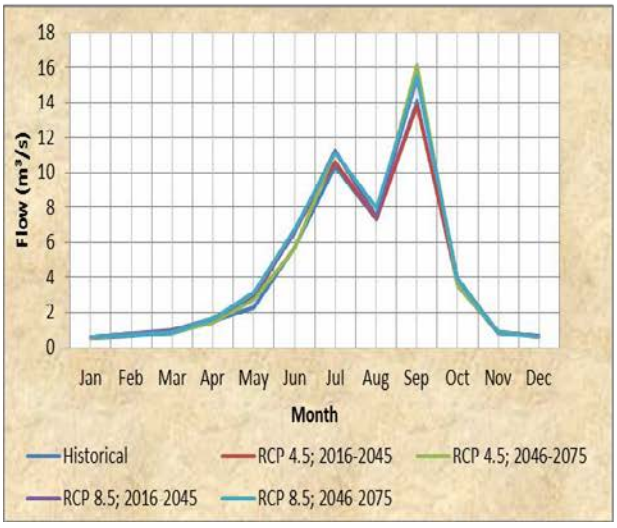
109. The changes in flow at the Gewog levels are reflective of the basin level changes under different scenarios and time periods. The changes in the pattern of flow are shown in the following figures. In the gewogs of Doongalong, Tshokhorling, Semjong, Kilkhorthang, Tsirang Toed and Gosarling a sharp increase of flow in the month of September can be observed which can also be observed for the respective sub-basins W1030 of the *Punatsang Chhu* in which these gewog fall. The annual flows of the gewog show an increase for both future scenarios and time periods. For RCP 4.5, the flow in the gewog show a decrease in the months of September, November and December for 2030, no change in August and an increase in the rest of the months whereas for 2060, under the same scenario, the months of January, April, June and December shows a decline in their flow, October shows no change and the rest of the months show an increase. For RCP 8.5, the months of November and December show a decline in both the future time periods whereas the rest of the months show an increase. A decline in the month of December for all the gewog was found to be common.

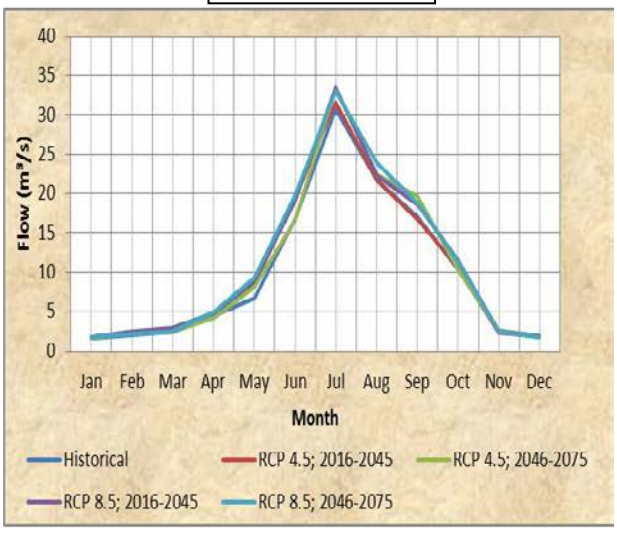

Barshong
Flow (m³/s)
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Historical
RCP 4.5; 2016-2045
RCP 4.5; 2046-2075
RCP 8.5; 2016-2045


Mendrelgang
Flow (m³/s)
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Historical
RCP 4.5; 2016-2045
RCP 4.5; 2046-2075
RCP 8.5; 2016-2045


Patshaling
Flow (m³/s)
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Historical
RCP 4.5; 2046-2075
RCP 8.5; 2016-2045


Sergithang
Flow (m³/s)
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Historical
RCP 4.5; 2046-2075
RCP 8.5; 2016-2045


Doongalong
Flow (m³/s)
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Historical
RCP 4.5; 2016-2045
RCP 4.5; 2046-2075
RCP 8.5; 2016 2045
RCP 8.5; 2046 2075


Pungtenchu
Flow (m³/s)
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Historical
RCP 4.5; 2016-2045
RCP 4.5; 2046-2075
RCP 8.5; 2016-2045
RCP 8.5; 2046-2075

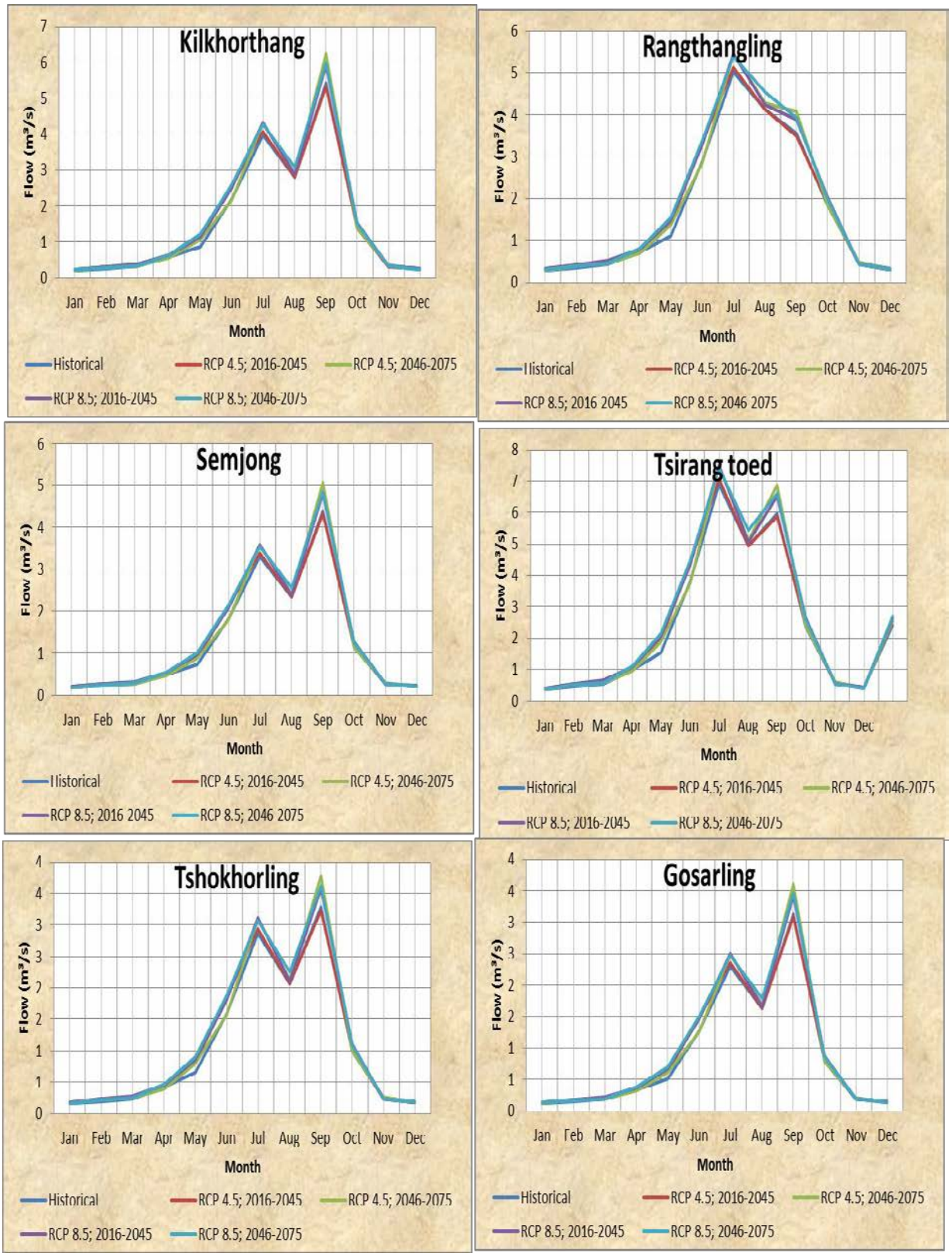


Figure 24 Change in flows under different scenarios in the gewogs of Tsirang

3.10 GROUNDWATER

110. Bhutan has deep groundwater aquifers that are predominantly unused. Groundwater contributes very little in quantity to Bhutan's overall water resource. Groundwater resources are believed to be limited in the rugged mountain areas of Bhutan; however, the wider and flatter valleys of Paro, Punakha, Thimphu, Wangdue, and areas bordering the plains of India may have significant groundwater reserves. No groundwater samples were taken as part of the project as there is not anticipates to be any impact on groundwater and any groundwater dependent ecosystems.

3.11 TERRESTRIAL FLORA AND FAUNA

111. Bhutan is among the top 10 countries in the world for forest coverage and wild life. The King has stated that Bhutan must maintain 60% forest coverage for all time to come and this is expressed in Bhutan's Constitution.

112. One of the four pillars of Bhutan's development philosophy guided by the GNHC is the preservation of environment. Bhutan is home to 7500 vascular plants (82 are endemic); >300 medicinal plants; 50 species rhododendron, and >40 species of orchids. Bhutan was popularly known as the Land of Medicinal Plants. Figure 29 shows land use and land cover of Bhutan while Table 3 shows eco-floristic zones across Bhutan.

Eco –Floristic Zones	**Dzongkhags**	**Main Forest Types and dominant flora (plants)**	**Main fauna (animals)**
Alpine Zone - >4000 metres above sea level	Northern part of Wangdiphodrang	Alpine meadows and scrubs dominated by Rhododendron scrubs, Juniper and medicinal plants and herb species such as *Aconitum, Gentiana, Nardostachys Delphinium, Rhodolia, Meconopsis, Osnomas, Dactylorhiza, Ophiocordyceps sinensis, Picorrhiza, Frtillaria etc*.	Snow leopard, Lynx, Blue sheep, Himalayan marmot, Tibetan wolf, Takin, Musk deer.
Temperate Zone - 2000-4000 metres above sea level	Punakha, Wangdiphodrang, Trongsa and upper part of Zhemgang	Fir Forest – >3000 metres above sea level; Fir forest consists either of largely pure stands of *Abies densa* or mixed with other species such as *Juniperus, Taxus and Larix.* Mixed Conifer Forest between 2500- 3500 metres above sea level; Mixed conifer forest includes mixed stands of spruce, hemlock, juniper, fir, larch, taxus. Some broadleaf are also common particularly *Quercus semecarpifolia, Quercus griffithii, Rhododendron spp., Acer spp., Betula sp.* Blue Pine Forest- 1500- 3200 metres above sea level; Blue pine forest consists of pure or dominant stands of blue pine. It is sometimes mixed with *Quercus semecarpifolia, Populus rotundifolia* and *Rhododendron spp.* Broadleaf mixed with Conifer between 2000-2500 metres above sea level; Consists of blue pine mixed with poplar, and other species such as *Castanopsis, Quercus, Persea, Litsea, Populus ciliate.*	Goral, Serow, Black bear, Grey langur, Red panda, Assamese macaque, Leopard
Sub Tropical Zone – 150-2000	Samtse, Dagana, Tsirang, Sarpang and	Broadleaf Forest – 1000-2000 metres above sea level; Represented by species	Water buffalo, Golden langur, Sambar deer,

metres above sea level	mid to lower part of Zhemgang	of *Castanopsis, Lithocarpus, Schima, and Quercus.* Chir pine Forest – 700- 2000 metres above sea level; Pure stands of Chir pine or in association with *Quercus lanata*, *Quercus griffithii*, *Quercus glauca* and *Alnus nepalensis* along water courses. Tropical Lowland Forest - <700 metres above sea level; Broadly classified as semi- evergreen but varies from almost totally deciduous on exposed dry slopes to almost evergreen in the moist valleys. Forests are multi- storied with high species diversity. Floristic composition consists of tropical species like *Shorea robusta, Terminalia myriocarpa, Bombax ceiba, Daubanga grandifolia, Sterculia villosa, Acacia catechu, Terminalia nudiflora.*	Tiger, Golden cat, Clouded leopard, Capped langur, Gaur

Table 3 Eco-Floristic Zones of Bhutan

113. During the field visit, many weed species were observed, indicating some habitat disturbance. While transects were not undertaken, this could just be edge affect in disturbed sections.

Figure 25 Weed infestation – potential edge affect

114. Bhutan is home to 770 species of birds (14 listed with the IUCN) and 200 species of mammals (26 listed with the IUCN). Bhutan is home to some of the most endangered animals including but not limited to Red Panda, Takin, Golden Languor, Rhino, Asian Elephant, Water Buffalo, Bengal Tiger, Golden

Langur and Snow Leopards. During the site visit, number species of Langurs and other monkeys were observed. An example is show in Figure 28.

115. During the site visit, numerous species of birds were observed, particularly around the river valleys and up on the hills. Examples of species observed included Scarlet Finch, Chestnut bellied Nuthatch, Slaty backed Forktail, Gorgeted Flycatcher, Wedge Tailed Green Pigeon, Verditer Flycatcher, Himalayan Monal, Striated Bulbul, common Kestrel, Spot-winged Grosbeak, Mountain Hawk Eagle, Whiskered Yuhina, Wall Creeper, Himalayan Swiftlet, Maroon Oriole, Racket tailed Drongo, Red headed Trogon, sultan tit, Grey Nightjar, Hill Prinia, Asian Emerald Cuckoo, Beautiful Rose Finch, Gold-Naped Finch, little Forktail, White Capped Redstart, Chestnut Bellied Rock Thrust, Coal Tit, and Longtailed Minivet.

Figure 26 Langur by the Mangdechhu River

116. Bhutan is home to numerous important protected areas. These include the following:

a. Jigme Dorji Wangchuck National Park (4,316km^2). The Jigme Dorji Wangchuck National Park covers parts of Paro, Thimphu, Punakha and almost all of Gasa Dzongkhag. The National Park is a habitat for many endangered species like the Snow Leopard, Takin, Blue Sheep, Musk Deer, Red Panda, Himalayan Black Bear, Leopard, Wild Cats, Wild dogs, Sambars, Barking deer, Pikas and Serow

b. Royal Manas National Park (1,057km^2). The Royal Manas National Park is located in South Central Bhutan and adjoins the Jigme Singye Wangchuck National Park to the north and India's Manas National Park and Tiger reserve to the south. The areas have been protected since 1966. The National Park is home to Rhinos, Asian Elephants, Water Buffalos, Bengal Tigers, Leopards, and the Golden Langur. There are 362 species of birds known to occur in this protected area.

c. Jigme Singye Wangchuck National Park (1,730km^2). The Jigme Singye Wangchuck National Park protects the Black Mountain Ranges that separate eastern and western Bhutan. Tigers, Black

Bears, Red Pandas, Langurs, Leopards and 449 species of birds have been recorded. Phobjikha Valley also falls within this region.

d. Phibsoo Wildlife Sanctuary (278km^2). The Phibsoo Wildlife Sanctuary was established to protect the only natural remaining Sal forests in Bhutan The Chital deer, Elephants, Guars, Tigers, the Golden Langurs, and Hornbills can be found here.

e. Thrumshingla National Park (905km^2). The Thrumshingla National Park is located between Bumthang and Mongar and protects the growth of ancient fir and chirpine, being within a temperate forest. The Thrumshingla National Park is home to similar species as observed in the Jigme Singye Wangchuck National Park including some rare and exotic birds.

f. Bomdeling Wildlife Sanctuary (1,545km^2). The Bomdeling Wildlife Sanctuary covers the majority of Trashi Yangtse Dzongkhag and is home to Blue Sheep, Snow Leopards, Red Pandas, Tigers, Leopards, Black Bears, and numerous species of birds including Black Necked Cranes.

g. Sakten Wildlife Sanctuary (740km^2). The Sakten Wildlife Sanctuary is said to be the habitat of the Yeti. This is also home to the Brockpas, an indigenous group of nomadic people, and home to a varied species of rhododendrons.

h. Khaling Wildlife Sanctuary (740km^2). The Khaling Wildlife Sanctuary is similar to the Royal Manas National Park where animals roam freely between the Indian Manas and the Bhutan Manas.

i. Torsa Strict Nature Reserve (664km^2). The Torsa Strict Nature Reserve is located in the western region of Haa Dzongkhag where the Torsa River enters Bhutan from Tibet. It was set aside to protect the pristine Alpine forests of that region. There are no people living there.

117. There are no protected areas and/or areas for conservation in proximity to the project sites.

3.12 Aquatic Flora and Fauna

118. Bhutan has limited records of described aquatic biodiversity; however, data on fish species is more common. The vast majority of any studies have been undertaken during the development of hydropower projects. These are in the upper reaches of where the irrigation projects will be undertaken.

119. The aquatic environments observed during the mission often had limited to moderate riparian vegetation and there was no instream flora. The riparian vegetation had often been disturbed and weed infestation was occurring as a result of the edge effect.

120. Instream is broken up into pools, riffles, cascades and rapids depending on the stream size. Given the time of year, all sites where water was observed, it was flowing rather than pooling.

121. In recent years, several new fish species in Bhutan have been observed. A preliminary nationwide fish survey conducted in 2015 stated that there are records of 109 species from 24 families, of which few of these species are yet to be described. Recent findings include the torrent catfish fish (*Parachiloglanis bhutanensis*) from Khalingchhu in Eastern Bhutan.

122. With respect to macroinvertebrates, small stretch of Toeberongchhu, a tributary of Punatsangchhu, Thruelpangchhu, a tributary of Mangdechhu, Kawangjangsa, a tributary of Wangchhu, Nikkachhu, Mangdechhu, Chamkharchhu in Wangchuck Centennial Park Chamkharchhu and its tributary has been partially assessed. A study for the Mangdechhu hydropower project recorded ten orders and 44 species of macroinvertebrates at the family level, from 14 sampling sites. Aquatic macro-invertebrates consist of insect larvae, insect nymphs, annelids, molluscs, crabs and prawns. Insects were the most dominant of aquatic macro-invertebrates. These macro-invertebrates are mostly benthic. Mayflies belonging to order Ephemeroptera are often abundant as larvae in streams.

3.13 LAND USE

123. Bhutan has five agro-ecological zones of Bhutan. The zones include alpine; cool temperate; warm temperate; humid sub-tropical; and wet sub-tropical. The land use in the areas of the irrigation activities is all agricultural land. The relevant farming systems and major land use, including crops and agricultural produce is shown in Table 4. Land cover is shown in Figure 29; with an example of existing land use is shown in Figure 30.

124. In proximity to the road projects, the land is easier agriculture and/or natural forest.

Agro-ecological zone	**Altitude (metres above sea level)**	**Rainfall (mm/annum)**	**Dzongkhags**	**Farming systems, major crops and agriculture produce**
Alpine	3600-4600	< 650	Northern part of Wangdiphodrang	Semi-nomadic people, yak herding, dairy products, barley, buckwheat, mustard and vegetables.
Cool Temperate	2600-3600	650-850	Upper part of Trongsa	Yaks, cattle, sheep &horses, dairy products, barley, wheat & potatoes on dryland, buckwheat & mustard under shifting cultivation; temperate fruits and vegetables
Warm Temperate	1800-2600	650-850	Mid to lower part of Wangdiphodrang and from mid to lower part of Punakha	Rice on irrigated land, double cropping with wheat and mustard, barley and potatoes on dryland, temperate fruit trees, vegetables, cattle for draft and manure, some machinery & fertilisers used.
Humid sub-tropical	600-1200	1200-2500	Upper part of Dagana, Tsirang, Sarpang and Zhemgang	Irrigated rice rotated with mustard, wheat, pulses and vegetables, tropical fruit trees.
Wet sub-tropical	150-600	2500-5500	Samtse, and lower part of Dagana, Tsirang, Sarpang and Samtse	As for the humid zones-irrigated rice rotated with mustard, wheat, pulses and vegetables, tropical fruit trees.

Table 4 Agro-ecological Zones of Bhutan

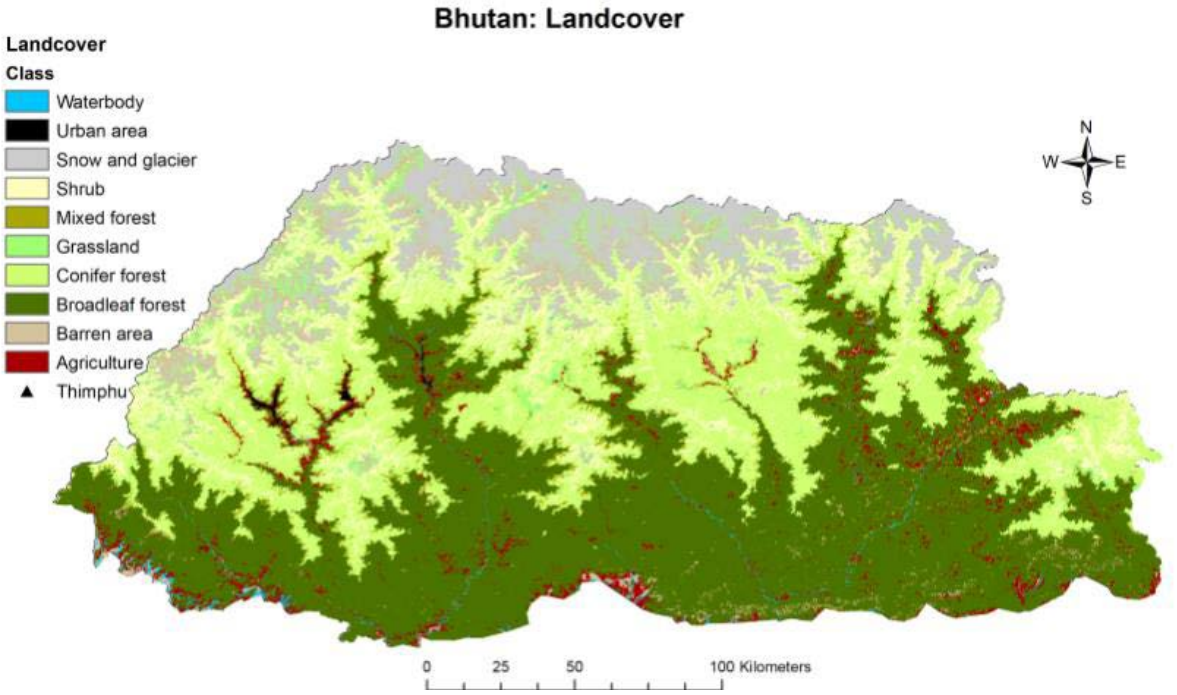


Figure 27 Land Cover of Bhutan

Figure 28 Typical Existing Land Use across the project areas

125. As an example, Figure 31 shows the current land use in Tsirang, which has a rich bio-diversity including forest vegetation, paddy fields, orchards and marsh/wet lands. It is noted that forests make up the greatest percentage of land.

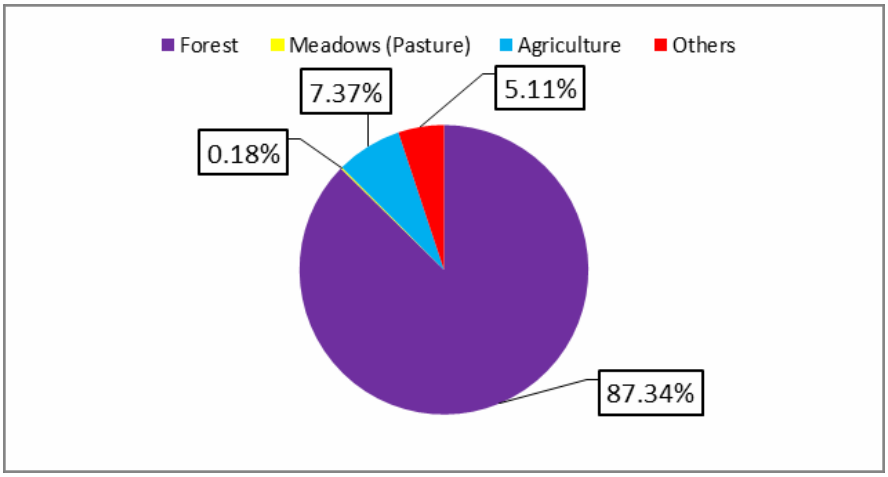


Figure 29 Land Use in Tsirang

126. Table 5 shows an example of cropping patterns currently undertaken in the Phangyul Irrigation Scheme, including how the crops are watered, the sowing and harvesting time period and the total area under specific crops for both summer and winter. While a representative sample, this is fairly consistent with other cropping patterns for other Dzongkhags.

Crop	**Water application**	**Sowing**		**Harvesting**		**Cropped Area (ha)**			
		Start	**End**	**Start**	**End**	**Summer**		**Winter**	
Rice	Irrigated	May-2	Jun-2	Oct-2	Nov-2	64	82%	0	0%
Wheat	Irrigated	Nov-1	Dec-1	Apr-1	May-2	0	0%	23	29%
Mustard	Irrigated	Nov-1	Dec-1	Mar-2	Apr-2	0	0%	7	9%
Vegetable- Summer	Irrigated	Apr-2	May-2	Oct-2	Nov-2	3	4%	0	0%
Vegetable- Winter	Irrigated	Nov-2	Dec-2	Apr-2	May-2	0	0%	3	4%
Wheat- Rainfed	Rainfed	Nov-1	Dec-1	Apr-2	May-2	0	0%	6	8%
Mustard- Rainfed	Rainfed	Nov-1	Dec-1	Mar-2	Apr-2	0	0%	1	1%
Vegetable- Summer	Rainfed	Apr-2	May-2	Oct-2	Nov-2	3	4%	0	0%
Perennials	Rainfed					1	1%	1	1%
Total cultivated area						71	91%	41	53%
Total arable land						78		78	
Annual cropping intensity									

Table 5 Cropping Pattern under Phangyul Irrigation Scheme

127. A household survey was conducted under the GEF/LDCF project with respect to current land use and water needs. In Tsirang, 624 households were surveyed regarding irrigation and cropping. Out of the total households surveyed 79% or 493 households practises cropping once a year, while 21% (131

households) practises cropping twice a year. Their satisfaction level with irrigation water availability is shown in Figure 32. The results showed that only 1% find irrigation water as being abundant, 33% adequate, while 47% found water for irrigation inadequate and 19% face severe shortage.

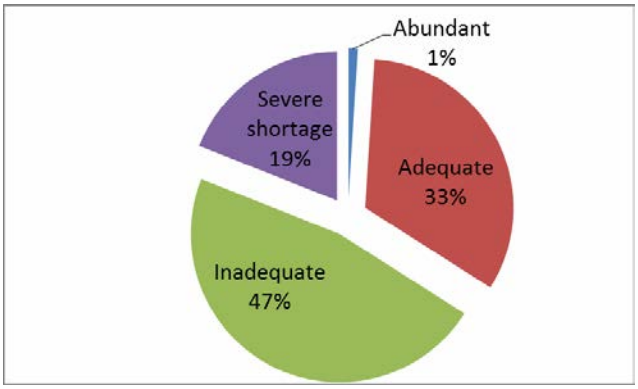


Figure 30 Perception on irrigation water availability in Tsirang (N=624)

128. Tsholingkhar, Rangthangling, Patshaling and Pungtenchu gewog reported severe shortage of irrigation water. All other gewog mostly reported adequate to in-adequate irrigation water availability as shown in Table 6.

Status	Abundant	Adequate	Inadequate	Severe shortage
Doonglagang	2%	17.60%	76.50%	3.90%
Kilkhorthang		50%	50%	
Mendrelgang		45%	55%	
Patshaling	8.20%	34.70%	22.40%	34.70%
Pungtenchu		21.50%	54.20%	24.30%
Rangthangling	6.30%	25%	6.30%	62.50%
Semjong		31.30%	65.60%	3.10%
Sergithang		64.90%	29.70%	5.40%
Tsholingkhar		32.40%	41%	26.70%
Tsirang Toed		42%	39.10%	18.80%

Table 6 Irrigation water availability by Gewog in Tsirang (N=522)

129. The most common water resources as per the surveyed population in Samtse are spring water resources (68.4%), followed by 23.29% using streams, 4.01% using rivers and 1.19% using ponds as shown in Figure 33 represents the number of households surveyed, while the main source of water is shown in Table 7.

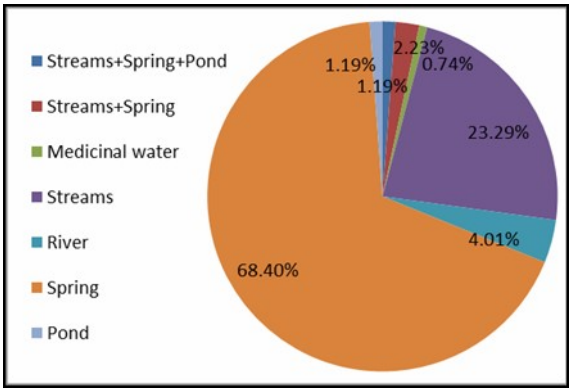


Figure 31 Water resource in Samtse (N=676)

Main use of water	Frequency	Percent
Irrigation	32	5.41
Drinking	313	52.96
Livestock	20	3.38
Others	27	4.57
Drinking + Livestock	38	6.43
Irrigation + Drinking	102	17.26
Irrigation + Livestock	4	0.68
Drinking + Others	6	1.02
Drinking + Livestock + Others	6	1.02
Irrigation + Drinking + Livestock	19	3.21
Livestock + Others	1	0.17
Irrigation + Livestock + Others	10	1.69
Irrigation + Drinking + Livestock + Others	2	0.34
Irrigation + Others	6	1.02
Irrigation + Drinking + Others	4	0.68
Hydropower + Drinking	1	0.17

Table 7 Main use of water resources by gewogs in Samtse (N=591)

3.14 Land Ownership and Customary Tenure

130. The majority of the land in the agricultural project areas is either privately owned and/or state land that is leased for the purpose of agriculture. The traditional property rights system of high altitude rangelands of Bhutan is complex. Most land is state property and individuals are given usufruct rights only to graze or lop timber.

131. No land rights will be affected by the projects.

3.15 POPULATION AND GENDER

132. The 2016 census recorded the total population of the Bhutan as 768,577 (the current population is approximately 787,000). This 2016 data indicated that there were 398,948 males and 369,629 females. The age ratio was 0-14 (227,444); 15-64 (504,150); 65+ (36,986) people.

133. As an example of population and gender, Tsirang has an area of 639km^2 with twelve (12) gewogs and a total population of 21,816 (2015) and an average occupancy rate of 4.5 people/household. The details of the gewog sizes and population in each gewog is shown in Figure 34 and the number of households along with the number of members/gewog is given in Table 8. Household size in shown in

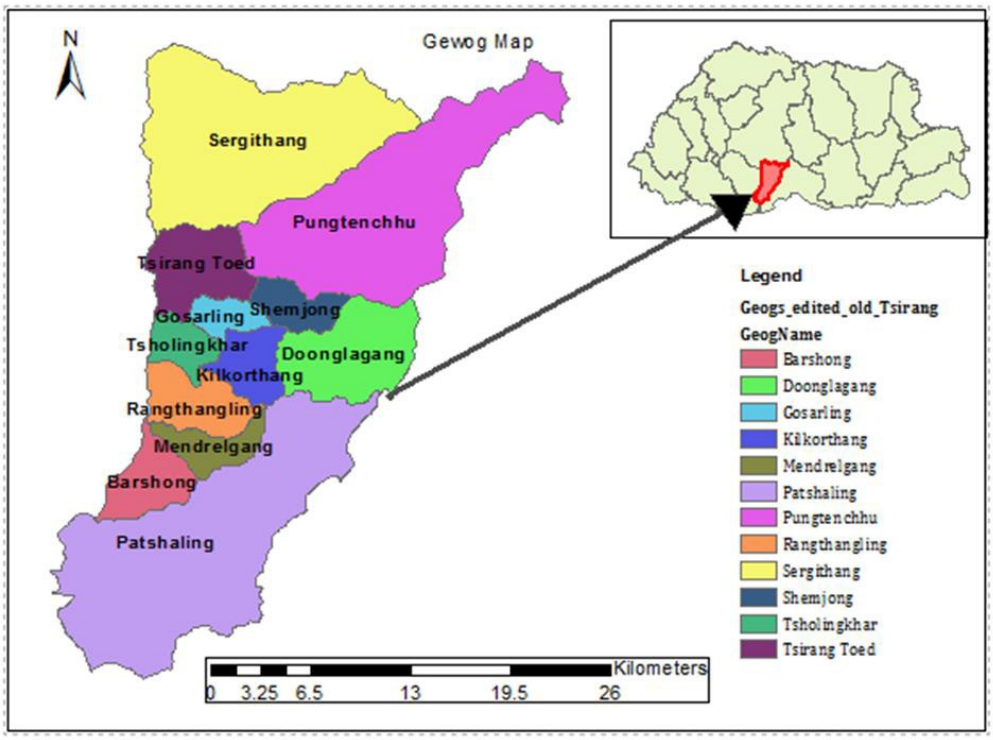


Figure 32 Gewogs in Tsirang

Gewog Name	Area (km^2)	Male	Female	Total
Barshong	21.75	384	375	759
Damphu Town		822	844	1,666
Doonglagang (Dunglagang)	46.02	545	590	1,135
Gosarling	10.24	730	698	1,428
Kilkhorthang	17.71	1,481	1,388	2,869
Mendrelgang	14.83	777	733	1,510
Patshaling	170.63	614	589	1,203
Pungtenchu	136.45	580	577	1,157
Rangthangling	24.58	774	673	1,447
Semjong	14.66	674	644	1,318
Sergithang	136.45	686	666	1,352
Tsholingkhar	13.12	847	823	1,670
Tsirang Toed	31.40	603	550	1,153
Total	638	9,517	9,150	18,667

Table 8 Gewogs in Tsirang

Dzongkhag	Size of household															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	All
TSIRANG	232	35	48	57	65	49	34	21	14	7	4	2	1	7	6	3,651
Barshong	5	21	21	16	27	15	16	12	8	3	2	0	0	2	0	148
Damphu town	38	36	64	80	79	38	16	12	5	2	1	1	1	0	0	373
Doonglagang	13	28	29	24	35	41	22	8	11	6	4	0	2	0	1	224
Gosarling	19	30	35	43	34	41	34	14	10	5	5	1	2	2	2	277
Kilkhorthang	33	58	75	74	10	77	41	28	23	6	5	3	2	1	0	529
Mendrelgang	19	31	28	50	59	48	25	18	8	6	4	4	1	0	0	301
Patshaling	11	7	21	32	51	32	31	14	7	5	3	2	1	1	0	218
Pungtenchu	11	24	29	40	49	21	22	17	8	4	2	3	1	0	0	231
Rangthangling	13	23	43	51	47	42	22	15	15	7	0	2	2	0	2	284
Semjong	11	12	20	34	46	38	23	19	12	3	9	3	2	0	1	233
Sergithang	16	25	37	35	37	35	26	21	12	7	3	3	2	0	0	259
Tsholingkhar	28	33	49	70	56	38	34	22	11	6	4	2	0	0	0	353
Tsirang toed	15	24	29	27	29	29	28	11	11	1	1	4	0	1	0	221

Table 9 Household size in Tsirang

134. The details of gewog population size and gender balance in Samtse Dzongkhag is shown in Table 10 and household size is provided in Table 11.

Dzongkhag, Gewog/Town	Persons			Percent			Sex ratio (males/females)
	Male	Female	Total	Male	Female	Total	
Samste Overall	30,742	28,261	59,003	100	100	100	108
Denchukha	1,156	1,154	2,310	3.8	4.1	3.9	100.2
Doongtoed	664	662	1,326	2.2	2.3	2.2	100.3
Dophuchen	2,189	2,230	4,419	7.1	7.9	7.5	98.2
Gomtu town	2,235	2,019	4,254	7.3	7.1	7.2	110.7
Namgyechhoeling	1,472	1,339	2,811	4.8	4.7	4.8	109.9
Norbugang	2,022	1,855	3,877	6.6	6.6	6.6	109.0
Norgaygang	1,743	1,660	3,403	5.7	5.9	5.8	105.0
Pemaling	1,535	1,491	3,026	5.0	5.3	5.1	103.0
Phuentshogpelri	2,756	2,301	5,057	9.0	8.1	8.6	119.8
Samtse	1,703	1,560	3,263	5.5	5.5	5.5	109.2
Samtse town	2,425	2,556	4,981	7.9	9.0	8.4	94.9
Sang-Ngag-	1,639	1,516	3,155	5.3	5.4	5.3	108.1
Tading	2,165	1,950	4,115	7.0	6.9	7.0	111.0
Tendruku	2,368	2,219	4,587	7.7	7.9	7.8	106.7
Tashichhoeling	1,969	1,201	3,170	6.4	4.2	5.4	163.9
Tashichhoeling town	455	449	904	1.5	1.6	1.5	101.3
Ugyentse	783	753	1,536	2.5	2.7	2.6	104.0
Yoeseltse	1,463	1,346	2,809	4.8	4.8	4.8	108.7

Table 10 Samtse gewog population and gender distribution

Dzongkhag, Gewog/Town	Size of household															
	1	2	3	4	5	6	7	8	9	10	11	1	1	1	15	All
SAMTSE	82	97	1,43	1,97	2,00	1,58	1,01	64	38	21	16	9	4	3	42	11,427
Denchukha	11	17	29	51	68	65	41	46	23	11	9	8	1	1	3	384
Doongtoed	8	18	22	31	42	43	29	17	9	3	7	3	0	2	1	235
Dophuchenrokha	90	79	101	135	147	130	94	48	32	16	11	5	2	0	1	891
Gumtu town	12	94	161	221	178	110	58	33	12	6	2	1	0	1	0	999
Namgaychhoeling	17	23	38	77	78	85	52	35	28	13	10	4	5	2	8	475
Norbugang	37	65	91	154	130	118	73	51	16	12	6	5	3	1	1	763
Norgaygang	36	44	51	99	93	87	64	46	37	15	13	7	1	8	5	606
Pemaling	28	50	70	91	96	86	64	26	20	18	12	7	1	0	4	573
Phuentshogpelri	98	80	142	160	160	129	89	51	38	33	18	1	5	3	1	1,018
Samtse	45	50	64	95	85	76	67	45	24	11	17	8	3	3	6	599
Samtse town	85	10	167	205	213	117	51	35	22	9	4	6	3	3	3	1,025
Sang-Ngag-Chhoeling	41	79	86	92	125	68	59	42	21	11	8	4	3	1	0	640
Tading	57	65	83	111	161	112	68	50	31	12	19	8	8	2	3	790
Tendruk	44	61	117	168	166	130	73	45	30	17	14	6	2	1	3	877
Tashichhoeling	38	46	77	85	80	71	46	27	14	9	7	1	2	1	0	504
Tashichhoeling	15	26	25	51	31	21	11	6	2	3	0	0	1	0	0	192
Ugyentse	23	38	44	54	56	39	22	18	10	6	2	3	0	0	0	315
Yoeseltse	34	40	63	93	95	94	54	26	15	6	6	7	4	1	3	541

Table 11 Household size in Samtse

3.16 TRAFFIC AND TRANSPORT

135. The use of the three sections of road have been impacted by the land slides. Traffic counts are shown for the Box Cut in Table 12; Khagochen in Table 13; and Reotala in Table 14.

Name of Regional Office: Sarpang.

Name of Road	Time	DAILY TRAFFICE COUNT(14th -28th Feb 2018)											
		Up travelling						Down travelling					
		Heavy vehicle	Medium vehicle	Light Vehicle	Two wheeler	Others	Total	Heavy vehicle	Medium Vehicle	Light Vehicle	Two wheeler	Others	Total
Gelephu-Trongsa PNH	6.00Am- 6.00Pm	548	116	1242	40	0	1946	320	114	1135	32	4	1605

Table 12 Traffic Counts for Box Cut

Abstract of Traffic Counts

Name of Road : Sunkosh-Dagana SNH

Period of survey : 15.09.2018-30.09.2018

Location : Dagapela Zero

Date	*Direction*		*Total Vehicles(all types)*	*Remarks*
	Towards Dagana	*Towards Sunkosh*		
15.09.2018	279	194	473	
16.09.2018	233	180	413	
17.09.2018	247	136	383	
18.09.2018	121	130	251	
19.09.2018	133	149	282	
20.09.2018	124	130	254	
21.09.2018	125	136	136	
22.09.2018	26	124	150	
23.09.2018	86	83	169	
24.09.2018	123	126	249	
25.09.2018	113	116	229	
26.09.2018	124	117	241	
27.09.2018	116	119	235	
28.02.2018	143	164	307	
29.09.2018	151	131	282	
30.09.2018	172	158	330	
Total	**2316**	**2193**	**4384**	
Hence an average vehcles plying on SNH (4384/15)			*292.2666667*	
			293 Vehilces/day	

Table 13 Traffic Counts for Khagochen

Name of Regional Office: Trongsa

Name of Road	Time	DAILY TRAFFICE COUNT(14th-28th Feb 2018)											
		Up travelling						Down travelling					
		Heavy vehicle	Medium vehicle	Light Vehicle	Two wheeler	Others	Total	Heavy vehicle	Medium Vehicle	Light Vehicle	Two wheeler	Others	Total
Chuserbu-Trongsa PNH	6.00Am- 6.00Pm	425	371	2004	12	4	2816	411	365	1935	7	4	2722
Wangdue-Trongsa PNH	6.00Am- 6.00Pm	627	381	1511	54	216	2789	539	382	1447	67	30	2465
Thimphu-Mongar PNH	6.00Am- 6.00Pm	124	47	996	2	9	1178	109	50	990	7	3	1159
Bumthang-Trongsa PNH	6.00Am- 6.00Pm	268	251	960	9	0	1488	291	276	1015	8	0	1590
Trongsa-Gelephu PNH	6.00Am- 6.00Pm	568	54	446	25	0	1093	607	46	502	17	0	1172

Table 14 Traffic Counts for Reotala

3.17 EMPLOYMENT

136. The statistic shows the distribution of employment in Bhutan by economic sector from 2007 to 2017. In 2017, 56.78% of the employees in Bhutan were active in the agricultural sector, 9.75% in industry and 33.47% in the service sector (Figure 35). No specific data is available for the project areas; however, given the majority are agricultural, it can be assumed that the numbers are higher than the average shown in Figure 35

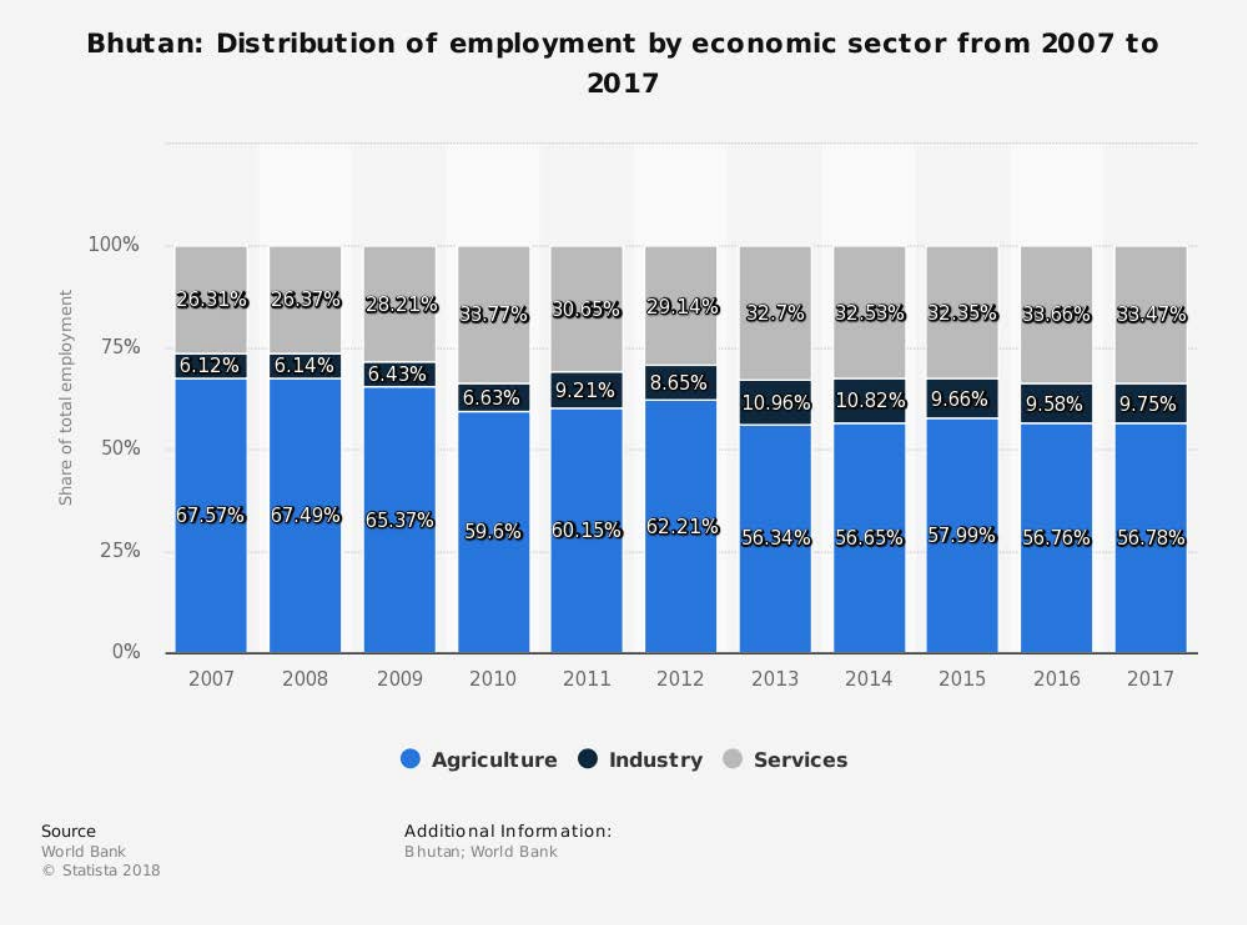


Figure 33 Distribution of Employment by Sector

3.18 ECONOMIC ASPECTS AND LIVELIHOODS

137. Bhutan is one of the smallest but fastest-growing economies in the world. Annual average growth between 2006 and 2015 reached 7.5%, which places Bhutan 13th of 118 countries, far exceeding the average global growth of 4.4%.

138. Bhutan has been successful in reducing poverty. Extreme poverty has been almost eradicated, with the rate falling to 2% in 2012 using the international poverty line of $1.90 per person/day.

139. The vast majority of people in the project area undertake agricultural activities for their livelihoods.

3.19 RELIGION

140. The official religion in Bhutan is Vajrayana Buddhism. Bhutan is a Buddhist country by constitution and Buddhism play a vital role in Bhutan. Freedom of religion is guaranteed by the King. Approximately 75% of the population follow either the Drukpa Lineage of the Kagyu school, the Nyingma school of

Tibetan Buddhism or another school of Buddhism. The remaining 25% mainly southern Bhutanese, practice Hinduism.

141. Many Buddhist temples were observed during the site visits. An example if included in Figure 36

Figure 34 Buddhist Temple

3.20 Indigenous Peoples and Ethnic Minorities

142. As part of due diligence, an analysis and consultations were undertaken as to the likelihood of any of the project's activities involving indigenous people and/or ethnic minorities.

143. There are numerous ethnic and indigenous groups in Bhutan, and no one group constitutes a majority of the Bhutanese population. The Bhutanese are made up of four main ethnic groups, which themselves are not necessarily exclusive. The groups include the Ngalop of western and northern Bhutan; the Sharchop of eastern Bhutan; the Lhotshampa in southern Bhutan; and Bhutanese tribal and aboriginal peoples living in villages scattered throughout Bhutan. The indigenous tribal peoples include the Brokpa, Lepcha, Lhop/Doyap, Monpa and Oalaps tribes as well as the descendants of slaves who were brought to Bhutan from similar tribal areas in India. Indigenous peoples speak Khengpa.

144. More broadly, the Government of Bhutan consider all Bhutanese as Indigenous People.

145. Given there are no specific no minority indigenous people that will be affected by the project, the project does not require a separate Indigenous Peoples' Planning Framework.

3.21 Archaeological and Cultural Heritage

146. Archaeological evidence points out that Bhutan was inhabited by 2000 BC, but there is no historical record. Buddhism entered Bhutan in the 7th century and has been the driving force behind the cultural

and religious life of the Bhutanese since then. Prior to the 17th century, Bhutan was a loose group of a number of small fiefdoms which were united by Zhabdrung Ngawang Namgyal. To protect Bhutan from external aggression, he built fortresses or dzongs and established the Tsa Yig to implement central administration.

147. Bhutan has many undiscovered archaeological sites such as ancient architectural ruins of dzongs (fortress) and manor houses, trade routes, burial grounds, settlements and caves which have existed for hundreds of years without too much human interference.

148. The culture of Bhutan is deeply immersed in the traditions of Buddhism and Hinduism. Due to its remoteness and isolation, it has managed to preserve its unique culture and so is referred to as the last Shangri-la. Bhutanese architecture is traditional with houses made of rammed earth dominating the landscape. The stonework and woodwork in the windows and rooftop is; however intricate. Bhutanese architecture also includes fortress called dzong which are massive in size.

149. Bhutan is also known for its mask dances and dance dramas which are accompanied by traditional music. These are generally performed during religious festivals.

150. There are highland nomad communities in Bhutan whose livelihood are dependent on trans-migratory livestock herding system, mainly of Yak (endemic breed of cattle suitable in the highland and tolerant to extreme cold). These communities are located above 3500 metres above sea level. In summer, these communities live in the highland grazing the high mountain pasture and meadow. In winter, these communities migrate to lower valleys with their livestock in their designated pasture areas. Conflict arising from such system is limited or non-existent since they have designated areas for grazing.

Figure 35 Dochula Cultural Heritage Site

4 ENVIRONMENTAL AND SOCIAL RISK ASSESSMENT

4.1 ASSUMPTIONS UNDERPINNING THE DEVELOPMENT OF THE ENVIRONMENTAL AND SOCIAL ASSESSMENT REPORT

151. The following assumptions have been made in the preparation of this ESMF:

a. none of the interventions will require the displacement of people and/or the need for land acquisition

b. none of the interventions will be conducted in protected areas or sensitive locations;

c. all material removed from the works will be remediated as required to ensure limited impact on the surrounding environment;

d. all material removed from the works for example, the river restoration works will be made available (beneficial reuse) for the use in agricultural systems or other activities following any necessary remediation;

e. none of the interventions will be in proximity to any archaeological and/or culturally sensitive location;

f. hydrological studies where necessary will be conducted prior to the final design to ensure stability and efficiency of the bank protection structures;

g. appropriate erosion and sediment control will be undertaken during all stages of the projects; and

h. there will be no release of pollution and/or chemicals as a result of the projects.

4.2 UNDP SOCIAL AND ENVIRONMENTAL SCREENING POLICY REQUIREMENTS

152. As this project is supported by UNDP in its role as a GCF Accredited Entity, the project has been screened against UNDP's Social and Environmental Standards Procedure. The Social and Environmental Screening Template was prepared and the project deemed to be a moderate risk (Category B) project. Discussions on the impact assessment are provided in the Social and Environmental Screening Template, which provided the rationale for the project being classified as a moderate risk. This ESMF provides further discussion below.

4.3 IMPACT ASSESSMENT METHODOLOGY

153. An impact risk assessment was undertaken using the UNDP Social and Environmental Screening Procedure to assess the probability (expected, highly likely, moderately likely, not likely) and the impact of the risk (critical, severe, moderate, minor, negligible). From this, a significance value was attributed to the potential impact (negligible, low, medium, high and extreme).

Score	Rating
5	Expected
4	Highly Likely
3	Moderately likely
2	Not Likely
1	Slight

Table 15 Rating of Probability of Risk

Score	Rating	Definition
5	Critical	Significant adverse impacts on human populations and/or environment. Adverse impacts high in magnitude and/or spatial extent (e.g. large geographic area, large number of people, transboundary impacts, cumulative impacts) and duration (e.g. long-term, permanent and/or irreversible); areas impacted include areas of high value and sensitivity (e.g. valuable ecosystems, critical habitats); adverse impacts to rights, lands, resources and territories of indigenous peoples; involve significant displacement or resettlement; generates significant quantities of greenhouse gas emissions; impacts may give rise to significant social conflict
4	Severe	Adverse impacts on people and/or environment of medium to large magnitude, spatial extent and duration more limited than critical (e.g. predictable, mostly temporary, reversible). The potential risk impacts of projects that may affect the human rights, lands, natural resources, territories, and traditional livelihoods of indigenous peoples are to be considered at a minimum potentially severe.
3	Moderate	Impacts of low magnitude, limited in scale (site-specific) and duration (temporary), can be avoided, managed and/or mitigated with relatively uncomplicated accepted measures
2	Minor	Very limited impacts in terms of magnitude (e.g. small affected area, very low number of people affected) and duration (short), may be easily avoided, managed, mitigated
1	Negligible	Negligible or no adverse impacts on communities, individuals, and/or environment

Table 16 Rating of Impact of Risk

Impact						
	5					
	4					
	3					
	2					
	1					
		1	2	3	4	5
		Probability				
Green = Low, Yellow = Moderate, Red = High						

Table 17 UNDP Risk matrix

4.4 DIRECT IMPACTS

154. The project will undertake activities across eight Dzongkhags in Bhutan. The activities will be undertaken in locations that are disturbed both natural and anthropogenic. The environmental and social impacts envisaged for the project are predominantly temporary in nature and are associated with construction and upgrading activities for the irrigation channel works, and the road remediation and landslip rehabilitation activities at the three road sites.

4.4.1 Construction Impacts

155. The project is unlikely to change the topography of the greater landscape. However, it has the potential to create very small spatial changes including the movement of sediment and soils for the works associated with the irrigation and road works during construction activities.

156. There are a number of potential impacts associated with the works including but not limited to the potential erosion and sediment movement during rainfall events and as a result of dust, all of which could have impacts on water quality, noise impacts from the use of trucks and excavators, the potential leakage of chemicals and oils, and other potential impacts. There is also the potential for the construction activities to generate sediment that may increase silt load through overland flow to other environments. The likelihood of these impacts are moderate (3) and the impacts are considered to also be moderate (3).

157. The construction works involve in the building of the irrigation infrastructure will result in the movement of sediment to install the pipe and channel works. It is anticipated that some of the material to be used for the construction of the irrigation works will where possible, be pre-fabricated and purchased in Bhutan. The proper handling of this material, and where possible, recycling and reuse of any local materials should be considered. The likelihood of these impacts are moderate (3) and the impacts are considered to also be moderate (3).

158. The construction activities could also result in changes to people's ability to move within the region. The likelihood of these impacts are moderate (3) and the impacts are considered to also be minor (2).

159. The proposed irrigation and road works are unlikely to impact on any important ecosystems and/or habitats. The current areas have been significantly impacted by climate induced events in the past and the activities will reduce the damage caused by future events as well as provide a constant supply of water for irrigation. As an example, the construction of the Baychu Irrigation Channel will require the removal of 3,309 trees from 24 species. Forty-three (43%) percent of the total trees needs to be removed are of sapling size (DBH less than 9.9 cm), followed 34% in DBH 10-19.9 cm, 19% in DBH 20 – 29.9cm class, and very small percent above DBH class 30 - 49.9 cm and above. The pattern of DBH class distribution is similar between the Kazhi and Phangyoul. The likelihood of these impacts are slight (1) and the impacts are considered to also be negligible (1).

160. All construction and operation activities have the potential to cause noise nuisance. Vibration disturbance to nearby residents and sensitive habitats is likely to be caused through the use of vibrating equipment. Blasting is not required to be undertaken as part of this project. The use of machinery or introduction of noise generating facilities could have an adverse effect on the environment and residents if not appropriately managed. The detail, typical equipment sound power levels, provides advice on project supervision and gives guidance noise reduction. Potential noise sources during construction may include:

    a. heavy construction machinery;

    b. power tools and compressors; and

    c. delivery vehicles.

161. Heavy machinery and haul trucks can generate high noise levels within and along the project area and route. All machinery and vehicles used will be restricted to 7am to 5pm. The likelihood of these impacts are moderate (3) and the impacts are considered to also be moderate (3)

162. Air quality is unlikely to be affected due to the limited exhaust emissions from construction vehicles and machinery such as plant for excavating foundations, concrete mixers, water tankers, small cranes, dumpers, forklift for the block work and fugitive emissions from aggregates, dust from exposed soils and stock piles. The likelihood of these impacts are slight (1) and the impacts are considered to also be negligible (1).

163. The project is unlikely to result in significant waste. With respect to the irrigation activities, prefabricated high pressure water pipe will be used and cut to measure, and as such, the likelihood of any impacts are considered to slight (1) with negligible impact (1). There may be the potential for sediment waste during both the installation of the irrigation pipes and also during the road destabilisation activities. Where possible, any extra sediment will be used on site, or in the alternative, provided to agricultural users. The likelihood of these impacts are moderate (3) and the impacts are considered to also be minor (2).

164. The project is unlikely to result in any significant risk to water pollution from oil, grease and fuel spills, and other materials from vehicles working on site. Construction vehicles could affect water quality by accidents from vehicles carrying hazardous substances (chemicals and fuel). Oil and grease from engine leaks can pollute surface water. While it is unlikely that there will be an impact as a result of a chemical, fuel and oil spill, these lubricants need to be handled with caution and importantly, where possible, should not be brought on site. In the case of a spill, every effort must be made that it does enter the rivers and stream. The likelihood of these impacts are not likely (2) and the impacts are considered to also be minor (2).

165. There is unlikely to be any significant impacts on both terrestrial and aquatic ecology. Terrestrially, the sites are all disturbed and the project will increase terrestrial strength through the planting of local provenance. As such, the likelihood of any impacts are considered to slight (1) with negligible impact (1). The projects are also unlikely to impact on aquatic environments. The project will not construct any structures that will reduce fish movement and moreover, will not undertake instream activities. The main activities will be the diversion of water and based on water balance calculations, this will ensure that there is sufficient environmental flow to maintain healthy ecosystems in those streams etc that are perennial. The likelihood of these impacts are not likely (2) and the impacts are considered to also be minor (2).

4.4.2 Construction and Operation

166. The vast majority of activities will be undertaken on Government of Bhutan land. There will be no land acquisition and/or resettlement. and therefore the UNDP and GCF Safeguards Policies with respect to land acquisition are not triggered.

167. There is very limited potential for impacts to people's land as a result of the need to utilise the land for access to the irrigation works (Likelihood: Not Likely; Impact: Minor). This is only likely to occur during the installation of underground water pipes that will be undertaken consistent with the All activities will be undertaken in full compliance with the *Land Pooling and Readjustment Regulations 2018* and the GCF and UNDP Policies, with the most stringent requirements being complied with.

168. All access will only be undertaken with a fully signed voluntary agreement allowing access consistent with the *Land Pooling and Readjustment Regulations 2018* and the GCF and UNDP Policies, with the most stringent requirements being complied with through an easement agreement.

169. During construction, this could result in the very small spatial and temporal loss of livelihood and damage to the land. The project has developed an outline for a Livelihood Restoration Plan that will allow for opportunities if and when livelihoods are impacted (see outline in Annexure Five of this report). If the project will impact in this way, the project will use the outline and develop activity specific Livelihood Restoration Plans. As such, the likelihood of any impacts are considered to slight (1) with negligible impact (1).

170. No activities will be undertaken on private property without the express approval of any land holder. No compensation will be paid to any land holder. Where agreement without compensation cannot be agreed upon, not work will be undertaken. The selection of specific sites will be based on a climate

vulnerability analysis (though prioritisation) that includes interviews with the potential beneficiaries. Access to and storage of water will be a factor in determining sites. Further, ecological and physical environmental benefits will also be a factor in determining sites.

4.4.3 Operation

171. There are unlikely to be any impacts once the activities are operational. There will be regular maintenance as included in the project budget and these maintenance activities will ensure limited ongoing impacts. The activities will provide beneficial impacts during this time. As such, the likelihood any impacts are considered to slight (1) with negligible impact (1).

4.5 Indirect Impacts

172. There are unlikely to be any real indirect impacts associated with the project if general care and maintenance are considered. As such, the likelihood any impacts are considered to slight (1) with negligible impact (1).

173. There are unlikely to be any adverse impacts on hydropower projects as a result of the projects. By contrast, it is likely that the interventions will have beneficial impacts by reducing the amount of sediment that would impact on any reservoirs. As such, the likelihood any impacts are considered to slight (1) with negligible impact (1).

4.6 Cumulative Impacts

174. The proposed interventions will be undertaken in eight Dzongkhags. There is the potential for limited cumulative impacts, these being impacts on sediment movement during the road construction activities; however, the distance between each site is unlikely to result in cumulative impacts. If there are any impacts, the impacts will be limited temporally. Conversely, the activities will significantly reduce on-going cumulative impacts by reducing the loss of sediment and bank erosion during large flooding events. As such, the likelihood any impacts are considered to slight (1) with negligible impact (1).

175. With respect to the agricultural activities, there is the very limited potential for cumulative impacts through the loss of usable land; and the loss of any land while the construction activities are being developed. However, the impacts are considered to both very small spatial scale and temporal in nature. Landholders will gain long term benefits from the irrigation activities.

4.7 Transboundary Impacts

176. While India is in close proximity to some of the sites, given the proposed interventions, there is unlikely to be any transboundary impacts. As such, the likelihood any impacts are considered to slight (1) with negligible impact (1).

4.8 Potential Benefits

177. The project will have very significant direct beneficial impacts to 460,000 people. The activities will significantly reduce the impact of road closures on people and their activities. Moreover, the agricultural improvement activities will have a significant benefit to users and improve food security.

178. With respect to the irrigation activities, these will have significant environmental and social benefits. These include a constant and managed supply of water during dry seasons.

179. To ensure equality and equity of water to all users, the project will consider the installation of multiple pipes within a single trench (for example, three) that will then allow the system to be effectively managed. This will also have important environments benefits where, if in the unlikely event that one pipe breaks, two thirds (2/3) supply can be maintained and supplied rather than losing total supply.

Additional environmental and social benefits of this include that by using three pipes rather than one, the individual pipes can be smaller in diameter and can therefore be produced locally, thereby increasing employment. Environmentally, by manufacturing the HPE pipe locally, this will reduce the carbon footprint of the manufacturing, thereby providing a small greenhouse gas emission mitigation.

5 AVOIDANCE AND MITIGATION MEASURES

180. There are a range of options to avoid and/or mitigate the environmental and social impacts associated with the proposed interventions. The ESMP contained in Chapter Eight (8) of the ESMF sets out appropriate and comprehensive mitigation measures for the potential impacts of the activity in the channels of the rivers and forestry activities. With compliance with the ESMP, the project is unlikely to have any significant impacts/risks.

181. The most appropriate mitigation measure is to ensure project activities to do not occur during periods of rainfall which could significantly increase sediment discharges and erosion. All works should comply with the erosion, drainage and sediment control plan (EDSCP – See Annexure Six). Further, prior to any works, sediments should be tested for contamination. Where any sediment is found to contain any contaminants, work should stop and appropriate remediation should be undertaken to reduce the release of these contaminants etc into the environment. Any additional sediment should be made available to the community, including but not limited to agricultural activities. All areas should be revegetated as soon as possible to reduce erosion and sediment loss.

182. Prior to any activity being carried out, the project should ensure equitable participation of men and women in all project activities. Further, the project should ensure it undertakes an assessment of sex-disaggregated data and the gender analysis as well as investigating ethnic minorities and/or internally displaced peoples. Further, the project should ensure women's participation in identifying best practices in agro-productive activities and stimulate non-traditional occupations through the work programme. This should also include undertaking an assessment of the involvement of women within agricultural systems, prior to planning measures.

183. The Government of Bhutan has passed the *Land Pooling and Readjustment Regulations 2018.* Any access requirements to any land should be undertaken in full compliance with a voluntary land access agreement that should be signed before any activities on private land are undertaken.

6 STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION

6.1 PUBLIC CONSULTATION AND ENVIRONMENTAL AND SOCIAL DISCLOSURE

184. The ESMF includes public consultation as part of the stakeholder engagement plan. The project was discussed with a wide range of stakeholders including relevant government departments, industry groups, NGOs, and individual community members and approved by Government. Extensive on-ground consultation has been undertaken during the design of the project (as well as during the earlier projects that this project is aiming to upscale) and it is expected that consultation with any affected communities will continue. It is anticipated that based on the communities' needs, the projects will be fully accepted.

185. The UNDP and GNHC will develop and release updates on the project on a regular basis to provide interested stakeholders with information on project status. Updates may be via a range of media eg print, radio, social media or formal reports. A publicised telephone number will be maintained throughout the project to serve as a point of contact for enquiries, concern, complaints and/or grievances. All enquiries, concern, complaints and/or grievances will be recorded on a register and the appropriate manager will be informed. All material must be published in English and Dzongkha, and any other language as appropriate.

186. Where there is a community issue raised, the following information will be recorded:

    a. time, date and nature of enquiry, concern, complaints and/or grievances;

    b. type of communication (e.g. telephone, letter, personal contact);

    c. name, contact address and contact number;

    d. response and investigation undertaken as a result of the enquiry, concern, complaints and/or grievances; and

    e. actions taken and name of the person taking action.

187. Some enquiries, concern, complaints and/or grievances may require an extended period to address. The complainant(s) will be kept informed of progress towards rectifying the concern. All enquiries, concerns, complaints and/or grievances will be investigated and a response given to the complainant in a timely manner. A grievance redress mechanism has been included in the ESMF and ESMP to address any complaints that may not be able to be resolved quickly.

188. Nominated PMU/contractor staff will be responsible for undertaking a review of all enquiries, concern, complaints and/or grievances and ensuring progress toward resolution of each matter.

189. Details of stakeholder engagement undertaken as part of the preparation of the ESMF are included in Annexure XIII of the Full Funding Proposal and included in Annexure Three.

7 FINDINGS AND RECOMMENDATIONS

190. This ESMF has been prepared in support of a project proposal entitled "*Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan*" by the Royal Government of Bhutan to the GCF. As this project is supported by the United Nations Development Programme (UNDP) in its role as a GCF Accredited Entity, the project has been screened against the UNDP's Social and Environmental Standards Procedure and deemed a Moderate Risk (GCF Environmental and Social Policy Category B) project. As such, an ESMF has been prepared for the project.

191. The GNHC as the National Designated Authority and executing agency is mandated to assume a function of "secretariat body to the Government". A Project Management Unit (PMU) for the implementation of the project and compliance with this ESMF and ESMP.

192. The project will directly benefit 27,598 agriculture households (118,839 people - 46.5% of the rural population of Bhutan) and 460,000 indirect people in eight selected Dzongkhags of Bhutan that highly vulnerable to climate change induced extreme events (Dagana, Punakha, Trongsa, Tsirang, Samtse, Sarpang, Wangdue Phodrang and Zhemgang). The population in these eight Dzongkhags constitutes 34.78% of the total population of 766,492 as of 2015. Five Dzongkhags: Dagana (25.1%), Samtse (22.2%), Zhemgang (26.3%), Trongsa (14.9%) and Tsirang (14.8%) in particular, have poverty rates which exceed the national average of 12%.

193. The project will improve the resilience of the eight provinces, through improved water and soil management to support agriculture production through enhanced water management; scaling up of sustainable land management technologies and promoting sustainable use of water and land resources by communities. Further, the project will provide climate-resilient road infrastructure to improve market accessibility; and thus the long-term growth of the agriculture sector.

194. The project has the potential to cause moderate environmental and social impacts. Prior to any activity being undertaken, all local government approvals will be obtained. These include impacts to water quality through sediment movement during mechanical water retention ponds restoration, construction of water canals and improvement and road works. This is likely to have a beneficial impact in the medium to longer term by reducing erosion and thus impacts on water quality. There will also be the potential impact of sediment movement during the road works. Noise and air quality may also be impacted during these works. Appropriate actions are proposed to deal with these issues. The project will also result in the development of a seed bank and the project will ensure there are no genetically modified seeds/crops used and moreover, only local provenance will be used.

195. The project does not require any land acquisition and/or resettlement; however, investments will be undertaken on private land. All activities will be undertaken in full compliance with the *Land Pooling and Readjustment Regulations 2018* and the GCF and UNDP Policies, with the most stringent requirements being complied with. Infrastructures is already being constructed on previously acquired land, and the project will be working on improving the resilience of the existing infrastructures. There will be no restriction on land use. The restriction would be the use of the irrigation channel during the construction phase to avoid damage and ensure quality. These are just temporary, and the project will engage the communities to plan the activities so that there is minimal disruptions. The project will work with individual farming communities, where the land is privately owned. The activities will include seed production and upscaling including installing climate resilient practices such as hydroponics, aeroponic and vertical gardening. During implementation, any private land activities will be identified and GNHC will ensure activities on private land are only undertaken with the full consent of landholders. Any grievances will the addressed through the developed Grievance Redress Mechanism. An outline of a Livelihood Restoration Plan has been developed for the project and is included as Annexure Three of this document.

196. The project has developed a Grievance Redress Mechanism to deal with any complaints and issues that may arise as a result of the project. This Grievance Redress Mechanism complies with Bhutan and UNDP Safeguard procedures.

197. Appropriate and relevant avoidance and mitigation options have been proposed in the ESMF, which if put in place, will significantly reduce the potential impacts of the project to an acceptable level. An

EDSCP has been developed. Moreover, the project will have significant environmental and social benefits that will be achieved more generally.

198. Budgeting for environmental interventions and the application of mitigation measures to enhance positive impacts for the eight provinces in Bhutan is an investment in the future as it will reduce the environmental and social liability at local, provincial and national levels. The end result of this budget will be that there will be clean water, more productive soils with less chemicals, more resilient crops to the impacts of climate change, healthy ecosystems, knowledgeable communities and overall improvement in the quality of life of the population as an investment in the future of the eight provinces, which if implemented as per the project proposal, will be repaid may times over through reduced long-term operating costs of implementing the project.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

199. This section identifies the key environmental and social indicators identified for the project and outlines respective management objectives, potential impacts, control activities and the environmental performance criteria against which these indicators will be judged (i.e. audited).

200. Consistent with paragraph 66 of the ESMF, prior to the implementation of the outputs and activities, the GNHC and UNDP will assess the need for any additional information and baseline data that may be required on project specific sites based on project activities. This data may include but not be limited to sediment and soil samples, and the collection of biological data, and the collection and modelling as necessary of hydrology and water quality. This information will be used to assess any potential site-specific impacts and then develop site specific ESMPs based on this current ESMP. The current ESMP will be continually updated throughout project implementation.

201. This section further addresses the need for monitoring and reporting of environmental performance with the aim of communicating the success and failures of control procedures, distinguish issues that require rectification and identify measures that will allow continuous improvement in the processes by which the projects are managed.

8.1 OVERVIEW AND OBJECTIVES OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

202. An ESMP is a management tool used to assist in minimising the impact to the environment and socially; and establish a set of environmental and social objectives. To ensure the environmental and social objectives of the projects are met, the ESMP will be used by the project implementers to structure and control the environmental and social management safeguards that are required to avoid or mitigate adverse effects on the environment and communities.

203. The environmental and social objectives of the projects are to:

a. improve the water supply in the targeted areas and introduce water conservation measures;

b. encourage good management practices through planning, commitment and continuous improvement of environmental practices;

c. minimise or prevent the pollution of land, air and water pollution;

d. protect native flora, fauna and important ecosystems;

e. ensure gender equality and inclusion across all facets of the project;

f. comply with applicable laws, regulations and standards for the protection of the environment;

g. adopt the best practicable means available to prevent or minimise environmental impact;

h. describe monitoring procedures required to identify impacts on the environment; and

i. provide an overview of the obligations of GNHC, UNDP staff and contractors in regard to environmental obligations.

204. The ESMP will be updated from time to time and particularly prior to the implementation of all activities as per paragraph 66 of the ESMF by the Project Management Unit (PMU)/contractor in consultation with the UNDP staff and GNHC to incorporate changes in the detailed design phase of the projects.

8.2 OVERVIEW OF INSTITUTIONAL ARRANGEMENTS FOR THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

205. The ESMP will be assessed for each sub-project by the GNHC and UNDP prior to any works being undertaken. The ESMP identifies potential risks to the environment and social matters from the projects and outlines strategies for managing those risks and minimising undesirable environmental

and social impacts. Further, the ESMP provides a Grievance Redress Mechanism for those that may be impacted by the projects that do not consider their views have been heard.

206. The GNHC will be responsible for the supervision of the ESMP. The UNDP with gain the endorsement of the GNHC and will ensure the ESMP is adequate and followed. The PMU will ensure timely remedial actions are taken by the contractor where necessary.

8.3 Project Delivery and Administration

8.3.1 Project Delivery

207. The project will be delivered on the ground via the GNHC through its subsidiary departments and the GNHC. In addition, collaboration with existing NGOs and local communities is expected UNDP.

8.3.2 Administration of Environmental and Social Management Plan

208. As the implementing agency, the GNHC will be responsible for responsible for the implementation with the ESMP via the contractors undertaking any specific works.

209. The ESMF and ESMP will be part of all tender documentation. The GNHC will be responsible for the revision or updates of this document during the course of work. It is the responsibility of the person to whom the document is issued to ensure it is the most up to date version.

210. The UNDP and GNHC are accountable for the provision of specialist advice on environmental and social issues to the contractors (eg contractors and/or NGOs eg the Tarayana Foundation) and for environmental and social monitoring and reporting. The GNHC or its delegate will assess the environmental and social performance of the contractors (eg contractors) in charge of delivering each component throughout the project and ensure compliance with the ESMF and ESMP. During operations the contractors will be accountable for implementation of the ESMF and ESMP. Personnel working on the project have accountability for preventing or minimising environmental and social impacts.

211. A Field Officer will be responsible for daily environmental inspections of the project/construction site. The GNHC or its delegate will cross check these inspections by undertaking monthly audits.

212. The contractor eg contractor will maintain and keep all administrative and environmental records, which would include a log of complaints together with records of any measures taken to mitigate the cause of the complaints.

213. The contractor will be responsible for the day to day compliance of the ESMP

8.3.3 Environmental procedures, site and activity-specific work plans/instructions

214. Environmental procedures provide a written method describing how the management objectives for a particular environmental element are to be obtained. They contain the necessary detail to be site or activity-specific and are required to be followed for all construction works. Site and activity-specific work plans and instructions are to be issued and will follow the previously successful work undertaking similar projects by the UNDP. The ESMP will be updated consistent with paragraph 66 of the ESMF. The Safeguards and Gender Manager of the PMU, the GNHC and UNDP will, in consultations with the contractor, update the ESMP periodically and also prepare site specific management plans. The Safeguards and Gender Manager will oversee compliance with the ESMP etc.

8.3.4 Environmental incident reporting

215. Any incidents, including non-conformances to the procedures of the ESMF and ESMP are to be recorded using an Incident Record and the details entered into a register. For any incident that causes or has the potential to cause material or serious environmental harm, the contractor shall notify the

Project Manager as soon as possible. The contractor/contractor must cease work until remediation has been completed as per the approval of GNHC.

8.3.5 Daily and weekly environmental inspection checklists

216. A daily environmental checklist is to be completed at each work site by the relevant contractor and maintained within a register. A weekly environmental checklist is to be completed and will include reference to any issues identified in the daily checklists completed by the field officers. The completed checklist is to be forwarded to GNHC for review and follow-up if any issues are identified.

8.3.6 Corrective Actions

217. Any non-conformances to the ESMF and ESMP are to be noted in weekly environmental inspections and logged into the register. Depending on the severity of the non- conformance, the Contractor may specify a corrective action on the weekly site inspection report. The progress of all corrective actions will be tracked using the register. Any non-conformances and the issue of corrective actions are to be advised to GNHC.

8.3.7 Review and auditing

218. The ESMF and ESMP and its procedures are to be reviewed at least every two months by UNDP staff and GNHC. The objective of the review is to update the document to reflect knowledge gained during the course of project delivery/construction and to reflect new knowledge and changed community standards (values).

219. The ESMP will be reviewed and amendments made if:

a. there are relevant changes to environmental conditions or generally accepted environmental practices; or

b. new or previously unidentified environmental risks are identified; or

c. information from the project monitoring and surveillance methods indicate that current control measures require amendment to be effective; or

d. there are changes to environmental legislation that are relevant to the project; or

e. there is a request made by a relevant regulatory authority; or

f. any changes are to be developed and implemented in consultation with UNDP Staff and GNHC. When an update is made, all site personnel are to be made aware of the revision as soon as possible eg through a tool box meeting or written notification.

8.4 TRAINING

220. Contractors have the responsibility for ensuring systems are in place so that relevant employees, contractors and other workers are aware of the environmental and social requirements for construction, including the ESMP.

221. All project personnel will attend an induction that covers health, safety, environment and cultural requirements.

222. All workers engaged in any activity with the potential to cause serious environmental harm (e.g. handling of hazardous materials) will receive task specific environmental training.

8.5 COMPLAINTS REGISTER AND GRIEVANCE REDRESS MECHANISM

223. During the construction and implementation phases of any project, a person or group of people can be adversely affected, directly or indirectly due to the project activities. The grievances that may arise

can be related to social issues such as eligibility criteria and entitlements, disruption of services, temporary or permanent loss of livelihoods and other social and cultural issues. Grievances may also be related to environmental issues such as excessive dust generation, damages to infrastructure due to construction related vibrations or transportation of raw material, noise, traffic congestions, decrease in quality or quantity of private/ public surface/ ground water resources during irrigation rehabilitation, damage to home gardens and agricultural lands etc.

224. Should such a situation arise, there must be a mechanism through which affected parties can resolve such issues in a cordial manner with the project personnel in an efficient, unbiased, transparent, timely and cost-effective manner. To achieve this objective, a grievance redress mechanism has been included in ESMF and ESMP for this project.

225. The project allows those that have a complaint or that feel aggrieved by the project to be able to communicate their concern, complaints and/or grievances through an appropriate process. The Complaints Register and Grievance Redress Mechanism set out in this ESMF and ESMP are to be used as part of the project and will provide an accessible, rapid, fair and effective response to concerned stakeholders, especially any vulnerable group who often lack access to formal legal regimes.

226. While recognising that many complaints may be resolved immediately, the Complaints Register and Grievance Redress Mechanism set out in this ESMF and ESMP encourages mutually acceptable resolution of issues as they arise. The Complaints Register and Grievance Redress Mechanism set out in this ESMF and ESMP has been designed to:

    a. be a legitimate process that allows for trust to be built between stakeholder groups and assures stakeholders that their concerns will be assessed in a fair and transparent manner;

    b. allow simple and streamlined access to the Complaints Register and Grievance Redress Mechanism for all stakeholders and provide adequate assistance for those that may have faced barriers in the past to be able to raise their concerns;

    c. provide clear and known procedures for each stage of the Grievance Redress Mechanism process, and provides clarity on the types of outcomes available to individuals and groups;

    d. ensure equitable treatment to all concerned and aggrieved individuals and groups through a consistent, formal approach that, is fair, informed and respectful to a concern, complaints and/or grievances;

    e. to provide a transparent approach, by keeping any aggrieved individual/group informed of the progress of their complaint, the information that was used when assessing their complaint and information about the mechanisms that will be used to address it; and

    f. enable continuous learning and improvements to the Grievance Redress Mechanism. Through continued assessment, the learnings may reduce potential complaints and grievances.

227. Eligibility criteria for the Grievance Redress Mechanism include:

    a. Perceived negative economic, social or environmental impact on an individual and/or group, or concern about the potential to cause an impact;

    b. clearly specified kind of impact that has occurred or has the potential to occur; and explanation of how the project caused or may cause such impact; and

    c. individual and/or group filing of a complaint and/or grievance is impacted, or at risk of being impacted; or the individual and/or group filing a complaint and/or grievance demonstrates that it has authority from an individual and or group that have been or may potentially be impacted on to represent their interest.

228. Local communities and other interested stakeholders may raise a grievance/complaint at all times to the GNHC. Affected local communities should be informed about the ESMF and ESMP provisions, including its grievance mechanism and how to make a complaint.

8.5.1 Complaints Register

229. Where there is a community issue raised, the following information will be recorded:

230. A complaints register will be established as part of the project to record any concerns raised by the community during construction. Any complaint will be advised to the UNDP and GNHC within 24 hours of receiving the complaint. The complaint will be screened. Following the screening, complaints regarding corrupt practices will be referred to the UNDP for commentary and/or advice along with the GNHC.

231. Wherever possible, the project team will seek to resolve the complaint as soon as possible, and thus avoid escalation of issues. However, where a complaint cannot be readily resolved, then it must be escalated.

232. A summary list of complaints received, and their disposition must be published in a report produced every six months.

8.5.2 Grievance Redress Mechanism

233. The Grievance Redress Mechanism has been designed to be problem-solving mechanism with voluntary good-faith efforts. The Grievance Redress Mechanism is not a substitute for the legal process. The Grievance Redress Mechanism will as far as practicable, try to resolve complaints and/or grievances on terms that are mutually acceptable to all parties. When making a complaint and/or grievance, all parties must act at all times, in good faith and should not attempt to delay and or hinder any mutually acceptable resolution.

234. In order to ensure smooth implementation of the Project and timely and effectively addressing of problems that may be encountered during implementation, a robust Grievance Redress Mechanism, which will enable to the Project Authorities to address the grievances of the stakeholders of the Project has been established.

235. All complaints and/or grievances regarding social and environmental issues can be received either orally (to the field staff), by phone, in complaints box or in writing to the UNDP, GNHC or the Construction Contractor. A key part of the grievance redress mechanism is the requirement for the GNHC/PMU and construction contractor to maintain a register of complaints and/or grievances received at the respective project site offices. All complainants shall be treated respectfully, politely and with sensitivity. Every possible effort should be made by the GNHC/PMU and construction contractor to resolve the issues referred to in the complaint and/or grievance within their purview. However, there may be certain problems that are more complex and cannot be solved through project-level mechanisms. Such grievances will be referred to the Grievance Redress Committee. It would be responsibility of the GNHC to solve these issues through a sound / robust process

236. The Grievance Redress Mechanism has been designed to ensure that an individual and/or group are not financially impacted by the process of making a complaint and/or grievance. The Grievance Redress Mechanism will cover any reasonable costs in engaging a suitably qualified person to assist in the preparation of a legitimate complaint and/or grievance. Where a complaint and/or grievance is seen to be ineligible, the Grievance Redress Mechanism will not cover these costs.

237. Information about the Grievance Redress Mechanism and how to make a complaint and/or grievance must be placed at prominent places for the information of the key stakeholders.

238. The Communication Specialist in the PMU will be designated as the key officer in charge of the Grievance Redress Mechanism. The Terms of Reference for these positions (as amended from time to time) will have the following key responsibilities:

    a. coordinate formation of Grievance Redress Committees before the commencement of constructions to resolve issues;

    b. act as the focal point at the PMU on Grievance Redress issues and facilitate the resolution of issues within the PMU;

c. create awareness of the Grievance Redress Mechanism amongst all the stakeholders through public awareness campaigns;

d. assist in redress of all grievances by coordinating with the concerned parties;

e. maintain information on grievances and redress;

f. monitor the activities of GNHC on grievances issues; and

g. prepare the progress for monthly/quarterly reports.

239. A two-tier Grievance Redress Mechanism structure has been developed to address all complaints and/or grievances in the project. The first trier redress mechanism involves the receipt of a complaint and/or grievance at the gewog (village) level. The stakeholders are informed of various points of making complaints (if any) and the PMU collect the complaints from these points on a regular basis and record them. This is followed by coordinating with the concerned people to redress the Grievances. The Communication Specialist of the PMU will coordinate the activities at the respective Gewog level to address the grievances and would act as the focal point in this regard. The Community Development Officer of the Dzongkhags or in the absence of the Community Development Officer, any officer given the responsibility of this would coordinate with the Safeguards and Gender Manager of the PMU and GNHC in redressing the grievances. The designated officer of the Local Authorities is provided with sufficient training in the procedure of redress to continue such systems in future.

240. The grievance can be made orally (to the field staff), by phone, in complaints box or in writing to the UNDP, GNHC or the Construction Contractor. Complainants may specifically contact the Communication Specialist and request confidentiality if they have concerns about retaliation. In cases where confidentiality is requested (i.e. not revealing the complainant's identity to UNDP, GNHC and/or the Construction Contractor). In these cases, the Communication Specialist will review the complaint and/or grievance, discuss it with the complainant, and determine how best to engage project executing entities while preserving confidentiality for the complainant.

241. As soon as a complaint and/or grievance is received, the Communication Specialist would issue an acknowledgement. The Community Development Officer receiving the complaint and/or grievance should try to obtain relevant basic information regarding the grievance and the complainant and will immediately inform the Communication Specialist in the PMU.

242. The PMU will maintain a Complaint / Grievance Redress register at the Gewog level. Keeping records collected from relevant bodies is the responsibility of PMU.

243. After registering the complaint and/or grievance, the Communication Specialist will study the complaint and/or grievance made in detail and forward the complaint and/or grievance to the concerned officer with specific dates for replying and redressing the same. The Communication Specialist will hold meetings with the affected persons / complainant and then attempt to find a solution to the complaint and/or grievance received. If necessary, meetings will be held with the concerned affected persons / complainant and the concerned officer to find a solution to the problem and develop plans to redress the grievance. The deliberations of the meetings and decisions taken are recorded. All meetings in connection with the Grievance Redress Mechanism, including the meetings of the Grievance Redress Committee, must be recorded. The Communication Specialist for the Grievances Redress Mechanism will be actively involved in all activities.

244. A Community Project Implementation Committee would be formed to oversee the first tier of the Grievance Redress Mechanism. The Community Project Implementation Committee would include:

a. Village Head Man (Chair);

b. Community Representative from the Gewog;

c. Member of a relevant Civil Society Group depending on their presence within the Gewog;

d. Project Manager from the PMU; and

e. Communication Specialist PMU.

245. The resolution at the first tier will be normally be completed within 15 working days and the complaint and/or grievance will be notified of the proposed response through a disclosure form. The resolution process should comply with the requirements of the Grievance Redress Mechanism in that it should, as far as practicable, be informal with all parties acting in good faith. Further, the Grievance Redress Mechanism should, as far as practicable, achieve mutually acceptable outcomes for all parties.

246. Should the grievance be not resolved within this period to the satisfaction of the complainant, the grievance will be referred to the next level of Grievance Redress Mechanism. If the social safeguard and gender officer feels that adequate solutions can be established within the next five working days, the officer can decide on retaining the issue at the first level by informing the complainant accordingly. However, if the complainant requests for an immediate transfer to the next level, the matter must be referred to the next tier. In any case, where the issue is not addressed within 20 working days, the matter is referred to the next level.

247. Any grievance related to corruption or any unethical practice should be referred immediately to the Bhutan Office of the Attorney General and the Office of Audit and Investigation within the UNDP in New York.

248. The Grievance Redress Committee formed at the *dungkhag* (subdistricts) level would address the grievance in the second tier. A Grievance Redress Committee will be constituted for the dungkhag by the circulars issued by the Dzongkhag Administrator, who would also be the Chairman of the Committee.

249. The Structure of the committee would be:

    a. Dzongkhag Administrator (Chair);

    b. Dzongkhag Environment Officer;

    c. Dzongkhag Engineer (for technical issues);

    d. Dzongkhag Forest Officer; and

    e. Member of a relevant Civil Society Group depending on their presence within the Dzongkhag.

250. The Communication Specialist from the PMU will coordinate with the GNHC in getting these Committees constituted for each Province and get the necessary circulars issued in this regard so that they can be convened whenever required.

251. The Terms of Reference for the Grievance Redress Committee are:

    a. providing support to the affected persons in solving their problems;

    b. prioritise grievances and resolve them at the earliest;

    c. provide information to the PMU and GNHC on serious cases at the earliest opportunity;

    d. coordinate with the aggrieved person/group and obtain proper and timely information on the solution worked out for his/her grievance; and

    e. study the normally occurring grievances and advise PMU, National and Dzongkhag Steering Committee on remedial actions to avoid further occurrences.

252. The Grievance Redress Committee will hold the necessary meetings with the aggrieved party/complainant and the concerned officer and attempt to find a solution acceptable at all levels. The Grievance Redress Committee would record the minutes of the meeting.

253. Bhutan also has the *Alternative Dispute Resolution Act of Bhutan 2013* which allows an individual to bring an action in the Administrative Tribunal as well as to an Alternative Dispute Resolution Centre.

254. Grievance Redress Committee will communicate proposed responses to the complainant formally. If the proposed response satisfies the complainant, the response will be implemented and the complaint closed. In cases where a proposed response is unsatisfactory to the complainant, the Grievance Redress Committee may choose to revise the proposed response to meet the complainant's remaining concerns, or to indicate to the complainant that no other response appears feasible to the Grievance

Redress Committee. The complainant may decide to take a legal or any other recourse if s/he is not satisfied with the resolutions due to the deliberations of the three tiers of the grievance redress mechanism.

255. In addition to the project-level and national grievance redress mechanisms, complainants have the option to access UNDP's Accountability Mechanism, with both compliance and grievance functions. The Social and Environmental Compliance Unit investigates allegations that UNDP's Standards, screening procedure or other UNDP social and environmental commitments are not being implemented adequately, and that harm may result to people or the environment. The Social and Environmental Compliance Unit is housed in the Office of Audit and Investigations and managed by a Lead Compliance Officer. A compliance review is available to any community or individual with concerns about the impacts of a UNDP programme or project. The Social and Environmental Compliance Unit is mandated to independently and impartially investigate valid requests from locally impacted people, and to report its findings and recommendations publicly.

256. The Stakeholder Response Mechanism offers locally affected people an opportunity to work with other stakeholders to resolve concerns about the social and environmental impacts of a UNDP project. Stakeholder Response Mechanism is intended to supplement the proactive stakeholder engagement that is required of UNDP and its Implementing Partners throughout the project cycle. Communities and individuals may request a Stakeholder Response Mechanism process when they have used standard channels for project management and quality assurance and are not satisfied with the response (in this case the project level grievance redress mechanism). When a valid Stakeholder Response Mechanism request is submitted, UNDP focal points at country, regional and headquarters levels will work with concerned stakeholders and Implementing Partners to address and resolve the concerns. Visit www.undp.org/secu-srm for more details. The relevant form is attached as Annexure Four of the ESMP.

8.6 Stakeholder Engagement and Public Participation

257. The ESMP includes public consultation as part of the stakeholder engagement plan. The project was discussed with a wide range of stakeholders including relevant government departments, industry groups, NGOs, and individual community members and approved by the Royal Government of Bhutan. Extensive on-ground consultation has been undertaken during the design of the project (as well as during the earlier projects that this project is aiming to upscale) and it is expected that consultation with any affected communities will continue. It is anticipated that based on the communities' needs, the projects will be fully accepted.

258. The UNDP and GNHC will develop and release updates on the project on a regular basis to provide interested stakeholders with information on project status. Updates may be via a range of media eg print, radio, social media or formal reports. A publicised telephone number will be maintained throughout the project to serve as a point of contact for enquiries, concern, complaints and/or grievances. All enquiries, concern, complaints and/or grievances will be recorded on a register and the appropriate manager will be informed. All material must be published in English and Dzongkha, and any other language as appropriate.

259. Where there is a community issue raised, the following information will be recorded:

    a. time, date and nature of enquiry, concern, complaints and/or grievances;

    b. type of communication (e.g. telephone, letter, personal contact);

    c. name, contact address and contact number;

    d. response and investigation undertaken as a result of the enquiry, concern, complaints and/or grievances; and

    e. actions taken and name of the person taking action.

260. Some enquiries, concern, complaints and/or grievances may require an extended period to address. The complainant(s) will be kept informed of progress towards rectifying the concern. All enquiries,

concerns, complaints and/or grievances will be investigated and a response given to the complainant in a timely manner. A grievance redress mechanism has been included in the ESMF and ESMP to address any complaints that may not be able to be resolved quickly.

261. Nominated PMU/contractor staff will be responsible for undertaking a review of all enquiries, concern, complaints and/or grievances and ensuring progress toward resolution of each matter.

8.7 BUDGET

262. A budget has been prepared for the implementation of the ESMP as follows:

Item	Cost
ESMP Updating and Auditing	$10,000
General ESMP Expenses	$20,000
Ecological Monitoring (40 sites - two assessments/year over five years)	$120,000
Water Quality Monitoring (monitoring to be undertaken over five years)	$220,000
Water Quality Sample Laboratory Analysis (monitoring to be undertaken over five years)	$60,000
Sediment Sample Field Testing (monitoring to be undertaken over five years)	$90,000
Sediment Sample Laboratory Analysis (monitoring to be undertaken over five years)	$90,000
Erosion, Drainage and Sediment Control (includes silt curtains etc)	$75,000
Archaeological Management	$25,000
Stakeholder Engagement Workshop	$140,000
Grievance Redress Mechanism	$50,000
Total	**$900,000**

8.8 KEY ENVIRONMENTAL AND SOCIAL INDICATORS

263. The ESMP identifies the key environmental and social indicators identified for the project and outlines respective management objectives, potential impacts, control activities and the environmental and social performance criteria against which these indicators will be judged (eg audited).

264. This section addresses the need for monitoring and reporting of environmental and social performance with the aim of communicating the success and failures of control procedures, distinguish issues that require rectification and identify measures that will allow continuous improvement in the processes by which the projects are managed.

8.9 TOPOGRAPHY, GEOLOGY AND SOILS

8.9.1 Performance Criteria

265. The following performance criteria are set for the projects:

a. no build-up of sediment in the aquatic environments and/or surface and/or groundwater as a result of construction and operation activities;

b. no degradation of water quality on or off site of all projects;

c. all water exiting the project site and/or into groundwater systems is to have passed through best practice erosion, drainage and sediment controls; and

d. effective implementation of site-specific EDSCP. An outline of an EDSCP is contained in Annexure Five.

266. Where contamination is considered a possibility, the contractor should conduct a preliminary site contamination investigation. The preliminary site investigation should

a. identify all past and present potentially contaminating activities;

b. identify potential contamination types;

c. discuss the site condition;

d. provide a preliminary assessment of site contamination; and

e. assess the need for further investigations.

267. An appraisal of the site history is fundamental to the preliminary assessment and may be used to assess potential site contamination. It is important to review and assess all relevant information about the site, including information obtained during a site inspection. Where a complete site history clearly demonstrates that site activities have been non-contaminating, there may be no need for further investigation or site sampling. However, where contaminating activities are suspected or known to have occurred, or if the site history is incomplete, it may be necessary to undertake a preliminary sampling and analysis program to assess the need for a detailed investigation.

268. By following the management measures set out in the ESMP, construction and operation activities of the projects will not have a significant impact as a result of sedimentation across the broader area.

8.9.2 Monitoring

269. A standardised sediment control monitoring program has been developed for the projects (Table 18). The program is subject to review and update at least every two months from the date of issue. The contractor will be required to:

a. conduct site inspections on a weekly basis or after rainfall events exceeding 20mm in a 24 hour period;

b. develop a site-specific checklist to document non-conformances to this ESMP or any applicable EDSCPs; and

c. communicate the results of inspections and/or water quality testing and ensure that any issues associated with control failures are rapidly rectified and processes are put in place to ensure that similar failures are not repeated.

8.9.3 Reporting

270. All sediment and erosion control monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The GNHC must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to erosion and sediment control is exceeded.

Table 18 Erosion, Drainage and Sediment Control Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
E1: Loss of soil material and sedimentation to the surface and/or groundwater systems from site due to earthwork activities	E1.1: Develop and implement an EDSCP for any surface works, embankments and excavation work, water crossings and stormwater pathways.	Construction phase	Contractor	Maintain records
	E1.2: Ensure that erosion and sediment control devices are installed, inspected and maintained as required.	Construction phase	Contractor	Maintain records
	E1.3: Schedule/stage works to minimise cleared areas and exposed soils at all times.	Pre and during construction	Contractor	Maintain records
	E1.4: Incorporate the design and location of temporary and permanent EDSC measures for all exposed areas and drainage lines. These shall be implemented prior to pre-construction activities and shall remain onsite during work	Pre and during construction	Contractor	Maintain records
	E1.5: Schedule/stage proposed works to ensure that major vegetation disturbance and earthworks are carried out during periods of lower rainfall and wind speeds.	Pre and during construction	Contractor	Maintain records
	E1.6: Strip and stockpile topsoil for use during revegetation and/or place removed soils back on to agricultural lands.	Pre and during construction	Contractor	Maintain records
	E1.7: Schedule/stage works to minimise the duration of stockpiling topsoil material. Vegetate stockpiles if storage required for long periods.	During construction	Contractor	Maintain records
	E1.8: Locate stockpile areas away from drainage pathways, waterways and sensitive locations.	Pre and during construction	Contractor	Maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
E1: Loss of soil material and sedimentation to the surface and/or groundwater systems from site due to earthwork activities	E1.9: Design stormwater management measures to reduce flow velocities and avoid concentrating runoff.	Pre and during construction	Contractor	Maintain records
	E1.10: Include check dams in drainage lines where necessary to reduce flow velocities and provide some filtration of sediment. Regularly inspect and maintain check dams.	Pre and during construction	Contractor	Maintain records
	E1.11: Mulching shall be used as a form of erosion and sediment control and where used on any slopes (dependent on site selection), include extra sediment fencing during high rainfall.	During construction	Contractor	Maintain records
	E1.12: Bunding shall be used either within watercourses or around sensitive/dangerous goods as necessary.	During construction	Contractor	Maintain records
	E1.13: Grassed buffer strips shall be incorporated where necessary during construction to reduce water velocity.	During construction	Contractor	Maintain records
	E1.14: Silt fences or similar structures to be installed to protect from increased sediment loads.	During construction	Contractor	Maintain records
	E1.15: Excess sediment in all erosion and sediment control structures (eg. sediment basins, check dams) shall be removed when necessary to allow for adequate holding capacity.	During construction	Contractor	Maintain records
E2: Soil Contamination	E2.1: If contamination is uncovered or suspected (outside of the project footprints), undertake a Stage One preliminary site contamination investigation. The contractor should cease work if previously unidentified contamination is encountered and activate management procedures and obtain advice/permits/approval (as required).	Construction phase	Contractor	Daily and maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
E2: Soil Contamination	E2.2: Adherence to best practice for the removal and disposal of contaminated soil/ material from site (if required), including contaminated soil within the project footprints.	Construction phase	Contractor	Daily and maintain records
	E2.3: Drainage control measures to ensure runoff does not contact contaminated areas (including contaminated material within the project footprints) and is directed/diverted to stable areas for release.	Construction phase	Contractor	Daily and maintain records
	E2.4: Avoid importing fill that may result in site contamination and lacks accompanying certification/documentation. Where fill is not available through on site cut, it must be tested in accordance with geotechnical specifications.	Construction phase	Contractor	Daily and maintain records
E3: Disposal of excess soil/silt	E3.4: Silt removed from dams/canals/weirs during rehabilitation / maintenance is to be beneficially reused eg composted, returned to farm land, brick making etc. Silt should be tested to confirm suitability for proposed use	Construction and operation phases	Contractor	Maintain records

8.10 Air Quality

8.10.1 Performance Criteria

271. The following performance criteria are set for the construction of the projects:
    a. release of dust/particle matter must not cause an environmental nuisance;
    b. undertake measures at all times to assist in minimising the air quality impacts associated with construction and operation activities; and
    c. corrective action to respond to complaints and/or grievances is to occur within 48 hours.

8.10.2 Monitoring

272. A standardised air monitoring program has been developed for the projects (Table 19). The program is subject to review and update at least every two months from the date of issue. Importantly:
    a. the requirement for dust suppression will be visually observed by site personnel daily and by GNHC and UNDP staff when undertaking routine site inspections; and
    b. vehicles and machinery emissions – visual monitoring and measured when deemed excessive.

8.10.3 Reporting

273. All air quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The GNHC must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to air quality is exceeded.

Table 19 Air Quality Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
A.1 Increase in dust levels at sensitive receptors	A1.1: Implement effective dust management measures in all areas during design, construction and operation.	Pre and during construction	All Personnel	Daily and maintain records
	A1.2: Restrict speeds on roads and access tracks.	During construction	Contractor	Daily and maintain records
	A1.3: Manage dust/particulate matter generating activities to ensure that emissions do not cause an environmental nuisance at any sensitive locations through the user of water for dust suppression	During construction	Contractor	Daily and maintain records
	A1.4: Construction activities should minimise risks associated with climatic events (check forecasts).	During construction	Contractor	Daily and maintain records
	A1.5: Implement scheduling/staging of proposed works to ensure major vegetation disturbance and earthworks are minimised.	Entire construction	Contractor	Daily and maintain records
	A1.6: Locate material stockpile areas as far as practicable from sensitive receptors. Cover if appropriate.	During construction	Contractor	Daily and maintain records
	A1.7: Source sufficient water of a suitable quality for dust suppression activities complying with any water restrictions.	During construction	Contractor	Daily and maintain records
	A1.8: Schedule revegetation activities to ensure optimum survival of vegetation species.	During construction	Contractor	Maintain records
	A1.9: Rubbish receptacles should be covered and located as far as practicable from sensitive locations	During construction	Contractor	Maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
A2. Increase in vehicle / machinery emissions	A2.1 Ensure vehicles/machines are switched off when not in use.	During construction	Contractor	Daily and maintain records
	A2.2 Ensure only vehicles required to undertake works are operated onsite.	During construction	Contractor	Daily and maintain records
	A2.3 Ensure all construction vehicles, plant and machinery are maintained and operated in accordance with design standards and specifications.	During construction	Contractor	Daily and maintain records
	A2.4 Develop and implement an induction program for all site personnel, which includes as a minimum an outline of the minimum requirements for environmental management relating to the site.	Pre and during construction	Contractor	Daily and maintain records
	A2.5 Locate construction vehicle/plant/equipment storage areas as far as practicable from sensitive locations.	During construction	Contractor	Daily and maintain records
	A2.6 Direct exhaust emissions of mobile plant away from the ground.	During construction	Contractor	Daily and maintain records

8.11 NOISE AND VIBRATION

8.11.1 Performance Criteria

274. The following performance criteria are set for the construction of the projects:

    a. noise from construction and operational activities must not cause an environmental nuisance at any noise sensitive place;

    b. undertake measures at all times to assist in minimising the noise associated with construction activities;

    c. no damage to off-site property caused by vibration from construction and operation activities; and

    d. corrective action to respond to complaints and/or grievances is to occur within 48 hours.

8.11.2 Monitoring

275. A standardised noise monitoring program has been developed for the projects (Table 20). The program is subject to review and update at least every two months from the date of issue. Importantly, the site supervisor will:

    a. ensure equipment and machinery is regularly maintained and appropriately operated; and

    b. carry out potentially noisy construction activities during ‘daytime’ hours only.

8.11.3 Reporting

276. All noise monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The GNHC must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to noise is exceeded

Table 20 Noise and Vibration Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
N1: Increased noise levels	N1.1: Select plant and equipment and specific design work practices to ensure that noise emissions are minimised during construction and operation including all pumping equipment.	All phases	Contractor	Maintain records
	N1.2: Specific noise reduction devices such as silencers and mufflers shall be installed as appropriate to site plant and equipment.	Pre and during construction	Contractor	Maintain records
	N1.3 Minimise the need for and limit the emissions as far as practicable if noise generating construction works are to be carried out outside of the hours: 7am-5.30pm	Construction phase	All Personnel	Daily and maintain records
	N1.4: Consultation with nearby residents in advance of construction activities particularly if noise generating construction activities are to be carried out outside of 'daytime' hours: 7am-5.30pm.	Construction phase	All Personnel	Daily and maintain records
	N1.5 The use of substitution control strategies shall be implemented, whereby excessive noise generating equipment items onsite are replaced with other alternatives.	Construction phase	All Personnel	Daily and maintain records
	N1.6 Provide temporary construction noise barriers in the form of solid hoardings where there may be an impact on specific residents.	Construction phase	Contractor	Daily and maintain records
	N1.7 All incidents complaints and non-compliances related to noise shall be reported in accordance with the site incident reporting procedures and summarised in the register.	Construction phase	Contractor	Maintain records
	N1.8 The contractor should conduct employee and operator training to improve awareness of the need to minimise excessive noise in work practices through implementation of measures.	Pre and during construction	Contractor	Maintain records

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
N2. Vibration due to construction	N2.1: Identify properties, structures and habitat locations that will be sensitive to vibration impacts resulting from construction and operation of the project.	Pre and during construction	Contractor	Maintain records
	N2.2: Design to give due regard to temporary and permanent mitigation measures for noise and vibration from construction and operational vibration impacts.	Pre-construction	Contractor	Maintain records
	N2.3: All incidents, complaints and non-compliances related to vibration shall be reported in accordance with the site incident reporting procedures and summarised in the register.	Construction phase	Contractor	Maintain records
	N2.4: During construction, standard measure shall be taken to locate and protect underground services from construction and operational vibration impacts.	Construction phase	Contractor	Maintain records

8.12 SURFACE WATER

8.12.1 Performance Criteria

277. The following performance criteria are set for the construction of the projects:

    a. no significant decrease in water quality as a result of construction and operational activities;

    b. water quality shall conform to any approval conditions stipulated by UNDP, GNHC and/or other government departments, or in the absence of such conditions follow a 'no worsening' methodology; and

    c. effective implementation of site-specific EDSCPs.

8.12.2 Monitoring

278. Having water of a quality that is fit for purpose is important. Water quality can affect plant growth, livestock health, soil quality, farm equipment and domestic use. The quality of a water source is also variable depending upon weather and external inputs.

279. Evaporation increases the concentrations of salts while a flush of water dilutes salts but may increase sediment and fertilisers, and manure or nutrient runoff. Monitoring should be done regularly and more frequently in summer or in periods of prolonged moisture stress. Table 21 outlines the monitoring required.

8.12.3 Reporting

280. All water quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The GNHC must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to water quality is exceeded.

Table 21 Water Quality Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
W1: Elevated suspended solids and other contaminants in surface water systems.	W1.1: Develop and implement a site specific EDSCP to address drainage control, sediment and erosion controls and stockpiling of materials including soil during construction of all components of the projects. EDSCP measures to be inspected regularly to ensure all devices are functioning effectively.	Pre Earthworks	Contractor	Initial set up and then as required with reporting to GNHC and UNDP
	W1.2: Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should have compacted impermeable bases and be surrounded by a bund to contain any spillage. Refuelling to be undertaken in areas away from water systems.	Entire construction and operation phase	All Personnel	Weekly with reporting to GNHC and UNDP
	W1.3: Conduct regular surface and groundwater quality monitoring in location where the groundwater is likely to be impacted including assessing the changes to groundwater quality.	Entire construction and operation phase	Contractor	Weekly and as required with reporting to GNHC and UNDP
	W1.4: Schedule works in stages to ensure that disturbed areas are revegetated and stabilised progressively and as soon as practicable after completion of works.	Avoid undertaking bulk earthworks during wet season	Contractor and GNHC	Maintain records
	W1.5: Construction materials will not be stockpiled in proximity to aquatic environment that may allow for release into the environment. Construction equipment will be removed from in proximity to the aquatic environment at the end of each working day or if heavy rainfall is predicted	Entire construction and operation phase	Contractor	Maintain daily records

8.13 GROUNDWATER

8.13.1 Performance Criteria

281. The following performance criteria are set for the project:
    a. no significant decrease in the quality and quantity of groundwater as a result of construction and operational activities in proximity to the projects;
    b. effective implementation of site-specific EDSCPs and other measures to protect groundwater.
282. By following the management measures set out in the ESMP the project will not have a significant impact on water quality across the broader area.

8.13.2 Monitoring

283. Refer to Table 22 for the monitoring requirements for groundwater.
284. During the project groundwater quality should be assessed initially and then at least every two months. Initial assessment should cover a wide range of parameters (eg depth to water, pH, DO, conductivity, nitrates, phosphates, faecal coliforms, heavy metals, turbidity, hydrocarbons) to provide a baseline and to confirm suitability for intended use. Subsequent monitoring parameters will be determined on need.
285. Ongoing monitoring should form part of the operation of the boreholes.

8.13.3 Reporting

286. All water quality monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The GNHC must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to water quality is exceeded.

Table 22 Groundwater management measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
GW 1: Increase of gross pollutants, hydrocarbons, metals and other chemical pollutants into the groundwater and/or surface water environment.	GW1.1: Conduct regular surface and groundwater quality monitoring in location where the groundwater is likely to be impacted, including assessing the changes to groundwater quality.	Construction and operation phase	Contractor	Weekly and as required with reporting to GNHC and UNDP
	GW1.2: Prevent contaminated surface water from entering aquifers via boreholes and wells - protect from runoff and flooding and keep surrounds clean.	All phases	All Personnel	Weekly
	GW1.3: Designated areas for storage of fuels, oils, chemicals or other hazardous liquids should have compacted impermeable bases and be surrounded by a bund to contain any spillage. Refuelling to be undertaken in areas away from water systems.	Entire construction and operation phase	All Personnel	Weekly with reporting to GNHC and UNDP
	GW1.4: Check all vehicles, equipment and material storage areas daily for possible fuel, oil and chemical leaks. Undertake refuelling at designated places away from water systems.	All phases	All Personnel	Daily and maintain records
	GW 1.5: Minimise the use of herbicides, pesticides and other chemicals and use only biodegradable herbicides that have minimal impact on water quality and fauna. Use only as per directions	All phases	All Personnel	Weekly reporting to GNHC and UNDP

8.14 Terrestrial and Aquatic Flora and Fauna

8.14.1 Performance Criteria

287. The following performance criteria are set for the construction of the projects:
    a. no clearance of vegetation outside of the designated clearing boundaries;
    b. no death to native fauna as a result of clearing activities;
    c. no deleterious impacts on aquatic environments and terrestrial habitats;
    d. no introduction of new weed species as a result of construction activities; and
    e. no increase in existing weed proliferation within or outside of any project footprint as a result of construction activities.

8.14.2 Monitoring

288. A flora and fauna monitoring program will be implemented (Table 23).
289. Weed monitoring will be undertaken and appropriate action taken in the event of alien or noxious species being identified.
290. The contractor will when undertaking works, compile a weekly report to GNHC outlining:
    a. any non-conformances to this ESMP;
    b. the areas that have been rehabilitated during the preceding week; and
    c. details of the corrective action undertaken.

8.14.3 Reporting

291. All flora and fauna monitoring results and/or incidents will be tabulated and reported as outlined in the ESMP. The GNHC must be notified in the event of any suspected instances of death to native fauna and where vegetation if detrimentally impacted.

Table 23 Flora and Fauna Management Measures

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
FF1. Habitat loss and disturbance of fauna	FF1.1 Limit vegetation clearing and minimise habitat disturbance through adequate protection and management of retained vegetation.	During construction	Contractor	Daily and maintain records
	FF1.2: Minimise noise levels and lighting intrusion throughout construction and operation in the vicinity of any sensitive locations.	During construction	Contractor	Daily and maintain records
	FF1.3: Ensure that all site personnel are made aware of sensitive fauna/habitat areas and the requirements for the protection of these areas.	During construction	Contractor	Daily and maintain records
	FF1.4 Minimise disturbance to on-site fauna and recover and rescue any injured or orphaned fauna during construction and operation.	During construction	Contractor	Daily and maintain records, report
	FF1.5 Where necessary and practicable, relocate native fauna to the closest river where works are being undertaken	During construction	Contractor	Daily and maintain records, report
	FF1.6 Where earthworks are undertaken, rehabilitate the site with local provenance vegetation that provides habitat for fauna	During and post construction	Contractor	Daily and maintain records, report
FF2. Introduced flora and weed species	FF2.1: Implement an ESCP to reduce the spread of weeds through erosion and sediment entering any waterways and therefore spreading.	Pre and during construction	Contractor	Maintain records
	FF2.2: Revegetate disturbed areas using native and locally endemic species that have high habitat value.	During construction	Contractor	As required and maintain records
	FF2.3: Minimise disturbance to mature remnant vegetation, particularly canopy trees.	During construction	Contractor	Daily and maintain records
	FF2.4: Seed is to be weed free	Operation	Contractor	Maintain records

Issue	Control Activity (and Source)	Action Timing	Responsibility	Monitoring and Reporting
FF2. Introduced flora and weed species	FF2.5: Small trees and shrubs shall be removed in preference to large trees.	During construction	Site Supervisor	Daily and maintain records
	FF2.6: Environmental weeds and noxious weeds within the project footprints shall be controlled.	During and post construction	Contractor	Weekly and maintain records

8.15 Land Ownership and Customary Tenure

8.15.1 Performance Criteria

292. The following performance criteria are set for the project:

    a. the community has been consulted and project elements have been designed with their informed consultation and participation throughout the project;

    b. all stakeholders are appropriately represented;

    c. avoid adverse impacts to local community during construction and operations and where not possible, minimise, restore or compensate for these impacts;

    d. cultural heritage is not adversely impacted;

    e. community health and safety is protected and overall well-being benefits derived from the project;

    f. complaint and grievance mechanisms are put in place and proactively managed; and

    g. long-term social benefits are achieved.

293. Local stakeholders and community members have a key role to play in the implementation and monitoring of the project. All activities will be undertaken in full compliance with the *Land Pooling and Readjustment Regulations 2018* and the GCF and UNDP Policies, with the most stringent requirements being complied with

294. Consultation with stakeholders will continue. This will help ensure that stakeholders continue to be aware of the project, its progress and any changes in the project. It will also assist in identifying any issues as they arise.

295. GNHC will be responsible for advisory support and extensions services to local beneficiaries along with being responsible for distributing material inputs and providing technical training and backstopping in the implementation of programme activities.

8.15.2 Reporting

296. Records of all consultations are to be kept and reported on monthly basis.

297. The GNHC must be notified in the event of any individual or community complaint or dissatisfaction and ensure the Grievance Redress Mechanism is complied with.

Table 24: Social Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
LO1: Ensure no impact on Land Ownership	LO1.1: Carry out community consultation on the purpose and benefits of making changes to land use	Pre-construction	GNHC	Maintain records
	LO1.1: Ensure all access is undertaken consistent with signed voluntary agreements	Pre-construction	GNHC	Maintain records
	LO1.3: Ensure full compliance with the UNDP Social and Environmental Standards Guidance Note for Standard Five (5) on Displacement and Resettlement	Entire construction and operation phase	GNHC	Maintain records
	LO1.4: All activities will be undertaken in full compliance with the *Land Pooling and Readjustment Regulations 2018* and the GCF and UNDP Policies, with the most stringent requirements being complied with	Entire construction and operation phase	GNHC	Maintain records
	LO1.5: Ensure compliance with the Grievance Redress Mechanism process	Entire construction and operation phase	GNHC	Maintain records

8.16 POPULATION

8.16.1 Performance Criteria

298. The following performance criteria are set for the project:
    a. the community has been consulted and project elements have been designed with their informed consultation and participation throughout the project;
    b. all stakeholders are appropriately represented;
    c. avoid adverse impacts to local community during construction and operations and where not possible, minimise, restore or compensate for these impacts;
    d. cultural heritage is not adversely impacted;
    e. community health and safety is protected and overall well-being benefits derived from the project;
    f. complaint and grievance mechanisms are put in place and proactively managed; and
    g. long-term social benefits are achieved.
299. Local stakeholders and community members have a key role to play in the implementation and monitoring of the project.
300. Consultation with stakeholders will continue. This will help ensure that stakeholders continue to be aware of the project, its progress and any changes in the project. It will also assist in identifying any issues as they arise.
301. GNHC will be responsible for advisory support and extensions services to local beneficiaries along with being responsible for distributing material inputs and providing technical training and backstopping in the implementation of programme activities.

8.16.2 Reporting

302. Records of all consultations are to be kept and reported on monthly basis.
303. The GNHC must be notified in the event of any individual or community complaint or dissatisfaction and ensure the Grievance Redress Mechanism is complied with.

Table 25: Social Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
SM1: Community Consultation	SM1.1: Carry out community consultation on the purpose and benefits of making changes to land use	Pre-construction	GNHC	Maintain records
	SM1.2: Get community buy-in on any change of land use	Pre-construction	GNHC	Maintain records
	SM1.3: Ensure compliance with the Grievance Redress Mechanism process	Entire construction and operation phase	GNHC	Maintain records
SM2: Public nuisance caused by construction/operation activities (eg noise, dust etc)	SM2.1: Carry out community consultation prior to undertaking activities	Pre-construction	GNHC	Maintain records
	SM2.2: Implement appropriate management plans (refer to Noise, Air, ESCP, and Waste sections of the ESMP)	Construction and operation	Site supervisor and GNHC	Daily and maintain records
	SM2.3: Ensure compliance with the Grievance Redress Mechanism process	All phases	GNHC	Maintain records

8.17 GENDER

8.17.1 Performance Criteria

304. The following performance criteria are set for the project:
    a. ensure the project has gender equality and women empowerment within all activities;
    b. ensure the project does not have any gender-based discrimination and/or inequalities;
    c. where practicable, preference should be given to women for any employment;
    d. complaint and grievance mechanisms are put in place and proactively managed; and
    e. long-term social benefits are achieved.
305. Local stakeholders and community members have a key role to play in the implementation and monitoring of the project.
306. Consultation with stakeholders will continue. This will help ensure that stakeholders continue to be aware of the project, its progress and any changes in the project. It will also assist in identifying any issues as they arise.
307. GNHC will be responsible for advisory support and extensions services to local beneficiaries along with being responsible for distributing material inputs and providing technical training and backstopping in the implementation of programme activities.

8.17.2 Reporting

308. Records of all consultations are to be kept and reported on monthly basis.
309. The GNHC must be notified in the event of any individual or community complaint or dissatisfaction and ensure the Grievance Redress Mechanism is complied with.

Table 26 Gender Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
GE1: Gender Equality and Women Empowerment	GE1.1: Ensure the project has gender equality and women empowerment within all activities	Entire construction and operation phase	GNHC	Maintain records
	GE1.2: Ensure the project does not have any gender-based discrimination and/or inequalities	Entire construction and operation phase	GNHC	Maintain records
	GE1.3: Where practicable, preference should be given to women for any employment	Entire construction and operation phase	GNHC	Maintain records

8.18 Employment, Labour and Working Conditions

310. The project has been designed with the assistance of stakeholders and aims to provide benefits to the broader community who will be involved in the construction of project interventions. Notwithstanding, as with any project that involves construction, some dissatisfaction can occur and conflicts may arise where individuals are unable to be provided employment. It is important that potential areas of tension are recognised early and appropriate actions taken to avoid or minimise conflict.

8.18.1 Performance Criteria

311. The following performance criteria are set for the project:

    a. ensure compliance with Bhutan labour and occupational health and safety laws including but not limited to *Regulation on Occupational Health, Safety and Welfare*, with obligations under international law, and consistency with the principles and standards embodied in the International Labor Organisation fundamental conventions, including freedom of association, elimination of discrimination in employment and occupation, elimination of forced or compulsory labour and Good International Industry Practice with respect to labour and occupational health and safety, and

    b. ensure no forms of child labour;

    c. where possible, local residents will be employed first for all construction activities;

    d. all employees and contractors will be paid equally;

    e. where practicable, preference should be given to women for any employment;

    f. ensure workers' health and safety is protected and overall well-being benefits derived from the project;

    g. ensure workers are trained in occupational health and safety;

    h. ensure workers are provided appropriate personal protective equipment suitable for their duties; and

    i. complaint and grievance mechanisms are put in place and proactively managed.

312. Local stakeholders and community members have a key role to play in the implementation and monitoring of the project and therefore preference should be given to them with respect to employment.

313. GNHC will be responsible for advisory support and extensions services to local beneficiaries along with being responsible for distributing material inputs and providing technical training and backstopping in the implementation of programme activities.

8.18.2 Reporting

314. Records of all consultations are to be kept and reported on monthly basis.

315. The GNHC and contractor should keep records on local employment and pay conditions;

316. The GNHC must be notified in the event of any individual or community complaint or dissatisfaction and ensure the Grievance Redress Mechanism is complied with.

Table 27 Employment, Labour and Working Conditions Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
WC1: Employment, Labour and Working Conditions	WC1.1: Ensure compliance with Bhutan labour and occupational health and safety laws and Good International Industry Practice with respect to labour and occupational health and safety	Entire construction and operation phase	GNHC and Contractor	Maintain records
	WC1.2: Employ local residents and women first where practicable	Entire construction and operation phase	GNHC	Maintain records
	WC1.3: Ensure workers' health and safety is protected and overall well-being benefits derived from the project	Entire construction and operation phase	Contractor	Maintain records
	WC1.43: Ensure workers are trained in occupational health and safety in compliance with Bhutanese laws and Good International Industry Practice	Entire construction and operation phase	Contractor	Maintain records
	WC1.5: Ensure workers are provided appropriate personal protective equipment suitable for their duties	Entire construction and operation phase	Contractor	Maintain records

8.19 Archaeological and Cultural Heritage

317. The following performance criteria are set for cultural heritage issues related to the project:

    a. there will be no impact on any important Archaeological, Indigenous and/or Cultural Heritage sites;

    b. manage any specific sites of important Archaeological, Indigenous and/or Cultural significance (significant sites);

    c. where there is a mix of modern development and traditional areas within villages use community engagement to confirm options of enabling future development as nominated by the participants and protecting culturally significant traditional areas;

    d. work with the village communities to differentiate between traditional village areas of cultural significance (uses and physical form) within each of the village boundary areas during the construction phase of the project; and

    e. monitoring

318. Local stakeholders and community members have a key role to play in the implementation and monitoring of the project.

319. Consultation with stakeholders will continue. This will help ensure that stakeholders continue to be aware of the project, its progress and any changes in the project. It will also assist in identifying any issues as they arise.

320. GNHC will be responsible for advisory support and extensions services to local beneficiaries along with being responsible for distributing material inputs and providing technical training and backstopping in the implementation of programme activities.

8.19.1 Reporting

321. Records of all consultations are to be kept and reported on monthly basis.

Table 28: Archaeological and Cultural Heritage

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
CH1: Damage or disturbance to significant important Archaeological, Indigenous and/or Cultural Heritage during the earth disturbances and land clearing activities	CH1.1: Should any important Archaeological, Indigenous and/or Cultural Heritage sites, immediately cease work within the area that the site has been observed and consult with the relevant Museum/traditional owner groups, UNDP, GNHC and archaeologist available for implementation during construction.	Pre and during construction	Contractor	Daily, maintain records and immediately notify UNDP and GNHC of any find

8.20 WASTE MANAGEMENT

8.20.1 Background

322. As the implementing agency, the GNHC advocate good waste management practice. The preferred waste management hierarchy and principles for achieving good waste management is as follows:
    a. waste avoidance (avoid using unnecessary material on the projects);
    b. waste re-use (re-use material and reduce disposing);
    c. waste recycling (recycle material such as cans, bottles, etc.); and
    d. waste disposal (all petruscible and/or contaminated waste to be dumped at approved landfills).
323. The key waste streams generated during construction are likely to include residual sediment and construction wastes such as:
    a. the excavation wastes unsuitable for reuse during earthworks;
    b. wastes from construction and rehabilitation maintenance. Various heavy vehicles and construction equipment will be utilised for the duration of the construction and drilling phase. Liquid hazardous wastes from cleaning, repairing and maintenance of this equipment may be generated. Likewise leakage or spillage of fuels/oils within the site needs to be managed and disposed of appropriately;
    c. non-hazardous liquid wastes will be generated through the use of workers' facilities such as toilets; and
    d. general wastes including scrap materials and biodegradable wastes.
324. Key waste streams generated during operations are likely to include:
    a. excavated sediment (primarily sand and rubble, which can be used for concrete or spread on suitable areas);
    b. wastes from construction equipment maintenance. Various heavy vehicles and construction equipment will be utilised for the duration of the project. Liquid hazardous wastes from cleaning, repairing and maintenance of this equipment may be generated. Likewise leakage or spillage of fuels/oils within the site needs to be managed and disposed of appropriately;
    c. non-hazardous liquid wastes will be generated through the use of workers' facilities such as toilets; and
    d. used oil and machinery parts.
325. Workers involved in construction and operational activities should be familiar with methods minimising the impacts of clearing vegetation to minimise the footprint to that essential for the works and rehabilitate disturbed areas. By doing these activities, the projects should minimise the impact of waste generated by the project.

8.20.2 Performance Criteria

326. The following performance criteria are set for the construction of the projects:
    a. waste generation is minimised through the implementation of the waste hierarchy (avoidance, reduce, reuse, recycle);
    b. no litter will be observed within the project area or surrounds as a result of activities by site personnel;
    c. no complaints received regarding waste generation and management;

d. any waste from on-site portable sanitary facilities will be sent off site for disposal by a waste licensed contractor; and

e. waste oils will be collected and disposed or recycled off-site, local oil companies or shipped for recycling.

8.20.3Monitoring

327. A waste management monitoring program has been developed for the projects (Table 29). The program is subject to review and update at least every two months from the date of issue.

8.20.4Reporting

328. The GNHC as implementing agency must be notified immediately in the event of any suspected instances of material or serious environmental harm, or if a determined level with respect to waste is exceeded.

Table 29 Waste Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
WT1: Production of wastes and excessive use of resources	WT1.1: Preference shall be given to materials that can be used to construct the project that would reduce the direct and indirect waste generated.	Pre and during construction	Contractor	Maintain records
	WT1.2: Daily waste practices shall be carried out unless these are delegated to the activities of external waste management bodies.	During construction	Contractor	Daily and maintain records
	WT1.3: The use of construction materials shall be optimised and where possible a recycling policy adopted.	During construction	Contractor	Weekly and maintain records
	WT1.4: Separate waste streams shall be maintained at all times i.e. general domestic waste, construction and contaminated waste. Specific areas on site shall be designated for the temporary management of the various waste streams.	During construction	Contractor	Weekly and maintain records
	WT1.5: Any contaminated waste shall be disposed of at an approved facility.	During construction	Contractor	Weekly and maintain records
	WT1.6: Recyclable waste (including oil and some construction waste) shall be collected separately and disposed of correctly.	During construction	Contractor	Weekly and maintain records
	WT1.7: Waste sites shall be sufficiently covered to ensure that wildlife does not have access.	During construction	Contractor	Daily
	WT1.8: Disposal of waste shall be carried out in accordance with the Royal Government of Bhutan requirements.	During construction	Contractor	Weekly and maintain records
	WT1.9: Fuel and lubricant leakages from vehicles and plant shall be immediately rectified.	During construction	Contractor	Daily and maintain records

8.21 Emergency Management Measures

329. In the event of actions occurring, which may result in serious health, safety and environmental (catastrophic) damage, emergency response or contingency actions will be implemented as soon as possible to limit the extent of environmental damage.

330. The contractor will need to incorporate emergency responses into the project complying with the requirements under the Occupational, Health and Safety Policy of the contractor and the relevant Bhutan legislation including but not limited to the *Regulation on Occupational Health, Safety and Welfare* (see Annexure XIII of the Full Funding Proposal).

8.21.1 Performance Criteria

331. The following performance criteria are set for the construction of the projects:

a. no incident of fire outbreak;

b. no failure of water retaining structures;

c. no major chemical or fuel spills;

d. no preventable industrial or work-related accidents;

e. provide an immediate and effective response to incidents that represent a risk to public health, safety or the environment; and

f. minimise environmental harm due to unforeseen incidents.

8.21.2 Monitoring

332. An emergency response monitoring program has been developed for the projects (Table 30). The program is subject to review and update at least every two months from the date of issue. Importantly, visual inspections will be conducted by the contractor daily with reporting to GNHC and UNDP staff on a weekly basis (minimum) noting any non-conformances to this ESMP.

8.21.3 Reporting

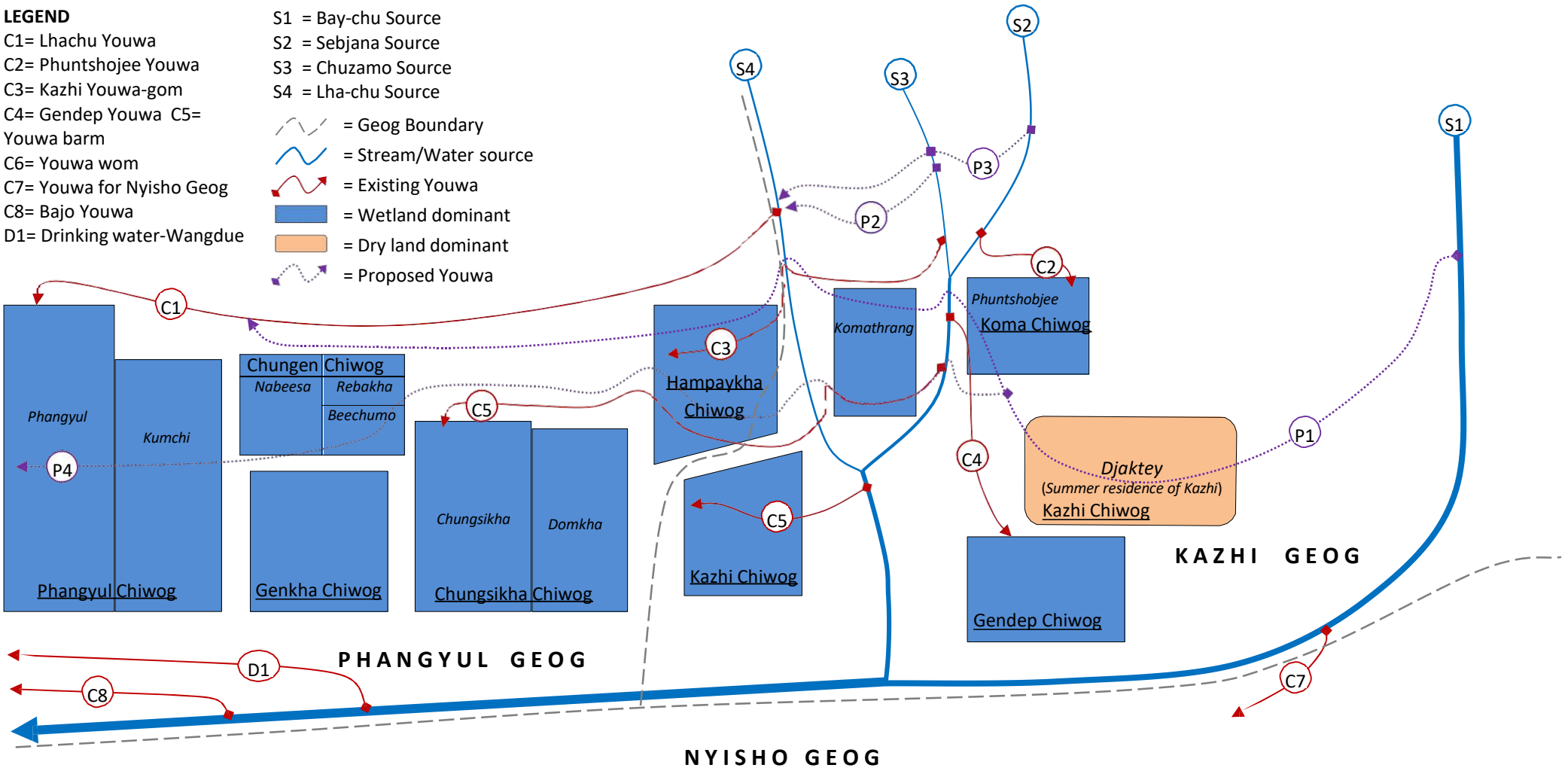
333. The GNHC and UNDP staff must be notified immediately in the event of any emergency, including fire or health related matter including those that have resulted in serious environmental harm.

Table 30 Emergency Management Measures

Issue	Control activity (and source)	Action timing	Responsibility	Monitoring & reporting
E1. Fire and Emergency management and prevention strategies implemented	E1.1: Flammable and combustible liquids bunding/storage areas to be designed in accordance with appropriate international standards	Pre and during construction	Contractor	Daily and maintain records
	E1.2: Fire extinguishers are to be available on site	During construction	Contractor	Daily and maintain records
	E1.3: No open fires are permitted within the project area	During construction	Contractor	Daily and maintain records
	E1.4: Communication equipment and emergency protocols to be established prior to commencement of construction activities.	During construction	Contractor	Daily and maintain records
	E1.5: Train all staff in emergency preparedness and response (cover health and safety at the work site).	During construction	Contractor	Daily and maintain records
	E1.6: Check and replenish First Aid Kits	During construction	Contractor	Daily and maintain records
	E1.7: Use of Personal Protection Equipment	During construction	All Personnel	Daily and maintain records

Annexure One Plans for the Existing and Proposed Channel Network in Kazhi and Phangyul Gewog

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing & Proposed*



Proposal

P1 = Construct channel from Bay-chu source → ***channel construction will affect about 1.2 acres of wetland in Komathrang and Phuntshobjee …***

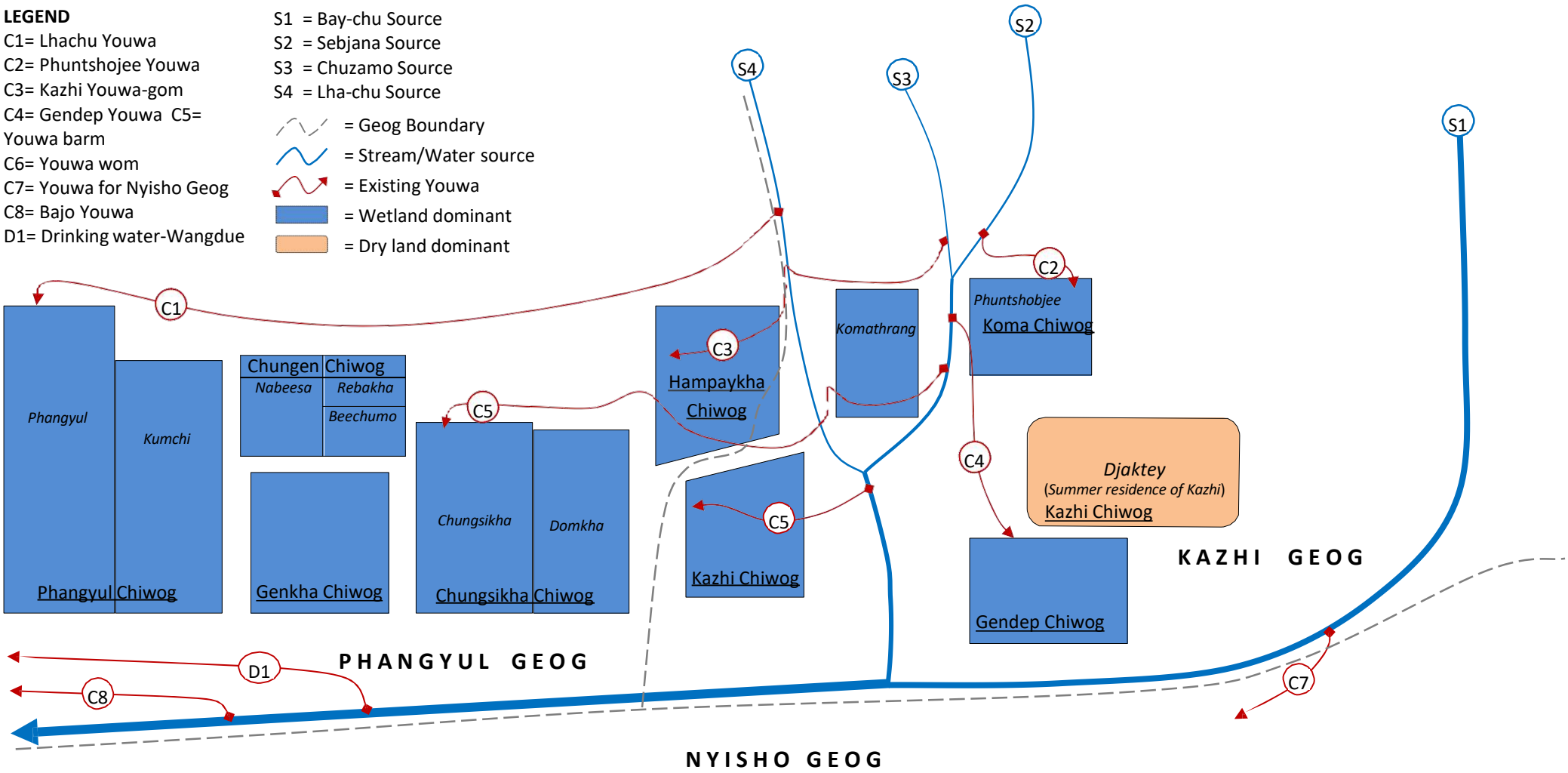
P2 = Exchange of source: Bay-chu with Chuzamo Source (100%)→ ***Source is too small and will not benefit Phangyul farmers- hence request to include Sebjena source …***

P3 = Exchange of source: Bay-chu with 50% of Chuzamo & 50% Sebjena source→ ***Gendep farmers feels they will have to maintain longer irrigation channel + they have cultural attachment to the source…***

P4 = As in P1 till Phuntshobjee but realign along Youwa-barm in Komatharang and completely new alignment thereafter→ ***Not benefit all the farmers in Phangyul + views of other stakeholders are not known yet…***

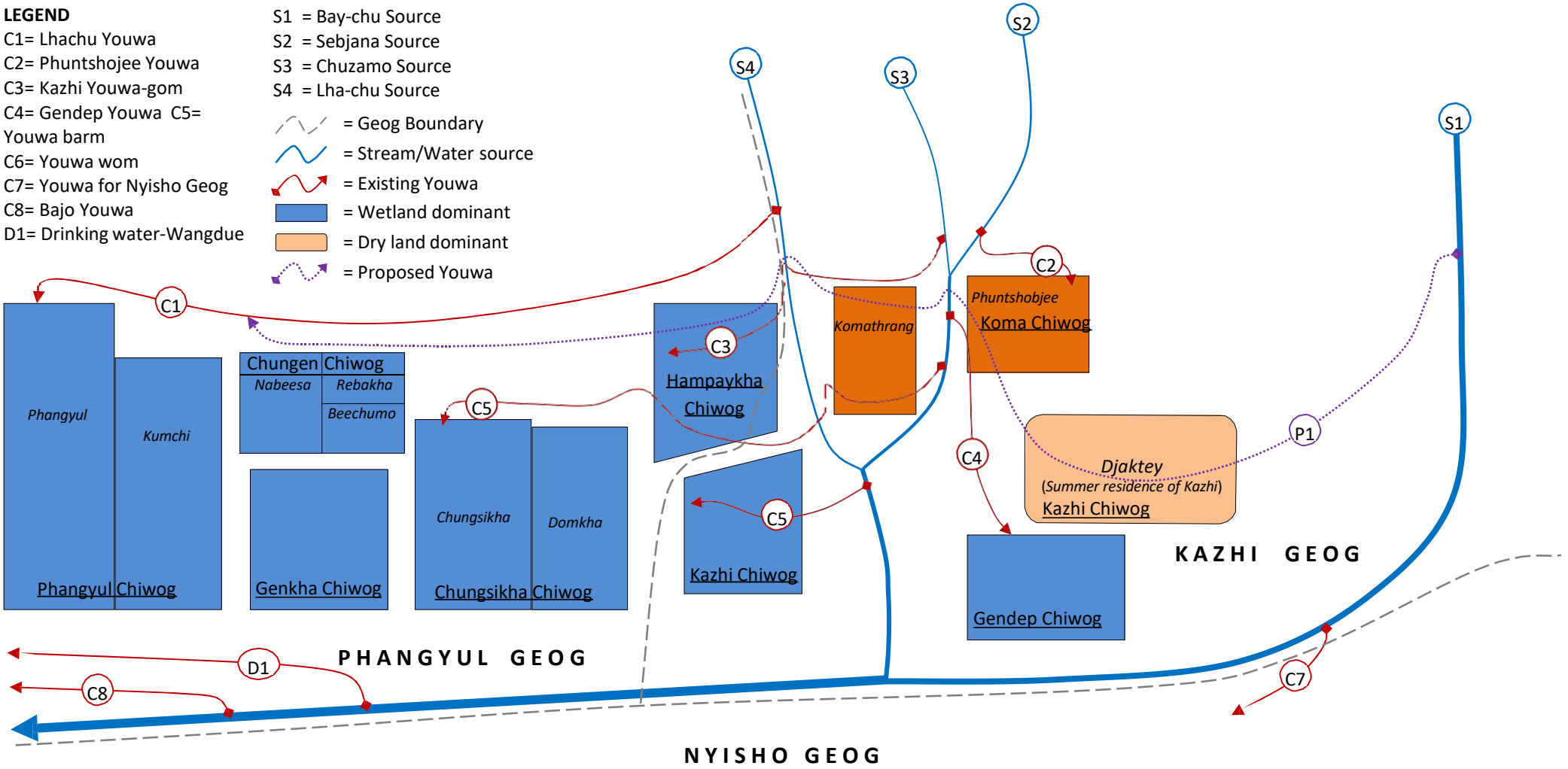
Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing*



Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing & Proposed P1*



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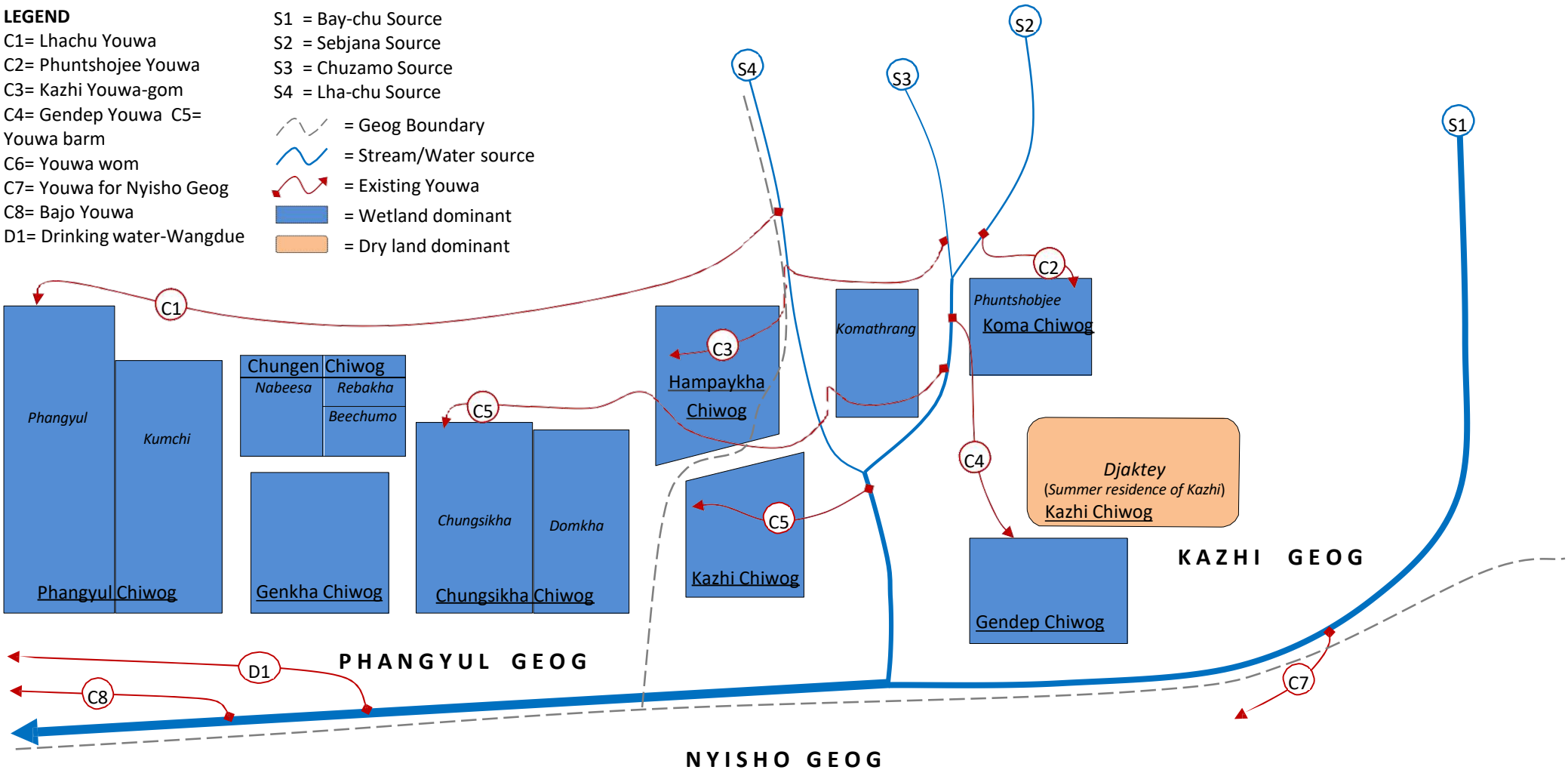
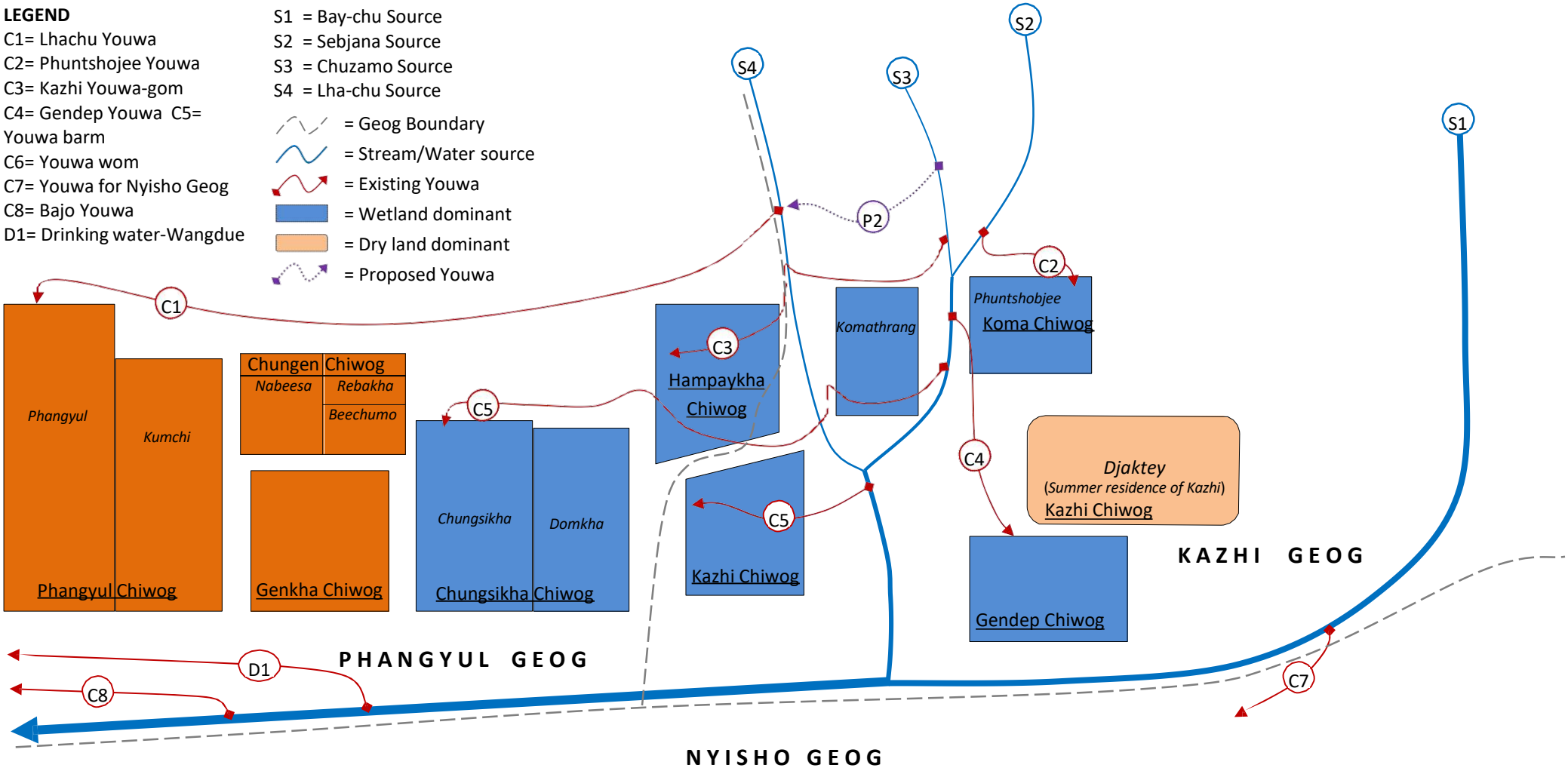
Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing*



Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing & Proposed P2*

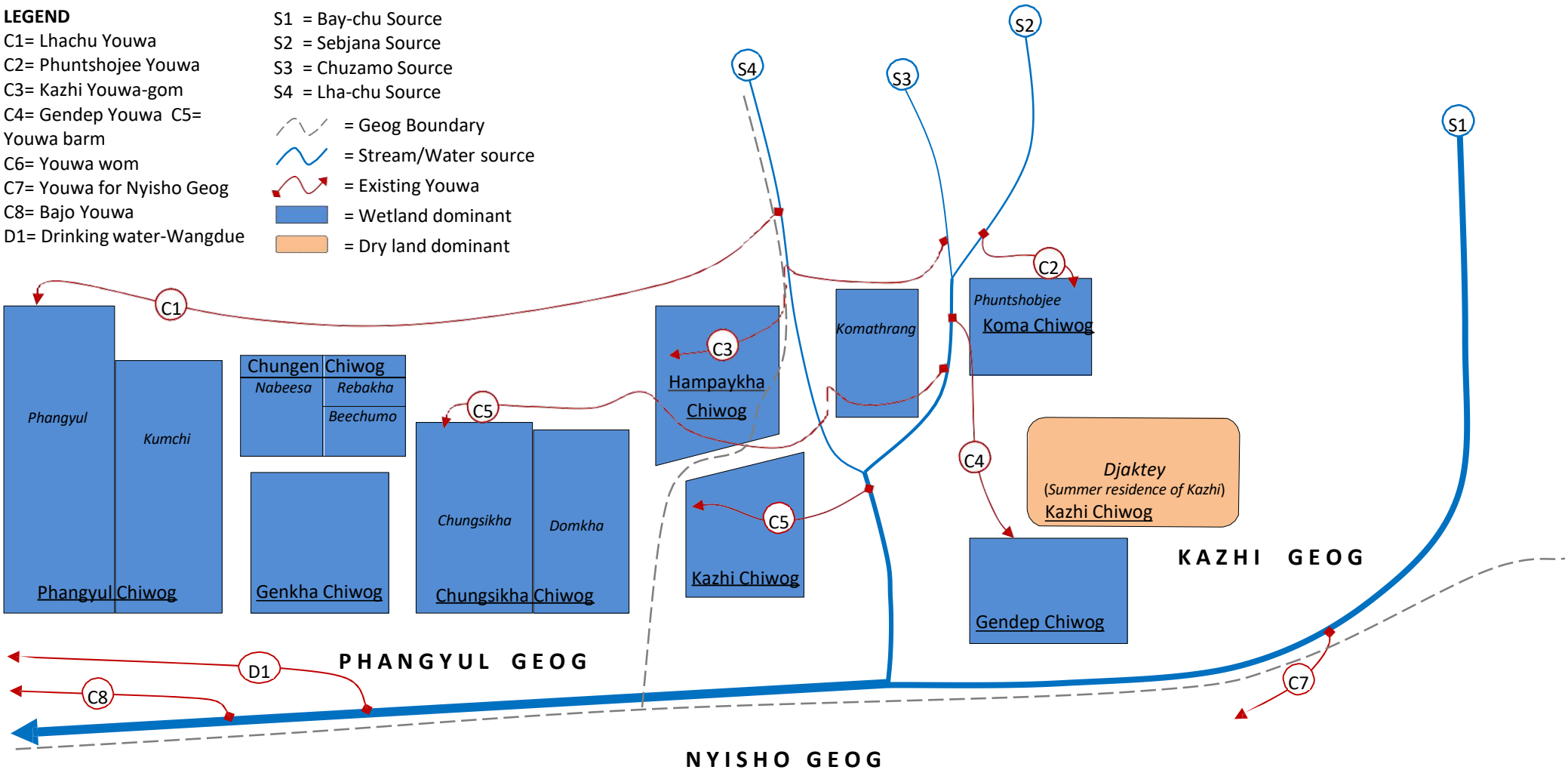


Proposal

P2 = Exchange of source: Bay-chu with Chuzamo Source (100%)→ ***Source is too small and will not benefit Phangyul farmers- hence request to include Sebjena source …***

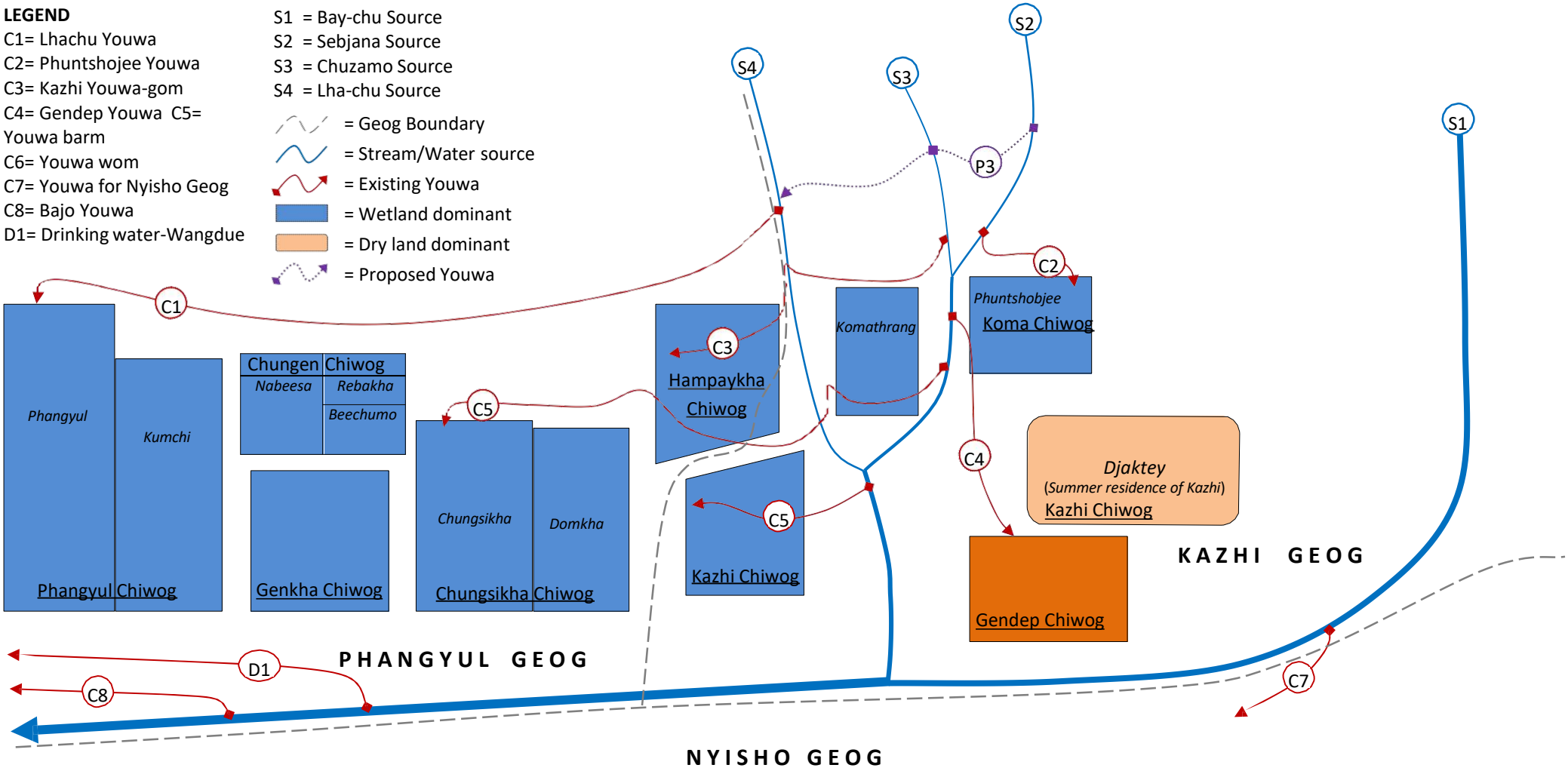
Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing*



Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing & Proposed P3*

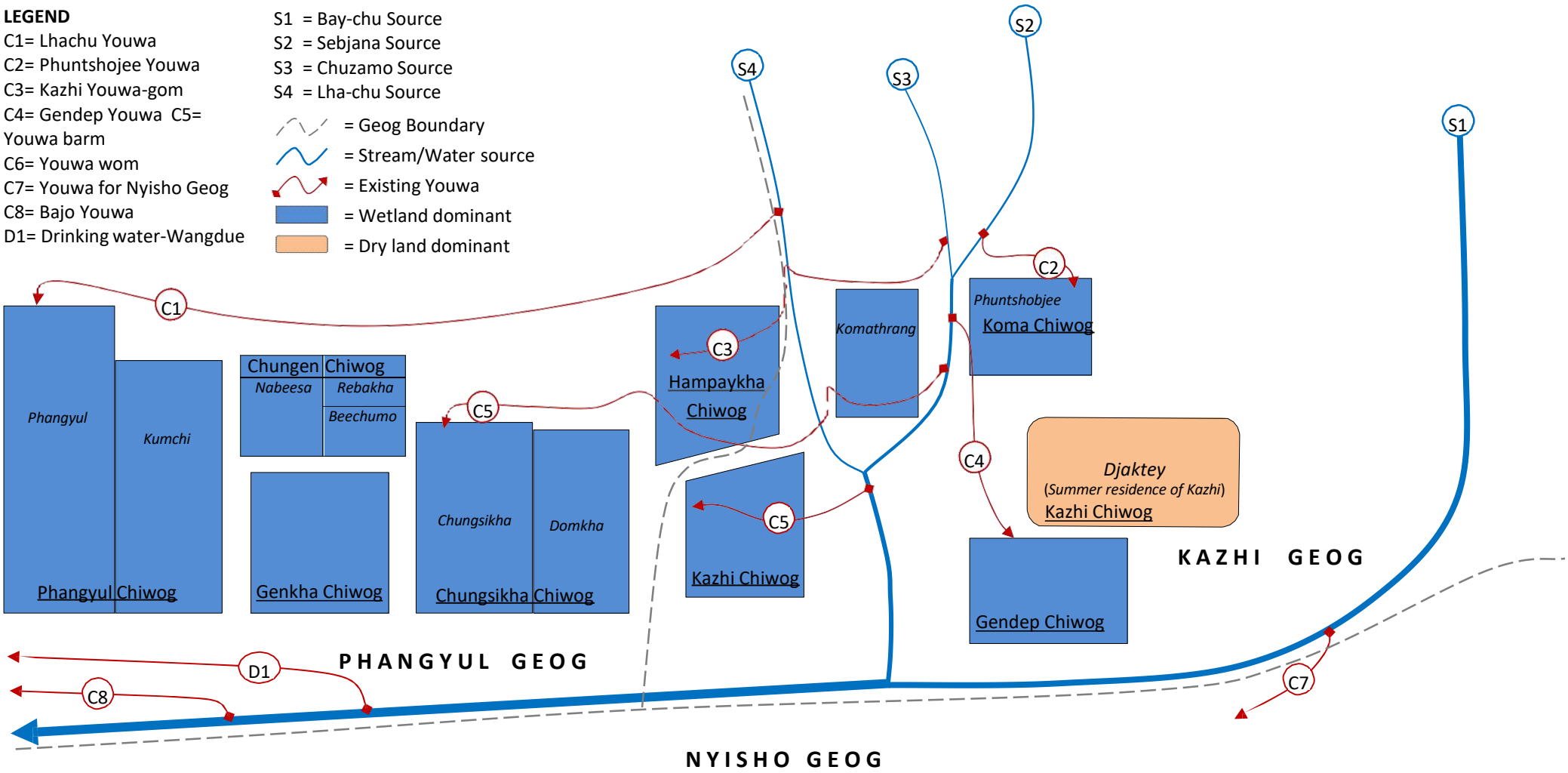


Proposal

P3 = Exchange of source: Bay-chu with 50% of Chuzamo & 50% Sebjena source→ ***Gendep farmers feels they will have to maintain longer irrigation channel + they have cultural attachment to the source…***

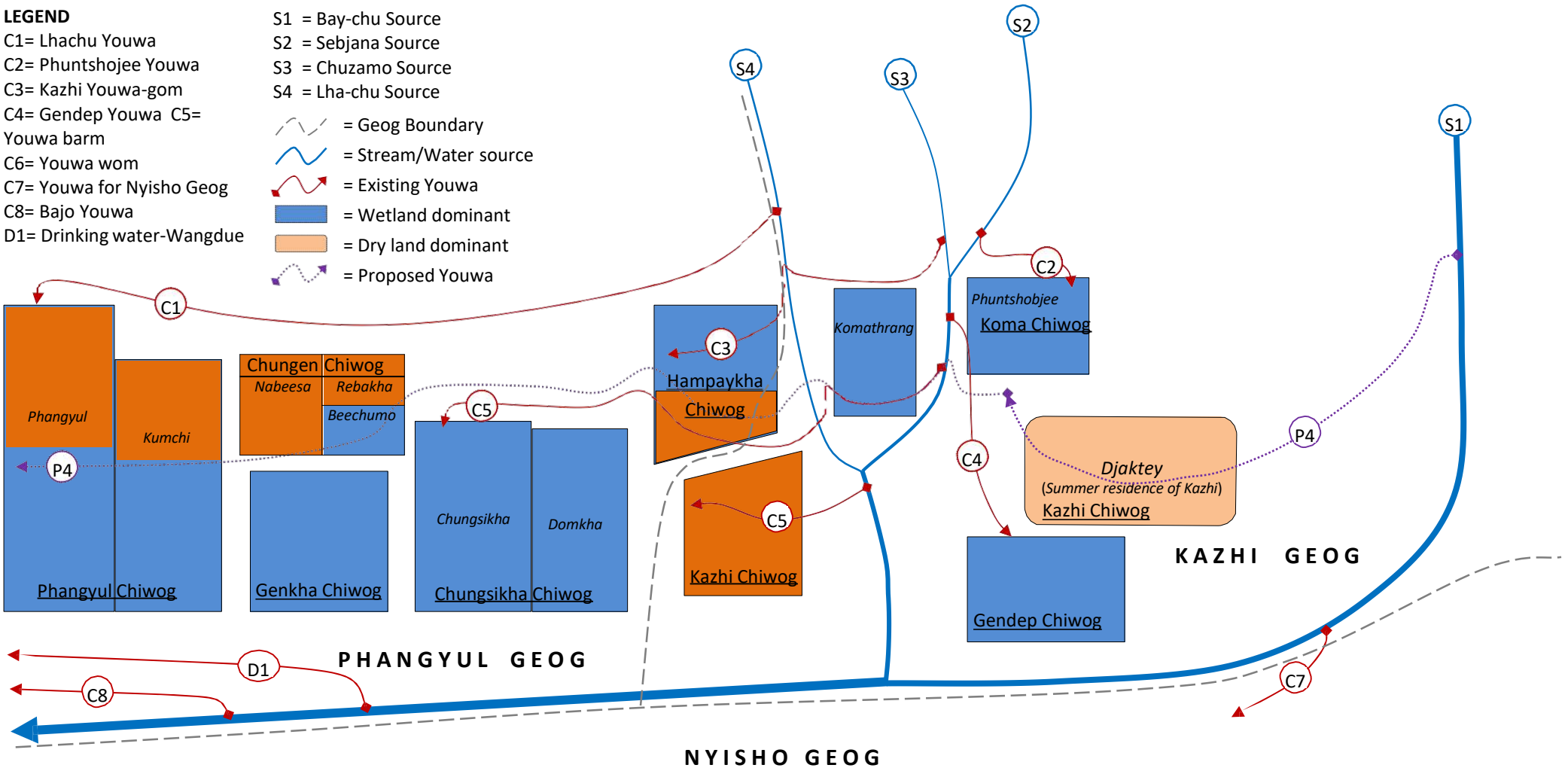
Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing*



Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing & Proposed P4*

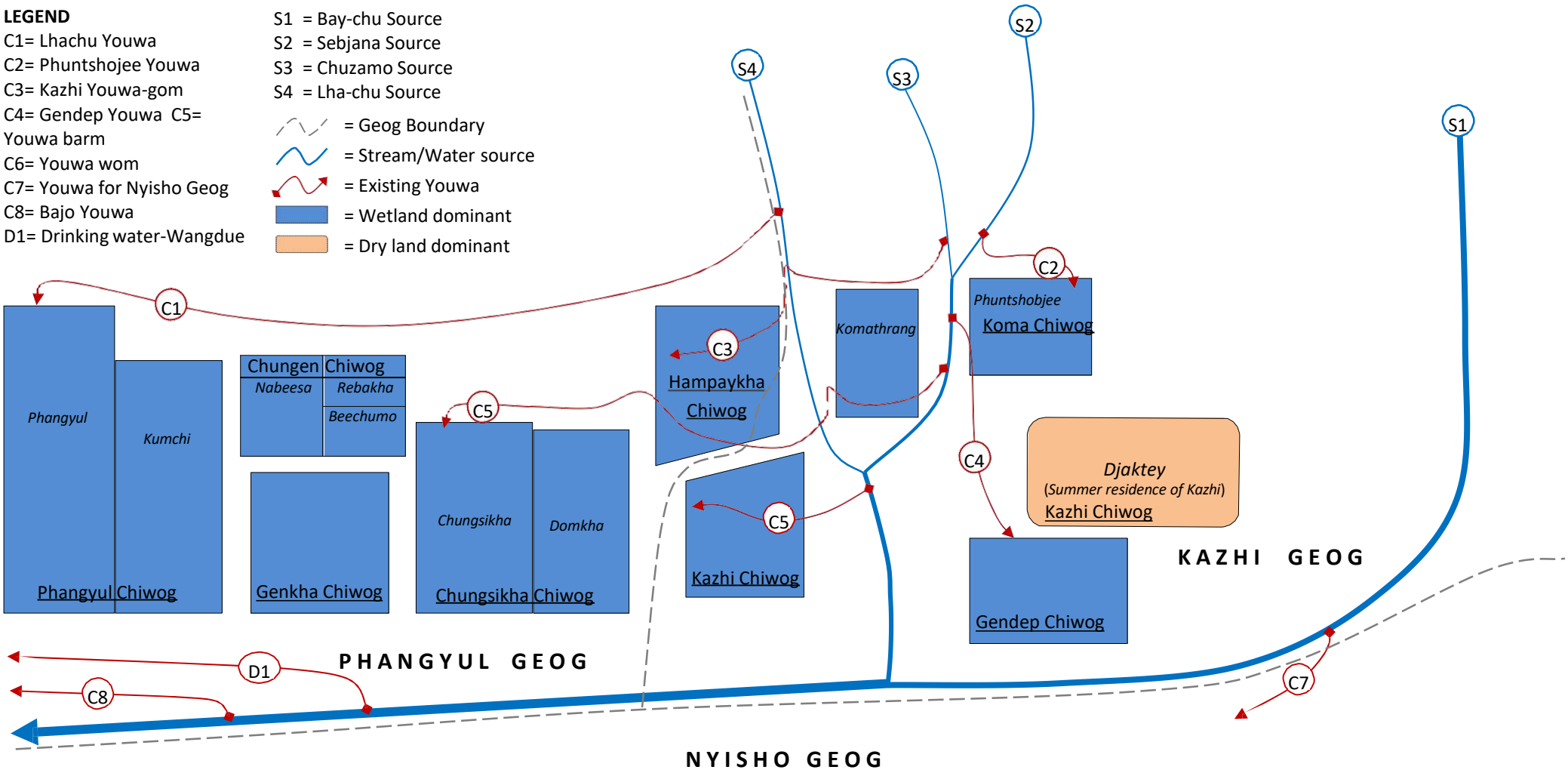


Proposal

P4 = As in P1 till Phuntshobjee but realign along Youwa-barm in Komatharang and completely new alignment thereafter→ ***Not benefit all the farmers in Phangyul + views of other stakeholders are not known yet...***

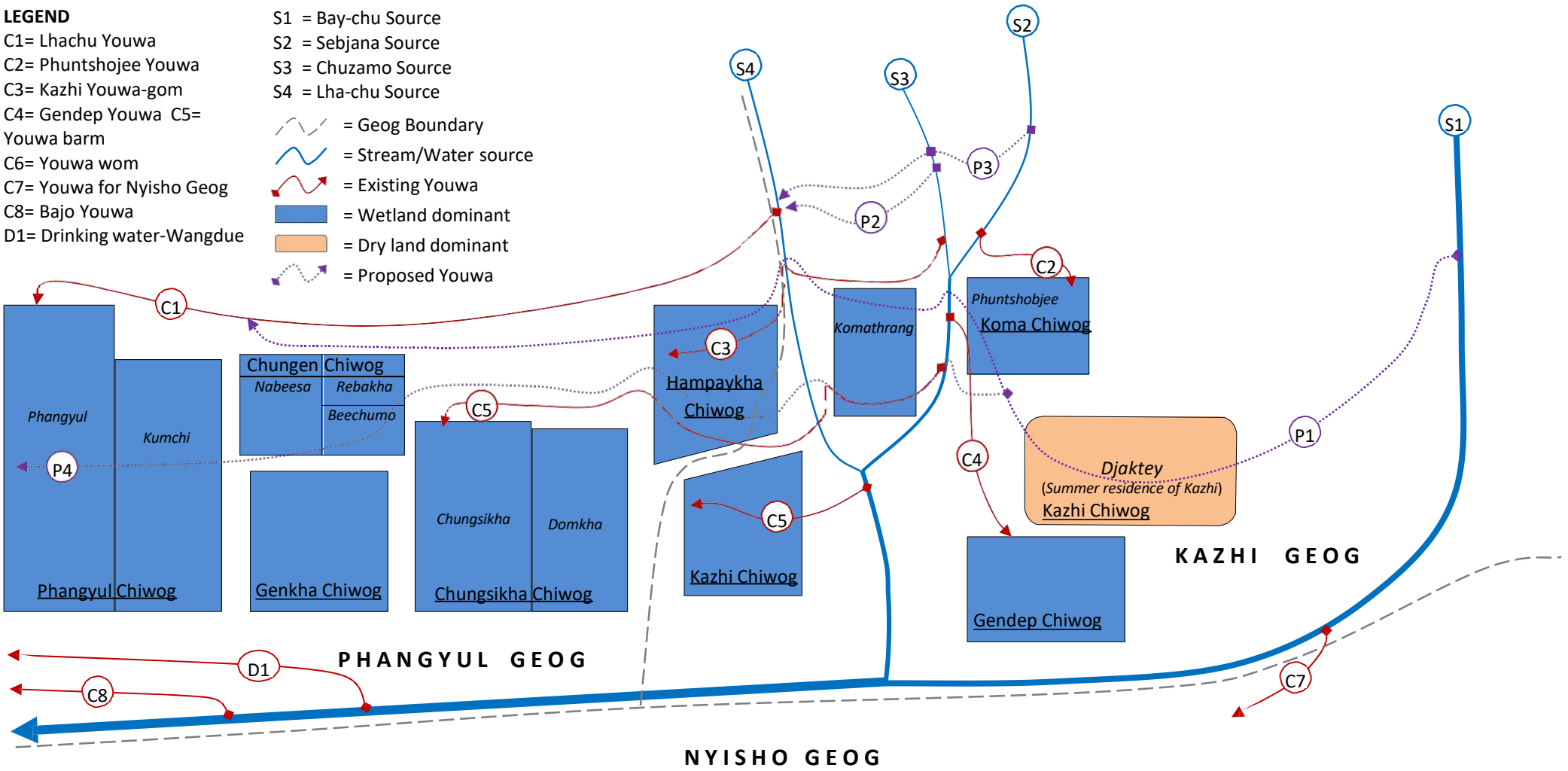
Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing*



Sketch on 06-09-2012

SKETCH PLAN OF CHANNEL NETWORK IN KAZHI & PHANGYUL GEOG: *Existing & Proposed*



Proposal

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Sketch on 06-09-2012

Annexure Two Overview of Potential Pumping Solutions

Proposed Gravity Channel

Proposed gravity open channel of 34.0 km long with 700 lps design capacity and 1000 acres designed command area.

Gravity_Intake 2168m

Chungdi Gonpa

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

N

2 km

Google Earth

Proposed Gravity Channel

Proposed gravity open channel of 34.0 km long with 700 lps design capacity and 1000 acres designed command area.

Gravity_Intake 2168m

Chungdi Gonpa

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

N

2 km

Google Earth

Proposed Pumping All Options

Overall plan

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Google Earth

Image © 2017 CNES / Airbus

N

2 km

Proposed Gravity Siphon Pipeline

Proposed gravity inverted siphon pipeline of 15.1 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

Delivery 2080m

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

N

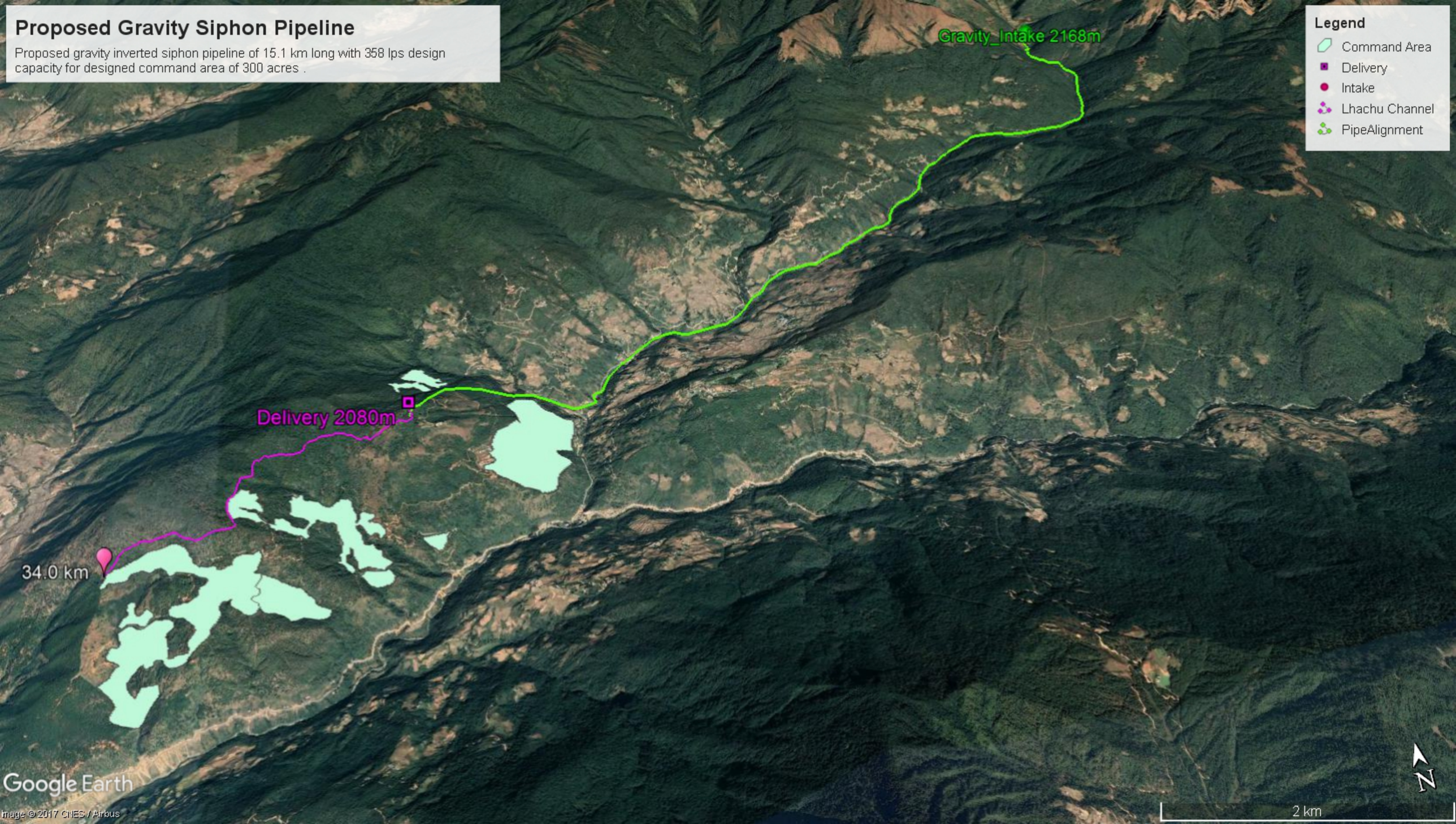
2 km

Google Earth

Image © 2017 CNES / Airbus

Proposed Gravity Siphon Pipeline

Proposed gravity inverted siphon pipeline of 15.1 km long with 358 lps design capacity for designed command area of 300 acres .



Proposed Gravity Siphon Pipeline

Proposed gravity inverted siphon pipeline of 15.1 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

Delivery 2080m

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

N

2 km

Google Earth

Image © 2017 CNES / Airbus

Proposed Pumping Option B1

Proposed pumpping with inverted siphon pipeline of 12.4 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

PumpingB1_Intake 2077m

Delivery 2080m

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

N

2 km

Proposed Pumping Option B1

Proposed pumpping with inverted siphon pipeline of 12.4 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

PumpingB1_Intake 2077m

Delivery 2080m

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Google Earth

Image © 2017 CNES / Airbus

N

2 km

Proposed Pumping Option B1

Proposed pumpping with inverted siphon pipeline of 12.4 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

PumpingB1_Intake 2077m

Delivery 2080m

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

N

2 km

Proposed Pumping Option B2

Proposed pumpping with inverted siphon pipeline of 4.4 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

PumpingB2_Intake1584m

Delivery 2080m

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Google Earth

Image © 2017 CNES / Airbus

N

2 km

Proposed Pumping Option B2

Proposed pumpping with inverted siphon pipeline of 4.4 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

PumpingB2_Intake1584m

Delivery 2080m

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Google Earth

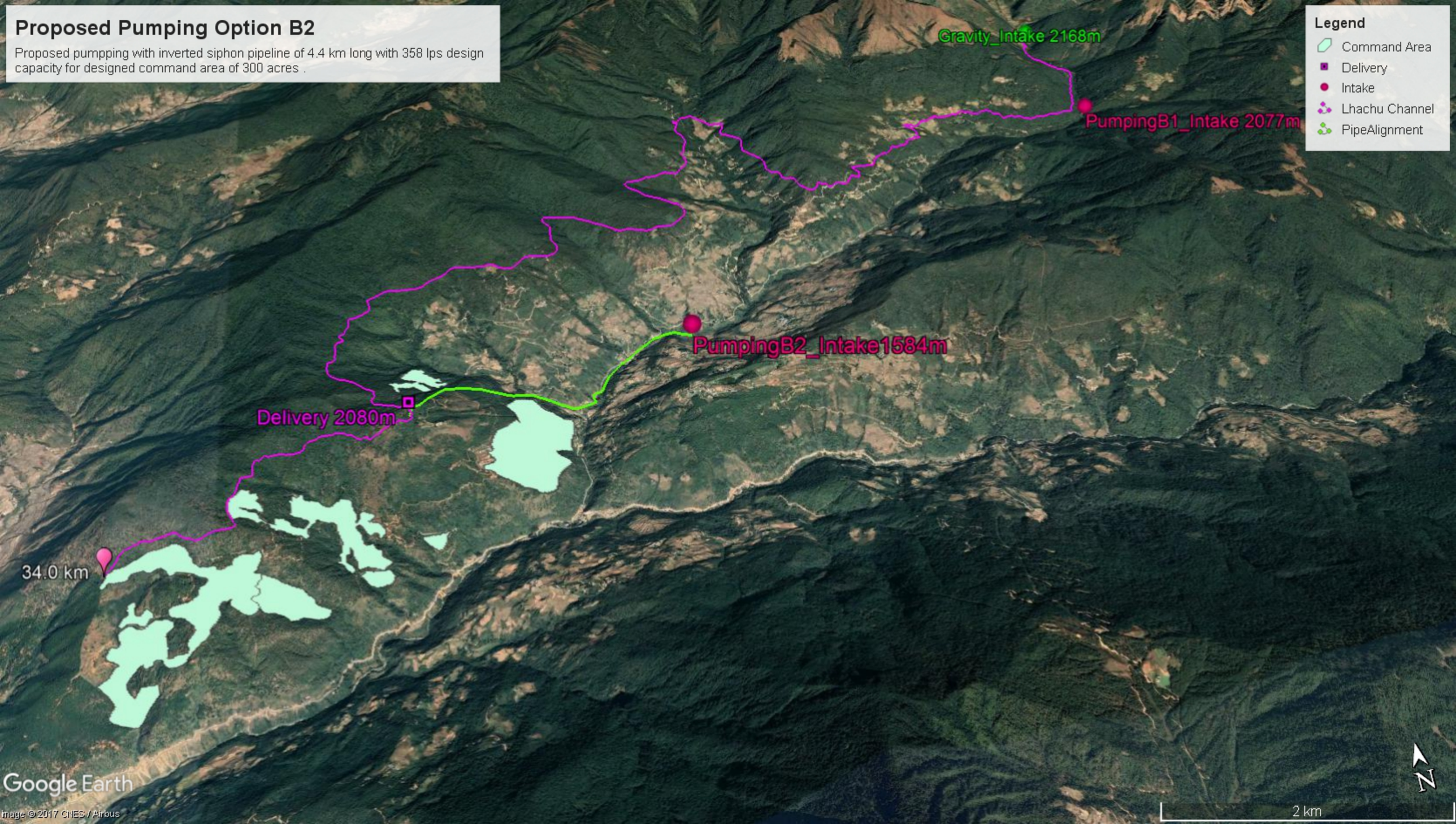
Image © 2017 CNES / Airbus

N

2 km

Proposed Pumping Option B2

Proposed pumpping with inverted siphon pipeline of 4.4 km long with 358 lps design capacity for designed command area of 300 acres .



Proposed Pumping Option B

Proposed pumpping with inverted siphon pipeline of 2.2 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

Delivery 2080m

Intake

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Google Earth

Image © 2017 CNES / Airbus

N

2 km

Proposed Pumping Option B

Proposed pumpping with inverted siphon pipeline of 2.2 km long with 358 lps design capacity for designed command area of 300 acres .

Gravity_Intake 2168m

Delivery 2080m

Intake

34.0 km

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Google Earth

Image © 2017 CNES / Airbus

N

2 km

Proposed Pumping Option B

Proposed pumpping with inverted siphon pipeline of 2.2 km long with 358 lps design capacity for designed command area of 300 acres .

Legend
- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Gravity_Intake 2168m

PumpingB1_Intake 2077m

PumpingB2_Intake1584m

Delivery 2080m

Intake

34.0 km

Google Earth

Image © 2017 CNES / Airbus

N

2 km

Proposed Pumping All Options

Overall plan

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

Gravity_Intake 2168m

PumpingB1_Intake 2077m

PumpingB2_Intake1584m

Chungdi Gonpa

Delivery 2080m

Intake

34.0 km

Delivery 1853m

Google Earth

Image © 2017 CNES / Airbus

N

2 km

Proposed Pumping All Options

Overall plan

Channel Intake_Baychu S (2280)

Gravity_Intake 2168m

PumpingB1_Intake 2077m

PumpingB2_Intake1584m

Chungdi Gonpa

Delivery 2080m

Delivery Point 2080m

34.0 km

Delivery 1853m

Legend

- Command Area
- Delivery
- Intake
- Lhachu Channel
- PipeAlignment

N

2 km

Annexure Three Community Consultation and Stakeholder Engagement Information

SUPPORTING CLIMATE RESILIENCE AND TRANSFORMATIONAL CHANGE IN THE AGRICULTURE SECTOR IN BHUTAN

Community Engagement Report in GCF Project Areas

and

STAKEHOLDER ENGAGEMENT PLAN

UNDP 2018

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Consultation and feedback of GCF Project Design Team

The Field information and feedback reflects that the field scenario adequately justify necessary support from the GCF to address the urgent needs of the agricultural and infrastructural sectors in adapting to climate change and the challenges inhibiting long-term economic growth. Therefore, it is important to promote sustainable use of terrestrial ecosystems through measures of protection and restoration by management of forests, watersheds, combating desertification, and reversing land degradation and halting loss of biodiversity.

The consultations and discussions also raised issue of women likely to be impacted more than men due to the current workloads (cooking, water, vegetables production, marketing, and looking after children. GCF project is expected to support in gender mainstreaming in light of increasing roles and responsibilities of rural women in overall development of agriculture and higher degree impact to the women due to climate change. The women in the project sites are expected to be engaged more actively in planning, management of activities and leadership roles.

Figure 1. Khengrig Namsum cooperatives in Zhemgang

The GCF project is feasible in the context of recurrent monsoon miseries to the people due to climate change impact and prolonged drought for crop productions. Therefore, there is a need to support to attain the sustainable development goals focused to climate adaptation and mitigation measures in the improvement and scaling up of earmarked activities under **Punakha, Wangdue, Dagana, Trongsa, Zhemgang, Tsirang, Sarpang and Samtse.**

The proposed eight Dzongkhags need support in terms of interventions areas and outputs designed in line to the climate change impact which has been acknowledged that the climate change impacts have been an emerging core issues in agriculture, livestock and infrastructure sectors. The following have been the outcomes of the discussions meeting with the stakeholders and clients during the consultations:

- ✓ The climate-resilience of Agriculture and Livestock sub-sectors will be improved with enhanced productivity to strengthen food security and enhance marketing of surplus productions through management of irrigation and watersheds besides promotion of climate-smart strategies
- ✓ The existing climatic vulnerable roads, Farm Road, Geog Connectivity Road, and vulnerable points of highways will be improved and scaled up with climate resilient design to strengthen and support market access with year-round connectivity for agriculture commercialization leading to increase in production and sales. The climate proofing of these infrastructure is expected to bring down the recurrent monsoon rehabilitation expenditures by at least 70% against the huge money spent every year.
- ✓ Skills developed, enhanced market analysis, value additions, value chain development, PPP development, NGOs support in marketing are noted to be the key areas of interventions to improve marketing of agriculture produce. The feedback also highlighted on the climate change research and development and climate-based knowledge building in programme planning and implementation to improve overall agriculture livelihoods.

Results from consultations will be used to inform development of the GCF project, also factoring in climate rationale and ongoing/planned interventions by partners.

Local Climate Change Vulnerability Assessment and Adaptation Planning

The objective of this assignment was to assess the climate change vulnerabilities to local livelihoods, including livelihood assets/ resources, identify existing and potential community-level adaptation responses and associated local capacity development needs to reduce the vulnerabilities. The findings of the assessment were vital to the formulation and design of the GCF project.

Although a household level survey is desirable to understand the real hardship of individual households and farmers, the assessment focused on sub-district level consultation with adequate representation of communities. The idea was that for the purpose of providing the required information for project formulation, gewog level information would suffice and that detailed surveys will have to be taken up during the project implementation to collect real-time baseline data. Therefore, a PRA at the Chiwog/village level has been carried out.

Table 1: Survey Area selection framework

Geographical location

Dzongkhag	Gewog	Chiwog/village
Dzongkhag	**Gewog**	
Trongsa	Korphu	5
	Tangsibji	5
Sarpang	Jigmechholing	6
Wangdue	Athang	5
	Dangchhu	5
	Phobji	5
Punakha	Toepisa	5
Zhemgang	Trong	5
	Nangkor	5
5	**9**	**46**

Field Survey and Data collection

Participatory discussions as well as key informants were engaged to derive information from the targeted respondents in the selected Gewogs and Chiwogs/villages. These exercises were guided by the structured questionnaires to assess community level climate change vulnerabilities. The following information at community level was collected through the PRA and key informants;

A. To assess vulnerability of people, livestock, physical assets/resources to adverse effects of climate change:

- Type and extent of community assets affected by climate change;
- Extent of adoption of climate-resilient technologies/practices.

B. To assess institutional and technical capacities for effective climate change adaptation:

- Sources of information on climate, early warning and related services;
- Trainings to assess climate change assessment/planning for adaptation or technologies

C. To assess climate change adaptation into relevant policies, plans and associated processes:

- Institutional arrangements to lead, coordinate and support the integration of climate change adaptation into relevant policies, plans and associated processes;
- National and sector-wide polices, plans and processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures;
- Local level plans and processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures;

- National and local level systems and frameworks for monitoring, reporting and review of adaptation.

The respondents at the Gewog level included the Gewogs RNR and health officials. Chiwog level PRA participants included local community household members from selected Chiwogs with representation of both men and women. Data at Gewog level on land and livestock population were taken from secondary sources.

Data compilation and analysis

Upon completion of Survey, data compilation was done in Access Database. Relations between different tables were built in the database and linked tables were transferred to excel database. Final analysis was done in excel based on tables imported from Access database. In addition, landscape and Gewog level maps were produced to highlight vulnerabilities across space. The analysis covered community level vulnerabilities to adverse effects of climate change as described under chapter 2. The following indicators define the survey area.

Figure 2: Community consultation with Khemdro-Nimphen Village, Phobjikha

Table 2: Climate Change related issues reported at Gewog Level by communities

Issues Reported	% of Survey Gewogs
Damage to farm roads due to poor drainages, landslides, erosion & floods	44.4
Drying up of water sources	33.3
Ban on retaliatory killing has increased wild boar population inflicting more damage	27.8
Conflicts in the community due to shortage of water	22.2
Soil erosion due to heavy rainfall	16.7
Reluctance of some farmers in electric fencing	11.1
No capacity in protection of critical land areas	11.1
No capacity in water management	11.1
Weak community ownership in maintenance works of farm roads	5.6
Unsuccessful plantations for land protection due to drought	5.6
Availability of NWFP is declining	5.6
Damage of water pipes	5.6

The assessment of local level adaptation measures and proposals on adaptation to climate change indicate that actions related to adaptation to climate change are fragmented and show weak coordination towards a commonly understood direction. Therefore, there is need to strengthen linkages across local level sector development plans and climate change adaption interventions. The issues pointed out related very much to local level development issues but do not indicate clear connection to climate change and reflect isolated issues that may or may not relate to climate change. Therefore, there is the need for such linkages across local level sector development plans. Likewise, national level policies and programs such as focus on renewable energy, watershed management, Environment Committees at Dzongkhag and Gewog levels, Electrical vehicles etc. do not emerge in local level discussions. Therefore, there is also need to strengthen such linkages with national level policies and programs.

The government has recognized that disaster risk management is an important entry point for stimulating livelihood adaptation. A national disaster management framework with actions and at the national, Dzongkhags, Thromde and Gewog levels is in place. Development programs increasingly recognize the need to reflect climate change issues in their activities. Within the MoAF, the concept of Climate Smart

Villages and climate smart agriculture is recognized as an intervention strategy to build resilience of communities and local production systems with strong emphasis on poverty alleviation and food security.

Figure 3; Community Consultation with Ada-Rukha Village

However, the RNR extension officials, who are the key facilitators for local actions and do not seem to have adequate awareness on climate change issues and more importantly on how to assess climate change vulnerability as well as in adaptation planning. Of all training programs to extension staff as well as to farmers in the 11th FYP local plans, there is hardly recognizable mention of training related to climate change.

Analysis of Chiwog level survey responses show that 31.71% of information on climate change is received through television, 25.61% through radio and 18.29% through friends. Only 9.76% is received through Gup offices, 8.54% is through trainings/workshops, and 2.44% through G2C centres. This indicates that there is minimal information on climate change issues made available through formal channels. Hence, there is scope for strengthening capacity of formal institutions such as the Gewog centres, associations and extension staff to be able to assess, maintain and disseminate climate related information to communities.

To enable building local capacities and abilities to address the complex, inter-sector climate change concerns, it is imperative to enable adequate understanding interpretation of climate change issues, risks and impacts based on which local level policies and programs and be initiated.

The survey has not been able to capture the level of local communities' understanding of climate change and related issues except for their observation of changes and sources of information on climate change. To enable the local communities to come up with appropriate local level policies, programs and actions there is need for sensitization on climate change, risks and impacts on local environment, livelihood options and well-being. Along the same line, consultations related to planning climate change interventions at local levels should be accompanied with awareness and sensitization on such topics.

Table 3: Community Assessment of changes in climatic factors

Total Participants	M	F	M+F
	187	299	486

Climate factors	Observed change			Observed Decrease			Observed Increase		
	Male	Female	M+F	Male	Female	M+F	Male	Female	M+F
Summer temperature	176	277	453	9	12	21	167	264	431
Winter temperature	157	258	415	80	85	165	77	173	250
Rainfall Patterns	155	246	401	63	83	146	92	163	255
Snowfall	87	197	284	86	186	272	1	11	12
Frost Patterns	47	110	157	46	99	145	1	11	12
Hailstorm Events	138	208	346	43	48	91	95	160	255
Windstorm Events	149	249	398	7	5	12	142	244	386

Climate factors	Observed change (%)	Decreased (%)	Increased (%)

	Male	Female	M+F	Male	Female	M+F	Male	Female	M+F
Summer temperature	94.1	92.6	93.2	5.1	4.3	4.6	94.9	95.3	95.1
Winter temperature	84.0	86.3	85.4	51.0	32.9	39.8	49.0	67.1	60.2
Rainfall Patterns	82.9	82.3	82.5	40.6	33.7	36.4	59.4	66.3	63.6
Snowfall	46.5	65.9	58.4	98.9	94.4	95.8	1.1	5.6	4.2
Frost Patterns	25.1	36.8	32.3	97.9	90.0	92.4	2.1	10.0	7.6
Hailstorm Events	73.8	69.6	71.2	31.2	23.1	26.3	68.8	76.9	73.7
Windstorm Events	79.7	83.3	81.9	4.7	2.0	3.0	95.3	98.0	97.0

Gewog Connectivity Roads Assessment in GCF Project Districts

Examining the existing status of gewog connectivity (GC) roads in the target project areas and their vulnerability to various climate-induced hazards, identifying and prioritizing the gewog connectivity roads that require to be strengthened for higher climate-resilience and analysing the costs and benefits of enhancing climate resilience of those roads were part of the project preparation phase.

Figure 4: Interaction with Roads Beneficiaries

Figure 5: Consultation with Local Leader and site engineer

Field visits to a total of 9 selected GC roads (Table 6) were undertaken for assessment in GCF targeted districts. Structured questionnaire survey was used to collect the required information. The key informants covered by the survey in the six GCF Dzongkhags included the local government officials like Gups, Gewog Administrative Officers, Mangmi and Tshogpas/communities. Furthermore, additional information was also collected from the engineers from the Department of Roads (DoR) at departmental head office Thimphu and field offices. Engineers from respective sites also accompanied during the field visits of the targeted roads. They provided valuable information about the road and also enabled during discussions and consultations with the local government officials and other public at the survey sites.

Table 6: Identification of GC roads for assessment by number and percentage

Sl. No.	Dzongkhag	No. of GC roads	GC road selected for study (Nos.)
1	Trongsa	3	1
2	Zhemgang	6	1
3	Sarpang	10	1
4	Tsirang	12	1
5	Wangduephodrang	15	4
6	Punakha	7	1
Total	**6**	**54**	**9**

Value Chain and Market Analysis of Renewable Natural Resources Products

The key objective of the value chain and market analysis assignment is to carry out value chain and market analysis of renewable natural resources commodities that can be produced from sustainable and climate-resilient livelihood practices. The findings of the assessment will be vital to the formulation and design of the GCF project, particularly in relation to development of climate-resilient livelihood options for the local communities.

Consultations with Key Stakeholders both in the Centre and Districts

Primary information has been collected through Focus Group Discussions (FGDs) and Key Informants Interview (KIIs) while one-to-one consultations were engaged with key informants in the *dzongkhags* as identified by *gewogs* corresponding to commodities. FGD discussion participants are provided in Annexure V.

Consultations with key stakeholders were as follows;

- Farmer groups and key informants such as village elders and progressive farmers
- Government officials
- Local Government officials
- Food Corporation of Bhutan
- Sersang Agriculture Exports Company
- Department of Trade, Ministry of Economic Affairs
- Member of Parliaments for BBIN, trade compacts and other issues
- Department of Agriculture Marketing and Cooperatives, MoAF.
- Bhutan Agro-Industries Ltd.

Secondary data sources have been derived mostly from the compilations of past years' data of Bhutan Trade Statistics, Agriculture Statistics, Livestock Statistics, Bhutan Agriculture Food and Regulatory Authority database and Food Corporation of Bhutan reports.

Field Visits to Target Project Areas by Landscape and Commodity Type

Field visits and commodity selection were undertaken corresponding to project districts, bearing in mind the following set of criterion;

1. Percentage cadastral area and associated beneficiary count of the *dzongkhag* and *gewog* falling under the specified landscape type.
2. Productive capacity of the commodity using past data and first-hand consultation with *dzongkhag* and extension officials.
3. Livelihood benefits, poverty alleviation potential and the degree of vulnerability.
4. Commodity resilient to extreme climatic conditions, e.g. drought/heat tolerance.
5. Role of women and men, and youth groups covering socially inclusive.
6. Markets, infrastructure and distance to markets.
7. Available of transportation facilities and road networks.

In addition to the above criteria the following observations were made while selecting the commodities under the respective landscapes;

1. Study inclusion of at least one commodity within each landscape as part of equal distribution of commodity value chain studies across the three landscape types.
2. Fair geographical distribution / representation across all three landscape types.
3. Commodity selection in addition to productive capacity is determined by choice distribution between

agriculture and livestock products.

4. Availability of information and personnel of the *dzongkhags* and *gewog* officials.

- Athang, Wangdue = Ginger
- Phobjikha, Wangdue = Potato
- Jigmecholing, Sarpang = Cardamom

Table 7: Tabular representation of commodities by dzongkhags.

Dzongkhag	**Commodities**	**Salient features of commodity choice**
Athang (Wangdue) Phobjikha (Wangdue)	Ginger Potato	Out of the total 23 *gewogs* under the landscape, 11 *gewogs* correspond to Wangdue *dzongkhag*, with 75% of area coverage of Athang and 55% of area coverage of Phobjikha falling within the landscape, leader in productive capacity for potatoes, livelihood option and poverty alleviation benefits, market value and export earnings, good road access, substantial income generation leading to improved livelihoods, climate resilient, long tested traditional knowledge and production experience, equal distribution of gender roles and responsibilities.
Jigmecholing, Sarpang	Cardamom	Climate resilient, 55% area coverage under landscape as compared to just 5% in Doban, productive capacity, cash income and poverty alleviation, road access, market value and future potential.

Crop and Livestock Compensation/Insurance against Climate-Induced disasters and wildlife incursions.

The objective of the assignment is to review crop and livestock loss to climate-induced disasters and wildlife incursions, examine existing and potential compensation/insurance/technical measures to mitigate losses, and propose viable options with special attention to community-based modalities. The findings of the assessment will be vital to the formulation and design of the GCF project, particularly in relation to development of climate-resilient livelihood options for the local communities and reduction of biodiversity threats from human-wildlife conflicts.

Table 8: Gewogs & Chewogs Covered in Sampled Dzongkhags

Dzongkhag	No. of Gewogs	No. of Chewogs
Wangdue	3	6
Punakha	1	2
Trongsa	2	4
Zhemgang	2	4
Sarpang	1	2
Total	9	18

Field Surveys

Fieldwork was designed to focus on the same areas identified and selected for the Climate Change Vulnerability Assessment, in order to exploit and benefit from more efficient data collection, than if the assignment were to be executed independently. In this way, any likely duplication and overlap was avoided with the other group. Most of the information required for climate change induced impacts on agriculture and crop loss was collected by the vulnerability assessment team.

PRA techniques and key informants' interviews were employed to derive information from targeted respondents in the selected Gewogs and Chewogs. For both PRA and key informant sources, a checklist of questions was administered to assess community level climate change vulnerabilities and climate change-induced wildlife incursions.

The following information at community level was collected through PRA and key informants:

Vulnerability of people, crops, livestock, physical assets/resources to adverse effects of climate change:

- Type and extent of assets strengthened and/or better managed to withstand the effects of climate change;
- Climate-resilient livelihood activities
- Extent of adoption of climate-resilient technologies/practices.

Climate change adaptation into relevant policies, plans and associated processes:

- Institutional arrangements to lead, coordinate and support the integration of climate change adaptation into relevant policies, plans and associated processes;
- Local level plans and processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures;
- Knowledge of and/or experience with crops and livestock compensation/insurance;
- Level of interest and financial ability to support crops and livestock compensation/insurance.

The checklist administered at Chewog level comprised of semi-structured questionnaires for which PRA sessions were used to derive the information.

Respondents at Gewog level included RNR extension agents and health officials of that Gewog, and also the Gup wherever possible. Chewog-level PRA participants included local communities from selected Chewogs, with representation of both men and women. Dzongkhag and Gewog-level information on land and livestock was extracted from secondary sources such as unpublished data from administrative records at the Department of Forests and Parks Services and the Department of Agriculture. In particular, crop damage trends for the years 2013 to 2015 were based on small area estimation conducted using current data.

Open-ended interviews were conducted at the centre with key, relevant resource managers to:

- identify the government's views on human-wildlife conflict in the study area,
- explore government's support for crop and livestock compensation/insurance,
- explore private sector interest in crop and livestock compensation/insurance, and identify the modalities to design pilot schemes for compensation/insurance for crops and livestock.

Assessment and Integration of Social, Environmental and Gender Standards in Project Design

The objective of this assignment is to screen the GCF project proposal for potential social and environmental risks and adverse impacts and ensure that necessary social and environmental safeguards and standards, especially including those related to gender, are integrated in the project design.

Study area and sampling

Based on the already identified project areas, following Dzongkhags, gewogs and villages were selected (Table 9). From the list of households in a village(s) available with the Gewog administration office, households were randomly selected and invited for an interview by the concerned gewog agriculture, livestock and forestry extension staff. Prior to interviews, the Dzongkhags and Gewogs administration offices were formally informed by the Gross National Happiness Commission.

Table 9. Number of persons interviewed by gender, Gewogs and Dzongkhags

Dzongkhag	Gewog	Men	Women	Total
Trongsa	Tangsibji	6	5	11
Wangdi Phodrang	Athang	6	3	9
Zhemgang	Trong	7	1	8
Dagana	Drujaygang	5	3	8
Tsirang	Rangthangling	3	3	6
Sarpang	Jigmecholing	4	3	7
Punakha	Guma	3	3	6
Samtse	Norbugang	7	5	12
Total		**41**	**26**	**67**

The heads of households either men or women who usually make a decision on behalf of the family were interviewed. The unit of observation was a household and information was solicited on household economy. The average ages of the respondents were; men (49 ± 15 (SD) ranged from 17-74 years and women (42 ± 11 (SD) ranged from 21-66 years. Altogether, 102 households with 58 men (57%) and 44 women (43%) were interviewed.

Participatory rural appraisal

Household interviews

Semi-structured questionnaires were administered to the respondents and information solicited using the tool 1, 2, and 3. Tool 1 identifies the division of task between men and women within a household**.** Depending on the local circumstances, men and women were asked to gather at a convenient place. As individual interviews progressed, the major activities were listed in the left-hand column and tallied against men, women or both in the right-hand column. Similarly, we solicited the information on access and control of land and natural resources using tool 2**.** Access was explained as an opportunity to use the resources. Access simply means that one is able to use the resources, but this says nothing about whether one has control over it. Control is the authority to determine the use of resources and impose a decision on others. A person who controls a resource is the one, who ultimately makes the decision. The difference between the practical and strategic needs was explained clearly and the respondents were asked to list down and priorities in the order of importance based on the frequency of priorities. Practical gender needs are those needs, which if they are met, would assist women and men in their current activities. Project interventions, which focused on meeting practical gender needs responds to an immediate necessity in a specific context,

often related to inadequacies in living conditions. Strategic gender interests are those needs, which if they are met, would enable women to transform existing power relations between men and women.

Focused group interview

After one-to-one interviews, the respondents were asked to gather in groups to solicit group views and suggestions by responding to key questions. Altogether, we consulted 12 groups with 57% men and 43% women. The gender differences in respondents were due to coincidence of the survey during women's busy agricultural schedule and monsoon-induced disaster risks. The focus group questions were similar to individual interviews used to corroborate the information solicited from household interviews. However, the questions were directed to retrieve information on what project or development interventions are needed to bring about gender equality and women's empowerment. The groups comprised of participants including local Government (Gups, Mangmi, Tshogpa, agriculture, livestock, and forestry extension) staff. The key questions were; i) what measures are appropriate to ensure women's access to benefits from land and natural resources; ii) women's access to and control over land, agriculture and forest resources; iii) reduce negative impacts on women; iv) improve women's ability in planning, decision-making and monitoring of development activities.

Field Mission by Project Preparation Team

The project preparation team made several field visits to various proposed project districts and met with various local government officials and communities to learn ground realities, seek clarification and interact with local government officials about the project.

Meeting with Park Managers and Chief Forest Officials: To understand various ongoing and planned conservation management programs/activities, coordination and linkages with adjacent biological corridors, key issues, etc. related to JSWNP.

Figure 7: Consultation with Trong Gewog communities, Zhemgang

Meeting with Dzongkhag/district officials: Unders the dzongkhag level, roles of dzongkhag administrations and gewog administrations, how the dzongkhag environmental committee functions, environment-climate change mainstreaming is done at dzongkhag level, etc.

Meeting with Gewog Administrations and communities: Understand the local development planning process, environment-climate change mainstreaming at the local level, community livelihoods and related climate change/ environmental sustainability issues, dzongkhag-gewog-chiwog coordination and planning linkages, etc. and elicit views on local climate change vulnerabilities and adaptation responses.

For detail list of communities consulted, refer annexure VII.

Stakeholder Engagement Plan

		Stakeholder Engagement Plan	
Outputs	**Activities**	**How**	**Stakeholders**
Output 1: Promote resilient agricultural practices in the face of changing climate patterns **Responsible Agencies:** NCHM, DoA, DoL, DAMC	Activity 1.1. Developing and integrating climate risk data into crop and livestock planning at the national and sub-national levels	This will be done through consultations and workshop. This will enable users at different levels to determine what type of data and in what form. This will inform help NCHM as data producers to generate demand-based information.	▪ National Centre for Hydrology and Meteorology (NCHM) ▪ Watershed Management Division ▪ Irrigation unit of the Department of Agriculture ▪ Department of Agriculture ▪ Irrigation unit of the Department of Agriculture ▪ DAMC ▪ Department of Livestock ▪ Dzongkhags & Gewog Extension services ▪ Project Dzongkhags & Local Government Administrations ▪ Research and Development Services
	Activity 1.2. Tailored climate information and related training to local government and farmers to interpret and apply climate risk data to local and household level agriculture planning	This will be done through consultations and workshops. It will allow users at different levels to identify information gaps or requirements and to determine related training. This will ensure NCHM training modules are tailored to different needs.	▪ National Centre for Hydrology and Meteorology (NCHM), extension services ▪ Watershed Management Division ▪ Irrigation unit of the Department of Agriculture ▪ Department of Agriculture ▪ Irrigation unit of the Department of Agriculture ▪ DAMC ▪ Department of Livestock ▪ Dzongkhags & Gewog Extension services ▪ Farmers Organizations ▪ Farmers beneficiaries ▪ Women and youth's farmers ▪ Research and Development Services ▪ Project Dzongkhags & Local Government Administrations ▪ Farmer Organizations (Groups/cooperatives) ▪ WUAs ▪ Farmers beneficiaries ▪ Women and youth farmers

	Activity 1.3. Scaling up climate-resilient agriculture practices, and training local entities in community seed production and multiplication and cultivation of climate-resilient crop alternatives	This will be done through workshops combined with field visit/demonstration at the Agriculture Research and Development Centre (ARDC). It will be led and facilitated by Department of Agriculture (DoA). The objective is to connect existing climate resilient technologies that are already under development at ARDC with different stakeholders. It will also provide an opportunity for the stakeholders to get firsthand exposure as well as share their own experiences. This way, it becomes participatory and inclusive.	▪ DOA, DOL, DoFPS, extension services, ARDCs ▪ DAMC ▪ Civil Societies and NGOs ▪ Farmers Organizations, Women's organizations, women, youths and beneficiaries' farmers ▪ Private sector ▪ Local Market middle agents ▪ Bhutan Export Association ▪ Extension service of the Dzongkhags ▪ Project Dzongkhags & Local Government Administrations
Output 2: Integrate climate change risks into water and land management practices that affect smallholders **Responsible Agencies:** DoA, DoFPS	Activity 2.1. Enhancing climate-informed wetland and water management to support agriculture planning	This will be done through workshops and community consultations. The workshop will help tease out issues related to wetland and water management.	▪ Watershed Management Division ▪ National Centre for Hydrology and Meteorology (NCHM) ▪ Irrigation unit of the Department of Agriculture ▪ Department of Agriculture ▪ Irrigation unit of the Department of Agriculture ▪ Department of Livestock ▪ Dzongkhags & Gewog Extension services ▪ Project Dzongkhags & Local Government Administrations ▪ WUAs ▪ Research and Development Services

	Activity 2.2. Establishment of climate resilient irrigation schemes and water saving technologies for smallholder farmers in 8 target dzongkhags	This will be done through meetings and focused group discussions and field work.	▪ Watershed Management Division ▪ Irrigation unit of the Department of Agriculture ▪ Dzongkhags & Gewog Extension services ▪ NGOs & Farmers Organizations, WUAs ▪ Research Centres ▪ Project Dzongkhags & Local Government Administrations
	Activity 2.3 Scaling up of sustainable land management (SLM) technologies to support soil and slope stabilization	This will be done through meetings and community consultations on range of issues and technologies that are applicable. Focused group meetings will also be encouraged, wherever necessary/applicable. Community/farmers exchange program will also be encouraged to support peer to peer learning and to share experiences	▪ DOA, DOL, DoFPS, extension services ▪ Watershed Management Division ▪ Farmers Organizations, Women's organizations, women, youths and beneficiaries' farmers ▪ Civil Society Organization and NGOs
	Activity 2.4 Capacity strengthening to farmers and extension officers on SLM technologies	This will be done through farmers' training and field demonstration program to provide practical field experience and knowledge on the application of SLM technologies	▪ Farmers Organizations, Women's organizations, women, youths and beneficiaries' farmers ▪ DOA, DOL, DoFPS, extension services ▪ Watershed Management Division ▪ Civil Society Organizations and NGOs
Output 3: Reduce the risk and impact of climate change induced landslides during extreme events that disrupt market access **Responsible Agencies:** Department of Roads (DoR), MoWHS	Activity 3.1. Slope stabilization along key sections of roads, critical for market access, and related technical capacity and knowledge products to support climate resilient road planning and construction going forward	This will be done through meetings to create technical awareness, and to also gather menu of ideas.	▪ DoR, MoWHS ▪ Project Dzongkhags & Local Government Administrations ▪ Construction Development Board ▪ Construction Development Corporation Limited ▪ Private sector ▪ Bhutan Standards Bureau

	Activity 3.2. Technical capacity building to support climate-risk informed and cost-effective slope infrastructure including stabilization, drainage and road construction & maintenance	This will be done through training that will include field works.	▪ DoR ▪ Research centres ▪ Academia ▪ Project Dzongkhags & Local Government Administrations

Annexure

Annexure I: List of stakeholders consulted by GCF project preparation team during field visit.

Punakha

Sl #	Name	Sector	Contact address/email id
1	Karma Dukpa	Dzongda	
2	Sonam Dorji	Engineering	peldendorji506@yahoo.com
3	Pema Ugyen	Livestock	lingmapong@yahoo.com/ tshering7@gmail.com
4	Pema Namgay	Forestry	namgyalpee@gmail.com
5	Phub Tshering	Agriculture	phubtshering@punakha.gov.bt (17624726)

Dagana

Sl #	Name	Sector	Contact address/email id
1	Dorji Khandu	Livestock	dkhandu@dagana.gov.bt
2	Cheten Wangda	Forestry	c_wangda@yahoo.com
3	Passang Tshering	Agriculture	ptshering@dagana.gov.bt
4	Tshedar	Planning	tshedardukpa@gmail.com
5	Jamyang Dorji	Engineering	jdorji@dagana.gov.bt
6	Pema Wangchuck	Livestock	pwangchuck@dagana.gov.bt
7	Surja Kumar Mongar	Agriculture	surjakhapangi@gmail.com
8	Pema Choeda	DoR	pemachoeda@yahoo.com

Samtse

Sl #	Name	Sector	Contact address/email id
1	Hari Prasad Adhikari	Agriculture	hpadhikari432@yahoo.com
2	Kinzang Chopel	Agriculture	kinzachop2014@gmail.com
3	Sangay Dorji	Forestry	sndorji@gmail.com
4	Chogyal Norbu	Agriculture	nchogyal@gmail.com
5	Karma Dorji	Livestock	karmadorji@samtse.gov.bt

Trongsa

Sl #	Name	Sector	Contact address/email id
1	Karma Wangdi	Agriculture	kwangdi@trongsa.gov.bt (17779032)
2	Jigme Tshering	Forestry	jtshering@trongsa.gov.bt (17654531)
3	Rinzin Dorji	Planning	rinzindorji81@gmail.com (17784426)
4	Passang Dorji	Engineering	passan15@yahoo.com (17622015)
5	Sherub Tenzin	Livestock	stenzin@trongsa.gov.bt (17626693)
6	Tougay Choedup	DoR	tchoedup@mowhs.gov.bt (17607620)

Zhemgang

Sl #	Name	Sector	Contact address/email id
1	Tshering Tobgay	Agriculture	ttobgay@zhemgang.gov.bt (17560944)
2	Dhono	Forestry	dhono@zhemgang.gov.bt (17688766)
3	Ugyen Lhendup	Livestock	ulhendup@zhemgang.gov.bt (17682723)
4	Kinley	Planning	kinley@zhemgang.gov.bt (17580651)

Tsirang

Sl #	Name	Sector	Contact address/email id
1	M.L Bhattarai	Agriculture	mitralal_bhattarai@yahoo.com (17684636)
2	Sonam	ADAO, Agriculture	sonamrabden@gmail.com (17634847)
3	Parsuram Rai	Engineering	parsubokhim@gmail.com (17600019)
4	Narash Bhandari	Agriculture	Robinsharm49@gmail.com (17808545)

Wangdue

Sl #	Name	Sector	Contact address/email id
1	Lhapchu	DE	lhapchu579@yahoo.com
2	Sonam Zangpo	Agriculture	sanzang_766@yahoo.com
3	Ugyen	Livestock	ugyen@wangduephodrang.gov.bt
4	Dorji Wangdi	Environmental	dorjiw7@gmail.com
5	Sahadev Thapa	Planning	sthapa@wangduephodrang.gov.bt
6	Tshewang Dema	Planning	tshong124@gmail.com
7	Tenzing Dorji	Forestry	tenw1235@gmail.com
8	Mahesh Ghimiray	RNOC RDC Bajo	mghimiray@gmail.com

Annexure II: List of people consulted during the field survey and consultations for Local Climate Change Vulnerability Assessment and Adaptation Planning

A. Chiwog level

Dzongkhag	Gewog	Chiwog	Participants	
			Men	Women
Punakha	Toepisa	Dochola_Maenchhuna	5	5
		Goenmkha_Mendrelgang	4	6
Sarpang	Jigmechoeling	Gongtsekha	8	7
		Samkhar	5	4
Trongsa	Korphu	Korphu Maed	6	1
		Nyimzhong Toed	4	6
	Tangsibji	Chendenbji	4	3
		Tangsibji	5	0
Wangdue	Athang	Lawa_Lamga	4	9
		Rookha	14	9
	Dangchhu	Tokaling_Tomla	5	5
		Uesagang	3	7
	Phobji	Damchhoe_Gangphel	2	9
		Khyimdro_Nemphel	22	63
Zhemgang	Trong	Dhangkhar_Trong	6	9
		Gongphu	0	7
	Nangkor	Buli	3	9
		Nyakhar	2	8

B. Gewog/sub-district level

Dzongkhag	Gewog	Gup /Mangmi/GAO	Livestock Sector	Agriculture Sector	Forestry Sector
Punakha	Toepisa	√	X	X	X
Sarpang	Jigmichhoeling	√	√	√	√
Trongsa	Korphu	√	√	√	√
	Tangsibji	√	√	√	√
Wangdue	Athang	√	X	X	X
	Dangchhu	√	X	X	X
	Phobji	√	√	X	X
Zhemgang	Trong	√	√	√	√
	Nangkor	√	√	√	√

X = Not available at the centre during the time of visit

Annexure III: List of stakeholders consulted for Gewog Connectivity roads assessment

Sl. No	Name	Designation	Contact Number	Dzongkhag / Gewog
2.	Mr. Balaram Acharya	A. E., Nobding, DoR	17759740	Wangdue Phodrang
3.	Mr. Nima Wangchu	J. E., Nobding, DoR	17799466	Wangdue / Phobji GC Road
4.	Mrs. Ugyen Tshomo	J. E., Pinsa, DoR	17993794	Wangdue / Athang, Gasetshowom, Nahi and Kabjisa (Punakha) GC Road
5.	Mr. Tsheten Tshering	A.E., Pinsa, DoR	17721448	Wangdue
6.	Mr. Prem Rai	Supervisor, Pinsa, DoR	77412172	Wangdue
7.	Mr. Ugyen (ata)	Mason, DoR	17604716	Punakha / Zomlingthang,
8.	Mr. Tougay	Chief, Trongsa, DoR	17607620	Trongsa, Bumthang
10.	Mr. Sonam Dorji	AE, Pangjor, DoR	17669903	Korphu GC Road
15.	Mr. Karma Dorji	Chief, Tingtibi, DoR	77347499	Zhemgang
16.	Mr. H.R. Ghalley	EE, Tingtibi, DoR	17512037	Zhemgang
17.	Mr. Sangay Dhuba	PE, Therang, DoR	17120698	Nimshong Office
18.	Mr. Nawang Kinga	Supervisor, DoR	17560089	Nimshong-Shingkhar GC Road
19.	Mr. C.B. Mongar	Chief, Sarpang, DoR	17606832	Sarpang, Tsirang, Dagana
20.	Mr. Ugyen Dorji	EE, Sarpang, DoR	17695244	Construction
21.	Mr. Leki Dorji	AE, Sarpang, DoR	17673459	GC roads.
28.	Mr. Ngawang Choeda	Gewog Adm. Officer	17812966	Wangdue / Phobji
29.	Mr. Ugyen Dorji	Mangmi	77639178	Wangdue/Athang
30.	Mr. Sangay	Gup	17618563	Wangdue/Gasetshowom
31.	Ms. Deki Lhamo	Gedung	77374373	Wangdue/Nahi
32.	Mr. Karma Gyeltshen	Gewog Adm. Officer	17907035	Punakha/Kabjisa
35.	Mr. Tashi Penjore	Gedung	17611459	Trongsa/ Korphu
37.	Mr. Nidup	Gup	17866591	Zhemgang/Shingkhar
39.	Mr. Shivalal Kararia	Gup	17921342	Tsirang / Phuentenchu
40.	Mr. Shanti Ram Chamlengai	Tshogpa	17317651	Tsirang / Phuentenchu

Annexure IV: List of farmers consulted during the field consultations for value chain and market analysis

Sl #	Name	Age	Gender	Village	Mobile No.
1.	Mr. Gyaltshen	59	Male	Samthang	17649770
2.	Mr. Sangay Dorji	60	Male	Thangna	77402503
3.	Mr. Phub Tshering	47	Male	Thangna	77452653
4.	Mrs. Buddha	58	Female	Samthang	77435684
5.	Mrs. Bokhum	59	Female	Hara Chu	77243877
6.	Mr. Tashi Dorji	48	Male	Thangna	77231919
7.	Mr. Daw Tshering	59	Male	Samthang	77448093
8.	Mr. Nim Tshering	49	Male	Thangna	77315537
9.	Mr. Pasang	48	Male	Samthang	77422762
10.	Mr. Wangchuk	65	Male	Phobjikha	77870515
11.	Mr. Pema	42	Male	Gangtey	17656514
12.	Mr. Wangchuk Dorji	48	Male	Gangtey	17854243
13.	Mr. Daw	72	Male	Phobjikha	17919109
14.	Mr. Tshering	70	Male	Gangtey	77310362
15.	Mr. Kumbu Dukpa	28	Male	Gangtey	17926292
16.	Mr. Phub Khandu	46	Male	Phobjikha	17869710
17.	Mrs. Nagee	62	Female	Phobjikha	17776658
18.	Mrs. Kali Bedha	60	Female	Phobjikha	No mobile
19.	Mrs. Lhamchu	56	Female	Phobjikha	No mobile
34.	Mr. Jagath Bdr. Tamang	48	Male	Jigmecholing	17842601
35.	Mr. Phurba Tamang	54	Male	Jigmecholing	No mobile
36.	Mrs. Phurba Dolma	25	Female	Jigmecholing	17657288
37.	Mr. Santa Kumar Tamang	28	Male	Jigmecholing	77277382
38.	Mr. Chandra Mon Tamang	58	Male	Jigmecholing	77610879
39.	Mrs. Mon Maya Tamang	58	Female	Jigmecholing	No mobile
40.	Mrs. Ambikha Gurayay	22	Female	Jigmecholing	17470741
41.	Mrs. Pabita Lami Chaney	67	Female	Jigmecholing	No mobile
42.	Mr. Phurba Tamang	53	Male	Jigmecholing	17843054

Annexure V: List of interviewed persons by Gewog and Dzongkhag for Integration of social, environmental and gender into project design

Sl. no	Name	Gender	Designation	Gewog	Dzongkhag
1	Namgay	Women	Farmer	Guma	Punakha
2	Khandu	Men	Farmer	Guma	Punakha
3	Tshering Wangmo	Women	Farmer	Guma	Punakha
4	Bago Dorji	Men	Farmer	Guma	Punakha
5	Bago	Men	Farmer	Guma	Punakha
6	Lhamo	Women	Farmer	Guma	Punakha
7	Passang Dorji	Men	Farmer	Athang	Wangdi Phodrang
8	Rinchen	Men	Farmer	Athang	Wangdi Phodrang
9	Passang Wangdi	Men	Farmer	Athang	Wangdi Phodrang
10	Phochum	Women	Farmer	Athang	Wangdi Phodrang
11	Tshering Dorji	Men	Farmer	Athang	Wangdi Phodrang
12	Kuncho Dorji	Men	Farmer	Athang	Wangdi Phodrang
13	Phuntsho Wangdi	Men	Farmer	Athang	Wangdi Phodrang
14	Pasa Dem	Women	Farmer	Athang	Wangdi Phodrang
15	Dorji Dem	Women	Farmer	Athang	Wangdi Phodrang
16	Phub Gyeltshen	Men	Farmer	Chendibji	Trongsa
17	Penba Tshering	Men	Farmer	Chendibji	Trongsa
18	Karma Tshering	Men	Farmer	Chendibji	Trongsa
19	Phub Lhamo	Women	Farmer	Chendibji	Trongsa
20	Lhachen	Women	Farmer	Chendibji	Trongsa
21	Pem zam	Women	Farmer	Chendibji	Trongsa
22	Tashi Lhamo	Women	Farmer	Chendibji	Trongsa
23	Sangay Om	Women	Farmer	Chendibji	Trongsa
24	Nim Tashi	Women	Farmer	Chendibji	Trongsa
25	Thinley Gyeltshen	Men	Farmer	Chendibji	Trongsa
26	Tandin Tshering	Men	Tshogpa	Chendibji	Trongsa
27	Sonam Penjor	Men	Farmer	Trong	Zhemgang
28	Pema Namgay	Men	Farmer	Trong	Zhemgang
29	Sithar	Men	Farmer	Trong	Zhemgang
30	Tshering Lhaden	Women	Farmer	Trong	Zhemgang
31	Sherab Dorji	Men	Farmer	Trong	Zhemgang
32	Kezang Dorji	Men	Farmer	Trong	Zhemgang
33	Pema Rinzin	Men	Farmer	Trong	Zhemgang
34	Phento	Men	Farmer	Trong	Zhemgang
35	Kezang Dorji	Men	Farmer	Jigmechholing	Sarpang
36	Pema Dorji	Men	Tshogpa	Jigmechholing	Sarpang
37	Harka Bdr Gurung	Men	Farmer	Jigmechholing	Sarpang
38	Tila Maya Gurung	Women	Farmer	Jigmechholing	Sarpang
39	Sangay Choden	Women	Farmer	Jigmechholing	Sarpang
40	Pema Lhamo	Women	Farmer	Jigmechholing	Sarpang
41	Bhim Bdr Gurung	Men	Farmer	Jigmechholing	Sarpang
42	Kumar Gurung	Men	Tshogpa	Jigmechholing	Sarpang
43	Sancha Maya Tamang	Women	Farmer	Rangthangling	Tsirang
44	Rupa Maya Tamang	Women	Farmer	Rangthangling	Tsirang
45	Jimki Maya Tamang	Women	Farmer	Rangthangling	Tsirang
46	Upen Deva Khatiwara	Men	Farmer	Rangthangling	Tsirang
47	Sonam Dorji Sherpa	Men	Tshogpa	Rangthangling	Tsirang
48	Shanti Ram Khatiwara	Men	Farmer	Rangthangling	Tsirang
81	Dorji Wangdi	Men	Farmer	Ura	Bumthang
82	Tashi La	Men	Farmer	Ura	Bumthang

Annexure VI: Local Government Officials/Territorial Forest Divisions/Range officers/Parks/Gewogs/Communities consulted during Project Preparation Team's mission

Sl.No.	Name	Designation	Agency
1	Pema Thinley	Forest Ranger	Wangdue Territorial Division, DoFPS
2	Phuntsho Namgay	Forestry Officer	Wangdue Territorial Division, DoFPS
3	Tandin	Forester	Wangdue Territorial Divison, DoFPS
4	Choki Dorji	Sr. Forest Ranger	Jigme Singye Wangchuck National Park, Trongsa
5	Jamthso	Sr. Forest Ranger	Jigme Singye Wangchuck National Park, Trongsa
6	Pankey Dukpa	Chief Forestry Officer/Park Manager	Jigme Singye Wangchuck National Park, Trongsa
7	Tashi Dendup	Environment Officer	Zhemgang Dzongkhag Administration
8	Dhono	Dzongkhag Forestry Officer	Zhemgang Dzongkhag Administration
9	Ugyen Lhendup	Dzongkhag Livestock Officer	Zhemgang Dzongkhag Administration
10	Jambay Ugyen	Assistant Dzongkhag Agriculture Officer	Zhemgang Dzongkhag Administration
11	Kinley	Dzongkhag Planning Officer	Zhemgang Dzongkhag Administration
12	Dawa Zangpo	Sr. Forestry Officer	Zhemgang Territorial Divison, DoFPS
13	Kezang Wangmo	Forestry Officer	Zhemgang Territorial Divison, DoFPS
14	Sonam Penjor	Tshogpa	Trong Gewog Administration, Zhemgang
15	Mon Bhadur Mongar	RNR Extension Staff	Trong Gewog Administration, Zhemgang
16	Sangay	Mangmi	Trong Gewog Administration, Zhemgang
17	Phuntshok	Sr. Ranger	Tingtibi Range Officer, JSWNP, Zhemgang
18	Karma Tenzin	Gewog Administrative Officer	Trong Gewog Administration, Zhemgang
19	Damber Bhadur Chhetri	Sr. Forester	Division Forest Officer Wangdue (Phobjikha)
20	Kinley Dem	Forest Ranger	Gogona FMU, Phobjikha
21	Kinley Wangmo	Forest Ranger	Gogona FMU, Phobjikha
22	Dampai Choizang	Forest Ranger	Wangdue Division, Phobjikha
23	Santalal Gajmir	Conservationist	Royal Society for Protection of Nature (RSPN), Phobjikha
24	Yeshi Phuntsho	RNR Extension Staff	Gangtey Gewog Administration, Wangdue
25	Pema Geyleg	Farmer	Gangtey Gewog
26	Pemba	Tshogpa	Gangtey Gewog Administration, Wangdue
27	Wangchuk Namgay	Farmer	Gangtey Gewog
28	Genphub	Farmer	Gangtey Gewog
29	Yangkar	Farmer	Gangtey Gewog
30	Tshering Gyaltsho	Farmer	Gangtey Gewog
31	Jambay Dorji	Farmer	Gangtey Gewog
32	Dophu	Gup	Gangtey Gewog Administration, Wangdue
33	Passang Dorji	Gewog Administration Officer	Gangtey Gewog Administration, Wangdue

Annexure Four Guidance for Submitting a Request to the Social and Environmental Compliance Unit and/or the Stakeholder Response Mechanism

Empowered lives.
Resilient nations.

Guidance for Submitting a Request to the Social and Environmental Compliance Unit (SECU) and/or the Stakeholder Response Mechanism (SRM)

Purpose of this form

- **If you use this form, please put your answers in bold writing to distinguish text**
- **The use of this form is recommended, but not required. It can also serve as a guide when drafting a request.**

This form is intended to assist in:

(1) Submitting a request when you believe UNDP is not complying with its social or environmental policies or commitments and you are believe you are being harmed as a result. This request could initiate a 'compliance review', which is an independent investigation conducted by the Social and Environmental Compliance Unit (SECU), within UNDP's Office of Audit and Investigations, to determine if UNDP policies or commitments have been violated and to identify measures to address these violations. SECU would interact with you during the compliance review to determine the facts of the situation. You would be kept informed about the results of the compliance review.

and/or

(2) Submitting a request for UNDP "Stakeholder Response" when you believe a UNDP project is having or may have an adverse social or environmental impact on you and you would like to initiate a process that brings together affected communities and other stakeholders (e.g., government representatives, UNDP, etc.) to jointly address your concerns. This Stakeholder Response process would be led by the UNDP Country Office or facilitated through UNDP headquarters. UNDP staff would communicate and interact with you as part of the response, both for fact-finding and for developing solutions. Other project stakeholders may also be involved if needed.

Please note that if you have not already made an effort to resolve your concern by communicating directly with the government representatives and UNDP staff responsible for this project, you should do so before making a request to UNDP's Stakeholder Response Mechanism.

Confidentiality If you choose the Compliance Review process, you may keep your identity confidential (known only to the Compliance Review team). If you choose the Stakeholder Response Mechanism, you can choose to keep your identity confidential during the initial eligibility screening and assessment of your

case. If your request is eligible and the assessment indicates that a response is appropriate, UNDP staff will discuss the proposed response with you, and will also discuss whether and how to maintain confidentiality of your identity.

Guidance

When submitting a request please provide as much information as possible. If you accidentally email an incomplete form, or have additional information you would like to provide, simply send a follow-up email explaining any changes.

Information about You

Are you…

1. A person affected by a UNDP-supported project?

Mark "X" next to the answer that applies to you: Yes: No:

2. An authorised representative of an affected person or group?

Mark "X" next to the answer that applies to you: Yes: No:

If you are an authorised representative, please provide the names of all the people whom you are representing, and documentation of their authorisation for you to act on their behalf, by attaching one or more files to this form.

3. First name:
4. Last name:
5. Any other identifying information:
6. Mailing address:
7. Email address:
8. Telephone Number (with country code):
9. Your address/location:
10. Nearest city or town:
11. Any additional instructions on how to contact you:
12. Country:

What you are seeking from UNDP: Compliance Review and/or Stakeholder Response

You have four options:

- Submit a request for a Compliance Review;
- Submit a request for a Stakeholder Response;
- Submit a request for both a Compliance Review and a Stakeholder Response;
- State that you are unsure whether you would like Compliance Review or Stakeholder Response and that you desire both entities to review your case.

13. Are you concerned that UNDP's failure to meet a UNDP social and/or environmental policy or commitment is harming, or could harm, you or your community? Mark "X" next to the answer that applies to you: Yes: No:

14. Would you like your name(s) to remain confidential throughout the Compliance Review process?

Mark “X” next to the answer that applies to you: Yes: No:

If confidentiality is requested, please state why:

15. Would you like to work with other stakeholders, e.g., the government, UNDP, etc. to jointly resolve a concern about social or environmental impacts or risks you believe you are experiencing because of a UNDP project?

Mark “X” next to the answer that applies to you: Yes: No:

16. Would you like your name(s) to remain confidential during the initial assessment of your request for a response?

Mark “X” next to the answer that applies to you: Yes: No:

If confidentiality is requested, please state why:

17. Requests for Stakeholder Response will be handled through UNDP Country Offices unless you indicate that you would like your request to be handled through UNDP Headquarters. Would you like UNDP Headquarters to handle your request?

Mark “X” next to the answer that applies to you: Yes: No:

If you have indicated yes, please indicate why your request should be handled through UNDP Headquarters:

18. Are you seeking both Compliance Review and Stakeholder Response?

Mark “X” next to the answer that applies to you: Yes: No:

19. Are you unsure whether you would like to request a Compliance Review or a Stakeholder Response? Mark “X” next to the answer that applies to you: Yes: No:

Information about the UNDP Project you are concerned about, and the nature of your concern:

20. Which UNDP-supported project are you concerned about? (if known):

21. Project name (if known):

22. Please provide a short description of your concerns about the project. If you have concerns about UNDP’s failure to comply with its social or environmental policies and commitments, and can identify these policies and commitments, please do (not required). Please describe, as well, the types of environmental and social impacts that may occur, or have occurred, as a result. If more space is required, please attach any documents. You may write in any language you choose

23. Have you discussed your concerns with the government representatives and UNDP staff responsible for this project? Non-governmental organisations?

Mark “X” next to the answer that applies to you: Yes: No:

If you answered yes, please provide the name(s) of those you have discussed your concerns with

Name of Officials You have Already Contacted Regarding this Issue:

First Name	Last Name	Title/Affiliation	Estimated Date of Contact	Response from the Individual

24. Are there other individuals or groups that are adversely affected by the project?

Mark “X” next to the answer that applies to you: Yes: No:

25. Please provide the names and/or description of other individuals or groups that support the request:

First Name	Last Name	Title/Affiliation	Contact Information

Please attach to your email any documents you wish to send to SECU and/or the SRM. If all of your attachments do not fit in one email, please feel free to send multiple emails.

Submission and Support

To submit your request, or if you need assistance please email: project.concerns@undp.org

Annexure Five: Livelihood Restoration Plan

Introduction

The section should include:

a. Brief project description;

b. Purpose of the Livelihood Restoration Plan, and

c. Scope of the livelihood impact management plan.

Project Description

a. Provide a comprehensive description of the project;

b. Include an overview of the project and subsequently describe the pre-construction, construction, and operational phases of the project;

c. Key aspects relevant to fish resources, fishing based livelihoods restoration of project-affected communities should be described in detail.

Statutory and Regulatory Framework

Livelihood Systems of Project-Affected Communities

a. Describe the livelihood systems of project-affected fishing communities.

Local Resources and Activities

a. Describe local resources and activities that are both impacted by and at risk from project activities.

b. Describe the range of activities used by individuals, households, and communities impacted by the project. Include postharvest processing and sale, including the value chain of produce.

Identification of Stakeholders

a. Identify the various stakeholders who may be impacted or may be involved in the process of development, implementation, and monitoring of the programs.

Impact Assessment

a. Impact Assessment

b. Definition of Eligibility Criteria and Entitlement Matrix for Directly Affected Fishermen

c. Restoration Strategy Define the overall impact management strategy.

Program and Activity Description

a. Provide a description of program and component activities. Include key information pertaining to target group, implementation, human resources, timeline, budget, etc.

Project Implementation (human resources, partners, and organisational responsibilities)

a. Describe human resources for implementation of the plan and component programs/interventions.

b. Clearly define roles and responsibilities and organisational structure.

c. Describe potential partners (affected groups and communities, NGOs, government, etc.) and their respective roles and responsibilities.

Schedule

a. Multi-year schedule of implementation for the component programs/ interventions and the overall plan.

Budget

a. Budgets for the component programs/ interventions and the total cost of the plan.

Monitoring and Evaluation

a. Overall monitoring and evaluation framework that integrates the monitoring and evaluation requirements for the component programs/ interventions

Annexure Six: Erosion, Drainage and Sediment Control Management Plan and Contaminated Soil Disposal Management Plan Outline

Project Description

a. Provide a comprehensive description of the project; and

b. Include an overview of the pre-construction, construction, and operational phases of the project.

Purpose, Scope and Objective

The section should include:

a. Scope of the Erosion, Drainage and Sediment Control Management Plan (EDSCP) and Contaminated Soil Disposal Management Plan (CSDMP)

b. Establish objectives for general EDSCP and CSDMP;

c. Establish specific objectives for site specific EDSCP and CSDMP;

d. Relationship to specific mitigation measures

Statutory and Regulatory Requirements

a. Legislative requirements as prescribed in the Project Environmental and Social Management Plan (ESMP)

Potential Impacts

a. Overview of impacts identified in ESMF and ESMP;

Erosion and sediment control impacts and mitigations

Source of Impact	Potential Impact and Relevant Management Plan Objective	Mitigation and Management (Design Feature/ Specific Measure)	Mitigation Measure	Activity/ Monitoring	Frequency	Duration	Responsibility	Evidence

Project Implementation (human resources, partners, and organisational responsibilities)

a. Describe human resources for implementation of the plan and component programs/interventions;
b. Clearly define roles and responsibilities and organisational structure;
c. Discuss training that will be provided; and
d. Describe potential partners (NGOs, government, etc.) and their respective roles and responsibilities.

Resources

a. Equipment requirements including erosion and sediment control devices (sediment fencing, silt curtains, etc) water quality monitoring equipment; and on-site weather monitoring station;
b. Staff involved including Construction Environmental Officer; Environmental Coordinator; Monitoring Officer; Environmental and Regulatory Manager; and
c. Registers including water quality monitoring record; and non-conformance register.

Schedule

a. Multi-year schedule of implementation for the component programs/ interventions and the overall plan.

Monitoring and Evaluation

a. Overall monitoring and evaluation framework that integrates the monitoring and evaluation requirements for the component programs/ interventions.

Reporting and Notification

a. Contractor's monthly report including results of the surveys and inspections; and number and results of verification inspections, including but not limited to landform stability inspections, sediment control structure and stockpile inspections and control measures implemented to manage failing sediment control structures and stockpiles.

Budget

a. Budgets for the component programs/ interventions and the total cost of the plan.

Annexure Seven: Standard General Environmental Contract Clauses

Generic contract clauses are provided in this annex to assist with environmental and social management works expected to have minor impacts. These mitigation measures are the core of a generic, standardised EMP (Environmental Management Plan) and the associated minor impacts typical of small works which can be routinely addressed with best industry practice. These clauses are general and may be modified to conform to applicable national laws, contract procedures and actual scope and nature of the works anticipated. These clauses are intended to be included as requirements in the works contract and shall remain in force throughout the contract period. These clauses represent the minimum standard of execution for environmental protection and include:

1 Permits and Approvals

2 Site Security

3 Discovery of Antiquities

4 Worker Occupational Health and Safety

5 Noise Control

6 Use and Management of Hazardous Materials, fuels, solvents and petroleum products

7 Use and Management of Pesticides

8 Use of Preservatives and Paint Substances

9 Use of Explosives

10 Site Stabilisation and Erosion Control

11 Traffic Management

12 Management of Standing Water

13 Management of Solid Wastes -trash and construction debris

14 Management of Liquid Wastes

Standard Clauses

1. Permits and Approvals

The contractor shall be responsible for ensuring that he or she has all relevant legal approvals and permits required to commence works.

2. Site Security

The contractor shall be responsible for maintaining security over the construction site including the protection of stored materials and equipment. In the event of severe weather, the contractor shall secure the construction site and associated equipment in such a manner as to protect the site and adjacent areas from consequential damages. This includes the management of onsite, construction materials, construction and sanitary wastes, additional strengthening of erosion control and soil stabilisation systems and other conditions resulting from contractor activities which may increase the potential for damages.

3. Discovery of Antiquities

If, during the execution of the activities contained in this contract, any material is discovered onsite which may be considered of historical or cultural interest, such as evidence of prior settlements, native or historical activities, evidence of any existence on a site which may be of cultural significance, all work shall stop and the supervising contracting officer shall be notified immediately. The area in which the material was discovered shall be secured, cordoned off, marked, and the evidence preserved for examination by the local archaeological or cultural authority. No item believed to be an artefact must be removed or disturbed

by any of the workers. Work may resume, without penalty of prejudice to the contractor upon permission from the contracting officer with any restrictions offered to protect the site.

4. Worker Occupational Health and Safety

The contractor shall ensure that all workers operate within a safe environment. Sanitation facilities shall be provided for all site workers. All sanitary wastes generated as a result of project activities shall be managed in a manner approved by the contracting officer and the local authority responsible for public health. The contractor shall ensure that there are basic medical facilities on site and that there are staff trained in basic first aid. Workers must be provided with the necessary protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles, boots, etc. The contractor shall provide the contracting officer with an occupational health and safety plan for approval prior to the commencement of site activities.

The contractor must ensure that all workers operate within a safe environment. All relevant Labour and Occupational Health and Safety regulations must be adhered to ensure worker safety. Sanitary facilities must be provided for all workers on site. Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow.

5. Noise Control

The contractor shall control noise emissions generated as a result of contracting activities to the extent possible. In the case of site locations where noise disturbance will be a concern, the contractor shall ensure that the equipment is in good working order with manufacturer supplied noise suppression (mufflers etc.) systems functioning and in good repair.

Where noise management is a concern, the contractor shall make reasonable efforts to schedule activities during normal working hours (between 8 am and 5 pm). Where noise is likely to pose a risk to the surrounding community either by normal works or working outside of normal working hours or on weekends, the contractor shall inform the contracting officer and shall develop a public notification and noise management plan for approval by the contracting officer.

6. Use and Management of Hazardous Materials, fuels, solvents and petroleum products

The use of any hazardous materials including pesticides, oils, fuels and petroleum products shall conform to the proper use recommendations of the product. Waste hazardous materials and their containers shall be disposed of in a manner approved by the contracting officer in accordance with national laws. A site management plan will be developed by the contractor if the operation involves the use of these materials to include estimated quantities to be consumed in the process, storage plans, spill control plans, and waste disposal practices to be followed. Any plans required shall be approved by the contracting officer.

Elements of the hazardous materials management shall include:

a. Contractor must provide temporary storage on site of all hazardous or toxic substances in safe containers labelled with details of composition, properties and handling information;

b. Hazardous substances shall be placed in an leak-proof container to prevent spillage and leaching

c. Wastes shall be transported and disposed of in a manner approved by the contracting officer compliant with national laws and policies

7. Use and Management of Pesticides

Any use of pesticides shall be approved by the contracting officer and shall conform to the manufacturers' recommendations for use and application. Any person using pesticides shall demonstrate that they have read and understood these requirements and are capable of complying with the usage recommendations to the satisfaction of the contracting officer. All pesticides to be used shall conform to the list of acceptable pesticides that are not banned by the relevant local authority.

If termite treatment is to be utilised, ensure appropriate chemical management measures are implemented to prevent contamination of surrounding areas, and use only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques.

8. Use of Preservatives and Paint Substances

All paints and preservatives shall only be used with the approval of the contracting officer. Information shall be provided to the contracting officer who describes the essential components of the materials to be used so that an informed determination can be made as to the potential for environmental effects and suitability can be made.

Storage, use, and disposal of excess paints and preservatives shall be managed in conformance with the manufacturers' recommendations and as approved by the contracting officer. The contractor shall provide the contracting officer with a list of materials and estimated quantities to be used, storage, spill control and waste disposal plans to be observed during the execution of the contract. This plan is subject to the approval of the contracting officer.

9. Use of Explosives

Use of explosives shall be at the approval of the relevant local authority and shall be supervised and undertaken by a qualified explosives technician. Blasting will be limited to between the hours of 9:00 am and 4:00 pm unless specifically approved by the local authority and the contracting officer. Any use of explosives shall be permitted only after an explosives management and blasting plan has been approved by the relevant local authority and the contracting officer.

This plan shall include:

1. Description of the explosive agent, charge description, intended use.
2. Site safety plan including:
    a. Storage of initiators, booster charges and principal blasting agents
    b. Handling precautions to be observed
    c. Transport to and from site
    d. Security of stored materials
    e. Disposal of excess or damaged explosive materials.
3. Analysis of risk to surrounding area and mitigation measures to be employed including:
    a. Over-pressure event
    b. Noise
    c. Flying debris
    d. Seismic transmission
    e. Accidental detonation
4. Name and qualifications for all persons responsible for handling explosive agents

10. Site Stabilisation and Erosion Control

The Contractor shall implement measures at the site of operations to manage soil erosion through minimisation of excavated area and time of exposure of excavated areas, preservation of existing ground cover to the extent possible, provision of approved ground cover and the use of traps and filtration systems. Where excavations are made, contractor shall implement appropriate stabilizing techniques to prevent cave-in or landslide. Measures shall be approved by the contracting officer.

The contractor must ensure that appropriate erosion control measures such as silt fences are installed. Proper site drainage must be implemented. Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. The use of retaining structures and planting with deep rooted grasses to retain soil during and after works must be considered. The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. All slopes and excavated areas must be monitored for movement.

The contractor will establish appropriate erosion and sediment control measures such as hay bales, sedimentation basins, and / or silt fences and traps to prevent sediment from moving off site and causing excessive turbidity in nearby streams, rivers, wetlands, and coastal waters.

An erosion management plan will be required where the potential exists for significant sediment accumulation in wetlands, lakes, and aquatic systems. This plan shall include a description of the potential threat, mitigation measures to be applied, and consideration for the effects of severe weather and an emergency response plan.

If works are near major steams and river, water quality monitoring must be done before construction, and at regular intervals to determine turbidity levels and other quality parameters.

Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute natural surface water bodies.

11. Air Quality

When appropriate, the contractor shall provide an air quality management plan for contracting officer approval. This plan will include provisions for the management and control of dust and unnecessary emissions resulting from construction activities. The plan shall include control measures to be implemented including the management of dust generated from transportation and site construction activities as well as excess emissions from vehicles and equipment. Under no circumstances shall site or roadway dusts be managed using oil spray techniques.

12. Traffic Management

In the event that construction activities should result in the disruption of area transportation services, including temporary loss of roadways, blockages due to deliveries and site related activities, the contractor shall provide the contracting officer with a traffic management plan including a description of the anticipated service disruptions, community information plan, and traffic control strategy to be implemented so as to minimise the impact to the surrounding community. This plan shall consider time of day for planned disruptions, and shall include consideration for alternative access routes, access to essential services such as medical, disaster evacuation, and other critical services. The plan shall be approved by the contracting officer.

Elements of the traffic management plan to be developed and implemented by contractor shall include:

a. Alternative routes will be identified in the instance of extended road works or road blockages;

b. Public notification of all disturbance to their normal routes;

c. Signage, barriers and traffic diversions must be clearly visible and the public warned of all potential hazards;

d. provision for safe passages and crossings for all pedestrians where construction traffic interferes with their normal route;

e. Active traffic management by trained and visible staff at the site or along roadways as required to ensure safe and convenient passage for the vehicular and pedestrian public;

f. Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or times of livestock movement.

13. Management of Standing Water

Under no circumstances shall the contractor permit the collection of standing water as a consequence of contractor activities without the approval of the contracting officer and consultation with the relevant local environmental health authority. Recommendations from that local authority on how to manage and treat the standing water must be implemented. The condition of the standing water must be monitored by the contractor to ensure that it does not present itself as a breeding ground for any pests such as mosquitoes.

14. Management of Solid Wastes and Construction Debris

The contractor shall provide a solid waste management plan that conforms to the national solid waste management policies and regulations for approval by the contracting officer. The site waste management plan shall include a description of waste handling procedures including collection, storage and disposal through the national waste management system. There will be no open burning of waste material and the contractor shall endeavour to recycle wastes as appropriate through the national waste management system.

Under no circumstances shall the contractor allow construction wastes to accumulate so as to cause a nuisance or health risk due to the propagation of pests and disease vectors.

15. Management of Liquid Wastes

The contractor shall provide the contracting officer with a liquid waste management plan as part of a site waste management plan that conforms to the waste management policies and regulations of the relevant Saint Vincent and the Grenadines authority. Under no circumstances shall the contractor allow construction related liquid wastes to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner or to cause a nuisance or health risk due to its content. The site waste management plan shall include a description of how these wastes will be stored, collected and disposed of in accordance with current law. Additionally the contractor shall provide for the regular removal and disposal of all site wastes and provide the contracting officer with a schedule for such removal.

Specific elements of the contractor's liquid waste management plan shall include: contractor to abide by all pertinent waste management and public health laws; waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities; construction and demolition wastes will be stored in appropriate bins; liquid and chemical wastes will be stored in appropriate containers separated from the general refuse; all waste will be collected and disposed of properly in approved landfills by licensed collectors; the records of waste disposal will be maintained as proof for proper management as designed; whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos); construction related liquid wastes must not be allowed to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner or to cause a nuisance or health risk due to its contents.