



**Part I: Project Information**

**GEF ID**

10779

**Project Type**

FSP

**Type of Trust Fund**

LDCF

**CBIT/NGI**

CBIT No

NGI No

**Project Title**

Advancing Climate Resilience of Water Sector in Bhutan (ACREWAS)

**Countries**

Bhutan

**Agency(ies)**

UNDP

**Other Executing Partner(s)**

Ministry of Works and Human Settlement

**Executing Partner Type**

Government

**GEF Focal Area**

Climate Change

**Sector**

Climate Change Adaptation Sector

**Taxonomy**

Focal Areas, Gender Equality, Climate Change, Climate Change Adaptation, Community-based adaptation, Innovation, Adaptation Tech Transfer, Private sector, Ecosystem-based Adaptation, Climate resilience, Complementarity, Influencing models, Demonstrate innovative approach, Deploy innovative financial instruments, Strengthen institutional capacity and decision-making, Transform policy and regulatory environments, Stakeholders, Beneficiaries, Type of Engagement, Information Dissemination, Civil Society, Non-Governmental Organization, Communications, Awareness Raising, Private Sector, Individuals/Entrepreneurs, SMEs, Local Communities, Gender Mainstreaming, Gender-sensitive indicators, Sex-disaggregated indicators, Gender results areas, Access and control over natural resources, Capacity Development, Participation and leadership, Access to benefits and services, Capacity, Knowledge and Research, Knowledge Exchange, Learning, Adaptive management, Indicators to measure change, Theory of change

**Rio Markers**

**Climate Change Mitigation**

No Contribution 0

**Climate Change Adaptation**

Principal Objective 2

**Biodiversity**

No Contribution 0

**Land Degradation**

No Contribution 0

**Submission Date**

1/30/2023

**Expected Implementation Start**

4/3/2023

**Expected Completion Date**

4/3/2028

**Duration**

60In Months

**Agency Fee(\$)**

848,580.00

**A. FOCAL/NON-FOCAL AREA ELEMENTS**

<b>Objectives/Programs</b>	<b>Focal Area Outcomes</b>	<b>Trust Fund</b>	<b>GEF Amount(\$)</b>	<b>Co-Fin Amount(\$)</b>
CCA-1	Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaptation	LDC F	8,932,420.00	25,132,000.00
<b>Total Project Cost(\$)</b>			<b>8,932,420.00</b>	<b>25,132,000.00</b>

## B. Project description summary

### Project Objective

To enhance resilience for sustainable economic well-being of the people of Bhutan through climate adaptation of the water sector ?????

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
1. Water Governance and Institutions	Technical Assistance	Strengthened water governance, institutions and financing mechanism in support of climate-resilient water management	<p>1.1 Relevant national and local policies and strategies aligned with sustainable and climate resilient water management (LDCF \$135,000, co-financing: \$1,367,000)</p> <p>1.2 Institutional &amp; community-level capacity for climate-smart water and watershed management strengthened (LDCF \$67,000, co-financing \$ 1,891,000 )</p> <p>1.3 Innovative financing mechanisms for both watershed management and water infrastructure introduced(LDCF \$ 84,500, co-financing \$1,081,000)</p>	LD CF	287,000.00	4,339,000.00



Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
2. Nature- based solutions for sustainable & climate-resilient	Investment	Vulnerable natural water catchments in the target river basin (Punatsang chu River Basin) restored, sustainably managed, protected and their ecosystem conditions improved	<p>2.1 Nature based solutions for watershed restorations implemented aimed at yielding stable spring/stream flows.</p> <p>(LDCF: \$250,810, Co-financing:\$5,658,000)</p> <p>2.2 Forest/Ground cover in catchment watersheds managed and maintained through the engagement of local communities and private/corporate sector (LDCF \$254,050; co-financing \$1,819,000)</p>	LD CF	504,860.0 0	7,477,000. 00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
3.Efficient,adequate, sustainable supply, distribution, and utilisation of water	Investment	Enhanced adaptive capacity of water infrastructure to climate-induced water shortages and quality deterioration through climate-proofing, private sector engagement, and technology deployment	<p>3.1 Climate proofing measures implemented in multi-purpose storage, conveyance, and distribution network of drinking and irrigation water (LDCF \$6,415,022, co-financing: \$6,190,000)</p> <p>3.2 Efficient drought-resilient water management technology tested and upscaled through private sector (youth-based start-up enterprises) (LDCF \$254,000 , co-financing: \$2,830,000)</p>	LD CF	6,669,022 .00	9,020,000. 00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
4.Knowledge Management	Technical Assistance	Strengthened awareness and knowledge sharing mechanism established	4.1 Communication strategy developed and implemented on water conservation and sustainable management developed and implemented (LDCF \$852,600; co-financing: \$3,416,380)  4.2 Publication of a State of the Basin Report (SOBR) for the Punatsangchu River Basin institutionalized (LDCF: \$65,500; co-financing: 0)	LD CF	918,100.00	3,416,380.00
Monitoring & Evaluation		Monitoring and Evaluation (M&E)		LD CF	249,500.00	
<b>Sub Total (\$)</b>					<b>8,628,482.00</b>	<b>24,252,380.00</b>
<b>Project Management Cost (PMC)</b>						
			LDCF		303,938.00	879,620.00
			<b>Sub Total(\$)</b>		<b>303,938.00</b>	<b>879,620.00</b>
			<b>Total Project Cost(\$)</b>		<b>8,932,420.00</b>	<b>25,132,000.00</b>

Please provide justification

**C. Sources of Co-financing for the Project by name and by type**

<b>Sources of Co-financing</b>	<b>Name of Co-financier</b>	<b>Type of Co-financing</b>	<b>Investment Mobilized</b>	<b>Amount(\$)</b>
Recipient Country Government	National Environment Commission Secretariat	Grant	Investment mobilized	1,200,000.00
Recipient Country Government	National Environment Commission Secretariat	In-kind	Recurrent expenditures	700,000.00
Recipient Country Government	Ministry of Works and Settlement	Grant	Investment mobilized	6,930,000.00
Recipient Country Government	Ministry of Works and Settlement	In-kind	Recurrent expenditures	700,000.00
Recipient Country Government	Ministry of Agriculture and Forest	Grant	Investment mobilized	3,500,000.00
Recipient Country Government	Ministry of Agriculture and Forest	In-kind	Recurrent expenditures	1,800,000.00
Recipient Country Government	Local Government-Tsirang District	Grant	Investment mobilized	3,970,000.00
Recipient Country Government	Local Government-Tsirang District	In-kind	Recurrent expenditures	642,000.00
Recipient Country Government	Local Government-Gasa District	Grant	Investment mobilized	3,510,000.00
Recipient Country Government	Local Government-Gasa District	In-kind	Recurrent expenditures	320,000.00

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount(\$)
Recipient Country Government	Local Government - Punakha District	Grant	Investment mobilized	1,520,000.00
Recipient Country Government	Local Government - Punakha District	In-kind	Recurrent expenditures	240,000.00
GEF Agency	UNDP	Grant	Investment mobilized	100,000.00
<b>Total Co-Financing(\$)</b>				<b>25,132,000.00</b>

**Describe how any "Investment Mobilized" was identified**

The investment mobilized for the indicated sources of co-finance will be as follows:???? ? The National Environment Commission will contribute to the proposed project through the implementation of activities related to water governance and management of River Basin Secretariat ? The Ministry of Works and Human Settlement will contribute to the proposed project as lead agency for overall project implementation, coordination and collaboration and corresponding to ongoing and future programs in complementarity to the Water Flagship program anchored within the scope of ACREWAS through skills development in water infrastructure, smart water managements, strengthen water user associations, project management designs and implementation ? The Ministry of Agriculture and Forest will contribute to the proposed project through the implementation of activities focused on conservation of and restoration of water catchments areas and rehabilitation of degraded water sources ? The Local Government districts of Gasa, Punakha and Tsirang will contribute to the proposed project through close coordination, collaboration on implementation of infrastructure development , smart water management, capacity development complementing the ongoing initiatives in the Water Flagship program of the RGOB ? UNDP will contribute to the proposed project by supporting communications and PMC related cost

**D. Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds**

<b>Agency</b>	<b>Trust Fund</b>	<b>Country</b>	<b>Focal Area</b>	<b>Programming of Funds</b>	<b>Amount(\$)</b>	<b>Fee(\$)</b>	<b>Total(\$)</b>
UNDP	LDC F	Bhutan	Climate Change	NA	8,932,420	848,580	9,781,000.00
<b>Total Grant Resources(\$)</b>					<b>8,932,420.00</b>	<b>848,580.00</b>	<b>9,781,000.00</b>

**E. Non Grant Instrument**

NON-GRANT INSTRUMENT at CEO Endorsement

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Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

**F. Project Preparation Grant (PPG)**

PPG Required **true**

**PPG Amount (\$)**

200,000

**PPG Agency Fee (\$)**

19,000

<b>Agency</b>	<b>Trust Fund</b>	<b>Country</b>	<b>Focal Area</b>	<b>Programming of Funds</b>	<b>Amount(\$)</b>	<b>Fee(\$)</b>	<b>Total(\$)</b>
UNDP	LDC F	Bhutan	Climate Change	NA	200,000	19,000	<b>219,000.00</b>
<b>Total Project Costs(\$)</b>					<b>200,000.00</b>	<b>19,000.00</b>	<b>219,000.00</b>

## Meta Information - LDCF

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LDCF true

SCCF-B (Window B) on technology transfer false

SCCF-A (Window-A) on climate Change adaptation false

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Is this project LDCF SCCF challenge program?

false

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This Project involves at least one small island developing State(SIDS). false

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This Project involves at least one fragile and conflict affected state. false

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This Project will provide direct adaptation benefits to the private sector. false

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This Project is explicitly related to the formulation and/or implementation of national adaptation plans (NAPs). true

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This Project has an urban focus. false

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This Project covers the following sector(s)[the total should be 100%]:\*

Agriculture	5.00%
Natural resources management	5.00%
Climate information services	0.00%
Coastal zone management	0.00%
Water resources management	25.00%
Disaster risk management	0.00%
Other infrastructure	65.00%
Health	0.00%
Other (Please specify:)	0.00%
Total	100%

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This Project targets the following Climate change Exacerbated/introduced challenges:\*

Sea level rise false

Change in mean temperature true

Increased climatic variability true

Natural hazards true

Land degradation true

Coastal and/or Coral reef degradation false

Groundwater quality/quantity false

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## Core Indicators - LDCF

### CORE INDICATOR 1

Total

Male

Female

% for Women

Total number of direct beneficiaries

37,873

19,815

18,058

47.68%

## CORE INDICATOR 2

Area of land managed for climate resilience (ha)

41,910.00

## CORE INDICATOR 3

Total no. of policies/plans that will mainstream climate resilience

38

## CORE INDICATOR 4

Male

Female

% for Women

Total number of people trained

1,429

929

500

34.99%

To calculate the core indicators, please refer to Results Guidance

# OBJECTIVE 1

Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaption

## OUTCOME 1.1

Technologies and innovative solutions piloted or deployed to reduce climate-related risks and / or enhance resilience



## OUTCOME 1.2

Innovative financial instruments and investment models enabled or introduced to enhance climate resilience

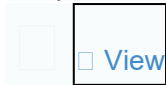


## OBJECTIVE 2

Mainstream climate change adaption and resilience for systemic impact

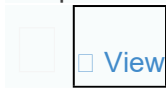
### OUTCOME 2.1

Strengthened cross-sectoral mechanisms to mainstream climate adaption and resilience



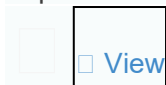
### OUTCOME 2.2

Adaptation considerations mainstreamed into investments



### OUTCOME 2.3

Institutional and human capacities strengthened to identify and implement adaptation measures



## OBJECTIVE 3

Foster enabling conditions for effective and integrated climate change adaption

### OUTCOME 3.1

Climate-resilient planning enabled by stronger climate information decision-support services, and other relevant analysis, as a support to NAP process and/or for enabling activities in response to COP guidance



[View](#)

## OUTCOME 3.2

Increased ability of country to access and/or manage climate finance or other relevant, largescale, pragmatic investment, as a support to NAP process and/or for enabling activities in response to COP guidance



[View](#)

## OUTCOME 3.3

Institutional and human capacities strengthened to identify and implement adaptation measures as a support to NAP process and/or for enabling activities in response to COP guidance



[View](#)

## Part II. Project Justification

### 1a. Project Description

#### CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF

There are no significant changes in overall alignment with the PIF, however the proposed outputs, activities, indicators and co-finance arrangements have been updated to reflect the on-ground situation.

#### 1. Changes in Outputs

Output 1.1 in the PIF stated: "Agencies for water utilities at national, river basin, and local levels established and supported to fully factor water level and water shortage forecasting into the service provision". This has now been dropped based on the recommendations by government stakeholders during the first PPG Meeting on 5<sup>th</sup> October, 2021. This decision was taken because the need for creating water agency was no longer the governments priority during the PPG as opposed to the PIF period. Consequently, the number of outputs under Outcome 1 have changed from 4 to 3. Therefore, Output 1.2 in PIF document has become Output 1.1; Output 1.3 in PIF document has become Output 1.2 and Output 1.4 in PIF document has become Output 1.3. During the first PPG meeting, the PPG team was advised to focus on strengthening existing entities for improved governance and provision of water utility services, rather than creation of new entities as prescribed in the PIF. This recommendation has been reflected under Output 1.3, Activity 1.3.2 to "Assess revenue generation and private sector engagement in water sector through pilot Public-Private-Partnership (PPP) model in providing local level water utility services".

Output 2.1 in PIF is described as "Vulnerable natural water catchments restored, sustainably managed, protected and their ecosystem conditions improved". This has now been reworded to "Nature based solutions for watershed restorations implemented aimed at yielding stable spring/stream flows". This was done to shift the emphasis from catchment restoration to the restoration and stabilization of hydrologic services from these catchments.

#### 2. Changes in Indicators

- Direct project beneficiaries disaggregated by gender in the PIF is 34,029 (16,334 females and 17,695 males). These figures were based on the targeted households of the Water Flagship Programme. This has been revised upwards to 37,334 (17,869 females and 19,465 males) as the project sites (Gewogs or sub-districts) were identified during the PPG phase and their demographic statistics were available.
- The project coverage in the PIF includes three Dzongkhags of Gasa, Punakha, Tsirang and Wangdue (with two gewogs of Phangyuel & Ruebisa). However, the proposal for inclusion of the gewogs of Phangyuel & Ruebisa in Wangdue have been dropped by the RGOB since these gewogs have already been covered under similar RGOB programmes. The project coverage in the prodoc is now limited to three districts of Gasa, Punakha and Tsirang.

- Area of land restored (under climate-resilient management) including area of watersheds restored and protected and area of agricultural land under climate-resilient practices in the PIF document is 38530. Ha. This has been increased to 40,853 Ha based on mapping of targeted catchments using GIS and remote sensing and ground-based validation of these catchments.

3. Changes in the stakeholder engagement are as follows;

- The engagement of Druk Holdings and Investments (DHI) as a partner for integration of IoT and mobile ICT technologies was specified in the PIF. The pre-identification of private sector and CSO/NGOs have been removed to enable transparent and competitive mode of engagement. Also the UNDP and RGOB's norms of engaging private sector entities will require standard bidding through a formal process during the implementation phase. By the same rationale the references to the engagement of Green Bhutan Corporation (GBCL) and Druk Green Power Corporation (DGPC) to be engaged in watershed maintenance have been removed. The scope of private and corporate sector engagement is still valid and will be discussed during the inception and project implementation based on outcome of formal standard bidding processes.

4. Changes in co-financing arrangements and allocations between components

- At the PIF stage, the total co-financing from RGOB is estimated at US \$ 25,190,600. The co-financing figure now stands at US \$ 25,132,000 which is less by US \$ 58,600 based on the co-finance details re-worked by the RGOB.

- Changes in allocation of funds between components

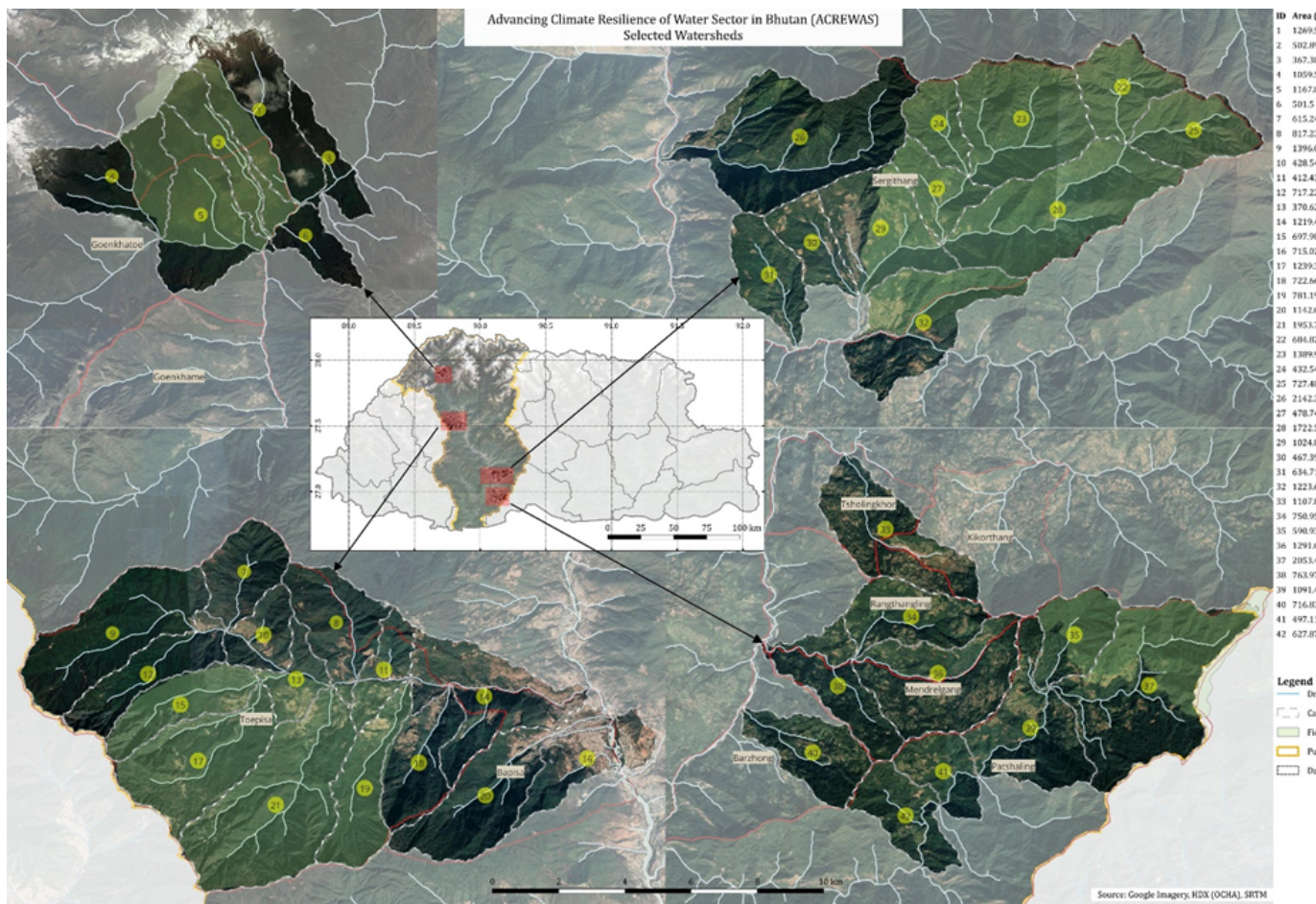
- The following changes in allocation were made:

	PIF Stage		Present	
	LDCF	Co-finance	LDCF	Co-finance
Component 1	977,000	1,492,000	287,000	4,339,000
Component 2	1,680,000	2,580,000	504,860	7,477,000
Component 3	5,400,067	19,065,000	6,669,022	9,020,000
Component 4	450,000	565,000	918,100	3,416,380

- These changes were informed by the site surveys during the PPG phase during which estimates for restoration and water infrastructure were developed. Furthermore, additional availability of funding from other projects, particularly in the area of watershed restoration and institutional support for water governance at the grassroots level allowed for an increase in the allocation towards climate resilient water infrastructure (component 3) and knowledge management (component 4).

## Background Context

Bhutan is a small landlocked country in the Eastern Himalayas, occupying 38,394 km<sup>2</sup> between China in the north and India in the south, east, and west. High snow-capped peaks and alpine pastures occupy the north and the mid ranges are covered with temperate forests in deep, north to south valleys and hills created by fast-flowing rivers. The south's foothills comprise alluvial plains with broad river valleys and sub-tropical forests. About half of Bhutan's rugged terrain has slopes greater than 50%, and 752.45% of its land area is over 2,600 meters above mean sea level.<sup>1</sup> The entire country, with its fragile mountainous ecosystems, is part of a global biodiversity hotspot.<sup>2</sup> Bhutan is among the least populated countries in mainland Asia with a population of 727,145 (47.7% of 52.3%) and a population growth rate of 1.3%<sup>3,4</sup>, with an additional 2.51% under meadows, 9.74% under shrubs and 5.35% under snow and glaciers.<sup>5</sup> 51.44% of the total area is protected.<sup>6</sup> Only 2.75% or 112,556.2 hectares constitute cultivated agricultural land. Maize, rice, potatoes, and vegetables are the major food crops, in addition to farmers raising livestock. Farmers largely depend on rainfed irrigation systems to grow crops.



The Punatsangchhu basin is the largest of Bhutan's five major river basins. It has the highest number of glaciers and glacial areas (436 and 361.6 of 9.3 km<sup>2</sup> respectively) and 223 glacial lakes occupying a total area of 25.23 km<sup>2</sup>,<sup>7,8</sup>. Although Punatsangchu is important in terms of hydro-power generation, the river has not benefited the farmers proportionately in terms of irrigation, as the agricultural lands are located on higher slopes. Smaller streams and spring sources on the upper slopes are tapped for irrigation and domestic water needs.



The project targets interventions in four watersheds namely Singtaulum, Okalum, Pawkhola and Sergithang Gewog Laraychuu which fall within three Dzongkhags (Gasa, Punakha and Tsirang) of the Punatsangchhu basin. These sites were selected based on a comprehensive assessment of socioeconomic and climate hazards at the dzongkhag level as well as a Gewog level vulnerability analysis of water resources in Bhutan including for the drinking water and irrigation water sources.

#### Problem Statement

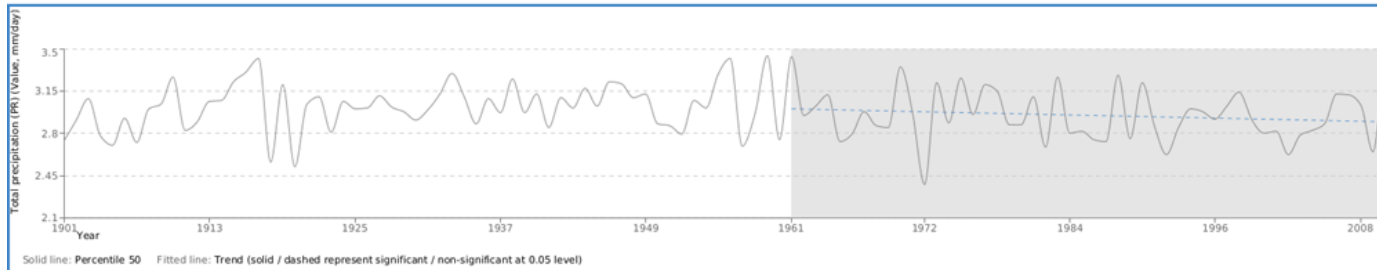
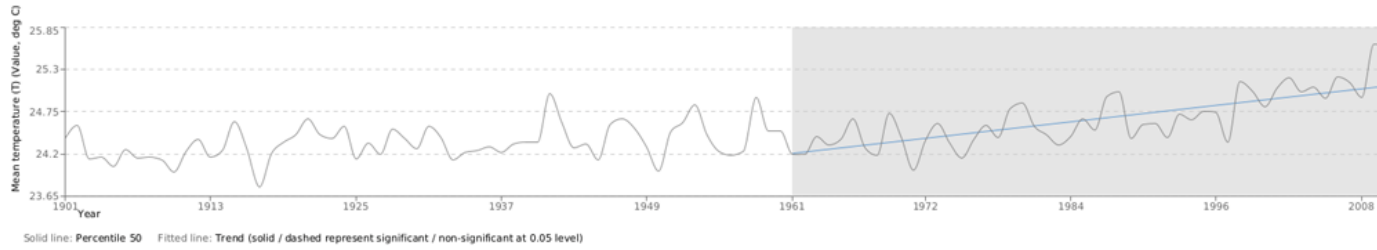
The project seeks to address the irrigation and domestic water shortages and declining quality of drinking water, on account of climate change induced alterations in weather patterns and increased frequency and intensity of climate-induced hazards. This has increased vulnerabilities of livelihoods, food production and human health that depend on the Renewable Natural Resources (RNR) sector, particularly for farmers and those dependent on forest resources. Rainfall variability has made water sources on which communities rely for irrigation and domestic use increasingly unreliable and inadequate. The infrastructure used to harvest and convey water is vulnerable to physical damage by floods and landslides, leading to water insecurity among both rural and municipal water users.

#### Climate Change

A summary of climate related challenges in Bhutan is presented below, a more detailed discussion is presented in Annex 13a.

Bhutan is the 46th most vulnerable country and the 64th most ready country to climate change impacts according to the ND-GAIN Index<sup>9</sup>. Historical data on temperature and precipitation trends in Bhutan shows a gradual increase in mean temperature (0.177 C per decade) and a declining trend in total precipitation (-0.0021mm/day per decade) since 1901. This analysis is based on the Climate Research Unit (CRU) of the University of East Anglia. The increase in temperature since the 1960's has been significant and has increased sharply after the turn of the century. Changes in precipitation too have been more marked in the past two decades with increased variability and a declining trend<sup>10</sup>. A more recent comparison of the CRU dataset with station data showed consistent patterns and an increase of 0.8 C in mean annual temperatures between 1976 and 2005<sup>11</sup>. The combination of increased temperatures and declining precipitation has contributed to a reduction of glacial areas. Erratic rainfall has resulted in reduction of water availability for irrigation leading to changes in growing zones, cropping patterns and worsening water pollution and scarcity<sup>12</sup>. Other consequences of climate change have included outbreaks of diseases and pests, erratic rainfall, windstorms, hail storms, droughts, flash floods and landslides<sup>13</sup>. The figure below presents historical observations of temperature and precipitation in the South Asian region based on the CRU dataset (source IPCC).





**Total precipitation (PR) - Trend (mm/day per decade)**  
**1961-2015 (Observations)**  
**CRU TS - Annual -South Asia**



The National Integrated Water Resources Management Plan<sup>14</sup> highlights the threat from Climate Change on drinking water supply, agricultural production and hydropower generation. The National Adaptation Programme of Action (NAPA) published in 2006<sup>15</sup> details the damage caused by glacial lake outburst flood (GLOF), and floods triggered by extreme rain to irrigation channels. It lists the following climate change related vulnerabilities pertaining to the agricultural and water resources sector, other than those mentioned above: 1) Decreased water availability for crop/livestock production; 2) Drying up of water sources affecting availability as well as water quality; 3) Increased sedimentation of rivers, water reservoirs and distribution network, affecting notably irrigation schemes? productivity/ agricultural crop yields; 4) Increased pressure on catchment areas to retain water/increased runoffs with enhanced soil erosion (deterioration of environment); 5) Deterioration of (drinking) water quality and 6) Loss of safe (drinking) water resources increasing water borne diseases.

Climate related disasters reported during the past three decades are summarised below:

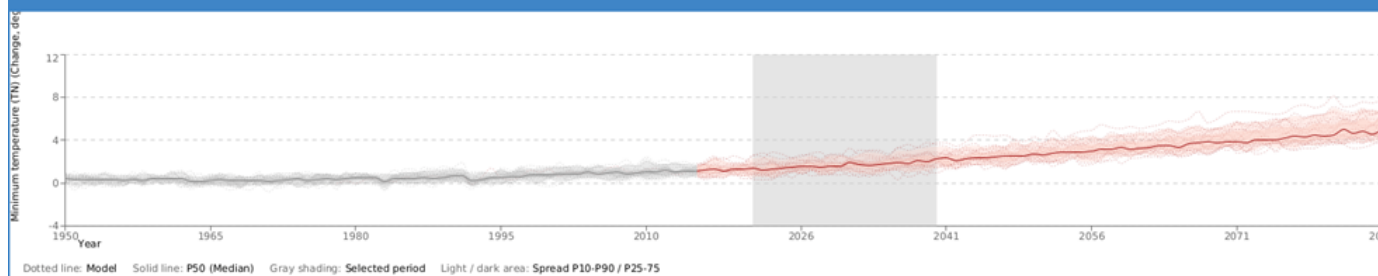
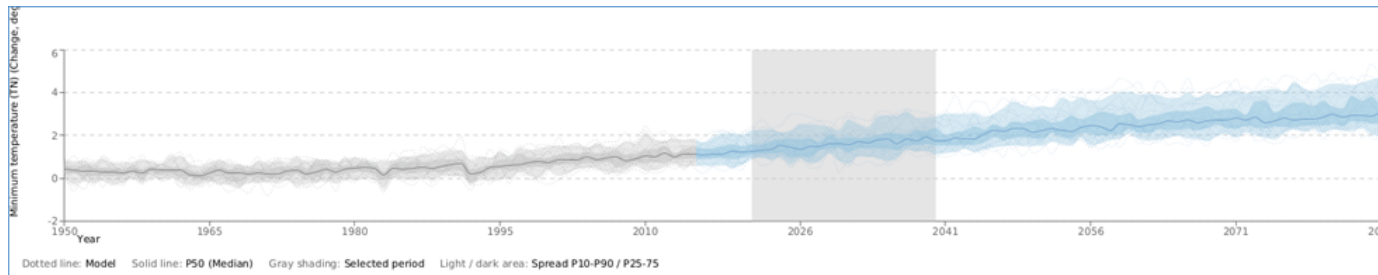
Year	Event	Region/River Basin / Dzongkhag	Reported Damage
1957, 1960, 1968	Glacial lake outburst flood (GLOF)	Lower valleys	Damage to life and property

1994	Most devastating GLOF in living memory	Luge Tsho in eastern Lunana burst. Pho Chu and Mochu rivers joined course above Dzongchu in Punakha.	Extensive damage to property along the Punakha-Wangdi valley. 91 households 5 water mills, 816 acres of dry land and 965 acres of pasture land damaged/washed away.
1994, 1999, 2001, 2003 & 2008	Drought	Paachu-Wangchu valley	Die back and insect attack on pine, conifer and oak forests. Low river flow/Water shortage /Impact on hydropower generation, drinking and irrigation water supply
1999 to 2014	Drought	Nationwide	An estimated average of 47 fire incidences recorded each year, totally 707 incidents of forest fire affecting over 102, 397.6 ha.
2000	Extreme rainfall, flash floods, landslides	Southern regions of Bhutan. Phuntsholing, Pasakha, Samtse and Kalikhola.	Unprecedented rains, highest recorded in Bhutan. Toorsa and Dhotikhola rivers changed their course. Loss of life and infrastructure.
2004	Extreme rains and floods	Eastern Dzongkhags of Trashigang, Trashiyangtse and Samdrupjongkhar	9 deaths, 29 houses washed away, 26 houses collapsed, 107 houses damaged. 161 acres of wetland and 503 acres of dry land was washed away. Agricultural produce lost to 1437 households. 39 irrigation channels damaged and 22 bridges were damaged or washed away.
2009	Rain, cyclone Aila	Nationwide	Private/ public buildings, water infrastructure, roads, forests, plantations, fields
2010	Flash floods	Sarpang river/ Sarpang Sarp town	Paddy fields, irrigation channels, farm roads, dinking water supply schemes, and crops
2012	Extreme rain, landslide/ flooding	Damji, under Gasa* Dzonkhags	Arable fields & road, siltation, irrigation canal networks
2013	Flash flood	Punakha Kabj*	Paddy fields (6 acres)
2014	Flash floods	Sengphug Rongchu, Trashiyangtse Toetsho gewog	Paddy fields (600-700 acres)
2015	GLOF	Lemthang Tsho, Gasa Laya*, Punakha-wangdue valley*	Drinking water infrastructure
2015	Flash flood	Nahi stream, Wangdue*	Drinking water sources, irrigation sources washed away

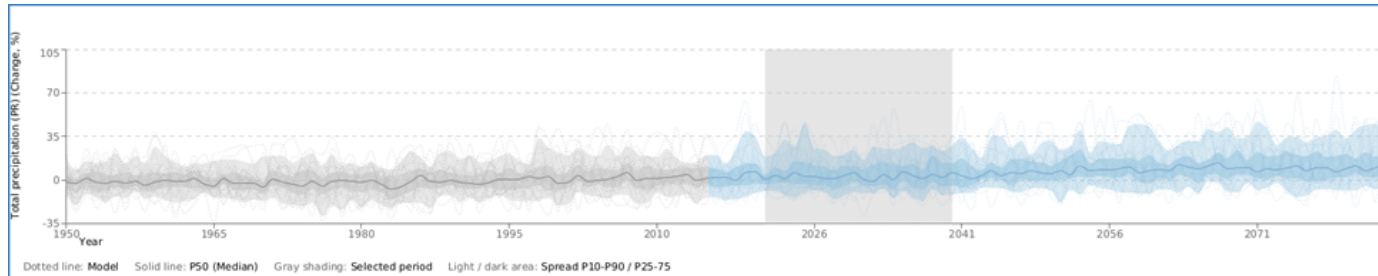
2016	Flash flood	Setikharay stream, Gelephu (Pelrithang)	Water treatment plant
2016	Flash flood	Setikharay stream, Gelephu geowg, Ghaden chewog	Paddy fields (60 acres), cardamom (2 acres)
2019	Flash flood	Phangruchhu stream, Jaroggang, Kamichu area, Wangdue Phodrang	Roads submerged, irrigation channel, drinking water infrastructure, paddy (20 acres)

Climate projections for Bhutan suggest an increase in temperatures likely to trigger heat waves and droughts and contribute to glacial and snow melt<sup>16</sup>. The latter is likely to change patterns of river discharge and water availability and cause an increased occurrence of glacial-lake outbursts in the region<sup>17</sup>. Floods, triggered both by glacial-lake outbursts and by increased frequency of extreme rain events during the monsoon are the most significant climate-related hazard in Bhutan, affecting agriculture in particular, which is concentrated in the more vulnerable drainage basins<sup>18</sup>. Bhutan lost 23.3 ± 0.9% glacial area between 1980 and 2010<sup>19</sup>. Warming trends, particularly at higher altitudes and during winter months, are likely to further accelerate glacial-melt which additionally threatens the water-dependent economy.

The next figure presents projections of change in temperature in the South Asian region with the short-term changes shaded in grey, the one below it shows projected changes in precipitation. Source ? IPCC.



Minimum temperature (TN) - Change (deg C)  
 Near Term (2021-2040) (SSP5-8.5) (rel. to 1850-1900)  
 CMIP6 - Annual (27 models)-South Asia



Total precipitation (PR) - Change (%)  
 Near Term (2021-2040) (SSP5-8.5) (rel. to 1850-1900)  
 CMIP6 - Annual (33 models)-South Asia



Regional level projections: The CMIP-6 model projections<sup>20</sup> (figure 2 and 3) suggest that in the Asia region, there will be an increase in average and heavy precipitation, a decline in glaciers, and an increase in glacial runoff. There will also be more intense and frequent heat waves and humid heat stress and an

increase in both annual and summer monsoon precipitation with enhanced inter-annual variability. Expected trends as per four different scenarios (representative concentration pathways) and for the near (2021-2040), medium (2041-2060), and long term (2081-2100) are presented in Table 1. A more comprehensive description is provided in the Feasibility Study (Annex-13a).

Table 1: CMIP6 - Total annual median change related to 1850-1900 baselines for precipitation (%) and minimum and maximum temperature change (? C). Source: interactive atlas

Period	Scenario	Precip. (%)	Min. Temp. (? C)	Max. Temp. (? C)
Near Term (2021-2040)	SSP1-2.6	5.6	1.6	1
Medium Term (2041-2060)	SSP1-2.6	8.2	2	1.5
Long Term (2081-2100)	SSP1-2.6	9.1	2	1.5
Near Term (2021-2040)	SSP3-7.0	5.3	1.5	0.9
Medium Term (2041-2060)	SSP3-7.0	5.4	2.3	1.5
Long Term (2081-2100)	SSP3-7.0	19.8	4.1	2.4
Near Term (2021-2040)	SSP2-4.5	4.3	1.6	0.9
Medium Term (2041-2060)	SSP2-4.5	8.7	2.1	1.6
Long Term (2081-2100)	SSP2-4.5	11.3	3	3.3
Near Term (2021-2040)	SSP5-8.5	4.4	1.7	1
Medium Term (2041-2060)	SSP5-8.5	9.3	2.7	1.9
Long Term (2081-2100)	SSP5-8.5	25.5	5.2	4.4

National and site level projections: The Third National Communication to the UNFCCC21 confirms these projections. In the coming years, Bhutan will likely face an increase in frequency and magnitude of extreme rain events and windstorms causing flash floods and landslides. Temperature increases are likely to alter patterns of glacial and snow melt and cause water sources and streams to dry up.

A Gewog level vulnerability analysis for water resources in 2021, as a part of the National Adaptation Plan (NAP) formulation for Bhutan, identifies the Punatsangchhu basin as a hot spot with the highest likelihood of increased duration and frequency of low flows<sup>22</sup>. The analysis concludes that climate change and erratic rainfall are causing an increasing lack of good quality water resources due to drying up of springs and streams during the dry season and reduced groundwater recharge. The 10-year precipitation events increase most in the Gewogs across the Punatsangchhu basin. An increase in landslide risk is projected for both RCPs 4.5 and 8.5 in the upstream regions of the basin. An increase in frequency of droughts and extreme rain events is projected in both Gasa and Tsirang. The NAP assessment on socioeconomic and climate hazards at the Dzongkhag level<sup>23</sup> ranked Gasa and Tsirang in third and fourth position in terms of vulnerability. Punakha was ranked at 17 on account of a very high adaptive capacity, even though it ranked among the highest in terms of hazard, exposure and environmental degradation.

Site-specific climate trends from the NASA Earth Exchange Global Daily Downscaled Projections were analysed as part of the PPG process (refer Annex 13a ? Climate Analysis). A comparison against baselines from 1960 to 1990 (Table 2) suggests an increase ranging from 8.9 to 9.6 percent for the near

term under RCP4.5. The same comparison for RCP8.5 scenario projects increases from 9.7 to 14.7%. For the long term, the increase in rainfall is expected to be between 16.5 and 18.6% for RCP4.5 and 40.3% and 45.5% for RCP8.5. The crucial issue with rainfall is its seasonality and variability. Most of the increases in rainfall will be during the monsoon months (June to September) and will be accompanied by fluctuating variability, particularly during June and July.

Minimum temperatures are also expected to increase significantly (Table 2). For the near term, an increase of 1.52° to 1.56° C is expected under RCP4.5, which under RCP8.5 is projected to be between 1.46° and 1.74° C. For the long term this is projected to be between 1.43° C and 2.74° C and 4.33° and 4.92° C under the RCP4.5 and RCP8.5 scenarios, respectively. Increases in temperatures, have serious implications for crop production and productivity of ecosystems, and in Bhutan, for increased glacial melt. Trends in minimum temperature<sup>24</sup> are projected to increase under both scenarios, with sharpest increases in the winter months.

Table 2: Percent change in precipitation and minimum temperature at project sites projected as per NEX-GDDP for the near, medium, and long term for two representative concentration pathways compared against baseline periods of 1961 to 1990. Additional details and plots presented in Annex 13a.

Site	RCP4.5 Near	RCP4.5 Medium	RCP4.5 Long	RCP8.5 Near	RCP8.5 Medium	RCP8.5 Long
<b>Precipitation</b>						
Gasa	8.9	16.2	18.6	14.7	22.6	45.5
Pawkhola	8.9	17.3	16.6	10	21.4	40.3
Punakha	9.6	15.2	17.5	12.9	21.8	43.1
Sergithang	8.9	15.7	16.5	9.7	20.7	40.4
<b>Minimum temperatures</b>						
Gasa	1.56	2.06	2.74	1.74	2.59	4.92
Pawkhola	1.49	2.02	2.43	1.46	2.27	4.33
Punakha	1.53	2.01	2.55	1.6	2.48	4.86
Sergithang	1.52	2.01	2.45	1.48	2.31	4.42

Implications: Impacts of climate change are expected to seriously affect food production, considered a direct threat to food security in Bhutan.<sup>25</sup> Climate projections suggest an increased frequency and duration of dry spells, reducing flows and recharge of aquifers during the dry season. However, the same sites will face increased damage to watersheds and water infrastructure from floods and landslides triggered by extreme rain events. The latter will additionally impact water quality and silt up springs, channels, reservoirs, and storage facilities.

Rapid changes in average temperatures and rainfall patterns are the biggest threat to farmers, who depend on the monsoon<sup>26</sup>. Variability in rainfall, particularly delays in the arrival of monsoon has led to water shortages affecting crop yield/productivity leading to fallowing of agricultural land which is recognised as a threat to food and nutritional security of the country<sup>27</sup>. These are often accompanied by excessive rains during the monsoon which triggers landslides and floods, causing extensive damage to both farms and infrastructure<sup>28</sup>. Rainfall variability also affects watersheds, with many water sources now drying

up. As per the 12th Five Year Plan on Renewable Natural Resource Sector<sup>29</sup>, 26.5% (54,524ac) of the total 205,026 acres of operational agricultural land are left fallow. The yields of crops have been declining at a compounded annual rate of 1.84% over the last 27 years<sup>30</sup>. Climate change impacts have been conspicuous in terms of reduced yields, frequent pests and diseases, and unpredictable weather patterns. Climate change, therefore, has the most pronounced impact on the poor, as poverty in Bhutan is predominantly a rural phenomenon. The recent food price inflation due to disruptions to agriculture because of the COVID-19 pandemic<sup>31</sup> Furthermore, climate-induced disasters result in loss of agricultural land, infrastructures, crops and livestock and affect the food distribution system and trigger price escalation of essential commodities.

Increases in temperatures, particularly during the dry season, have severe implications for crop production and productivity of ecosystems. Increase in temperatures significantly increases water demands of major crops, and on average reduces yields of several important cereals, highlighting the need for reliable irrigation as a means of mitigating climate change impacts. Observed warming of more than 1 degree Celsius is equivalent to another 10?20 percent reduction in rainfall for crops<sup>32</sup>, and, on average, reduce yields of wheat by 6.0%, rice by 3.2%, maize by 7.4%, and soybean by 3.1%<sup>33</sup>. The Renewable Natural Resources (RNR) sector, including agriculture, livestock and forestry, employs 64.96% of the population and provides livelihoods for about 57% of the total population. The agricultural sector alone employs 49.9% of the total population and 69.3% of the rural population of Bhutan. Rural areas account for 62.2% of the population and 90% of its poor.

In most parts of Bhutan, farming is done on steep and moderate slopes, susceptible to erosion, landslides and other forms of land degradation induced by climate change<sup>34</sup>. Rapid changes in average temperatures and rainfall patterns are the biggest threat to farmers who depend on the monsoon. Variability in rainfall, particularly delays in the arrival of monsoon is often accompanied by excessive rains, which trigger landslides and floods, causing extensive damage to farms and infrastructure. Rainfall variability also affects irrigated farmlands as water used for irrigation is sourced from small rivers and streams in the headwaters of the watersheds, which are drying up. These climate change related impacts have resulted in the following problems:

#### Declining Productivity and Diminishing Ecosystem Services from Watersheds

The degradation of forests and watersheds coupled with impacts of climate change has put increasing pressure on the integrity of biodiversity and ecosystem services in the country. Several assessments in the recent past, including those with communities<sup>35</sup> and forest management units adjacent to commercial as well as community managed forest areas have confirmed the loss of ecosystem services as a consequence of forest degradation.<sup>36</sup> The Assessment and Mapping of Water Sources/Springs in Bhutan reports that about 34.6% of the watersheds around all water sources in Bhutan are degraded<sup>37</sup>. Degradation of watersheds has a direct and long-term impact on ecosystem services, particularly hydrologic services.<sup>38</sup> This is often in the form of reduced dry season flows coupled with increased flashiness of streams during the wet season. Increased runoff and erosion are other consequences of degraded watersheds,<sup>39</sup> especially from deforestation and cultivation on slopes,<sup>40</sup> which directly impact off take for domestic water supplies.

#### Declining Supply Duration, Volume and Quality of Water

## Domestic Water

Issues of acute domestic water shortages and dried-up water sources were raised by almost all Dzongkhags and communities where rural water supply schemes were implemented.<sup>41</sup> Decreased winter flows over the past two decades and drying up of springs and rivulets, comprising about 35% of all water sources, has led to a surge of water shortages across Bhutan during winter. According to the studies on community perceptions<sup>42</sup>, winter flows in springs and rivulets, which are the major domestic water sources, have declined over the past two decades. Of the 7,399 water sources recorded in a recent assessment,<sup>43</sup> 25.1% or 1,856 sources were found to be drying.

Increased frequency of extreme rain and consequent floods, landslides and mud-slips have resulted in higher sediment loads in streams and rivers, which are the offtake points for domestic and irrigation water. Existing filtration systems at these offtake points are not designed to address this growing challenge, leading to a decline in water quality.

## Water for irrigation

Increasing temperatures and longer dry periods contribute to crop failures and/or decreased yields.<sup>44</sup> In Bhutan, the projected increase in temperature, combined with a decrease in winter precipitation<sup>45</sup> is expected to increase area under fallow land and create acute water shortages, reducing the area suitable for the cultivation of key crops such as potatoes and maize under both RCP4.5 and RCP8.5 over the medium and long term. For rice, the models suggest an increase in a suitable area in the medium but a reduction over the long term under both scenarios.<sup>46</sup>

## Increased Vulnerability of Livelihoods Dependent on Agriculture and Natural Resources

Climate change is predicted to result in a decline in agricultural production in Bhutan from 4% to 10% in the absence of appropriate measures<sup>47</sup>. Separate studies have documented the impacts climate change has had on communities. Natural calamities, such as floods, temperature increases and prolonged dry spells, increased production losses from close to 65 MT in 2011 to more than 1,154 MT in 2015<sup>48</sup>. Natural calamities, limited access to seeds and crop damage by pests and disease were reported to be among the most important constraints on farming.<sup>49</sup> Climate change has weakened the livelihood systems of both poor and middle-income households who lack knowledge on adaptation measures to mitigate its impacts.<sup>50</sup>

## Root Causes

### High dependence on climate sensitive natural resources

The RNR sector, including agriculture, livestock and forestry, is crucial in securing national food security and self-sufficiency. The agricultural sector accounted for 19.23% of GDP in 2020<sup>51</sup>, employing 49.9% of the total population and 69.3% of the rural population of Bhutan. The share of women in the sector is much higher at 58.5% when compared to men (41.7%)<sup>52</sup>. Rural areas account for 62.2% of the population<sup>53</sup> and 90% of its poor<sup>54</sup>. The agricultural sector is predominantly subsistence-based and



cultivated agriculture is only 2.75% of the land area, of which just 300 sq.km., or 0.83% of total land area, is under irrigation<sup>55</sup>. Nearly 30% of agriculture households depend on rain-fed irrigation.

Gender roles in Bhutan add to the climate vulnerability of rural women<sup>56</sup>. These include the role of producing and sourcing food in addition to supporting household wellbeing. Therefore, women depend more on natural resources such as water, non-wood forest products, and fuel-wood energy sources, all of which are impacted by climate change. This increases the time and labour burden on women as well as their health and security.<sup>57</sup>

17.7% of Bhutan's GDP is from hydropower export<sup>58</sup> which also accounts for 99% of all electricity used in the country<sup>59</sup>. The sector, an important economic driver, is vulnerable to Climate change induced changes in precipitation patterns, increased evapotranspiration and heightened risks of glacial lake outbursts.

#### Inaccessible Topography and Terrain

The mountainous landscape, fragile ecosystem and diverse agro-climatic conditions make Bhutan vulnerable to several risks. Half of the land area of Bhutan has slopes greater than 50% and lies over 2600 meters above mean sea level.<sup>60</sup> The inaccessible terrain makes the delivery of infrastructure and services, including during emergencies, difficult and expensive and contributes to increased vulnerabilities. It severely constrains market penetration and commercialization and weakens supply and value chains that are necessary to sustain and support economic development.<sup>61</sup>

The proposed climate change adaptation solutions are: 1) Adoption of climate resilient practices in agriculture, forestry and natural resources management among communities; 2) Restoration, enhancement and climate proofing of water infrastructure and implementation of small scale water storage and of conveyance and distribution systems for both domestic and irrigation supply which are designed to be climate resilient; 3) Soil and water conservation measures and construction of protective infrastructure to stabilize catchments, slopes and channels; 4) Nature based solutions, including assisted natural regeneration to for ecological restoration and revival of watersheds; and 5) Providing climate resilient livelihood alternatives and income sources specifically targeting youth and women.

However, there are significant barriers that prevent the proposed adaptation solutions from being realized.

#### Barriers

##### Lack of Awareness, Capacities and Skills among Communities Dependent on RNR sector to Address Climate Impacts

Most farmers in Bhutan perceive that rainfall has decreased, become unpredictable and the frequency of extreme rain events has increased. Drying up of water sources, delays in planting, soil erosion, damage to infrastructure and disruption to work are perceived as the immediate impacts of these anomalies.<sup>62</sup> However, farmers (including women and youth), lack awareness, capacities, skills and resources to mitigate and adapt to the impacts of climate change. For instance, inappropriate cultivation practices on

slopes or poor crop choices contribute to erosion and impact soil fertility in the long run. This requires adoption of water-use efficiency and a more resilient irrigation system with enhanced skills and knowledge among the farmers to operate and manage water resources. These capacities and resources are required to up-scale existing Climate Smart Agriculture (CSA) technologies and to test and adopt new ones.

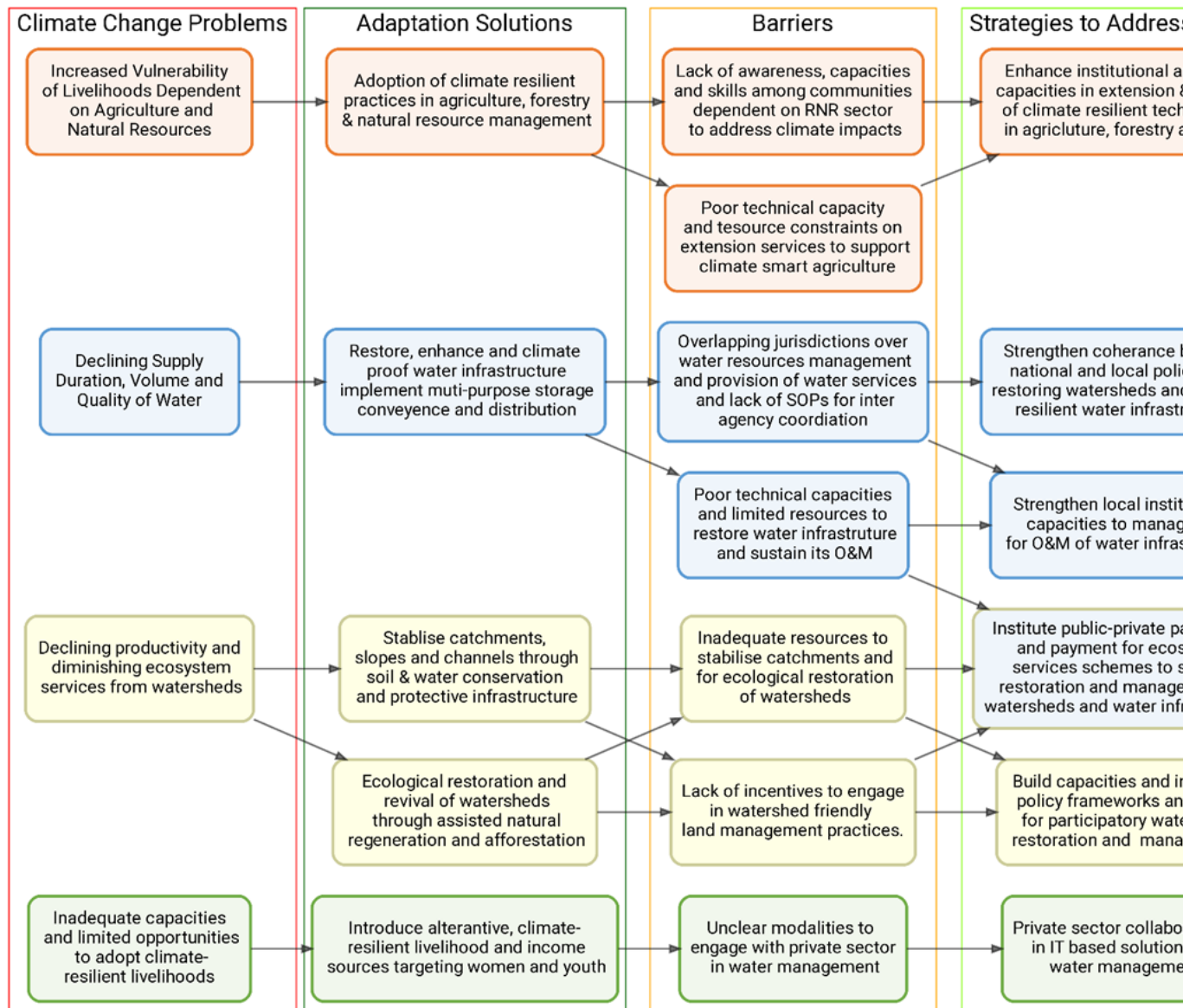


Figure 2: Relation between problems/barriers and solutions/strategies proposed

Poor Technical Capacity and Resource Constraints in Agricultural Extension Services to Support Climate Smart Agriculture

Challenges due to climatic shocks and distress can be addressed through up-scaling and adoption of CSA approaches. However, government institutions have gaps and resource constraints in implementing climate adaptation measures and supporting communities in adopting climate resilient livelihoods. Poor research-extension linkages impede the adoption of CSA technologies by farmers. The technical skills of extension officers in surveying and designing water supply systems, water treatment plant operation and maintenance, monitoring and evaluation, instrumentation and maintenance of instruments need to be enhanced. There is a need for capacity development on climate resilient water/watershed management practices as well as training on climate-smart operation and maintenance of water supply systems, water conservation/efficiency technologies and adoption of Integrated Water Resources Management (IWRM) approaches.

Bhutan's agricultural system faces many challenges associated with its distinct geographical conditions and climate change impacts. The situation is aggravated by inadequate access to technology and the absence of an enabling environment for private sector investments and business development services.<sup>63</sup> Furthermore, investment in research, innovation and technology, have been on a decline due to overall decrease in share of capital investment in the agricultural sector.<sup>64</sup> The assessment of RNR institutional capacity<sup>65</sup> recommended that extension programs need to be expanded to promote climate resilient and sustainable agricultural production systems. The RNR strategy<sup>66</sup> identifies climate-smart production systems such as land development, pest and disease management and smart irrigation technologies as the strategic priorities for extension advisory and technology transfer.

Agriculture and food security, water, forest and biodiversity have been identified as the core sectors vulnerable to climate change which require immediate attention. Gaps in technical capacities, knowledge and data need to be addressed to enable climate change adaptation.<sup>67</sup> These capacity gaps need to be understood to better support smallholder farmers and communities with timely advisory, technology transfer and facilitation of CCA with a focus on climate smart agricultural technologies. Strengthening capacities are an immediate priority for the next 1-2 years.<sup>68</sup> This includes protected cultivation technologies, Sustainable Land Management and bio-engineering technologies, irrigation system, Crop protection, Integrated Pest and Nutrient Management, and biogas. Critical inputs, capacity-building and extension services will be key basis for adopting of various CSA practices and technologies.

#### Overlapping Jurisdictions and Policy Gaps in Water Resources Management and Provision of Water Services

Gaps in water governance policy result in lack of clarity in roles and responsibilities of the institutions responsible for water supply and management. Multiple institutions have responsibilities and mandates for protection of watersheds and managing water distribution in Bhutan. At the national level, the agencies include the Ministry of Agriculture and Forest (MoAF), National Environment Commission (NEC), the Ministry of Works and Human Settlement (MoWHS), and the Ministry of Health (MoH). At the local level, the Dzongkhag Engineering Divisions are responsible for infrastructure, including water management. These overlaps in roles and lack of coherent and consistent standard operating procedures for inter-agency coordination are a barrier to effective management of water resources and implementation of watershed restoration initiatives<sup>69</sup>. The Water Act of 2011<sup>70</sup> empowers NEC to coordinate line agencies through the Water Resources Technical Advisory Committee. However, the committee, comprising senior officials from relevant agencies, has failed to make any significant impact.

## Poor Technical Capacities and Limited Resources to Restore Water Infrastructure and to Sustain its O&M

Line departments lack the resources and technical capacities to restore water infrastructure and sustain their O&M<sup>71</sup>. Technologies being used to monitor and manage distribution systems are obsolete and result in wastage, poor and delayed O&M and inefficiencies. Presently, there are no incentives to mobilize investment in technological upgrades or management practices to ensure efficiencies in the system. This is a barrier to water resource management and prevents adoption of appropriate technologies for water infrastructure design and systems. Many engineers and technicians currently lack technical competence in climate-resilient designs, construction, and water infrastructure management. There is a need to increase awareness and emphasise capacity development in these aspects, including climate-resilient watershed management, restoration, and climate-smart operation and maintenance of water supply systems.

Traditional systems and institutions for managing infrastructure and water resources cannot cope with climate change induced hazards coupled with degradation and increased vulnerabilities of catchments. These institutions need to be strengthened and their capacity built to address the increased scale of damage and deterioration to water infrastructure due to erosion, landslides and mud-slips.

## Inadequate Resources to Stabilise Catchments and for Ecological Restoration of Watersheds

Substantial investment is required for stabilisation and ecological restoration of catchments through soil and water conservation initiatives<sup>72</sup>. Both government agencies and communities lack the financial and technical resources to undertake these interventions, particularly the sophisticated design elements to factor in climate change induced extreme weather events. Weak Mechanisms for Coordination and Financial Support to Participatory Watershed Management.

As mandated by the Water Act of Bhutan 2011<sup>73</sup>, the National Integrated Water Resources Management Plan (NIWRMP)<sup>74</sup> was prepared in 2016 which identified the need to form River Basin Committee (RBC). To date, only Wangchhu RBC has been formed. The RBC is required to develop River Basin Management Plan (RBMP) which serves as management framework for IWRM at the basin level. The watershed management programme of the MoAF in the 12th Five Year Plan<sup>75</sup> includes watersheds assessments, assessment of drying water sources, preparation of watershed and wetland management plans and climate-smart restoration of watershed. However, due to the lack of RBC, water users are often not involved and lack coordinated approach in watershed management activities.

## Lack of Incentives to Engage in Watershed Friendly Land Management Practices

There are few financial mechanisms to sustain the continuous monitoring of catchment conditions, O&M and infrastructure protection and implementation of vegetative measures required to restore watersheds. This is partly because there is no existing framework to monetise the ecological goods and services from these watersheds and existing PES mechanisms remain limited to Damphu township in Gasa and Khuchi-Darachhu/Thakoling in Tsirang.

It is also observed that in areas with a high population of people and livestock, the pressure on natural resources has increased leading to over-exploitation, deforestation, overgrazing and consequently degradation<sup>76</sup>. These challenges are compounded by the following<sup>77</sup>:

- ? Master plans for watershed management tend to present a static approach to an inherently dynamic challenge and diverse interest groups.
- ? Watershed boundaries do not coincide with political boundaries creating problems in establishing watershed authorities.
- ? Inefficient use of data for planning, creating unrealistic plans which are inherently complicated.
- ? Slow planning processes impeding on-ground action.
- ? Fragmented authority and mandates of agencies engaged in watershed and water resources management compounded by limited resources.

Unclear modalities to engage the private sector in water management

The lack of clear modalities for engaging the private sector, absence of water pricing mechanisms, and methods of arriving at actual cost as well as inadequate capacity and experience are some of the factors limiting the engagement of the private sector in water management. While the Economic Development Policy<sup>78</sup> (EDP), 2016, supports private sector participation through the Public-Private Partnership (PPP) policy including private/community participation in the development and maintenance of irrigation and water management systems, there is very limited examples of private sector engagement in the field of domestic and irrigation water management.

Further, challenges of terrain and connectivity, coupled with impacts of the COVID-19 pandemic, have adversely affected the development of the private sector in Bhutan. Limited market access due to logistics challenges, particularly for rural agricultural communities, also limits livelihood and income diversification opportunities. The 12th Five Year Plan for the RNR sector<sup>79</sup> recognises inadequate implementation and coordination between value chain players in agro-based enterprises. It emphasises the need for reallocation of economic activity towards the promoting of agro-processing (value-addition) activities and agro-based enterprises to create a significant number of 'off-farm' jobs and to also achieve the economy of scale.

Immediate Causes

Deterioration and Increased Vulnerability of Water Supply Points and Water Infrastructure

Landslides, flash floods and landslips are increasingly damaging water infrastructure, including water intakes and conveyance and distribution structures. They additionally obstruct access, hindering O&M and repairs resulting in delayed and insufficient supplies and deterioration of water quality.

Domestic water

Based on a supply and demand analysis carried out for 2014 and 2030, the capacity of existing infrastructure requires rehabilitation to cater to the demand of some of the urban centers. In addition to the inadequacy of infrastructure, a public survey on access to 24x7 safe domestic water commissioned by MoWHS in 2018 indicated water pipe leakage, tank overflows, illegal tapping of waterlines, frequent breakage of water pipelines, lack of maintenance, increase in consumption, drying up of water sources<sup>80</sup> as some of the challenges. In Gasa and Lobeysa area of Punakha which fall within peri-urban areas are reliant on multiple off-take points at streams and springs. Furthermore, there are no facilities for water storage to help tide with increasingly frequent and prolonged dry spells. Neither of the sites have any water treatment facilities, which are now a necessity given the increased sediment loads and debris being transported by streams, owing to more frequent extreme events.

### Irrigation

The irrigation Master Plan<sup>81</sup> assessed canal seepage, wetting, and drying of canals, leakage at canals, blockage and management inefficiency as major problems. Conveyance and distribution efficiency were found to be at 75% and application efficiency at 70% with the overall irrigation system efficiency at 39%. Most irrigation systems in Bhutan are ageing run-of the river, gravity-fed earthen canals with low technical efficiency. Their climate inefficient designs are vulnerable to deterioration by even slight increases in stream/river floods and landslides caused by climatic variability.<sup>82</sup> The high conveyance losses of these systems due to seepage and their poor design leads to mismanagement and increased conflict among water users. Water shortages are more pronounced during the main cropping season, which coincides with the pre-monsoon season. Farmers are not able to deal with the increasingly frequent damage these system face.

### Environmental and Ecological Deterioration of Watersheds

The loss of forest, habitat degradation, overgrazing, land use conversion coupled with unsustainable agricultural practices for various purposes have been repeatedly flagged as a matter of serious concern in Bhutan.<sup>83</sup> This is further exacerbated by increased forest fires, hydro-power projects, haphazard infrastructure development, mining and quarrying<sup>84</sup>. Local institutions, particularly those in densely populated areas, have been unable to reconcile the accelerated demand for natural resources with conservation.<sup>85</sup> An increased awareness of the role of healthy watersheds in water resources and capacity building of community-based institutions for watershed restoration is urgently needed to manage and protect watersheds as mandated by the watershed management policy in Bhutan. The Water Flagship Program, 2020 recognises the impacts of climate change is exacerbating systemic issues leading to the degradation of watersheds and threatening water availability. These include insufficient source management, inadequate infrastructure development and maintenance, and issues in governance and sector-based systems<sup>86</sup>. Inappropriate and Climate Vulnerable Practices in Agriculture and Unsustainable Use of Natural Resources and Forests

The recently concluded vulnerability assessments conducted to inform the National Adaptation Plan<sup>87</sup> and the Nationally Determined Contributions (NDC)<sup>88</sup> recognise the vulnerability of the agriculture sector to the impacts of climate change. It highlights the need to promote climate smart and resilient agriculture and livestock development, sustainable forest management and conservation of biodiversity.

The RNR Sector Adaptation Plan of Action (SAPA 2016)<sup>89</sup> also identifies climate change issues, vulnerabilities, and adaptation plan.

Traditional farming practices and undulating terrain present some of the greatest challenges in the adoption of CSA in Bhutan<sup>90</sup>. The steep slopes inhibit mechanisation, soil conservation measures such as terracing and counter hedgerow are expensive and labour intensive, adoption of integrated pest and soil fertility management is hindered by costs and socio-cultural barriers, low acceptance of legumes inter-cropping, and limited knowledge about good practices for cattle and poultry cross breeding for disease resistance and higher yields. Limited access to credit and financial services and the predominance of small holdings also excludes farmers from crop intensification, diversification and technological investments.

#### Baseline Analysis and Initiatives

The proposed project will specifically build on and complement several government efforts in Bhutan. Partnerships and collaborations are summarised in the relevant section below with details in Annex 13g.

#### Baseline efforts and investments

Through the central government programs, the RGOB has invested in on-going programs on sustainable land management, plantation activities, renovation and establishment of new domestic and irrigation water infrastructure, improved pasture development, establishment of cottage livestock enterprises and sustainable management of forest areas. The Ongoing government programmes under the Renewable Natural Resource (RNR) sector invested Nu. 1,784.843 million (?21.42m USD) for current and Nu. 2,241.609 million (?26.9m USD) was capital works. The bulk of these investments were made by three key departments. The Department of Agriculture had a total expenditure of 903.15 million nu (?10.83m USD). In all, 3591.65 ha of agricultural land was developed, and fallow land was revived. In addition, 178.42 ha were brought under Sustainable Land Management. In addition, 1,019,785 fruit seedlings were supplied under Million Fruit Tree Plantation and 2,38,323 fruit seedlings under the National Seed Centre. New and renovated irrigation of 289.4km was done leading to 945.75 ha being brought under micro-efficient irrigation.

A total of 5,119 green houses were established for high value crops. The Department of Livestock had an expenditure 741.12 million nu (?8.89m USD) in the last fiscal year. This was used to bring 12140.58 ha under improved pasture developed and 214,531 MT of conserved forage production. Of this 650.28 ha of improved pasture and 2,008.46 ha was for winter fodder as part of their climate smart livestock farming. Other investments included support to dairy for milk, poultry, piggery, goats, sheep, yak and fisheries. Investments included the establishment of layer farms, fishponds, milch cattle and pig breeders. The Department of Forest and Park services had a total expense of 1,309.34 million nu (?15.71m USD). This was used to support sustainable extraction of timber and scientific thinning (146ha). The department developed 9 nature based eco-tourism products and improved effective management of 18 protected areas. Human wildlife conflict mitigation measures were additionally implemented for tiger, elephant and snow leopard related conflicts. Investments in livelihoods training and income diversification

included training to 887 youths for enterprise development and to over 300 farmers/youths on farmers' business literacy.

The RGoB, through its local governments, has taken up construction of domestic and irrigation water schemes as well as rehabilitation of existing ones. Since 2012, the RGoB has developed 20.2 km of new irrigation schemes and renovated 74.2 km of irrigation schemes in the project districts. The local development plans, which largely comprise of these efforts will continue to invest about US 9.02 annually in the project dzongkhags and will continue to do so in the form of co-financing for the project from the local governments.

The RGoB has made significant investments in strengthening water resources and ecosystems. Expansion of the irrigation network has been prioritized in the 11th FYP as well as 12th FYP, to achieve national food self-sufficiency goals. The national water flagship program aims to enable access to domestic and irrigation water by all communities in the country through appropriate design and implementation of water infrastructure, skills development in water infrastructure, smart water management and strengthening of water user associations.

The RGoB has also made targeted investments in sustainable land management (SLM) to reduce soil erosion ? to increase crop diversity and fodder availability, as well as to enhance resilience of irrigation networks (e.g. irrigation channel renovation works are often needed because of persistent slope instability issues like deep-seated landslides, mudflow areas, rock fall areas and flooding of intake areas).

Bhutan has over 51.44% of its land area under protected areas network system. The Department of Forests & Park Services (DoFPS), has been implementing Sustainable Management of areas outside the protected areas under State Reserve Forests (SRFL) or areas outside the protected areas, Sustainable management of forest landscapes and conservation of biodiversity and integrated watershed management to ensure sustainable environmental service delivery.

Gaps related to the baseline efforts

Despite the considerable investments made in water resource management, there has been limited explicit consideration of future climate change impacts undermining these investments jeopardizing many of the gains made through past interventions. For instance, RGoB's past investment in irrigation and domestic water systems has not been climate resilient, causing irrigation system susceptibility to flood damage from heavy monsoon, erosion and flooding while the sustainable land management efforts such as terracing and integrating with efficient use of water in the field needs upscaling.



While forestry legislations require all areas under state forest to be strategically guided by sustainable management plans, only about 6.4% of the SRFL under Forest Management Units and Working Schemes and 2.2% under Community Forests have well formulated resource management plans. Besides other forest defined as Forest Management Units, Working Schemes, Local Forest Management areas, Community Forests, the DoFPS have also been implementing Watershed Management Plans and Wetland Management Plans. These watershed plans are not necessarily aligned to the actual catchments that function as the water source for actual domestic and irrigation water schemes downstream.

The ACREWAS project builds on these key investments by 1) "Climate proofing" existing infrastructure, particularly water infrastructure; 2) Enhancing investments in management and protection of critical catchments to sustain water sources; 3) Contributing to policies plans to enhance coordination between departments for effective and targeted investments; and 4) Incorporation of climate projections in designs of water infrastructure.

This project builds on a number of prior projects and lessons learned from past experiences in Bhutan. Some of these projects are still in the pipeline, while others were recently approved. The table below summarises these projects, with more detailed descriptions in Annex 13d.

Sl	Project/Initiative Title	Funding Agency	Implementing Entity	Duration	Grant (mill US\$)	Focal areas/ Relevance	Type of Partnership
1	Enhancing Sustainability and Climate Resilience of Forest and Agricultural Landscape and Community Livelihoods	GEF-Multi Trust Fund	UNDP	2017 to 2023	13.967	Support for SLM, climate-smart agriculture and enhancement of climate-resilient infrastructure.	Collaboration Knowledge sharing
<p>?The third and fourth components of the project closely compliment with component two and four of ACREWAS. Both project seek to support SLM, climate-smart agriculture and enhancement of climate-resilient infrastructure. The ACREWAS project would gain from the additional emphasis on livelihood diversification and livestock management that is part of this project's strategy. At the same time the ACRWAS project's emphasis on climate-proofing water infrastructure and interventions in catchment areas that protect water resources and water infrastructure would complement the impact of the climate resilience project. The M&amp;E and knowledge management components of the two projects would also complement each through cross learning and sharing of data and information.</p>							
2	Supporting Climate Resilience and Transformational Change in the Agriculture Sector project	GCF	GNHC(recently merged under MOF)	2019-2025	24	Climate resilient agriculture	Collaboration

?Climate resilient and climate smart agriculture and integration of climate risk into water and land management are areas where the two projects need to ensure cross learning and collaboration as well as preventing duplication of effort. The ACREWAS project would gain significantly from lessons learned and take advantage of the enhanced capacities of local government and farmers in use of climate information and early warning. It will scale up work on climate resilient and climate smart agriculture, and sustainable land management. In turn, the work on catchment restoration, additional protective measures for infrastructure and enhanced surveillance and management of watersheds by the ACREWAS project, will support resilience of water infrastructure by the GCF project as well.

3	Adaptation to Climate-induced Water Stresses through Integrated Landscape Management in Bhutan	Adaptation Fund	Bhutan Trust Fund for Environmental Conservation	2023-2027	9.999	Climate resilient agriculture and integration of climate risk into water and land management.	Collaboration
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?Both the project have similar approaches and propose similar interventions through their respective components, namely 1) adaptive management of watershed for enhancing resilience of community; 2) climate resilient water infrastructures for uninterrupted supply of water for drinking and irrigation and 3) climate-smart agriculture through sustainable land management. The two projects will complement each other through cross-learning and collaboration to expand the impact of interventions. The proposed ACREWAS project will benefit from the improved Agro-meteorological services and local Governance for effective Climate Change Adaptation mainstreaming with focus on water management at the grass-roots that is proposed by the Adaptation Fund supported project.

4	Securing Ecological Connectivity of High Conservation Value Areas (HCVAs) in South-Western Bhutan	WWF/IKI	DoFPS	2020-2028	? 9.7	Watershed restoration, protection of water infrastructure and increased community-based Forest Management	Collaboration
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?ACREWAS will collaborate with the project in Tsirang Dzongkhag where the ACREWAS project targets 17,654 persons (9110 ?, 8544 ?) and 20,420 ha under 21 catchments for watershed restoration, protection of water infrastructure and increased management. The two projects can scale up and co-finance both proposed interventions to cover a wider area for restoration and have higher investments in management, monitoring and wider community mobilisation. The ACREWAS project will benefit from the lessons learned and institutional capacities created by the IKI funded project while results of interventions in water infrastructure and landscape restoration in ACREWAS will increase climate resilience and economic benefits of local communities targeted by both projects.

5	Preparation of a National Adaptation Plan (NAP) for Bhutan, with a focus on the water sector	GCF	NEC	2019-2023	2.52	NAP readiness focusing on water sector;	Collaboration Knowledge sharing
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?The results of this project have contributed substantially to the strategy developed for implementing the ACREWAS project. This includes the selection of sites and the prioritisation of activities under each. The reports have also contributed to the discussion on the climate case for the project presented in the feasibility study (Annex-13a). This project will continue to be an important source of lessons for the ACREWAS project, particularly through its inception phase, through the availability of data, information and the enhanced capacities of staff from the WSD and NEC. In turn, the lessons learned from ACREWAS will contribute to the updating of the NAP for Bhutan through knowledge sharing events and products proposed under component 4.

6	Bhutan For Life	GCF/FAO	MoWHS	2018-2032	26.56	Water governance, watershed management, climate resilient infrastructure	Collaboration
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? There are a number of areas of overlap between the ACREWAS and this GCF project. There are opportunities to co-finance, collaborate and scale up interventions in the areas of restoration, enhanced monitoring of forest areas and of strengthening communities and local institutions in conservation and NRM. The ACREWAS project will benefit from the ecosystem services that are enhanced and secured by the GCF project while downstream water users benefit from climate-proofing of water infrastructure. The projects will mutually benefit from cross-learning and institutional capacities that are created.

7	Water Flagship Program	ADB	MoWHS	2023-2027	6	Sustainable and inclusive domestic water, and irrigation services; river basin management planning and lessons on the institutional arrangements, particularly at the local level	Collaboration
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?The project is at its final stages of approval and will provide important lessons and opportunities for cross-learning for the ACREWAS project. One of the Dzogkhags of the project falls under the Punatsangchu Basin which will allow it to contribute to the river basin management plan proposed under output 1.1 of ACREWAS. The ACREWAS project will benefit from lessons on the institutional arrangements, particularly at the local level, and will replicate these structures and arrangements to benefit from past experiences and lessons on smart water management.

8	Strengthening community-based adaptation and food system resilience for vulnerable communities in Nepal and Bhutan	Adaptation Fund	World Food Programme/ GNHC (recently merged under MOF)	5 years (proposed)	14	Capacities for use of climate information and early warnings. Participatory adaptation and mitigation measures for water infrastructure	Collaboration
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?Stakeholders in sites common to both projects stand to gain from dissemination and capacities for use of climate information and early warnings. Participatory adaptation measures adopted by communities would be extended to mitigating measures that protect water infrastructure and thereby enhance resilience of end-user communities.

9	Commercial Agriculture and Resilient Livelihoods Enhancement Programme	IFAD	IFAD	2015 - 2025	25.64	Climate-resilient agriculture and technologies to increase agricultural productivity	Collaboration
<p>?There are clear overlaps between the two projects, particularly component 2 where ACREWAS also seeks to promote climate-resilient agriculture and promote technologies to increase productivity. The emphasis of ACREWAS on water infrastructure presents room for collaboration wherein the IFAD project could gain from improved irrigation supply.</p>							
10 ?	DHI Research and Innovation Venture Excellence (DRIVE) program	DHI	DHI	Ongoing	Unspecified	ICT and IoT technology application and entrepreneurship in water management.	Capacity building, entrepreneurship, PPP
<p>?The project seeks to build collaborations with the DRIVE center in three key areas:</p> <ul style="list-style-type: none"> <li>? Technology development: Development, testing and scaling up the application of ICT and IoT tools in the management of water services, including O&amp;M and metering.</li> <li>? Training and capacity building: Supporting local agencies and municipalities in setting up ICT systems for water distribution, including technical training, supply of IT equipment and hand-holding until the new technologies have been internalized and worked into the regular workflows.</li> <li>? Mentoring and incubation: Providing hands on training to young entrepreneurs on the application of these ICT tools for water supplies for both domestic and agricultural water users. Mentoring of selected trainees and supporting them to set up private ventures with start-up capital, technical backstopping and linkages to relevant financial services.</li> </ul>							
11 ?	Enhancing Climate Resilience of Water Sources in Bhutan	GCF	NEC	Proposed	1.0	Climate proofing water sources for water supply and sanitation. Climate resilient rural water infrastructure.	Collaboration and knowledge sharing
<p>? Key among the similar strategies between the two projects are lessons to be learned from activity 3 of the project on modeling climate change scenarios on small local water sources. The ACREWAS project, whose implementation is likely to precede that of the GCF project, could in turn contribute to activities 1, 2 and 4 of the GCF project.</p>							

3) the proposed alternative scenario with a brief description of expected outcomes and components of the project;

The objective of this project is to enhance the resilience and sustainable economic well-being of the people of Bhutan by supporting climate adaptation interventions that enhance climate resilience of water resources through climate adaptation of the water sector. This will be achieved through catchment

restoration and management, 'climate-proofing' of small-scale water infrastructure for rural and peri-urban areas and enhancing institutional capacities in local government and communities for operation, maintenance and management of these catchments and water infrastructure. The project will be implemented in three Dzongkhags of Gasa, Punakha and Tsriang. The project comprises of four closely integrated components which will benefit 37,334 residents of three Dzongkhags (19,465 men/ 17,869 women), restore and manage 38,518 ha of watersheds and bring 3,392ha of agricultural land under climate resilient practices including adoption of climate smart agricultural technologies. Water storage will be augmented (by 1,266 cum), water transmission and distribution lines (74.14km) and water off-take points along streams and springs will be made resilient to landslides, mud-slips and floods. Both government and community-based institutions will be strengthened for sustained management and O&M of these resources and infrastructure through financial mechanism and supportive policy frameworks.

? Component 1: Water governance and institutions

o Outcome 1: Strengthened water governance, institutions, and financing mechanisms in support of climate-resilient water management

? Component 2: Nature-based solutions for sustainable & climate- resilient watersheds, and livelihood enhancement

o Outcome 2: Vulnerable natural water catchments in the target river basin (Punatsangchu River Basin) restored, sustainably managed, protected and their ecosystem conditions improved.

? Component 3: Efficient, adequate, and sustainable supply, distribution, and utilization of water

o Outcome 3: Enhanced adaptive capacity of water infrastructure to climate-induced water shortages and quality deterioration through climate-proofing, private sector engagement, and technology deployment.

? Component 4: Knowledge management

o Outcome 4: Strengthened awareness and knowledge sharing mechanism established

The TOC presents strategies to address the climate change problem by addressing specific barriers, described earlier, to the proposed adaptation solution through clear causal linkages. These strategies were developed through extensive consultations with stakeholders at all levels, including women and vulnerable groups. Analysis of data collected by subject experts from field sites and secondary sources, coupled with an exhaustive review of literature, informs this strategy. The project strategy seeks to leverage available opportunities, including collaborating with the private sector and CSOs/NGOs. It is relevant to the local context and situation and includes a comprehensive assessment of watershed conditions, engineering designs and options, and economic analysis, details of which are presented in the Feasibility Study (Annex 13b Watershed Assessment and 13c Economic Analysis). Details of the consultations conducted, and descriptions of stakeholders are presented in the Stakeholder Engagement Plan (Annex 9).

The root causes are a combination of climate change-induced hazards with Bhutan's unique geographical characteristics such as high elevations and rugged terrain. The latter limits access and delivery of services and contributes to the high dependence of rural populations on locally available natural resources and agriculture. These root causes lead to environmental deterioration of watersheds and increased vulnerability of water sources and supply points as a consequence of inappropriate practices in agriculture and unsustainable use of natural resources to create serious problems for communities. The climate change problems include reduced flows from catchments due to delayed onsets of monsoons and reduced quality of water from damage to water infrastructure and increased sediment loads in water sources from floods and landslides triggered by extreme rain events. These problems have accelerated the degradation of critical water catchments, reducing their productivity and disrupting critical hydrologic services. Water infrastructure to capture and transfer water for irrigation and domestic use has faced structural damage and inefficiencies and increased O&M costs. Consequent loss of irrigation has resulted in an increase in fallow land and declining yields which are further affected by increased variability in rainfall, longer and hotter dry spells. The lack of alternative sources of income and livelihoods has increased the dependence of local communities on natural resources leading to their over-exploitation which has further accelerated their degradation and exacerbated the vulnerability of local communities as it disrupts hydrologic services and productivity.

In order to address these climate change driven problems, communities need to adopt climate resilient practices in agriculture, forestry and natural resource management. Critical water infrastructure needs to be restored and storage and conveyance structures need to be "climate proofed" and their O&M improved to meet the additional challenges posed by climate change. Ecological restoration of watersheds is needed to ensure sustained provision of ecosystem services. This needs to be coupled with soil and water conservation measures to stabilise critical catchments and protective structures around water off-take points. Finally, alternative, climate resilient livelihoods need to be promoted, especially among women and youth.

There are key barriers to the proposed solutions. Communities lack awareness of the implications of climate change and those dependent on natural resources lack capacities to address climate impacts. Constraints on technical capacities and resources hinder extension services to support climate resilient and climate smart agriculture. Barriers at the policy level include overlapping and unclear jurisdictions between agencies engaged in water resource management and delivery of water services. Limitations of resources and technical capacities are a barrier to restoring and sustaining the O&M of existing water infrastructure or to undertake ecological restoration of watersheds and stabilize critical catchments. The involvement of the private sector in water management is constrained by the lack of formal mechanisms and modalities and hinders the adoption of innovative technologies and financial sustainability of these services.

In order to address these barriers the project proposes to enhance institutional and local capacities in extension and delivery of climate resilient technologies in agriculture, forestry and NRM. It will strengthen and increase coherence of national and local policies for climate resilient water resource management and supply of water for irrigation and domestic use, including creation of climate-resilient water infrastructure. It will simultaneously strengthen local institutions to manage, operate and maintain their water infrastructure.

The government, in line with the mandate of the Water Act, is developing River Basing Management Plans for five major river basins in Bhutan. This provides an opportunity for the LDCF project to support establishment of the RBC for Punatshangchhu river basin with appropriate linkages to grassroots water user stakeholders and to systematically embed climate change risks based on the risk modelling work that will be delivered by the project. The plan will additionally provide a framework for coordination between line agencies and local governments on projects and programs that affect the basin.

Public-private partnerships will be instituted and payment for ecosystem services schemes for watershed restoration and management will be replicated and scaled up to ensure their financial sustainability. The project will also build capacities and institute policy frameworks and standard operating procedures to enhance participatory watershed restoration and management. Finally, the project will facilitate private sector collaborations in IT based solutions for water management.

The project will engage local youth-based enterprises to manage the technology components and support the overall O&M of water infrastructure in collaboration with concerned WUAs or the municipal authorities under activity 3.2.1. These enterprises will be incentivized through payment for their services by the WUAs and municipalities post project period while it will bring about efficiency in the O&M. During the PIF and PPG design phase consultations have been held with all key stakeholders including DHI. DHI offers extensive homegrown experience in the setting up water management systems within Bhutan which meets the expectation of the ACREWAS project to contribute and add value. Engagement of corporate and private sector (start-ups) in O&M is expected to ensure long term sustainability of the project. However, during the PPG, the UNDP and the Government strongly expressed the need to engage private sector through competitive procurement process as standard selection process, based on request for proposals during the PPG. During the implementation, private sector entities such as the DHI will be invited to participate in the project through competitive procurement process to integrate automation of irrigation and drinking water assets.

The strategies are based on rigorous assessments outlined below.

? Catchment-based technical assessments of watersheds interventions, water infrastructure and the economic viability of identified activities have been undertaken and inform this strategy. These reports are part of the Feasibility Study (Annex 13b).

? Comprehensive assessments of gender (Annex 11 Watershed Assessment) and social and environmental safeguards (Annex-6 and Annex-10) following UNDP and GEF guidelines.

? A desktop study on biophysical and climatic trends and climate impacts based on remotely sensed datasets and literature. The analysis is part of the feasibility study (Annex-13a Climate Analysis) and covers both the national as well as site-specific scenarios.

? comprehensive consultations with communities and stakeholders at all levels have been undertaken (Annex-9) and validated the proposed strategy and the technical assessments. These have also informed the selection of sites.

? Interactions with the private sector, CSO, and NGO has helped inform the strategic framework for wider stakeholder engagement and partnerships.

? Continuous and rigorous engagement with the project preparatory team comprising of members from relevant national and local stakeholders, UNDP CO, UNDP RAP and consultants.

The Theory of Change for the project can be summarized as follows:

The project will undertake the restoration of watersheds and critical catchments along with "climate-proofing" of water infrastructure and modernizing and decentralizing the management of water resources and water distribution. It will do so through strengthening of local institutions by making them gender-responsive, inclusive and financially and technically self-reliant by facilitating private sector engagement. It will additionally, enhance adoption of climate-resilient practices in agriculture thereby mitigate the impacts of climate change<sup>91</sup> on water sources, water supply, water infrastructure and agriculture.

This will be facilitated by streamlining institutional policies and procedures and improved coordination between national and sub-national agencies. The project will strengthen the capacities of public institutions to develop adaptive water management policies and deliver services, including extension services to facilitate the adoption of climate adaptation practices It will engage local entrepreneurs and the private sector to bring in IT based solutions to improve O&M and efficiencies in water distribution and supply.

The following assumptions are made in the theory of change. These are shown as red text in the figure below.

1a. Women, minorities and vulnerable groups will have equal and equitable access to all project related activities and benefits. These risks, mitigation measures and strategies are presented in the GAP (Annex 11), the SESP (Annex-6) and the ESMF (Annex-10)

1b. Local institutions and local leaders will be willing to provide meaningful representation to other stakeholders in the community and facilitate women, minority groups and vulnerable sections in participating in these committees. These risks and strategies for stakeholder engagement are presented the SEP (Annex-9).

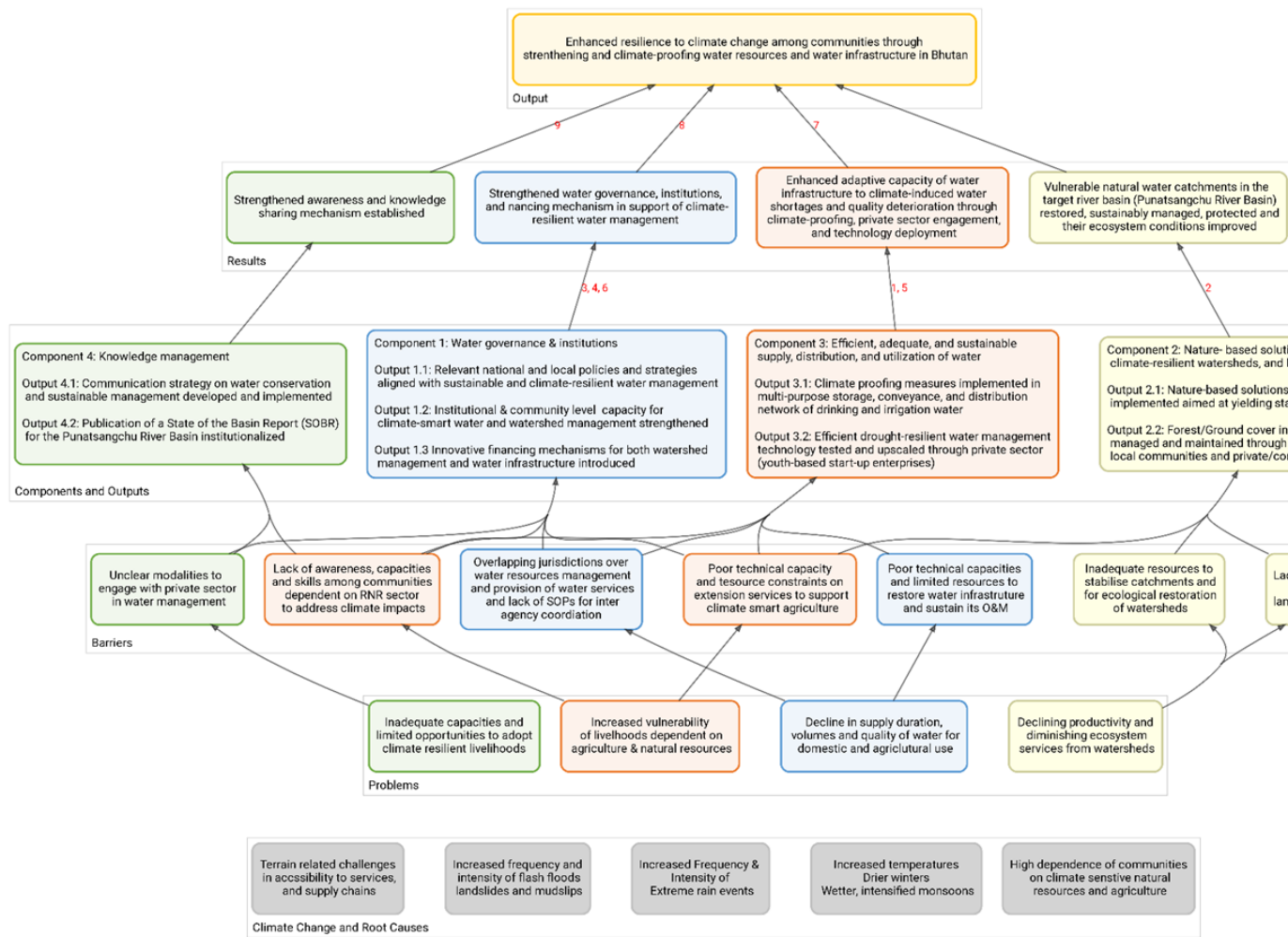
2. Traditional and customary tenure and owners of actual and perceived rights over natural resources, including grazing grounds and forests will permit community-based management of these resources which may include setting aside areas for regeneration and creation of structures and enclosures. This risk is particularly relevant to outputs under Component 2.

3a. Government agencies will be receptive to proposed innovative financial mechanisms and private sector involvement and partnerships.

3b. Relevant authorities will accept and provide permission, support and resources at to use technologies such as IoT and ICT-based sensors and will integrate them with existing management and planning systems.



4. National and district policies, strategies and plans will be adopted by local level institutions and leadership - including traditional and customary leaders.
- 5a. Rural infrastructure will be made available for restoration and new infrastructure created by the project including water infrastructure and infrastructure for SWC, water harvesting, and flood control will be operated and maintained by communities.
- 5b. The global COVID pandemic will not significantly affect the activities proposed. There is a risk that lock-downs and other restrictions may disrupt supply chains, delaying and affecting prices of transport and labour availability. A detailed discussion of risks to the project is provided in Section 4.3.2. This is an assumption at the project
- 6a. Institutions and governance structures at the local level will remain stable and provide a framework for project implementation as well as continuation of its activities.
- 6b. Community based organisations including committees, associations and federations of users will be integrated with formal systems of management and coordination and government mandated governance structures.
7. Training and capacity building and support provided to communities and other actors will be retained and used for actual implementation and continuation of activities past the project's life.
8. Entrepreneurs and private sector participants will be able to access credit, insurance and other material and technical resources from existing sources in the government, private sector and CSOs.
9. There is ownership and willingness among stakeholders to mainstream local plans and programs



## Proposed Solutions

The project will employ gender-responsive approaches that assist climate-vulnerable communities build capacities to manage and protect natural resources and water sources, and to sustainably operate and maintain water infrastructure. Communities will be supported to adopt climate-smart and efficient technologies in agriculture and to diversify into livelihoods and income sources that are climate resilient. Local institutions will be the primary conduit for project activities and will be provided necessary resources and training for long-term extension service delivery to communities. Policy gaps that hinder coordination between government agencies will be addressed and guidelines and standard operating procedures established to ensure a consistent and coherent institutional and policy framework. Linkages and partnerships with the private sector, especially youth-based enterprises in water utility service

management will be demonstrated along with scaling up of PES based financial mechanisms to sustain protection and conservation of watersheds.

The project will address adaptation problems and barriers using gender responsive, integrated watershed-based approaches for restoration and innovative financial mechanisms and tools that leverage Internet of Things (IoT) and digital technologies to improve operational efficiencies by automating detection of leaks and simplifying metering.. It will tackle both the supply side of the challenge, of declining water quality and quantity, as well as the demand side, wherein appropriate technologies and techniques are used to reduce water consumption by improving efficiencies of delivery networks and exploring tariff regimes for both domestic and irrigation water, with community oversight. Involvement of women and vulnerable groups, including youth, will be guided by the SEP and GAP (annex 9 and 11) Policy gaps and capacity constraints that hinder coordination and prevent the use of appropriate climate-resilient technologies will be addressed in the initial phases of the project along with extensive awareness-raising and mobilisation of communities and strengthening of institutions responsible for managing and protecting watersheds. The inception phase of the project will include validation of capacity gaps identified by recent studies and project.

The feasibility of design and engineering options for climate-proofing and strengthening water infrastructure was conducted as part of the PPG phase. These designs will be finalised during the inception phase of the project and water infrastructure will be restored, enhanced and made resilient to climate change impacts. The project will implement multipurpose storage conveyance and distribution systems for both domestic and irrigation water. A mix of appropriate, innovative technologies and local knowledge will be used to extend water supplies. This includes restoration and up gradation of traditional systems of water conveyance which, in many areas, are highly inefficient and vulnerable to impacts of climate change. Policy frameworks and procedures will be reviewed and Activities under this include;

strengthened by clear, consistent frameworks and SoP established to disentangle confusing mandates and roles. This will specifically target policies dealing with local institutions and governments engaged with the construction, operation and maintenance of water infrastructure as well as those engaged in water resource governance.

Consultative procedures will be put in place so that local communities, including women, are involved in the design and siting/locating of infrastructure. Local institutions will be trained in performing their mandated responsibilities in the O&M of water infrastructure. Financial mechanisms for user fee collection and contribution of materials and labour will be instituted to ensure the financial sustainability of these groups and committees. Dual purposing of irrigation and domestic water supply schemes will be explored to improve the reach of project investments.

Catchments draining into water sources will be stabilised and restored based on the comprehensive assessments conducted during the PPG phase (report presented in Annex 13b). A mix of locally available materials supplemented with construction and vegetative methods for slope stabilisation and protection of infrastructure will be used. Designs will incorporate risks due to climate change-induced extreme weather events and hazards. Integrated watershed approaches that utilise assisted natural regeneration with afforestation measures will be used to restore the watersheds, ensuring long-term, equitable benefits from their goods and services. Innovative financing mechanisms such as payment for ecosystem services (PES) schemes where downstream water users support watershed management upstream are presently operational in parts of Gasa and Tsirang. These will be scaled up to financially support upstream communities in the management and protection of these catchments.

Local institutions will be supported through capacity building and framing gender responsive watershed development plans and SoPs will be established for institutional support to participatory watershed management. Rural communities will be encouraged to set up fee-based structures for water supplies which are created or extended through the project. Extensive engagements and sensitisation of communities and local government agencies will be taken up to explore both cash and in-kind payments, the latter including a contribution of labour and materials to O&M costs to enable poor and vulnerable groups to pay in kind. This will serve the dual purpose of financial sustainability for the O&M of the infrastructure and an incentive to adopt water-saving technologies. Income generation through the promotion of high-value crops, particularly winter cash crops, agro-enterprises and processing of NTFP through existing community forest initiatives will additionally be supported through training and subsidies targeted at women and youth in particular.

In addition to the proposed solutions summarized here, specific pathways to solving the five key adaptation problems in the proposed project sites have been presented below; and elaborated in Section 4 (Results and Partnerships) describing each of the project components, outputs, and activities in detail.

Addressing climate change driven water stress in the sector of agriculture and for domestic use: The project will systematically enhance efficiencies in the harvesting of water, its conveyance and distribution in view of the increasing climate driven water stress scenario in Bhutan. This will be done through upgrading and climate proofing water infrastructure and its management. Water services will be modernized and fee-based and cost recovery systems will be put in place for O&M. These fee structures will be in accordance with the communities' ability to pay and will include both in terms of cash as well as labor contributions. ICT technologies will be brought in to improve operational efficiencies of conveyance and metering, as well as increasing transparency in the O&M of water services.

The project will conduct a comprehensive review of existing policies and procedures, to identify and disentangle conflicting jurisdictions and roles of local institutions. The review process will also ensure plans and policies are gender responsive and appropriately address differential priorities of women and men who are the end users of the water. The project will strengthen local institutional capacities in the management and O&M of water infrastructure and collection of tariffs, emphasising integration of modern IoT and Information and Communication Technology (ICT) equipment and techniques. This is expected to allow the project to implement activities to "climate proof" water infrastructure through strengthening, improvements and enhancements in existing installations.

Reversing degradation of watersheds reviving ecosystem services: A mix of assisted natural regeneration, reforestation and soil and water conservation measures will be undertaken. This will be combined with enhanced patrolling and protection of critical water catchments and construction of protective structures around water off-take points and along erosion prone slopes and streams. Local communities, including women and marginal/vulnerable groups will lead these watershed restoration measures. Bottom-up participatory watershed planning and comprehensive assessments of each micro-watershed comprising the targeted catchment will be taken up. The project will carry out extensive mobilisation and capacity building among communities and local institutions to this end. Public private partnerships and financial instruments, such as PES, will be instituted and formalized to ensure financial sustainability of these interventions.

Improving livelihood resilience of the communities engaged in agriculture and forestry: The project will facilitate the adoption of climate resilient practices in agriculture, forestry and Natural Resource Management (NRM) through capacity building of both institutions and of communities based on recent capacity gap analysis conducted by ongoing projects. Appropriate technologies and techniques will be introduced through hands-on, farmer field-based approaches. This will include efficient irrigation systems (drip, sprinklers) and soil moisture and nutrient management measures. Local institutions will be facilitated in setting up demonstration sites within the communities. Scaling of CSA practices, agroforestry and forestry will be facilitated through strengthened, field-based extension service, including farmer-to-farmer learning, knowledge exchange and replication. Training materials and programmes will specifically target women farmers and farmers from minority groups and will be designed to be gender-responsive and inclusive. The project will implement initiatives from several CSA practices that have been identified as suitable for Bhutan.<sup>94</sup>

Increasing capacities and opportunities for climate-resilient livelihoods and incomes: The project will support communities, particularly women and youth, to adopt climate resilient livelihoods and income sources by increasing opportunities for private sector engagement and entrepreneurial activities. Entrepreneurs will be supported by mentors identified from within the private sector and corporations. They will be provided on-the-job training and facilitated in establishing their start up enterprises on successful completion of their internships.

## Expected Results

The project objective is to enhance resilience for the sustainable economic well-being of the people of Bhutan through climate adaptation of the water sector. It will directly benefit 37,334 persons (19,465?, 17,869 ?) residing across three Dzongkhags and four watersheds. Of these 19,391 will benefit from water supply and 17,943 from enhanced watershed services .

The project will climate-proof 74.14 km of water transmission and distribution infrastructure and will augment water storage and treatment through small tanks (1 to 250 cubic meters) and two water treatment plants to ensure reliable supplies for both agricultural domestic use. Public-private partnership (PPP) models will be explored for long term financial sustainability of water utility services. Entrepreneurs will be facilitated, on a PPP model, to take over aspects of O&M of water supply networks or the management of the automated monitoring and metering system of the infrastructure.

The project is will also bring 3,392 hectares of agricultural land under assured irrigation, and 38,518 hectares of watershed under climate-resilient management to stabilize water yields under extreme events such as rainfall variability and long dry spells. PES models will be upscaled from existing approaches to sustain restoration and management of critical catchments and monetize biodiversity services by exploring opportunities in eco-tourism and agro-tourism.

A river basin management plan will be prepared for the Punatsangchu River Basin which will be coupled with the strengthening of institutional capacities of nine watershed institutions. The project will set up three facilities for domestic water quality analysis and measurement of supply across both irrigation and domestic water distribution networks. The three project Dzongkhags will also be supported in adopting a water management information systems and using designs for irrigation and domestic water infrastructure based on modeling of climate scenarios developed under the project.

The project will target five key groups for different types of activities, summarized below. A more detailed description of the stakeholders and their associated activities are provided in the Stakeholder Engagement Plan (Annex-9).

1. The first group includes downstream farmers and domestic water users. Farmers will be mobilized and supported to adopt climate resilient agricultural practices and water efficient irrigation technologies through hands on training and provision of materials and implements. Domestic water users will be

targeted for adoption of water saving technologies. Both groups will be supported in setting up local institutions for water management.

2. Upstream communities in the catchment areas that drain into water sources are the second group targeted by the project. They will receive support in setting up local institutions and through them, to adopt a slew of measures to protect and restore degraded watersheds. These include afforestation, soil and water conservation measures, assisted natural regeneration, agroforestry and sustainable management and use of forests and catchments.

3. Youth and women will be targeted for training and capacity building to help them take up agro-enterprises, income diversification from NTFP, eco-tourism and agro-tourism and for entrepreneurship training and incubation, including for private sector involvement in the O&M and metering of water distribution systems.

4. Private sector and entrepreneurs will be the fourth group who will be engaged in PES schemes, Public Private Partnerships in water utility service delivery and for integrating ICT and IoT technologies in O&M and metering of distribution networks. Private sector collaborations will also be sought in exploring income diversification through eco-tourism/agro-tourism. Private sector entities will be engaged through contractual arrangements for the development of the infrastructure for irrigation and domestic water schemes and will be engaged for at least a year of O&M upon completion of the development to ensure that functionality of the schemes are effective prior to handing over to communities.

5. Finally, the project will engage with government agencies and their technical staff at multiple levels. These agencies will be engaged in the project to deliver and install equipment and infrastructure for enhanced O&M and distribution networks. Government agencies will also be involved in setting up hydromet equipment for monitoring and early warnings. Agencies at the Dzongkhag level and below will be the key conduit for the project to conduct technical training and capacity building for communities and for water quality testing and monitoring and O&M of water infrastructure. Local extension services will be involved in demonstrations sites for climate resilient agriculture and in institutional capacity building of CBOs.

The project will be implemented in two phases, the inception phase for the first year and the implementation phase in the remaining four years. The first phase will focus on creating awareness and sensitization, organizational strengthening through training, and completing activity-specific surveys. Detailed designs and cost estimates for proposed activities will be reviewed and required environmental and social impact assessments will be drawn up for all physical interventions that are proposed. The latter will help to update gender action plans, stakeholder engagement plans, and social and environmental safeguards plans, biodiversity action plans including the livelihood action plan. All plans and guidelines prepared and updated during the inception phase will be formally validated by both the communities as well as the project steering committee.

The implementation phase of the project will focus on hands-on capacity building of technical staff, trainers, communities, and project beneficiaries. Water infrastructure will be "climate-proofed", and watersheds will be restored to enhance hydrologic services, introduce a tariff structure and support water-saving technologies. Institutional structures and arrangements, including the river basin committee and its linkage with local stakeholders, will be put in place for coordination, management, replication of the physical interventions. Financial mechanisms will be established to encourage and facilitate the private sector/entrepreneur participation in water resource management including in the O & M. PES models that have been successfully implemented elsewhere will be replicated and upscaled in the project area

The four components, expected outcomes, outputs and activities are summarised below. Site specific details of the activities and the assessments carried out during the PPG phase are presented in the Feasibility Study (Annex 13e).

#### Component 1: Water governance and institutions

Outcome 1: Strengthened water governance, institutions and financing mechanism in support of climate-resilient water management (LDCF: \$ 287,000; Co-financing: \$ 4,339,000)

This outcome will support, 1) : Alignment of relevant national and local policies and strategies with sustainable and climate resilient water management; 2) : Institutional & community level capacity for climate-smart water and watershed management and 3) Innovative financing mechanisms for both watershed management and water infrastructure.

Output 1.1: Relevant national and local policies and strategies aligned with sustainable and climate resilient water management

Under this output, the project will support development of water standards and tools to strengthen water resource planning and management. Assessments of water consumption and distribution will be made and cross-sectoral standards for water quality will be formulated. Dzongkhag level water master plans will be developed based on ecological analysis of climate trends and a river basin management plan for Punatsangchhu basin will be developed based on Integrated Water Resources Management (IWRM) principles. Activities under this include;

Activity 1.1.1: Revise national water standards to account for climate risks and gendered approaches. A gender responsive domestic water safety plan for project sites will be developed. Existing WHO-based Drinking Water Quality standards will be aligned to local conditions based on a daily per capita drinking



water consumption baseline for Bhutan; GIS-based digitization of domestic water distribution networks and overall developing a guiding tool for national and Dzongkhag level water master plans.

Activity 1.1.2: Conduct participatory water resource assessments in the three project dzongkhags in alignment with the National Integrated Water Resources Management Plan (NIWRMP), 2016. The assessment will be used to develop watershed development plans for implementation by local institutions and Dzongkhag Water Masterplans for the project Dzongkhags and River Basin Management Plan for Punatsangchhu river basin. This will facilitate the adoption of integrated approaches to water resource governance and management and enable 1) economic water security; 2) urban water security; 3) environmental water security and 4) disaster and climate change resilience at both Dzongkhag and basin levels.

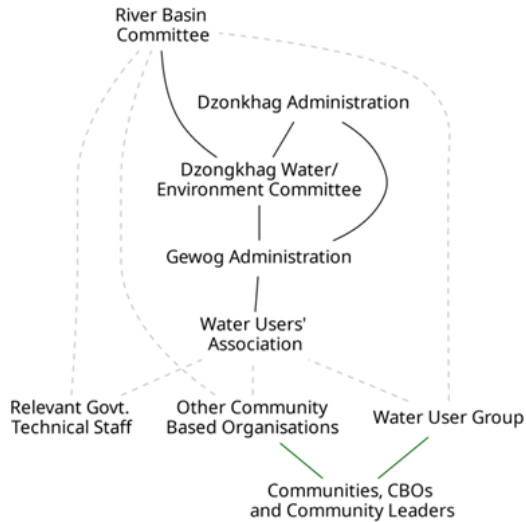
Activity 1.1.3: Develop hydrologic models to underpin and inform the water master plans and water governance decisions. A modeling exercise will be conducted based on available, downscale climate projections to help develop different scenarios for the short, medium and long terms that inform the design of the water master plans and provide decision support for water governance.

Output 1.2: Institutional & community level capacity for climate-smart water and watershed management strengthened

This output will result in strengthened institutional frameworks and capacities among institutions at both government and local levels in water governance and management that will fully account for the risks of climate change across the scenarios. This project will support establishment of the RBC for Punatsangchhu river basin with appropriate linkages to grassroots water user stakeholders. Critical capacity gaps will be addressed through establishment of water-related institutions and enhancement of their capacities including that of the RBC Secretariat at the NECS. These institutions will be critical in ensuring that water resource management at the basin level as well as sub-catchment levels are proper and in alignment with the NIWRMP. Activities under this include;

Activities under this include;

Activity 1.2.1 Establish the River Basin Committee (RBC) for Punatsangchhu river basin representing stakeholders from the five Dzongkhags of Gasa, Punakha, Wangdue, Tsirang, and Dagana as well as relevant regional and national key stakeholders.



Activity 1.2.2 Form and strengthen capacities of community-based water sector institutions including Water User Groups (WUGs) at grass roots level and Water Users Associations (WUAs) at domestic water and irrigation scheme level with defined norms for formal registration of these institutions and established linkages to the RBC through the Gewog Administrations and Dzonkhag Water Management Committees (DWMC).

Activity 1.2.3 Train local WUA representatives, staff from the Gewog Administrations, members of Dzonkhag Water Management/Environment Committee and relevant Dzonkhag sector staff in IWRM principles and practices, legal and technical matters related to water governance, water allocation and O&M aspects of domestic and irrigation water assets.

Output 1.3: Innovative financing mechanisms for both watershed management and water infrastructure introduced

Studies to improve water pricing and tariff systems will be conducted to provide an assessment and gather feedback on national water tariff guidelines and criteria. The assessment will include costs of ecological services from watersheds for provisioning and regulating water quality. This will consist of a feasibility assessment on water pricing for peri-urban and rural areas for both domestic and irrigation and will provide feedback on establishing and implementing water tariff guidelines for the project sites. A PPP model for corporate engagement in domestic and irrigation water supply will be introduced in Gasa and Lobeysa townships. The PPP arrangement will be used to address challenges, identify roles and establish protocols for engagement of private entities who can work with the municipalities and WUAs in providing elements of water utility service. These include the development and installation of IoT sensors for real time monitoring of water infrastructure, particularly distribution networks and their use in O&M of water infrastructure and for household or farm level metering systems. Modalities for participation of corporate and private sector in water resources management and the management of water infrastructure will be tested and formalized. This output will provide lessons and framework for up-scaling and replication of innovative financing mechanism in the domestic water utilities. The project

will test the implementation of the draft national water tariff guidelines of NECS by commissioning a study to determine the potential for and impact of introducing a water tariff system for Gasa and Lobeysa townships including impacts on poor, vulnerable groups, gender implications and impacts on women headed households. This activity will lead to finalizing the national water tariff guidelines/criteria.

Activities under this include;

Activity 1.3.1: Assess the options for the introduction of water tariff system in Gasa and Lobeysa townships to inform the national domestic water tariff guidelines/criteria.

Activity 1.3.2: Assess revenue generation and private sector engagement in water sector through a PPP model in providing local level water utility services.

Component 2: Nature-based solutions for sustainable & climate- resilient watersheds, and livelihood enhancement

Outcome 2: Vulnerable natural water catchments in the target river basin (Punatsangchu River Basin) restored, sustainably managed, protected and their ecosystem conditions improved (LDCF: \$ 504,860 Co-financing: \$ 7,477,000)

Building on the water source assessment and mapping report, 2021 and the outcomes of watershed assessment during PPG phase, this outcome will support 1) restoration of the watershed through the implementation of nature-based solutions, and 2) improvement of the management of watershed by engaging local communities , establishing PES schemes to sustain watershed management and involving the private sector to improve the yield of spring and stream flows. It will support the participatory assessment, identification & declaration of critical watersheds/catchment areas/spring recharge areas, and management interventions to improve and restore ecosystem conditions of vulnerable natural water catchments. Afforestation, reforestation and agroforestry will be supported as part of management intervention, improve forest and/or ground cover to enhance water infiltration in catchments. Where possible, community-based start-up enterprises will be promoted to incentivize and enhance watershed conservation, and its experience will be documented and shared for wider adoption.

Output 2.1 Nature-based solutions for watershed restoration implemented aimed at yielding stable spring/stream flows

The project will implement nature-based solutions for rehabilitation and restoration of catchment watersheds to improve forest conditions and stabilise stream and spring discharges across project sites. Interventions will include physical and vegetative measures such as plantation, bio-engineering works,

removal of exotic species and replantation of native species in strategic locations to restore biodiversity and hydrology, establishment of site-specific micro check dams to arrest drain runoff along steep natural drains and enhanced protection of watershed through monitoring to sustainably manage extraction of natural resources and avoid degradation. Physical assets created by the project will be made climate resilient through soil conservation and erosion control structures along water conveyance lines, protective walls around water off takes and vegetative/bio-engineering measures around the small reservoirs and water transmission lines. These activities will be coordinated by the Watershed Management Division in collaboration with the respective Forestry divisions and form part of the watershed management program.

Activities under this include;

Activity 2.1.1 Develop catchment restoration plans based on initial watershed assessments done during the PPG (Annex 13b) to guide physical interventions. Revive spring sources, restore degraded catchment watershed areas and enhance re-charge areas Restore/rehabilitate degraded catchment watershed areas including physical and vegetative measures such as plantation of native species, bio-engineering works, site-specific soil conservation and erosion control measures and installation of data monitoring met stations for monitoring.

Activity 2.1.2 Strengthen monitoring of forest conditions, spring discharges and rainfall in the water source catchments of project sites including installation of meteorological stations and five flow gauges, supporting SMART patrolling methods, and supporting capacities of local institutions and communities in monitoring hydro-meteorological conditions.

Activity 2.1.3: Formulate community-based watershed and forest management plans for improved health of watersheds including two community forest management plans in Gasa water source catchment and four local forest management plans in the catchments of four water supply schemes supported by the project. Local communities will be directly engaged in both preparation and implementation of the watershed management plan in the project sites to ensure improved ownership of investment by the local agents. The role of the government will be that of facilitators and will largely be limited to providing technical backstopping.

Output 2.2: Forest/Ground cover in catchment watersheds managed and maintained through the engagement of local communities and private/corporate sector

The output will establish two PES schemes contributing to sustainable watershed management of critical catchment areas. The PES schemes are similar to earlier GEF supported schemes on PES to sustain hydrologic services[1]. These PES scheme will involve arrangements through which the beneficiaries

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of ecosystem services (communities benefiting from water sources) compensate those providing the services (communities in the catchment watersheds) for appropriate management and protective measures in sensitive catchments, such as sustainable management of grazing and extraction of forest produce. Flexible systems for payments will be instituted which allow water users, especially farmers, to contribute to the catchment maintenance through in-kind payments of labour and materials for restoration activities. The PES system will establish agreements between the catchment communities (ecosystem service providers) and beneficiaries/users communities paying for the upkeep of hydrologic provisioning and regulatory ecosystem services. Ecosystem service providers and user groups will be formed by the project covering domestic water and irrigation water supply. Activities of the groups will be defined by framing bylaws and fee negotiations will be completed between service providers and users and formalized into signed agreements. These agreements will include a formal monitoring and evaluation protocol. WUAs and committees engaged in O&M of infrastructure will be assisted in raising finances and resources from PES systems and will be provided necessary training in financial administration and bookkeeping as well as monitoring and O&M, thereby sustaining the impact of the project

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[1] Jaime Cavelier and Ian Munro Gray. ?Gef Investments on Payment for Ecosystem Services Schemes?. Global Environment Facility, 2014. <https://www.thegef.org/sites/default/files/publications/28252nomarks.pdf>.

Sustainable and climate resilient farmland management will be pursued in the form of terracing of farmlands on slopes and planting of grass-slips and hedgerows in dry-land areas to enhance soil stability as well as provide fodder. Extension services will be strengthened to support farmers in adopting soil and moisture conservation measures such as mulching and efficient irrigation technologies such as drip and sprinklers. Both agricultural extension and forestry services will additionally support the restoration of barren and disturbed areas which will be planted with economically valuable and useful native species. Bio engineering works will be taken where necessary for improved soil and slope stability. Finally, the output will explore partnerships and mechanisms for long term support from the private sector to sustain watershed restoration activities.

Activities under this include;

Activity 2.2.1: Scale up existing PES agreement between Damphu township and Khuchi-Darachhu/Thakoling CFMGs in Tsirang and establish a new PES agreement between catchment communities of Toedpisa Gewog and downstream communities of Toepisa and Barp Gewogs in Punakha.

Activity 2.2.2: Promote sustainable climate resilient farmland management practices in project gewogs of Tsirang through extension and forestry services where project support includes integrated domestic and irrigation water supply.

Activity 2.2.3: Facilitate corporate, private, and civil society entities in long term watershed and restoration rehabilitation activities through involvement in project planning meetings, workshops and training on plantation and maintenance.

Component 3: Efficient, adequate, and sustainable supply, distribution, and utilization of water

Outcome 3: Enhanced adaptive capacity of water infrastructure to climate-induced water shortages and quality deterioration through climate-proofing, private sector engagement, and technology deployment (LDCF: \$ 6,669,022; Co-financing: \$ 9,020,000)

This component will focus on the establishment and demonstration of adequate climate-smart and efficient water infrastructure. The component will enhance efficiency in tapping at source, storage, conveyance, and distribution of domestic and irrigation water in the three project Dzongkhags and address barriers related to inefficient and inadequate surface water storage and distribution. Increased frequency of landslides and mud slips has contributed to sedimentation and contamination of water sources. The component will also address challenges related to quality of domestic water by improving and expanding water sources, storage, and treatment to meet Bhutan's Domestic Water Quality Standard, 2016 and WHO guidelines for domestic water quality. Two water treatment plants, one for Gasa and another for Toedpisa and Barpisa and Lobeysa township in Punakha will serve 8,965 persons. To improve monitoring of infrastructure failures for both volume and quality of water supplies, the project will support integration of new/improved technologies so that vulnerability of the infrastructure to climate-induced hazards or disturbances are detected and solutions provided in a timely manner. Collaboration with the private sector will be explored to promote IT-based solutions for water management including automated IOT/ICT based systems

Output 3.1: Climate proofing measures implemented in multi-purpose storage, conveyance, and distribution network of domestic and irrigation water

This output will result in the establishment of multi-purpose climate-smart water infrastructure and storage that is effective and ensures efficient conveyance and distribution of water in four Dzongkhags for both irrigation and domestic water users. The output will result in tapping of additional water sources, creation of local storage structures and climate resilient water transmission. The output will provide direct access to domestic water by 7533 individuals (5903 females); to domestic and irrigation water by 11,362 individuals (5791 females); to irrigation water by 496 individuals (264 females) enabling access to assured water supply by 19,391 individuals (9413 females). With focus on watershed restoration activities under component two, an additional population of 17, 943 individuals (8,456 females) will be benefited with water shed benefits securing their water sources. Overall, the project will accrue domestic water, irrigation and watershed benefits to 37,334 individuals (17,869 females) in the three Dzongkhags.

Further, this output will enable winter cropping of 1816 Ha of agricultural land in Tsirang which is currently limited to cultivation during summer due to shortage of assured irrigation water. An additional 519 Ha of fallow land will be brought under sustainable cultivation contributing to enhanced livelihood of communities through assured irrigation Water. Climate resilient and "smart" water. Conveyance lines will be established from off-takes in sources to users. Soil and water conservation structures will be built along the water conveyance lines and off-takes and reservoirs will be protected with walls and gabions. Extensive use of vegetative measures will be made to protect all water infrastructure. Site and activity specific ESIA will be conducted for installations where deemed necessary by government regulations and ESMPS for will be prepared and implemented during project implementation period.

Activities under this include;

Activity 3.1.1: Install a water supply system in Gasa township comprised of one collection tank at intake point, two water storage tanks of 120 cum and 50 cum, one water treatment plant of 1 MLD and piped water conveyance length of 2.5 km from Shingtalum water source to Gasa town.

Activity 3.1.2 Climate proof domestic water supply systems for Toedpisa and Barpisa including Lobeysa township in Punakha comprising of one reliable and consolidated collection tank at intake point, two water storage tanks of 16 cum and 20 cum, one water treatment plant of 1 MLD and piped water conveyance length of 17 km from Okalum water source to Lobeysa town with distribution points along the pipeline connected to the existing distribution network.

Activity 3.1.3 Climate proof integrated domestic and irrigation water supply main line for Patshaling, Barshong, Mendrelgang, Rangthangling, Tsholingkhar and Kilkhorhang Gewogs in Tsirang comprising of one reliable and collection tank at intake point, three water storage tanks of 250 Cum each and eight brake pressure points of 5 Cum each and piped conveyance length of 43 Km connected to existing distribution network through several distribution points for all communities along the length of the main conveyance line.

Activity 3.1.4 Climate proof integrated domestic and irrigation water supply main line for Sergithang Gewog in Tsirang comprising of one water storage tanks of 250 Cum and 5 brake pressure points of 1 Cum each and piped conveyance length of 11.64 Km connected to existing distribution network through several distribution points for all communities along the length of the main conveyance line.

Output 3.2: Efficient drought-resilient water management technology tested and up-scaled through private sector (youth-based start-up enterprises)

This output will result in the installation IoT based telemetric sensors in 74.14km of water transmission and distribution lines across the project sites. Sensors will also be installed in water storage facilities for

the 1,266 cum of storage created to help track water levels on a continual basis. The automation will be integrated with GIS systems.

The integration of innovative IoT and ICT based monitoring technologies will modernize monitoring, maintenance and metering for efficient water distribution and management in all water related assets created by the project. Systems such as the Supervisory Control and Data Acquisition (SCADA) and equivalent tools will result in improved efficiency in water acquisition, storage, conveyance, distribution, quality assurance and overall operations, monitoring and maintenance of the water infrastructure. This output will also facilitate the involvement of private sector entities in Bhutan as part of addressing climate risks and adaptation and will enable enterprise development. Partnerships with private entities involved in development of low cost IoT based sensors and their integration with ICT based monitoring systems for water distribution networks will be established to train and help establish local entrepreneurs in the management of these systems. Private sector partnership is a strategic decision to enhance partnership through introduction of technology and innovation, optimizing resource use and cost savings and reinforce sustainability during and beyond the project period.

During the PIF and PPG design phase consultations have been held with all key stakeholders including DHI. DHI offers extensive homegrown experience in setting up water management systems within Bhutan which meets the expectation of the ACREWAS project to contribute and add value. Hence, private sector entities such as the DHI will be explored to integrate automation of irrigation and drinking water assets using Supervisory Control and Data Acquisition (SCADA) technologies anchored on IoT, AI, micro-controller and sensor based data science within water intake at source, water storage tanks, WTP facilities, main transmission lines and subsidiary distribution lines; assess, procure, and install sensors, electric valves, gauges, flow meters, fire hydrants, balancing units, and weather monitoring stations linked to main control; facilitate acquisition of real time climatic data such as temperature, humidity, rainfall and soil moisture at the catchment as well as on water levels, flow rates, water pressure, water quality parameters to facilitate critical decision making; establish communication and display of management information on monitoring screens and mobile phones; train and groom Water user groups and youth-based start-up enterprises to manage the technology components and support the overall O&M beyond the project period for a service fee and enable collaboration with agencies on tech driven innovation to enhance water use efficiencies for agriculture, drinking and other domestic use.

Activities under this include;

Activity 3.2.1: Assess and integrate innovative IoT and ICT based technologies such as microcontrollers and sensors into water collection, storage conveyance and distribution networks to improve the performance of the water investments made by the project in Gasa, Punakha and Tsriang.



#### Component 4: Knowledge management

Outcome 4: Strengthened awareness and knowledge sharing mechanism established (LDCE: \$ 918,000  
Co-financing: \$ 3,416,380)

This component will support documentation and sharing of knowledge and practices as well as effective capacity for climate-resilient water and watershed management. It will address the barriers related to poor awareness and data availability on climate change impacts on water resource and watershed management by documenting and disseminating successful lessons from the project and from other projects in the country, region and internationally. The knowledge sharing component will be gender-responsive and inclusive. **The local language will be used in discussions, dialogue and dissemination. Written material will be translated into the local language where possible, including summaries of technical documentation where literal translations are not possible.**

Knowledge management activities will lead to basic awareness on water saving interventions among both rural and domestic water users. They will enhance awareness of new technologies, and know-how of their application and implementation in water management and in measuring water resources. This includes the measurement of hydro-meteorological and discharges at off-takes, use of IoT and ICT devices and the installation of a GIS based digital platform for water resources management and water service networks. Enabling conditions will be created for collaborative planning and development management in the form of enhanced awareness, knowledge, and information availability on risks and vulnerabilities of climate change, adaptation options, technologies, and solutions at different levels. The project's overall impact, including plans to learn from relevant projects, initiatives and evaluations will be made available on the websites of UNDP and of the MOWHS.

The component will also generate and disseminate knowledge on gender and social and environmental safeguards that need to be in place for implementation of water infrastructure and conveyance projects in the eco-sensitive regions of Bhutan. This output will result in comprehensive review and updating of these safeguards and will generate awareness about their application and mechanisms for reporting grievances and incidents by communities. A comprehensive, quantitative and robust M&E strategy will be put in place which is gender responsive, and which relies on easy to measure indicators and leverages the broad coverage and use of ICT. Indicators will be gender disaggregated where possible and participatory, citizen-based approaches will be instituted in their collection. Information from the M&E process will be shared with stakeholders to ensure inclusive and transparent reporting at all levels.

A number of new approaches and strategies are being piloted or scaled up by the project. These will be carefully documented as part of this component along with strengthening of technical training that is provided for water resource management in tertiary training institutions in Bhutan. This will enhance capacities of staff hired for water resources management and of engineers who design and install water

infrastructure and delivery systems. It will result in the creation of a comprehensive digital platform for managing information pertaining to watershed restoration and water resources and services. This digital platform will be based on open-source technologies and will leverage IoT and ICT systems proposed in component 2 and 3.

Finally, the component will enable meeting the requirements of the National Environment Protection Act and the Water Act of Bhutan to regularly publish information on the environment, including periodic state of the environment reports and to provide access to water and watershed-related information.

Output 4.1 Communication strategy developed and implemented on water conservation and sustainable management developed and implemented

This output will develop and implement a gender responsive communication strategy for water conservation and sustainable management. Awareness will be created at different levels on water efficiency and conservation, watershed and source protection and water use and conservation. Specific attention will be given to issues of climate change impacts on water resources and vulnerabilities of ecosystems, communities and human health and well-being. Institutional and regulatory provisions for climate change adaptation in water resources will be strengthened. The output will result in the documentation of adaptation options, technologies and solutions that are gender responsive and which will build a case for harmonised data collection and reporting on identified parameters that represent the health of river basins.

The output will result in comprehensive, gender-responsive, process-based documentation of good practices to facilitate scaling up as well as of the lessons learned through the course of the project. Study visits, on-site demonstrations and exchange programs to other projects will be conducted on a regular basis for farmers, entrepreneurs and community members in general. Documentation in the form of audio-visual media, brochures, flyers and policy briefs will be generated based on project progress and impacts. This will be disseminated locally and nationally using print and social media in both English and Dzongkha.

Activities under this include;

Activity 4.1.1: Develop awareness packages through documentation of good practices on water conservation and sustainable water resources management, lessons learned from the project and policy, regulations and roaches for IWRM

Activity 4.1.3: Establish the PMU and project governance arrangements for efficient coordination, management and M&E of the project

Activity 4.1.4: Align and update technical and engineering curricula and relevant agencies with modern and emerging technologies for climate resilience

Activity 4.1.5: Provide diagnosis, analytical capacity and water quality testing in 21 Primary Health Care Centers of 3 project Dzongkhags

Output 4.2 Publication of a State of the Basin Report (SOBR) for the Punatsangchu River Basin institutionalized

The preparation of the State of the Basin Report (SOBR) for the Punatsangchu river basins will be a key result of this output of knowledge management component at the national level. The SOBR will include an analysis of the overall situation of river basin in terms of its ecological health and the social and economic circumstances including water security index and impact of climate change on water sector in Bhutan. The report will further highlight of key issues faced in establishment and functioning of the agency for water utilities at national level, River Basin Management Committees (RBMCs), Dzongkhag Water Management Committees (DWMCs) and Water User Associations (WUAs). Finally the report will determine gaps and needs for development of relevant River Basin Management plans and their effective implementation.

This output will also enable meeting the requirements of the National Environment Protection Act and the Water Act of Bhutan to regularly publish information on the environment, including periodic state of the environment reports and to provide access to water related information. The output will additionally publish and disseminate the SOBR through engagements with government and non-government agencies at the local and national level.

A framework and SoP for regular reporting and sharing of data and reports on state of river basin will be put in place. This will result in systematic tracking and documenting of water quality, quantity, availability, assets and inventory. A digital platform will be designed and deployed for harmonisation of the data collected. It will streamline the reporting and archival of data on domestic and irrigation water supply and availability. The system will be accessible by stakeholders at the Gewog, Dzongkhag and basin level. Government and community institutions will receive training on data gathering and reporting on this system.

Activities under this will include:

Activity 4.2.1: Institute mechanisms and build capacities for regular reporting and sharing of data and reports on state of river basin

Activity 4.2.2: Publish and disseminate State of the Basin Report (SOBR) for the Punatsangchu River Basin

4) Alignment with GEF focal area and/or Impact Program strategies;

The project is aligned with the GEF programming strategy on adaptation to climate change for three of the LDCF objectives and entry points:

Objective 1: Reduce Vulnerability and Increase Resilience through Innovation and Technology Transfer for Climate Change Adaptation. The project will reduce vulnerability and increase resilience of communities to impacts of climate change by restoring, protecting and sustainably managing vulnerable water catchments in target river basins. Nature-based solutions will be combined with site-specific interventions such as plantations and bio-engineering and micro-check dams and other soil and water conservation structures which protect and improve natural systems and enhance ecosystem services. Water infrastructure created by the project will be climate resilient. Soil stabilization and erosion control structures will be constructed along water conveyance lines, protective walls and vegetative/bio-engineering measures will be built around small water reservoirs (component 2). This will be combined with IT based solution to enhance detection of leaks and enhance efficiencies of water transmission (component 3).

Objective 2 Mainstream Climate Change Adaptation and Resilience for Systemic Impact.

The proposed project will promote sustainable climate resilient farmland management practices in project gewogs of Tsirang where project support includes integrated domestic and irrigation water supply. These will include sustainable agriculture land management practices such as terracing of farmland on slopes; plantation of grass slip/hedgerow in dry-land agriculture for integrated fodder and soil stability measures; development of fodder/pasture; promotion of mulching technologies; Installation of sprinklers and drip irrigation and introduction of water harvesting ponds and structures to store water for irrigate crop during lean season (component 2).

Objective 3 Foster enabling conditions for effective and integrated climate change adaptation.

The project will support alignment of relevant national and local policies and strategies with sustainable and climate resilient water management; strengthen institutional & community level capacity for climate-smart water and watershed management and initiate innovative financing mechanisms for both watershed management and water infrastructure (component 1). It will also strengthen monitoring of forest conditions, spring discharges and rainfall in the water source catchments of project sites. Furthermore, it will sensitize and create awareness to generate public action for conservation and sustainable management of water resources and publish and disseminate State of the Basin Report (SOBR) for the Punatsangchu River Basin (Component 4) to enable sustainability and integration of climate change adaptations

The following GEF Focal Area Outcomes will be addressed through the proposed project:

CCA 1.1 Technologies and innovative solutions piloted or deployed to reduce climate-related risks and/or enhance resilience

The proposed project will facilitate the adoption of support watershed restoration and management in water source catchments and innovative use of IoT and ICT in managing water supply, storage and distribution networks in Gasa, Punakha and Tsirang.

CCA 1.2 Innovative financial instruments and investment models enabled or introduced to enhance climate resilience

Opportunities for revenue generation and enhancing sustainability of water supply systems will be explored through feasibility assessment on water pricing for peri-urban and rural areas for domestic water supply and providing feedback on establishing and implementing water tariff guidelines for the project sites which will gather feedback on national water tariff guidelines and criteria. A PPP model for corporate or private sector engagement in domestic water supply utility service will be piloted in Gasa and Lobeysha townships in Punakha. The pilot initiative will be used to address challenges, identify roles and establish protocols for engagement of private entities that can work with the municipalities and WUAs in providing elements of water utility service.

CCA 2.1 Strengthened cross-sectoral mechanisms to mainstream climate adaptation and resilience

The project's Stakeholder Engagement Plan (SEP) lays out a comprehensive multi-stakeholder engagement strategy across sectors and stakeholders to ensure equitable access and sharing of benefits from the project as well as equitable and meaningful participation of women and vulnerable groups within communities. It defines responsibilities to be undertaken by different stakeholders, timetable of activities and mode of communication including planning meetings and workshops, awareness and sensitization and trainings.

A Multi Sector Technical Advisory Committee for the project will advise the PMU and PSC on issues concerning stakeholder sector agencies and mainstream project learnings and lessons into the sector policies and programs mainstreaming climate change adaptation in agriculture, forests and natural resources management sector policies and programs.

#### CCA 2.2 Adaptation Considerations Mainstreamed into investments

The project will enhance the adaptive capacity of water infrastructure to climate-induced water shortages and quality deterioration. Based on the lessons learnt from the project, the nationwide water flagship program will subsequently upscale and adopt similar adaptation and climate risk-reduction measures will be deployed approach in other Dzongkhags and river basins in a coordinated manner within Bhutan. The PMU of the project, being the coordinating agency for the water flagship program is strategically placed to upscale this approach.

#### CCA 2.3. Institutional and human capacities strengthened to identify and implement adaptation measures.

The project will develop technical and institutional capacity for effective climate change adaptation at river basin, local government, and community-levels in Punatsangchhu river basin through;

- Alignment of national and local policies and strategies with sustainable and climate resilient water management including the gender responsiveness and climate resilience of national water standards;
- Strengthening of institutional & community level capacity for climate-smart water and watershed management, including-establishment of the River Basin Committee (RBC) for Punatsangchhu river basin. This would include formation and building capacities of community-based water sector institutions such as Water User Groups and Water User Associations; training of local WUA representatives, staff from the Gewog Administrations, members of Dzongkhag Water Management/Environment Committee and relevant Dzongkhag sector staff.
- Promotion of sustainable climate resilient farmland management practices in project gewogs of Tsrirang
- Sensitization and communication and awareness on issues of climate change impacts on water resources and vulnerabilities of ecosystems, communities and human health and well-being including documentation and sharing of good practices and lessons learnt from the project,

#### CCA 3.1: Climate-resilient planning enabled by stronger climate information decision-support services and other relevant analysis

The project will support participatory water resource assessments in the three project dzongkhags and facilitate development of Dzongkhag Water Masterplans for the project Dzongkhags and River Basin Management Plan for Punatsangchhu river basin. At local levels, community-based watershed and forest management plans will be supported for improved health of watersheds including two community forest management plans in Gasa water source catchment and four local forest management plans in the catchments of four water supply schemes. The publication of a State of the Basin Report (SOBR) for the Punatsangchu River Basin will highlight water and water issues faced by the river basin and better inform governance and planning for climate resilient water resources management.

The project will utilize several innovations and new technologies that facilitate adaptation to climate change impacts. These include:

- ? Adoption of low cost water harvesting and flood control techniques to local conditions such as soils and topography, making use of locally available materials and labour.
- ? Local adaptations of designs and materials for rural infrastructure that increase efficiency of irrigation and/or reduce costs.
- ? Use of IoT and ICT for monitoring and managing water supply and distribution networks, including for detection of leaks, scheduling and metering.
- ? Geospatial technologies for watershed mapping, including participatory GIS methods that facilitate micro-watershed and watershed mapping which feeds into the basin level mapping and information system.
- ? The mainstreaming of systematic impact will be achieved through investments collaborations with research and development agencies and through policy advocacy in key areas. These include:
  - ? Climate risk and vulnerability assessments that feed into Dzongkhag, river basin and national policies on watershed management and forest management.
  - ? Development, documentation and dissemination of scalable, climate resilient designs for water infrastructure including both rural water infrastructure for irrigation as well as domestic water distribution, and their integration with policies such as the Water Flagship Programme and water regulations.
  - ? Collaborations with government agencies on development and testing of climate smart agricultural technologies for the selected sites including documentation, dissemination and integration with national programmes on agriculture and food security.
  - ? Collaborations with government agencies engaged in water resources management and delivery of water services to ensure complementary between policies, plans and approaches.

Support of Strategic Approach

The project will bring transformational changes to the management of water resources and the O&M of water infrastructure in Bhutan. It will demonstrate and scale up payment for ecosystem services for community-based watershed management and private sector investment in financing watershed restoration activities. Engagement with private entities and young entrepreneurs will encourage the wide use and deployment of technical innovations that leverage IoT devices and ICT for managing water distribution networks including controlling valves, measuring flow rates and water quality, metering and leak detection.

A multi-pronged project strategy is proposed. Adaptation problems identified during consultations and field visits will be addressed through on-ground interventions that: 1) utilise locally appropriate techniques and technologies; 2) generate awareness, mobilise and build capacities of local institutions and community based organisations for implementing these activities in a participatory framework; 3) engage with entrepreneurs from the community for PES to support watershed restoration and management, and innovative use of IoT and ICT in managing water supply, storage and distribution networks.

Simultaneously, the project will address barriers that may prevent or reduce the efficiency and efficacy of these on-ground interventions through: 1) policy interventions in plans and strategies, specifically to address overlapping jurisdictions and to strengthen and establish SoP for interaction between ground level community based organisations and higher level committees at the watershed and basin level; 2) development of technological solutions such as climate smart agriculture and applications of ICT and IoT technologies to automate operation of water supply and distribution networks; 3) capacity building of institutions at the local and national level for contextual application and dissemination of these technologies; and 4) formalising mechanisms for public private partnerships to explore long term investments in water and watershed management. These activities will facilitate the on-ground interventions by providing policy and financial mechanism, a supportive planning and monitoring framework based on state-of-the-art technologies, and a system to build capacities and sustain local communities in the adoption of adaptation technologies and techniques.

Key strategic elements of the project are as follows:

? Engagement and involvement with community-based organisations, specifically including women, minority groups and vulnerable sections to ensure transparency, equity and social safeguard standards are met and that local institutional capacities for sustaining and extending interventions are enhanced.

? A 12 month inception phase to complete all in-depth field surveys and finalise designs and plans for interventions in close consultations with stakeholders.



? Updating the social and environmental management framework, the gender action plan and the stakeholder engagement plan during the first six months of the project and institution of the grievance redress mechanisms ahead of activities.

? Gender sensitization of communities, gender disaggregated planning of activities, creation of women groups for implementing relevant interventions and gender disaggregated monitoring and reporting.

? Strengthening local government institutions at Gewog and Dzongkags to ensure project activities can be sustained, replicated and scaled up.

? Strengthening/replacement of decrepit water infrastructure with modern, climate resilient infrastructure that requires minimal maintenance over extended time periods, ensuring long term benefits to communities.

? Use of local materials, skilled and unskilled labour to reduce costs, maximise local employment and instill a sense of local ownership of assets created through the project and transfer of skills required for construction, maintenance and enhancement of rural infrastructure.

? Adapt and adopt relevant CSA technologies and innovative micro/drip irrigation practices to local conditions to ensure technologies are properly vetted and extension services have the expertise for their dissemination.

? Involvement of the private sector for long term sustainability of the proposed interventions through 1) Public private partnerships for long term financing of watershed restoration; 2) Facilitating entrepreneurs from within the community for nature-based, small-scale income generation and livelihood diversification activities; and 3) Managing water distribution networks and tariff collection through innovative applications of ICT and IoT.

5) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing;

This project seeks to strategically invest in climate proofing and restoration of rural infrastructure. It will strengthen local institutions, especially community development councils and CBOs to sustainably manage this infrastructure and use them as a conduit to build capacities in CCA among vulnerable communities, including women and minority groups. GEF investments will lead to creation of rural infrastructure to protect communities and water infrastructure from climate related hazards. Repair, restoration and enhancement of decrepit and dilapidated water infrastructure will lead to assured irrigation for food production. Investments in assisted natural regeneration, rangeland restoration and community based forest restoration and management will increase resilience of natural systems to climate impacts and buffer impacts of extreme events and prolonged droughts. The project will mainstream climate change adaptation and resilience building in local government development plans and will introduce watershed based integrated, climate resilient planning and management of natural resources. GEF support will provide local entrepreneurs much-needed support and impetus to develop and exploit

available opportunities in post-harvest technologies, food processing and storage and packaging. Groups of entrepreneurs, specifically including women groups, will be supported in setting up small scale food processing units. These will be networked with established traders and markets. Federations of farmers and pastoral groups will be supported to set up collection and storage facilities at provincial centres as an impetus to traders. This is expected to improve incomes and financial sustainability of rural communities. By doing so GEF funding will address critical gaps in addressing the additional costs that climate change imposes on its development pathway.

An economic and financial efficiency analysis of the project was done as part of the feasibility study (Annex 13c). The economic analysis indicates that investment with climate-proofing results in a positive ENPV of \$75.73, and an EIRR of 17%, confirming the project's economic viability. The estimated cost-benefit ratio is greater than one, indicating that the project is expected to generate incremental economic value. On the other hand, investment without climate-proofing results in a negative ENPV of (\$35.26) and a cost-benefit ratio of less than one, demonstrating the unviability of the investment. The economic analysis demonstrates that investment without climate-proofing generates higher incremental opportunity costs than incremental benefits to the communities and the RGoB. Whereas the project intervention with climate-proofing results in positive financial, economic, and social returns to the larger groups of communities and RGoB.

Component wise cost reasoning and additionality is provided below:

The estimated additional costs of adaptation benefits in Component 1 are:

? LDCF grant request: \$ 287,000

? Co-financing : \$ 4,339,000

Table 6: Details of co-finance for Component 1

Output	Source and Description	Cash*	Kind*
1.1	Local Governments of Gasa, Punakha and Tsirang from central govt. supported programmes for agriculture, forestry and livestock	0.75	0.101
	NECS: E-flow and Water resources management program	0.286	0.23
1.2	Local Governments of Gasa, Punakha and Tsirang from central govt. supported programmes for agriculture, forestry and livestock	0.75	0.101
	MoWHS: WUA formulation and water shed management and maintenance as part of the Water Flagship Programmes	0.8	
	NECS: Staff and office		0.24
1.3	Local Governments of Gasa, Punakha and Tsirang from central govt. supported programmes for agriculture, forestry and livestock	0.75	0.101

	NECS: Staff and office		0.23
Total		3.336	1.003

\* USD Million

The climate additionality for Component and Outcome 1 will be through:

1. Alignment of relevant national and local policies and strategies with sustainable and climate resilient water management Climate change impacts will be integrated with national and local policies and plans. This includes integration of climate scenarios and models to inform design, O&M, management plans and intervention strategies.

2. Institutional & community level capacity for climate-smart water and watershed management The ability of communities, their organisations as well as of local institutions responsible for managing watersheds will be strengthened so they are able to implement measures that specifically mitigate likely impacts of climate change on watersheds and improve the efficiency of distribution and use of water for domestic and agricultural purposes, specifically for periods of scarcity.

3. Innovative financing mechanisms for both watershed management and water infrastructure This will lead to financial sustainability of measures that ensure upkeep of watersheds and of water infrastructure, thereby ensuring that hydrologic services from these watersheds are protected from the likely impact of climate change.

The estimated additional costs of adaptation benefits in Component 2 are:

? LDCF grant request: \$ 504,860

? Co-financing : \$ 7,477,000

Table 7 Details of co-finance for Component 2

Output	Source and Description	Cash*	Kind*
2.1	DoFPS: From the Programme on Conservation of National Parks and Protected Areas	3.5	
	DoFPS: HR and Professional Services		0.9
	Local Governments of Gasa, Punakha and Tsirang from central govt. supported programmes for agriculture, forestry and livestock	0.54	0.07
	NECS: Program on Management of invasive species for agro-biodiversity and livelihood; Waste Flagship Programme	0.648	
2.2	DoFPS: HR and Professional Services		0.9
	Local Governments of Gasa, Punakha and Tsirang from central govt. supported programmes for agriculture, forestry and livestock	0.81	0.109

Total		5.498	1.979
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\* USD Million

The climate additionality for Component and Outcome 2 will be through:

1. Restoration of the watershed through the implementation of nature based solutions Critical, climate vulnerable watersheds/catchment areas/spring recharge areas will be identified and restored through approaches which leverage and enhance natural regenerative processes and conditions. Training will be provided in afforestation, reforestation and agroforestry which utilise natural seed banks and locally available species known to withstand climate extremes.

2. improvement of the management of watershed by engaging local communities and private sector to improve the yield of spring and stream flows The project will address the increased importance of healthy catchments as a climate resilience measure by supporting local communities in their management to stabilise and increase water yields. Expertise watershed planning and management will be transferred to local committees along with techniques that enhance infiltration and stabilise slopes. Partnerships with corporate enterprises will be promoted to incentivise and enhance private sector involvement in watershed conservation as a climate change mitigation measure.

The estimated additional costs of adaptation benefits in Component 3 are:

? LDCF grant request: \$ 6,669,022

? Co-financing :\$ 9,020,000

Table 8 Details of co-finance for Component 3

Output	Source and Description	Cash*	Kind*
3.1	Local Governments of Gasa, Punakha and Tsirang from central govt. supported programmes for agriculture, forestry and livestock	3.78	0.51
	MoWHS: From the Water Flagship Programme. Treatment Plan, Irrigation channel, Distribution network, construction of rural and urban water supply scheme, integrated scheme	1.9	
3.2	Local Governments of Gasa, Punakha and Tsirang from central govt. supported programmes for agriculture, forestry and livestock	1.62	0.21
	MoWHS: Smart water management under the Water Flagship Programme	1	
Total		8.3	0.72

\* USD Million

This component will address the increased risk to water infrastructure and increased need for improved efficiencies in water transmission because of climate change induced extreme events and prolonged dry

spells. It will enhance efficiency in acquisition, storage, conveyance and distribution of water for both irrigation and domestic users. Water supply and the operations, monitoring and maintenance of infrastructure and infrastructure failure will be improved by deploying IOT based digital technologies. This will ensure speedy detection of damage and breakages and ensure O&M is timely and effective. Collaboration private sector will be explored to promote start-up enterprises with IT-based solutions for water management. Impacts of longer dry spells and pollution of sources due to extreme events will be addressed by improving and expanding water sources, storage and treatment facilities.

The estimated additional costs of adaptation benefits in Component 4 are:

? LDCF grant request: \$ 918,100

? Co-financing :\$ 3,416,380

Table 9 Details of co-finance for Component 4

Output	Source and Description	Cash*	Kind*
4.1	MoWHS: Under the Water Flagship Programme: WUA training, Watershed management training, Skilling, O and M of Water Infrastructures, Water Quality Testing Training and Water Discharge Assessment training, Wetland assessment training	2.6	
	NECS: Ongoing Environment Services and Regulation procedures (Clearances and Environment Impact assessment)	0.2	
	MoWHS: HR management and PMU under the Water Flagship Programme		0.6
Total		2.8	0.6

\* USD Million

This component will support documentation and sharing of knowledge and practices as well as effective capacity for climate-resilient water and watershed management. It will address the barriers related to poor awareness and data availability on climate change impacts on water resource and watershed management by documenting and disseminating successful lessons in a gender-responsive and inclusive manner. Both rural and domestic water users will be targeted for awareness raising on water saving interventions. Local institutions will be introduced to new technologies, and know-how of their application and implementation in water management. This includes the measurement of hydro-meteorological and discharges at off-takes, use of IoT and ICT devices and the installation of a GIS based digital platform for water resources management and water service networks. Enabling conditions will be created for collaborative planning and development management in the form of enhanced awareness, knowledge, and information availability on risks and vulnerabilities of climate change, adaptation options, technologies, and solutions at different levels.

6) global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF);

Global environmental benefits of the project as per the GEF are presented in Table 1.

The project will contribute to the following adaptation benefits which are to be monitored using the LDCF Core Indicators:

1. Total of direct beneficiaries: 37,334 persons (19,465?, 17,869 ?).
2. Area of land managed for climate resilience (ha): 41,910 (38,518 of watersheds and 3,392 of farm land)
3. Total no. of policies and plans that will mainstream climate resilience: 19
4. Total no. of people trained: 1,429 (929 male and 500 female).

Other than the above the project contributes to the following global environmental benefits listed in the food systems, land use and restoration impact program:

? Climate change mitigation: climate smart agriculture. The project interventions will cover 3,392 ha of irrigated agricultural land. Crop diversification will reach 2,400 farmers, half owning irrigated and the other rain-fed lands and 30% of who will be women.

? Land Degradation: Sustainable land management, Diversification of crop and livestock systems, Restoration of degraded production landscapes. Other than the area mentioned above, 2,350 ha of land will be brought or restored for agroforestry, plantations, rangeland restoration and woodlots. And under the sustainable forest management impact programme the project will contribute towards:

? Biodiversity: Conserving globally important biodiversity in key landscapes and forested areas. Under outcome 3 the project will restore 16,662 ha, manage 7,094 and protect an additional 14,762 ha of watersheds through nature based solutions and enhanced monitoring and patrolling.

7) innovativeness, sustainability and potential for scaling up. ?

The project components re-enforce one another by: 1) Providing a favorable policy and governance environment for the management and restoration of water resources and the sustainable financing of water services; 2) Enhanced ecosystem services, particularly hydraulic provisioning and regulatory services from watersheds through their restoration and protection; 3) Climate proofing of water infrastructure and modernizing systems for managing, O&M and metering; 4) Close engagement with the private sector at both with corporate entities and local entrepreneurs to pilot and establish partnerships in watershed management, water services provision and O&M and nature based income generation

activities; and 5) Documentation, dissemination and exchange of lessons, experiences and knowledge generated during the project and cross fertilization of ideas and experiences from other projects.

Each of the four components brings in innovative approaches and mechanisms that will sustain and scale up its activities. Close involvement of government institutions and departments in the project's development and implementation processes will ensure the replication of successful approaches. The strengthening of capacities among government stakeholders will ensure continued mainstreaming of climate considerations into planning and decision-making in the water sector. This will be further strengthened by extensive training and capacity building of local communities and technical staff on adaptation interventions will align future activities to be climate resilient. Overall, as a result of increased participation, project interventions are more likely to be replicated and/or scaled up.

There is also potential for replication of livelihood diversification interventions, both nationally and internationally. These interventions may be easily replicated in other villages with relatively small investment. The project will actively share experience about approaches, techniques, successes and failures to facilitate adoption and replication. The project will pilot and scale up the following innovative strategies for a transformational impact on the management of water resources and on the O&M of water infrastructure and services.

#### Innovativeness

The project will test and adapt relevant technologies and innovative practices to local conditions in Bhutan to ensure water and associated infrastructure management more effective and resilient to climate change risks.. This includes those in which the private sector can play a crucial role in delivering.

The project proposes a synergetic combination of watershed level restorative work, resilient livelihood development and upgrading and "climate-proofing" water infrastructure coupled with enhanced efficiencies in the system through digital solutions of management.

Payment for ecosystem services will be used to sustain watershed management and monitoring. These will scale-up existing PES arrangements between upstream communities and Dhamphu town. Furthermore, PES systems will be piloted wherein farmers using irrigation water contribute in terms of in-kind contributions into O&M of water infrastructure and catchment restoration efforts.

Public private partnerships will be piloted in the three project Dzongkhags. Two areas of partnerships will be explored: 1) The development and introduction of new technologies in water service management, as well as measurements and monitoring of discharges and off-takes; and 2) Plantations and greening of degraded catchment areas and barren lands.

Incubators will be set up using the PPP mechanism to facilitate training of entrepreneurs in the water service and O&M sector. Youth and women will be encouraged to participate in these training modules and provided support in establishing commercial units.

Use of IoT based sensors, SCADA systems for monitoring and metering of water distribution and supply networks will bring a number of new technologies that have the potential to transform the water service sector by bringing in new levels of efficiency and cost effectiveness.

The project will create a node-based distributed digital data archival and analysis system which leverages ICT technologies. This system will serve as the information backbone of the River Basin Management Plans and will be populated with GIS based surveys of water resources, water infrastructure and service networks. It will include data collected from WUAs and their committees including data pertaining to O&M and activities. The information system nodes will be located at Gewogs, Dzongkhag and national levels, creating a transparent and localized yet networked solution for information needs for water resource planners and communities.

Formal collaborations with research and extension agencies for access to latest technologies and techniques for climate resilient agriculture will be explored. This includes i) new and suitable varieties of crops (cereals, pulses and vegetables); ii) indigenous species of trees, shrubs and grasses for horticulture, agro-forestry and watershed restoration; iii) quick growing varieties of fuel, fodder and multiuse species of trees for plantations in barren areas and homesteads and iv) drought resilient varieties of livestock, milch animals and small ruminants. The project will additionally tie up with research agencies for access to the latest IPM techniques and veterinary and animal health technologies.

In-situ trials and demonstrations of technologies will be the primary vehicle for imparting training. This will additionally ensure appropriate testing and adaptation of new technologies to local conditions. The project will replicate lead farmer and demonstration based training models for imparting knowledge on climate resilient agriculture and techniques for watershed management, including soil and water conservation measures and vegetative restoration techniques.



Integration of ICT and IoT technologies with the M&E system proposed will ensure verifiable, quantitative and granular monitoring of project impacts. Citizen sensing approaches will engage volunteers from the WUAs and staff for recording ground conditions using mobile phones. Robust, gender-responsive, quantitative and easily measured indicators will be identified to encompass biophysical and socioeconomic parameters, including those for environmental and social safeguards. Tools such as the Open Data Kit (ODK), and on registers which can be photographed using smartphones will be used extensively to facilitate efficient and accurate reporting and surveying of field observations, including collection, recording and transmitting data collected by the community facilitators and volunteers.

The project use contemporary design and techniques that maximize the use of locally available materials and labor while undertaking repair and enhancement of water infrastructure. This will enhance local incomes and skills and ensure that capacities for O&M are available within communities. The use of alternative energy sources and modern lining materials to improve efficiency of water distribution will be combined with micro-irrigation and water saving techniques.

#### Sustainability

The project's sustainability hinges on successful ownership of its activities by local communities, local government agencies and the active engagement with the private sector. In addition, the project will invest both in restoring and enhancing hydrologic services from catchments and in constructing highly resilient water infrastructure which is designed to work with minimal O&M for extended periods. Its focus on government policies and cross-sectoral master plans will ensure policy coherence across the sectors for integrated water and land management at watershed scale. It will additionally enhance the capacity of agencies to generate climate risk information (through modeling work) to underpin adaptive strategies for water management, including climate proofing of water infrastructure.

The broadening of the financial mechanisms to support O&M of water infrastructure and restoration and protection of catchment areas is another strategy to ensure sustainability of project interventions. These mechanisms will include PES systems, tariff and user fee and payments. Linking these payment mechanisms to private sector and entrepreneurship-based O&M and management will further increase the sustainability of the enterprises.

Other elements of the sustainability strategy are as follows.

? The project will ensure there is complete and comprehensive ownership of its strategy and activities by communities and local government partners. The project will ensure long term sustainability and continuation by investing in the strengthening of community-based institutions and government agencies

at the local level. Awareness and sensitization will be undertaken to facilitate representation of women and vulnerable groups in decision making. Mechanisms will be instituted for training of community facilitators and members of different user groups to coordinate, collaborate, cross-learn and complement each other's activities. WUAs and their committees will be strengthened through training and provision of relevant assets. Communities will consequently be able to organize and pool resources for sustaining and extending project activities.

? Investments in water infrastructure will provide long term benefits to communities, for which small user fees will be collected both in kind and in cash. WUAs and committees engaged in O&M of infrastructure will be assisted in raising finances and resources from PES systems and will be provided necessary training in financial administration and book keeping as well as monitoring and O&M, thereby sustaining the impact of the project.

? Climate proofing water infrastructure and construction of climate resilient water infrastructure will ensure long term success of the project's activities. The infrastructure will communities well beyond the five years of the proposed project.

? A comprehensive technical, social and environmental evaluation of the sites and users will be made ahead of project implementation. This will ensure that any negative impacts of the project are identified and addressed well in advance and will therefore directly contribute to the acceptance and longevity of project interventions.

? All construction activities will utilise local materials where possible and employ local manpower. This will enhance local capacities in and skills for subsequent upkeep and O&M. This will also bring down costs of O&M operations and provide an incentive to communities.

? Types of equipment selected for the project will be determined by the availability of spares and parts among nearby markets and towns. Entrepreneurs who service and repair equipment will be identified and linked to the relevant WUAs.

? Linkages with markets, private sector agencies for sales of produce and accessing financial services as well as extension support such as veterinary care will also be established to increase the financial viability of interventions and ensure the private sector meaningfully engages with the project and contributes to its long term sustainability.

? Private sector engagement and entrepreneurial interventions will be supported through the PPP model that is being piloted in the three Dzongkhags. The sustainability of entrepreneurial interventions and the role of the private sector in the project will be ensured by seeking out private sector involvement in supply of inputs, O&M of equipment and in water service provision for both farmers and domestic use as described earlier.

Potential for scaling up

Replication and scaling up of project activities will be ensured through the following approaches.

Private actors, including the corporate sector will be engaged in water and watershed management, livelihood development and development, deployment and training of entrepreneurs in setting up businesses for water service delivery. The emphasis on knowledge sharing and dissemination of both successful activities and lessons learned will facilitate adaptive learning in the project. Replication of successful interventions to other areas will also be ensured by strengthening government agencies in their implementation.

? Knowledge sharing, cross-learning and dissemination within and between stakeholders in the community, local government, national, regional and international levels will be ensured through:

a. Exchange visits between WUAs, their committees and their representatives, both horizontally - to other similar agencies, and vertically, to national and site level committees and user groups.

b. Bi-annual knowledge sharing events organised at each of three project Dzongkhag and at the national level.

c. Training programmes, workshops and awareness generation events conducted throughout the project life cycle and aligned to project activities and workplans.

d. Regular meetings at the level of the WUAs and their committees to provide a formal mechanism to report, share and plan project activities. These meetings will also facilitate learning and coordination of projects and programs of the government and other agencies in each project site.

e. Formal partnerships with other ongoing projects of the government and development agencies through concerted coordination, knowledge exchange and collaboration to ensure long term sustenance of these activities.

? The project will invest in development and documentation of the new and innovative technologies and techniques described earlier. Training materials and modules will be designed for use by both technical and non-technical users that focus on locally relevant, low-cost techniques and technologies, facilitating their scaling up and replication.

Strengthening of government agencies to implement and replicate the project will be ensured. The project will be implemented through existing governmental mechanisms and institutions, thereby strengthening them and contributing to their capacity development, particularly at the local level. Extension and development services will be trained and provided hands-on experience and opportunities for cross learning with experts in the field. Gaps in critical communication systems and facilities will be addressed by basing the local PMU at the Dzongkhag level. Extension and development agencies and staff will be equipped with survey and storage equipment, materials and supplies for extension support. This will ensure lessons from the project are supported over a long term and replicated in other areas within the Dzongkhags

**1b. Project Map and Coordinates**

**Please provide geo-referenced information and map where the project interventions will take place.**

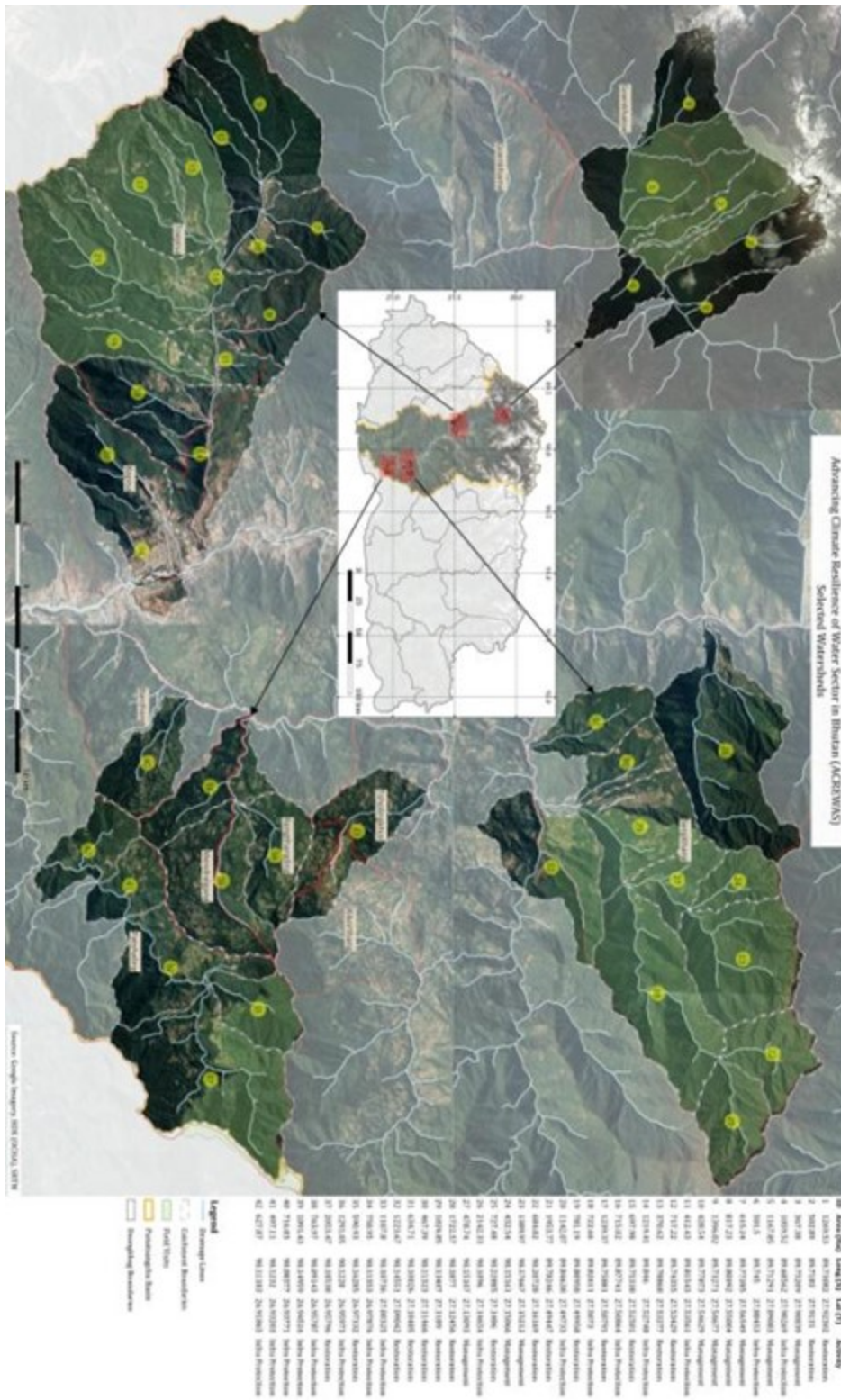


Figure 9: Punatsangchu basin with the four watersheds and 42 micro-watersheds selected for the project

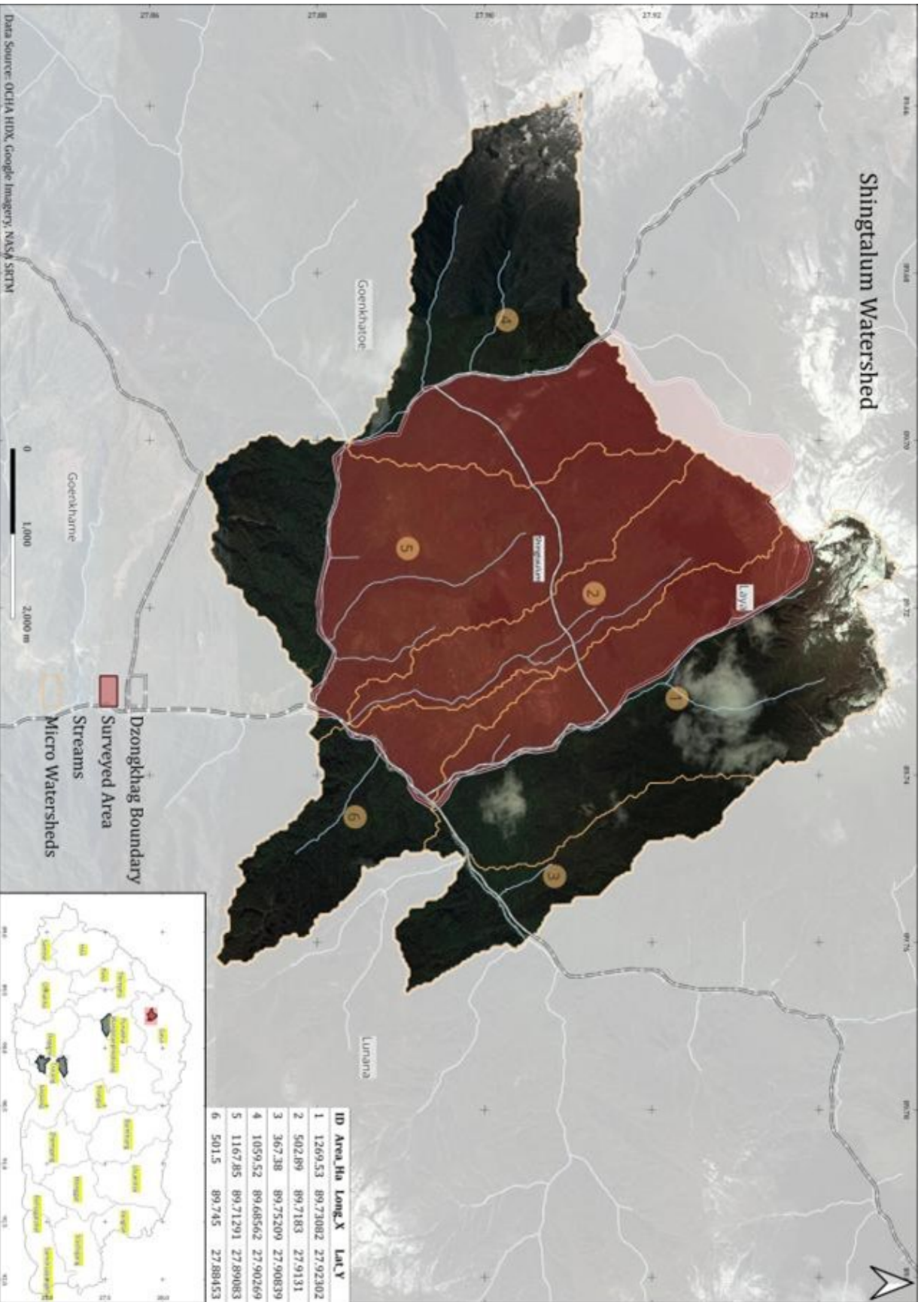
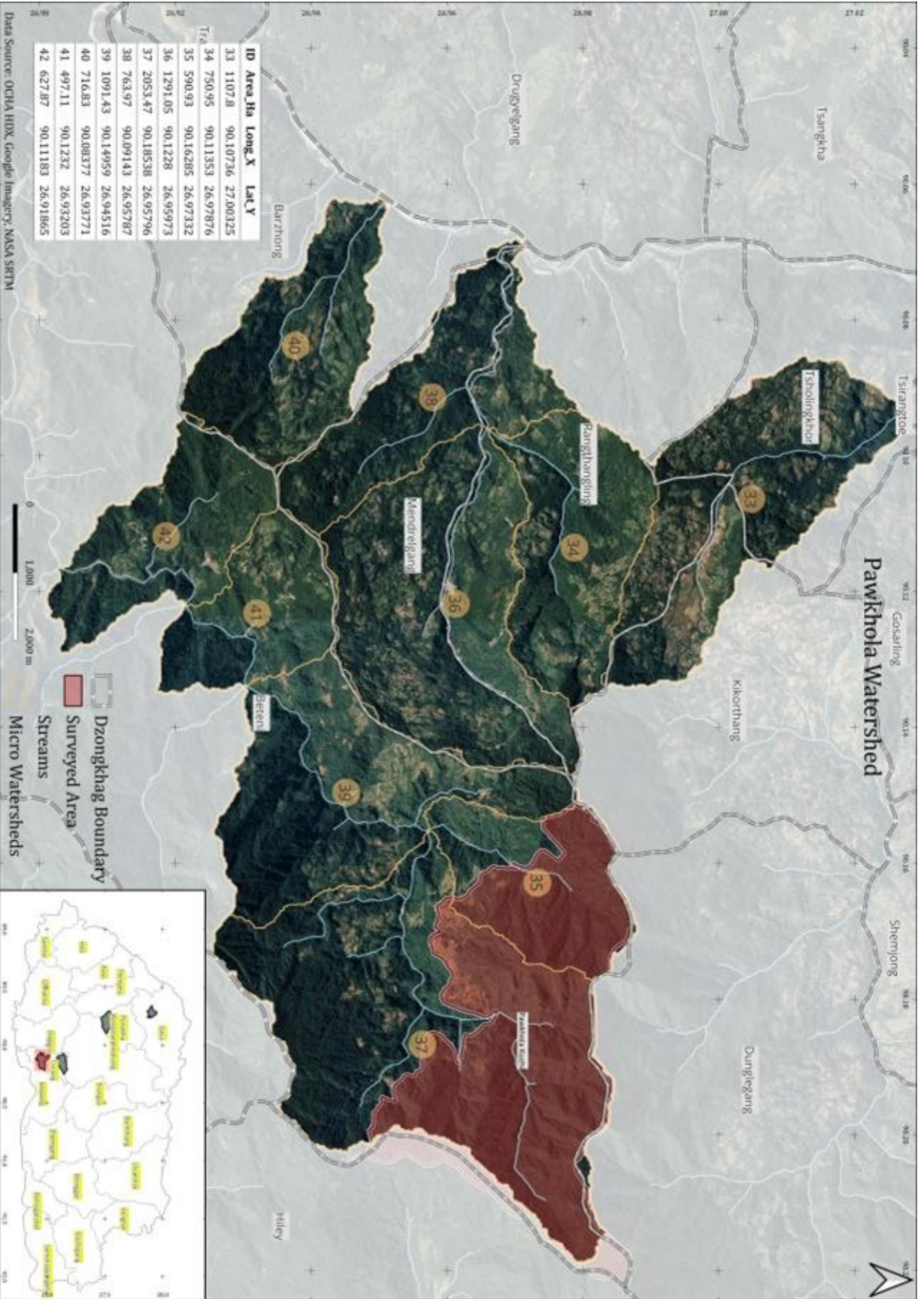


Figure 10: Shingtalum watershed





ID	Area	Ha	Long	X	Lat	Y
33	1107.8	90.10736	27.00325			
34	750.95	90.11353	26.97876			
35	590.93	90.16285	26.97332			
36	1291.05	90.1228	26.95973			
37	2053.47	90.18538	26.95796			
38	763.97	90.09143	26.95787			
39	1091.43	90.14959	26.94516			
40	716.83	90.08377	26.93771			
41	497.11	90.1232	26.93203			
42	627.87	90.11183	26.91865			

Data Source: OCHA HDX, Google Imagery, NASA SRTM



Figure 11: Pawkhola watershed

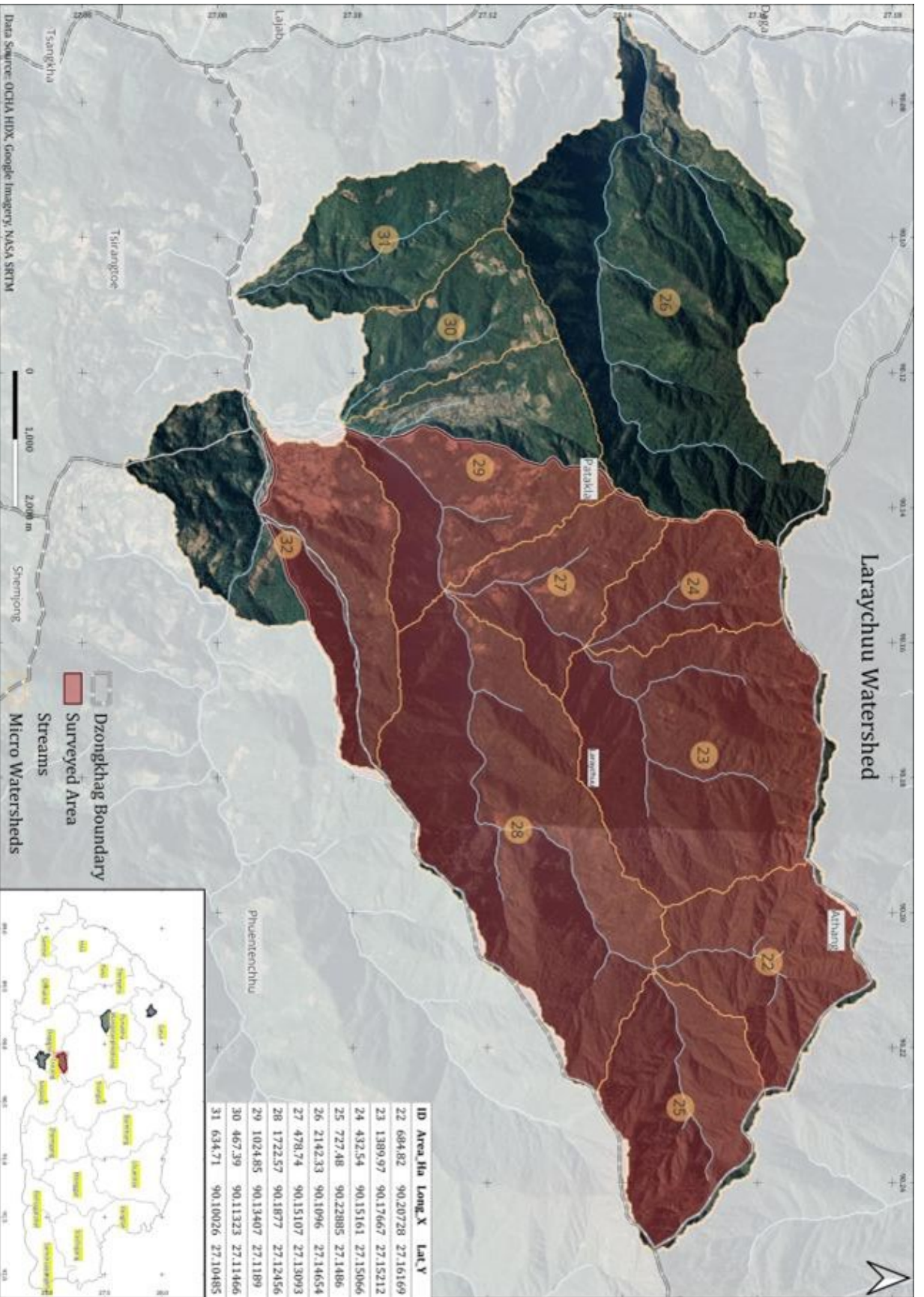
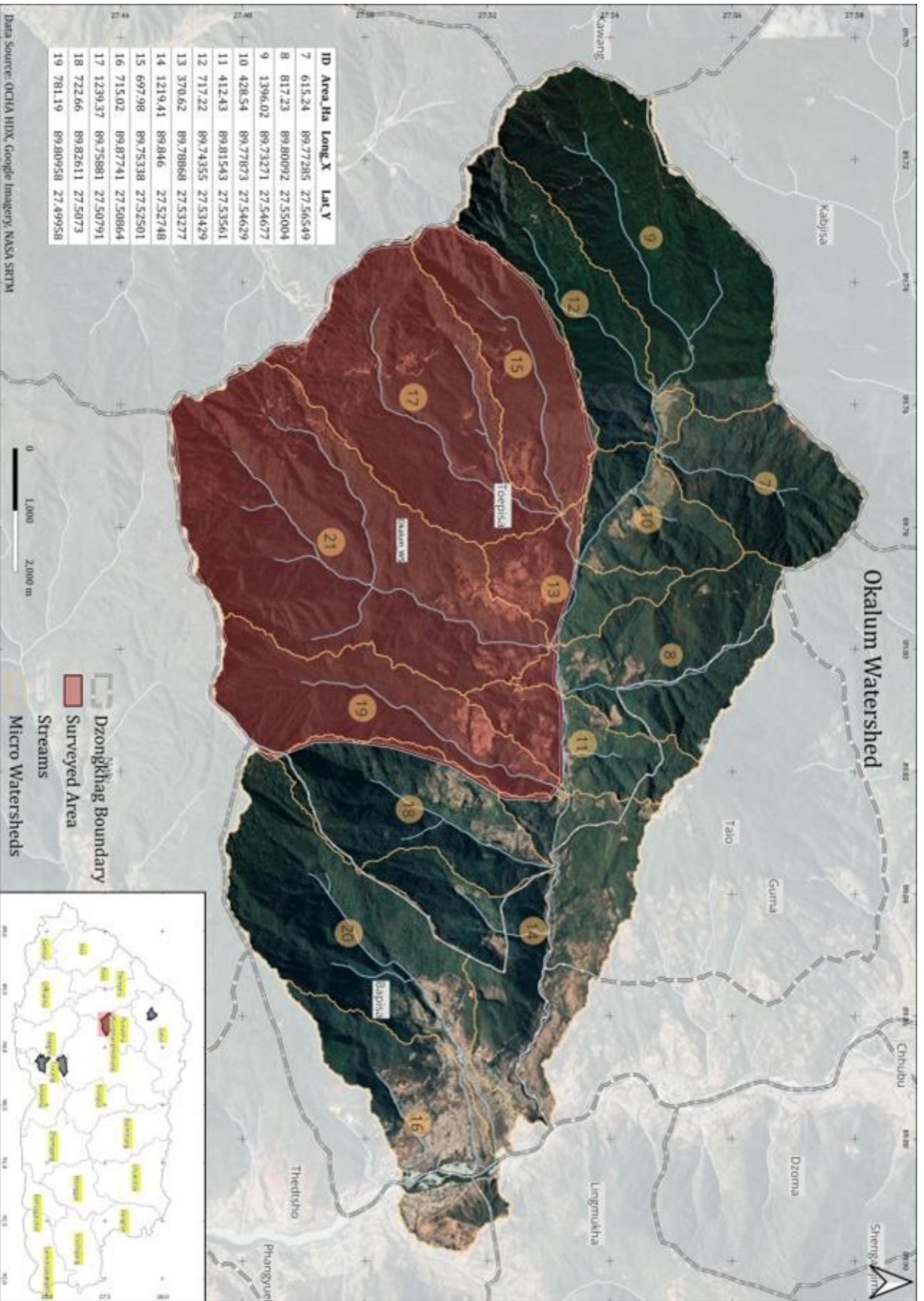


Figure 12: Larachuu watershed



ID	Area	Ha	Long	X	Lat	Y
7	615.24	89.77285	27.56549			
8	817.23	89.80092	27.55004			
9	1396.02	89.73271	27.54677			
10	428.54	89.77873	27.54629			
11	412.43	89.81543	27.53561			
12	717.22	89.74355	27.53429			
13	370.62	89.78868	27.53277			
14	1219.41	89.846	27.52748			
15	697.98	89.75338	27.52501			
16	715.02	89.87741	27.50864			
17	1239.37	89.75881	27.50791			
18	722.66	89.82611	27.5073			
19	781.19	89.80958	27.49958			

Data Source: OCHA HDX, Google Imagery, NASA SRTM

Figure 13: Okalum watershed



### **1c. Child Project?**

**If this is a child project under a program, describe how the components contribute to the overall program impact.**

#### **2. Stakeholders**

**Select the stakeholders that have participated in consultations during the project identification phase:**

**Civil Society Organizations** Yes

**Indigenous Peoples and Local Communities** Yes

**Private Sector Entities** Yes

**If none of the above, please explain why:**

The Stakeholder Engagement Plan is provided in Annex 9.

A summary of the SEP and mechanisms for consultation with stakeholders in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement:

This project has been designed on the basis of extensive consultations with stakeholders in the RGoB from all levels, with local institutions such as the Chiwogs, Gewogs, their associated committees and federations and through directly interacting with communities, with specific attention being given to inclusion of women, marginalised/minority groups and vulnerable sections in the consultations.

The key elements that will ensure their active and meaningful involvement throughout the project are:

1. Free Prior and Informed Consent of communities engaged in the project;
2. Ensuring representation and participation of women and vulnerable groups at all stages of the project. Comprehensive mobilization and awareness generation to ensure inclusive participation, including that of women and vulnerable groups
3. Creation of a supportive environment for meaningful involvement of women and members from vulnerable groups to participate in project implementation and benefit from its activities. This will be guided by gender sensitive ESMF and climate change strategies and plans of the UNDP and GEF policy requirement.

4. Continuous engagement with community leaders, local NGOs, CBOs and CSOs at ensuring their ownership and commitment for project development process and implementation. Community engagements will be most intense during the inception phase (first year) of the project but will be sustained throughout its life cycle.

5. Creation and strengthening of local institutional structures for the management of water resources and infrastructure. Water User Associations at different administrative levels will be the key conduit for project activities. They will be strengthened through institutional capacity building, registration and on-boarding into the existing watershed management structures.

6. Continuous capacity building and training to ensure necessary skills and resources are provided to stakeholders. Identifying and building capacities of focal points in the WUAs, progressive farmers and entrepreneurs in the community to lead specific roles in the project. These roles will range from communication, monitoring and report to active participation in demonstrations, dissemination of awareness and capacity building. Identified individuals will include women and members of vulnerable groups.

7. Ensuring meaningful participation and ownership of project activities and assets by community members by creating framework for in-cash/in-kind contributions for project activities and users fee for the use of assets created by the project to sustain their operation and maintenance.

8. Enhancing capacities of extension staff from local government, through training of trainers, creation/restoration of assets, facilities, communication and related infrastructure. This will ensure long term support to communities for adaptation planning, management of resources through these institutions and implementation of adaptation and mitigation measures for long term resilience to climate change induced disasters.

9. Formal frameworks and mechanisms to ensure transparency, including multiple channels of communication and information dissemination, and resolve grievances of individuals and communities in an efficient, transparent and cost-effective manner. Mechanisms for oversight in the transfer of ownership of assets created by the project to CBOs, including WUAs and their committees and associations, and to entrepreneurs participating in the incubators set up by the project.

10. Alignment with provisions for gender and social and environmental safeguards of the project.

11. Continuous and participatory monitoring of project activities and impacts.

Resources allocated towards activities for stakeholder engagement are summarized in the table below.

A. No.	Sub-activity and output	Year1	Year2	Year3	Year4	Year5	Total
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1.1.1	Develop gender responsive water safety plan for Gasa, Punakha and Tsirang including training on gender safeguards	0	0	0	0	13,500	13,500
	Develop guiding tool for Development of Water Master Plan	15,000	0	0	0	0	15,000
	Revise Drinking Water Quality Standard	3,000	9,000	0	0	0	12,000
1.1.2	Undertake participatory assessment of water resources and water issues within local watersheds	17,400	11,600	0	0	0	29,000
1.1.3	Formulate river basin management plan for Punatsangchhu river basin (1 RBMP)	0	2,400	9,600	0	0	12,000
	Water master plan for Gasa, Punakha and Tsirang Dzongkhags for each project site (3 Dzongkhag Master Plans)	0	6,000	6,000	0	0	12,000
1.2.1	Establish River Basin Committee (RBC) for Punatshangchhu	4,800	11,200	0	0	0	16,000
1.2.2	Form/Strengthen of WUAs and enable their representation at the Gewog level	6,000	20,000	0	0	0	26,000
	Strengthen Dzongkhag Environment Committee to bear the role of water management committee at Dzongkhag level (Train DEC on legal and technical matters related to water governance, water allocation and management)	0	18,000	0	0	0	18,000
1.3.1	Study and recommend tariff system for Gasa town and Lobeyssa, and document lessons learnt for policy feedback	0	0	0	2,500	0	2,500



	Study feasibility of introducing water tariff in rural and peri-urban area	0	12,000	0	0	0	12,000
1.3.2	Study and pilot two water utility service provisions through private or PPP arrangement (1 study and 1 pilot)	0	0	5,000	10,000	0	15,000
2.1.1	Implementation of infrastructure protection intervention or climate proofing measures to enable climate resilience of physical assets	0	7,380	7,380	0	0	14,760
	Revival of springs/streams/ponds and rehabilitation/restoration of degraded watershed areas through afforestation and assisted natural regeneration to enhance recharge areas including sensitization and training on springshed assessment and management	8,000	30,000	30,000	0	0	68,000
2.1.2	SMART patrolling capacity and system in four project sites	1,500	0	0	0	0	1,500
	Training on data monitoring and management of monitoring stations	2,250	0	0	0	0	2,250
2.1.3	Assessment and Review of CF management plan for Rangzhin Kuenphen CF and Tashi Thogmen CF, Shingtalum, Gasa	8,000	0	0	0	0	8,000
	Prepare Local Forest Management Plan for Shingtalum watershed	10,500	1,500	1,500	1,500	1,500	16,500
	Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha	8,500	19,000	3,000	0	0	30,500

	Prepare Local Forest Management Plans for Kuchi watershed, Thakorling, Tsirang including biodiversity assessment	5,000	8,500	0	0	0	13,500
	Prepare Local Forest Management Plans for Chedachhu, Bulkey and Larichhu watershed in Sergithang, Tsirang including biodiversity assessment	6,500	11,000	0	0	0	17,500
2.2.1	Establish a new PES scheme for Okalum watershed between catchment communities of Toedpisa Gewog and downstream communities of Toepisa and Barp Gewogs and institutions within the gewogs including Lobeysa township.	0	0	10,000	0	0	10,000
	up-scale existing PES scheme between Thakhorling Community Forest Group of Patsaling gewog and residents of Damphu town, additional six gewogs, Mendrelgang satellite town and institutions within these gewogs	0	0	5,000	0	0	5,000
2.2.2	Develop fodder/pasture on private land (25 acres, Khuchi-Thakorling; 2 Ha in Bulkey and Chedachhu	0	1,125	1,125	0	0	2,250
	Install sprinklers and drip irrigation to improve water efficiency in Mendrelgang and Sergithang (Training and supply of sprinklers materials)	0	21,500	21,500	0	0	43,000

	Plant Grass slip/hedgerow in dryland agriculture for integrated fodder and soil stability measures (7 ? Chedachhu, 7 Ha)	1,350	0	0	0	0	1,350
	Promote of mulching technologies to conserve soil water in Kuchi watershed gewogs and Sergithang	46,375	46,375	46,375	46,375	0	185,500
2.2.3	Planning meetings and workshops	2,800	1,000	0	0	0	3,800
3.1.1	Local consultations, travels and assessments	3,000	0	3,000	6,000	3,000	15,000
	Operation and maintenance for one year as liability period	0	0	0	19,200	0	19,200
4.1.1	Document good practices on water conservation and sustainable water resources management and approaches for scale up	0	7,500	7,500	7,500	7,500	30,000
	Prepare a communication plan on dissemination of lessons, best practices and other information to stakeholders	5,000	0	0	0	0	5,000
	Prepare videos / brochures/ flyers/poster and other communication materials on project success stores, progress, impacts, knowledge and practices for climate resilient water and watershed management, standards and tools based on output 1.3	2,400	2,400	4,800	8,400	6,000	24,000
	Study visit and exchange programs among farmers, community and local government functionaries	0	0	0	7,000	0	7,000

4.1.2	conferences and workshops to strengthen south-south cooperation and knowledge sharing	0	12,500	12,500	12,500	12,500	50,000
	exhibitions, workshops, events	0	0	0	0	15,000	15,000
	Study visit and exchange programs among local government functionaries	10,000	0	0	10,000	0	20,000
4.1.3	Gender safeguards	31,000	8,000	8,000	0	0	47,000
	Social and environmental safeguards	83,250	35,500	6,250	6,250	6,250	137,500
4.1.4	Support implementation of water resource management curriculum at tertiary education level including (2 tertiary institutions)	18,000	15,000	15,000	0	0	48,000
	Support technical capacity and skills in water supply engineering and Climate and hydrological modeling ( 5 officials)	0	107,000	0	0	0	107,000
	Training of trainers on climate resilient water infrastructure design, planning, implementation and O&M (10 officials, Ex country training)	0	214,000	0	0	0	214,000
4.1.5	Support diagnosis, analytical capacity and water quality testing capacities at 21 Primary Health Care Centers of 3 Dzongkhags	0	0	0	2,000	0	2,000
4.2.1	Develop harmonized comprehensive database on water resources and infrastructure within the Punatshangchhu river basin ( for water security index system on water for urban, rural, economic, environment, disaster and climate resilience)	0	0	13,500	0	0	13,500

4.2.2	Carry out overall situation analysis of river basin in terms of its ecological health and the social and economic circumstances including water security index and impact of climate change on water sector in Bhutan; Highlight of key issues faced in establishment and functioning of the agency for water utilities at national level, River Basin Management Committees (RBMCs), Dzongkhag Water Management Committees (DWMCs) and Water User Associations (WUAs)	0	0	13,500	0	0	13,500
	Develop a commonly agreed SOBR format and document SoBR for Punatsangchhu river basin and institute mechanism for regular reporting and sharing of data and reports on state of river basin	0	0	7,000	0	0	7,000
	Publish and disseminate State of the Basin Report (SOBR) for the Punatsangchu River Basin	0	0	4,590	4,455	4,455	13,500
4.1.3	Gender safeguards	5,000	5,000	5,000	5,000	0	20,000
	MTR and TE	0	0	12,500	0	15,000	27,500
	Project governance and monitoring	24,400	14,400	14,400	14,400	24,400	92,000
	Social and environmental safeguards	5,000	5,000	5,000	5,000	0	20,000
4.1.3	Establish PMU	1,306	1,306	1,306	1,306	1,307	6,531
	Project governance and monitoring	7,000	2,000	2,000	2,000	2,000	15,000
		342,331	667,186	282,326	171,386	112,412	1,575,641

**Please provide the Stakeholder Engagement Plan or equivalent assessment.**

The Stakeholder Engagement Plan is provided in Annex 9 of the ProDoc which is uploaded to the Roadmap section of GEF Portal.

In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement

**Select what role civil society will play in the project:**

**Consulted only;**

**Member of Advisory Body; Contractor;**

**Co-financier;**

**Member of project steering committee or equivalent decision-making body; Yes**

**Executor or co-executor; Yes**

**Other (Please explain)**

**3. Gender Equality and Women's Empowerment**

**Provide the gender analysis or equivalent socio-economic assesment.**

A comprehensive Gender Analysis and Action Plan (Annex 11) has been developed for the project. The analysis included field data collected during visits to the three districts (Gasa, Punakha and Tsirang). Consultations were held with the project beneficiaries of respective districts, Honorable Governors, the Planning Officers, Environment Officers, Kidu Officers, District Engineers, District Health Officers and the Gender Focal Persons. Discussions with primary beneficiaries during site visits included meetings, focus group discussions (FGD) and Key Informant Interviews (KII). The GAP also includes a comprehensive review of policies and literature related to gender and women in Bhutan, on international conventions that Bhutan is signatory to and on best practices and strategies for gender inclusion in project design.

The GAP provides a contextual situation analysis of gender equality in Bhutan, reviews the laws and policies, cultural norms and beliefs, gender roles and responsibilities and analyses gender aspects of access and control over resources. Its findings are summarised below.

? Women in the project area were aware of gender equality and women's empowerment. With the advocacy programs of CSOs like RENEW and the Gender Focal Persons in the Dzongkhag, they understood about the gender-based violence, sexual harassment issues etc.

? The study revealed that gender roles in water management are well spelt out with women involved in collection, provision and management of water in the household level. They are responsible for maintaining sanitation and hygiene in the house while men are more involved in maintenance of the water source, restoring breakages and repair of water supplies.

? Woman's independent decision-making role was limited to household issues like water use at home, hygiene and sanitation etc. Women contributed to major household decisions like purchase of agriculture machinery, sale and purchase of land while men could take such decisions independently.

? The challenges that women were facing with regard to water use, collection and management are now exacerbated by the consequences of climate change.

? Water Users' Associations (WUAs) were formed in some of the project site some in the past. However, such groups are working sub-optimally and informally and these require support in terms of capacity building.

? Unequal gender participation was observed both in rural and urban WUAs because of issues of representation, power relations, and culture.

? Women representatives in the Executive Committees of WUAs are minimal.

? Same set of women were representing many village groups (like the Community Forestry Management Groups, the Non-Timber Forest Products Groups, the Water Groups, Dairy Farming Groups, Vegetable Groups etc.), hence their participation in many groups/committees were not effective.

? There is a strong presence of age old cultural and traditional value embedded in the society with varying degree of cultural bias that led women to being considered inferior to men. There are proverbs and beliefs that exist in the villages which portrays men's superiority over women. Hence, impact of societal, cultural and gender stereotypes play a big role in the participation of women related to the use of water resources and infrastructures though women in project areas expressed it to its contrary.

? District headquarters do not have a water management plan. Water is managed by Municipal sector in urban areas while at Gewog level, users form user group with technical backstopping from the Dzongkhag wherever Chiwogs have water issues.

? Since gender is a cross cutting issue for 12th Five Year Plan, gender balance representation is encouraged in decision-making platforms, with equal participation from both genders. Awareness programs are conducted at Gewog level and information is shared regarding policies about women's

participation in meetings and decision-making bodies. However, some KII informants felt that, at the grass root level, people are still not fully aware and confused as to how to relate gender with water resource management.

The project aims to incorporate gender analysis and gender concerns into all aspects of project cycle management at planning, implementation and monitoring and evaluation. The GAP facilitates increased participation of women in decision-making processes. Project activities will be designed in a gender-responsive way while facilitating equality and equity for both men and women and youth to the extent possible, given the constraints of systemic barriers that are related to deep-rooted traditions, norms and stereotypes and power structures. The project seeks to enable transformational changes in women's ability to engage in decision-making processes. The project activities will ensure that both men and women are empowered to increase their understanding and appreciation of the importance that both genders play in everyday management of water resources.

In line with national policies as well as UNDP and GEF guidelines, the project will adopt the following principles in its day-to-day management:

- ? Demonstrate gender-responsiveness in all interactions with project stakeholders;
- ? Refrain from using language or behaviour bias and disrespect based on gender;
- ? Avoid gender stereotyping in project documents and communication outputs;
- ? Support zero tolerance to sexual harassment, gender-based violence and/or sexual exploitation and abuse of men, women, girls and boys that may occur in connection with any of its supported activities; and
- ? Collect gender disaggregated data/information under gender-responsive indicators to inform results-based and adaptive M&E; this allows for evidence-based decision-making throughout the project cycle.

The project will allocate available resources and time to address gender imbalances and to strengthen representation of women in local organizations and institutions within the framework of the project's key objectives. The project will be in-line with government policies and national strategies for empowerment of women, and closely aligned with the GEF and UNDP guidelines on gender mainstreaming.

Key recommendations from the Gender Analysis are as follows



1. Various programs on awareness, trainings and sensitization on gender issues and gender strategies will be conducted at institutional levels and for communities, including:

- ? PMU team, partner institutions and responsible parties;
- ? Local government and technical staff at dzongkhag, gewog and chiwog;
- ? Community representatives, including Local Government and religious leaders;
- ? Community based organizations including Water Users? Associations

2. A gender focal person will be nominated at the PMU in order to ensure that the consultative processes, planning, development of documents, IEC materials, awareness and sensitization programs and project implementation, monitoring and evaluation are carried out under the gender lens. Further, Gender Focal points of the 3 districts as well as other responsible parties like NEC, MoAF (WMD) are engaged from the very outset of the project in planning, design of activities and project implementation for continued support to enable optimal gender mainstreaming in the project cycle management. The Gender Focal Person will ensure the following:

- ? Gender concerns are appropriately integrated and that women are facilitated through mobilization, training and/or representation on management structures,
- ? Involve women at the design stage of all intervention activities. This includes:
  - o Siting of installations and infrastructure such as multi-use irrigation systems;
  - o Prioritization of areas to be restored;
  - o Timings, duration and volume/delivery of domestic water supplies;
  - o Selection of species for woodlots/plantations and seeding of pasturelands.
- ? To ensure women household representatives from a minimum of 25% household and 25% of Executive committee members in each WUA are women taking up the role of Chairperson heading the WUA.
- ?  
?
- ? Ensure awareness creation of WUA members on gender equality, sexual harassment, promotion of conducive environment and arrangements to enable women participation.
- ? To provide flexibility to women wage earners to nurse/take care of their children as and when required.

? The project will explore possibility of establishing day care facility and support the community to efficiently run it both during the project period and beyond.

? Clear policy and system for grievances and complaints for women staff and community members on the project.

? Facilitate formal linkages with government gender focal persons in relevant organizations and with the National Commission for Women and Children.

? Promote Access to information and grant support for startups on agriculture and or water related businesses targeting vulnerable women headed households and youth groups.

? Promote agricultural/farming technologies that are women friendly including O&M trainings

3. A clear and comprehensive communication strategy and plan will be formulated for the project. The plan will cover both gender sensitization and awareness building in communities as well as institutional mobilization and support LG officials who will be engaged in project implementation. The plan will ensure that training and awareness materials and modules are designed to be accessible by semi-literate and illiterate audiences and are relevant to the local context, the implementation of which will result in mobilizing, raising awareness and building capacities of individuals and institutions as well as communities themselves.

4. Women facilitators of water projects during training programmes, both hardware and software, serve as role models and an incentive that encourages rural women to take bold initiatives that help them to play their required roles. ACREWAS to encourage recruitment for participation of women facilitators and trainers in the capacity development programmes.

5. Robust and quantitative indicators will be identified to track and monitor gender related impacts of the project and to trigger interventions, where needed, that ensure women do not face unintended consequences from project activities. Proactive measures will be taken by the project to ensure women are able to access and manage key resources, assets and information that facilitate adoption of measures to mitigate and adapt to climate change impacts on their livelihoods and food security.

6. Household water usage and collection system. Communities including all women and youth in the project sites will be made aware and trained in the water management system, household water use and collection systems efficiently. Furthermore, most households and especially all women headed and single mother households, will have drinking water supply connected to their house. They will be supported to implement these activities at household and neighborhood level. Women, men and youth will be equally involved in related consultation processes, surveys, assessments and especially the water tariff study/determination and women engaged in local decision making.

7. The PMU staff and the relevant stakeholders will be expected to demonstrate a clear understanding of gender mainstreaming issues and opportunities. Gender statistics, and not only gender-disaggregated indicators, will be integrated into the project's logical framework, and measured during regular M&E

processes. Capacity building and gender mainstreaming skills and gender aspects of climate change adaptation and resilience building will be imparted to the PMU, LG, District and other relevant stakeholders (ACREWAS) who will be implementing the project. Their capacity for consultation with partners/stakeholders and processes on reporting, monitoring and evaluation will be strengthened. All project members will take part in gender specific capacity development measures so that the project staff will have gender competencies.

8. Participatory training programmes will be organized for both men and women at the community level on the important role of women in water projects in general and operation and maintenance in particular. This would enable the men to appreciate women and accord them the recognition; it would also make the men more amenable to changing their stereotyped attitudes concerning women's traditional roles. Such trainings will be conducted throughout the project period in a progressive upscale manner, especially with support of the NCWC, so that respondents are provided required knowledge in order that their attitude and practice change over a period of time.

9. In order to take into consideration multiple discrimination and special needs, it has to be ensured during the planning and implementation that disadvantaged groups such as women, women headed households, poor households and people with disabilities are always consulted. Women will be recognised as central to the provision, management and safeguarding of water and are involved in the planning and decision making of water management systems making it a gender sensitive participatory planning. This will improve water management scheme performance while strengthening the position of rural women and vulnerable groups.

10. At least 25% of the households are represented by women members in the WUAs. Furthermore, 25% of the Executive members in the WUAs are women taking up the role of Chairperson, who will be heading the WUAs. At the beginning of the implementation phase of the project, a memorandum of understanding (MoU) will be signed between the PMU and the LG to ensure appropriate women participation in the WUA.

11. The ACREWAS will promote women and youth as agents of change, initially by empowering them in the various aspects of local water management, foreseeing them to be future leaders in the community and being instrumental in gender mainstreaming at the local level.

12. ACREWAS will train women ? especially economically disadvantaged and female-headed households in water-saving techniques, various operation and maintenance (O&M) measures, water use for home gardening, etc., the knowledge of which could be used in income generation and knowledge sharing with their communities and beyond. Additionally, involvement of women in O&M will empower them, making them less dependent on the expertise of men.

13. The project will maintain gender disaggregated data collected through surveys, regular record keeping, monitoring etc. This will enable proper monitoring of gender benefits and impacts. Further, there is a need to sensitize and train officials in the PMU detailing how such data is to be collected and maintained. Maintaining gender disaggregated data/information makes it easier for the monitoring and evaluation, future planning as well as attracts the interest of a variety of stakeholders.

14. The monitoring strategy will include tracking of social and environmental safeguards which includes gender impacts. Focal persons will be identified in each project site and these will preferably be women who are office bearers in the LG, WUA or any other sub-committees. These focal persons will be trained in recording and reporting on specific indicators and events. For instance, maintenance of attendance and financial records, sites selected for local intervention, allocation of saplings, plantation of saplings etc. They will be guided and monitored by the PMU ensuring that such information are correctly recorded and maintained for further use during reporting. Furthermore, these essential information are spelled out as indicators for the GAP which will be referred while monitoring progress of the project.

15. Indicators used for the monitoring of project will include gender indicators that capture differences and inequalities in the situation of women and men. Monitoring data will be gender-disaggregated where feasible which will also serve to identify any gender gaps or inequalities in delivery of project benefits or participation. Data collected will be disaggregated by sex and age. Robust and quantitative measures that can capture trends and magnitudes of change or impact will be collected in addition to qualitative measures that provide an understanding of socio-cultural contexts, political alignments and decision-making processes. Reflection of gender issues such as gender differences and biases in ownership, access and decision making and control over benefits and results of project activities will be picked.

**Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment?**

Yes

**Closing gender gaps in access to and control over natural resources; Yes**

**Improving women's participation and decision making Yes**

**Generating socio-economic benefits or services or women Yes**

**Does the project's results framework or logical framework include gender-sensitive indicators?**

Yes

**4. Private sector engagement**

**Elaborate on the private sector's engagement in the project, if any.**

explored in the integration of technology-based applications in the operation and maintenance of the climate resilient infrastructure installed by the project and in training and hand holding of young entrepreneurs interested in application of IT tools for monitoring and metering of water supply. Entrepreneurs will be encouraged and equipped to take up management of domestic and irrigation supply systems along with their respective WUAs and committees. Further details are presented in the description for Component 3.

PPP will be for the development and introduction of new technologies in water service management, as well as measurements and monitoring of discharges and off-takes. PPP will also be explored for long term support for watershed restoration through plantations and greening of degraded catchment areas and barren lands. Finally, incubators will be set up using the PPP mechanism to facilitate training of entrepreneurs in the water service and O&M sector.

Entrepreneurs will be supported in setting up commercial units which use IoT based sensors and automated systems for monitoring and metering of water distribution and supply networks. This is expected to facilitate the adoption of a number of new technologies that have the potential to transform the water service sector by bringing in new levels of efficiency and cost effectiveness.

Linkages with markets, private sector agencies for sales of produce and accessing financial services as well as extension support such as veterinary care will also be established to increase the financial viability of interventions and ensure the private sector meaningfully engages with the project and contributes to its long-term sustainability.

**5. Risks to Achieving Project Objectives**

**Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):**

Risks threats to achievement of project results are summarised below.

Table 5: Risks that threaten the achievements of results and mitigation measures

Description	Type	Mitigation measures	Risk owner
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<p>Risk 1:</p> <p>Climate induced hazards may damage water infrastructure or obstruct and delay work</p>	<p>Environmental</p>	<p>1. Infrastructure constructed as part of the project will be designed in accordance with updated projections of potential climate change induced hazards. Infrastructure will additionally be protected through slope stabilisation and support structure and water conservation measures.</p> <p>2. In order to minimize impacts of inclement weather on project deliverables, all activities will be planned keeping in mind the likely seasonal weather disruptions. Movement of materials and all infrastructural interventions will be made during the dry season and based on local forecasts.</p>	<p>MOWHS</p>
<p>Risk 2:</p> <p>Underdeveloped private sector and weak value and supply chains may hinder adoption and success of private sector engagements</p>	<p>Institutional/ regulatory</p>	<p>The project will involve the private sector to ensure sustainability of the project. The project will further engage with the private sector in a number of income generation and livelihood diversification activities and by also tying up with ongoing initiative through cross learning and knowledge sharing</p>	<p>MOWHS</p>
<p>Risk 3:</p> <p>IoT devices equipment may fail to perform due to poor power supply, network connectivity issues and breakdown</p>	<p>Operational</p>	<p>Equipment's will be procured through established vendors and companies and will comply with the necessary ruggedness standards expected. Finally, all equipment will be purchased under warranties and regular monitoring and maintenance will be carried out with back up plans</p>	<p>MOWHS</p>
<p>Risk 4:</p> <p>Beneficiaries? unwillingness to pay for the improved water facilities and supplies may not generate enough funds to sustain delivery of water utility services</p>	<p>Financial</p>	<p>Water user associations will be required to ensure their members are involved in decisions pertaining to tariff, fee or other kind of in-kind payments.</p> <p>Multiple forms of payments will be explored, including provision of labour or time for O&amp;M and monitoring works by the WUA.</p> <p>Multiple sources of income for the WUAs will be explored so that fee collection is not the sole means of financially sustaining the project activities.</p>	<p>MOWHS</p>

<p>Risk 5:</p> <p>Emergent risks due to the COVID-19 pandemic</p>	<p>Implementation</p>	<p>Standard health and safety precautions required for protection against COVID-19 will be implemented, including, but not limited to: (i) wearing a face mask, (ii) handwashing regularly, (iii) social distancing, and (iv) enabling as possible for local communities, project staff, government staff and other stakeholders to voluntarily get vaccinated.</p> <p>During lockdown the project will introduce innovative implementation, monitoring and oversight arrangements</p>	
<p>Risk 6:</p> <p>Changes in government may lead to changing priorities causing conflict with the project objectives, such as lesser priority on the water flagship</p>	<p>Political</p>	<p>1. Water is a priority sector and a strong feature of the political manifestoes. The Water Flagship programme of the 12th Plan faced implementation challenges due to the pandemic. The programme must continue in the 13th Plan gaining more momentum and the project will advocate climate rationale.</p> <p>2. The project's communication and knowledge management components will ensure adequate advocacy on water.</p>	<p>MOF/ MOWHS</p>
<p>Risk 7:</p> <p>Slow economic recovery may reduce government and partners capacity to co-finance the project</p>	<p>Financial</p>	<p>Co-financing agreements is secured, and contributions will be periodically monitored with partners and discussed in the PSC.</p>	<p>MOWHS/MOF</p>
<p>Risk 8</p> <p>Institutional reorganisation and capacity gaps among IP/ RPs may affect project implementation</p>	<p>Institutional and organisational</p>	<p>Clear and regular coordination mechanisms established IP /RP</p> <p>The coordination mechanism will be reviewed both during project inception and through regular meetings of the Steering Committee/Board, to accommodate any changes.</p> <p>During the PPG capacity gap assessments has been conducted in the project areas with the concerned stakeholders. This has informed on inclusion of relevant capacity development activities in the project</p>	<p>MOF/MOWHS</p> <p>PMU</p>

<p>Risk 9</p> <p>Poor connectivity over rugged terrain combined with inclement weather conditions may hinder supply of critical inputs during project implementation.</p>	<p>Operational</p>	<p>This risk will largely be addressed by the presence of Dzongkhag level coordination units for the project which will adequately procure and stock relevant materials in advance of the monsoon season and winters. The high level of mobile connectivity across Bhutan further ensures communications between field teams and administrative offices at different levels. Finally, the project strategy will rely primarily on local supply chains and markets for essential commodities and services.</p>	<p>PMU, Dzongkhag Unit</p>
<p>Risk 10</p> <p>Price escalation due to the ongoing economic slowdown may exceed budgeted costs, affecting project achievements.</p>	<p>Financial</p>	<p>This risk is largely outside the influence of the project. Workplans and budget allocations will be reviewed on a quarterly basis. Opportunities for cost-cutting and improving efficiencies will be fully exploited. Where possible, additional sources of co-finance and collaboration will be explored.</p>	<p>PMU/MOF</p>

## Summary of the SESP

The SESP (Annex 6), provides a detailed analysis of the projects social and environmental risks which examines the risks and provides a detailed assessment including measures to avoid the risks where possible and to mitigate and manage them where necessary. The SESP identified 9 risks of which 6 were scored as moderate and 3 were scored low, resulting in an overall categorization of Moderate Risk to the project. An additional safeguards screening is provided for during the project inception. This will ensure the safeguards screening accommodates any new activities that may be proposed based on site specific conditions.

An Environmental and Social Management Framework attached as annex 10 sets out the principles, rules, guidelines, and procedures for screening, assessing, and managing the potential social and environmental impacts of forthcoming interventions of the project. It aims to effectively address risks through thorough application of the environmental and social measures, including time-bound action plans for avoiding, and where avoidance is not possible, reducing, mitigating, and managing adverse impacts related to the future activities or policies/regulations. It specifies the most likely applicable social and environmental policies and requirements, as well as how those requirements will be met through procedures for the screening, assessment, approval, mitigation, monitoring, and reporting of social and environmental risks and impacts associated with the activities to be supported. It ensures that the activities are screened and assessed, and that appropriate management measures are in place prior to implementation and have been designed to ensure compliance with relevant social and environmental policy frameworks. This includes both Bhutan's legal,



policy, and institutional framework, as well as UNDP's Social and Environmental Standards. The ESMF outlines all steps required in order to ensure full compliance with SES requirement during project implementation. In accordance with the ESMF an environmental and social impact assessment (ESIA) will be carried out for all significant risks. The ESIA process will draw upon the ESMF to assess the associated impacts, and to inform the specific management measures outlined in the ensuing Management Plans. Downstream interventions, including specifics of rural water infrastructure and interventions in agriculture, rangeland, natural resource and forest management will be specified during the inception phase. The potential direct impacts of each specific intervention will be assessed during this phase

The project will be implemented using standard good practice such as consultative and community based selection of sites and design of on-ground activities together with FPIC of the communities. The SESP will be translated into Dzongkha and will be made available to all stakeholders, including women, for their inputs. Further consultations with communities on the field after the activities have been specified will potentially result in updating of the SESP in the first six months of the project. A social baseline will be created during the first six months of the project, before any field interventions are implemented. Activities will result in a comprehensive, field based and participatory planning exercise which involves stakeholders from the government, development agencies and communities. The Stakeholder Engagement Plan (SEP-Annex9) will be made available to all stakeholders in English and Dzongkha, before the activities start. It specifies the need for a full disclosure of information and providing for meaningful participation of stakeholders during the planning and implementation of site-specific activities including as part of site-specific Environmental and Social screenings and assessments. A clear FPIC protocol will be put in place to address conflict resolutions mechanisms. This will be supported by a formal Grievance Redress Mechanism as part of the ESMF. The project will follow a human rights-based approach and contribute to reducing inequalities and improving livelihoods of poor and vulnerable people[1].

The following principles and standards are triggered by these risks:

- ? Overarching Principle: Leave No One Behind
- ? ? Human Rights
- ? ? Gender Equality and Women's Empowerment
- ? ? **Sustainability and Resilience**
- ? ? Accountability
- Standards
- ? ? Std. 1. Biodiversity Conservation and Sustainable Natural Resource Management
- ? ? Std. 2. Climate Change and Disaster Risks
- ? ? Std. 3. Community Health, Safety and Security

- ? ? Std. 4. Cultural heritage
- ? ? Std. 6. Indigenous Peoples
- ? ? Std. 7. Labor and Working Conditions
- ? ? Std. 8. Pollution Prevention and Resource Efficiency

### **Social and Environmental Safeguard Elements**

An overview of the required social and environmental safeguards elements to be designed in the first six months of project implementation is provided below. Substantial and moderate risk activities listed in the SESP will only start after the appropriate Management Plans are in place. The relevant safeguard elements are:

- ? Targeted assessments in accordance with UNDP's SES policy, moderate, substantial and high-risk projects require comprehensive forms of assessment. The targeted assessments will be developed and carried out by independent experts in a participatory manner with stakeholders during the inception phase. This will address all relevant issues related to the SES Overarching Principles and Project-level Standards.

- ? Environmental and Social Management Plans (ESMP) A key output of the ESIA/targeted assessments is an ESMP, prepared within the first six months of project implementation. The ESMP further refines risk identification and mitigation strategies and establishes a system for monitoring these risks. Necessary management plans will be developed and implemented as appropriate based on the findings of the ESMP.

- ? The project's ESMP will be complemented by relevant action plans to supplement the ESMP.

- ? Technical and feasibility studies Selected outputs and activities to be supported by the project will be subject to technical and feasibility studies according to UNDP guidelines.

- ? Setting up a robust Grievance Redress Mechanism (GRM) The project will review the project-level GRM prepared during the PPG at the start of implementation. The full details of the GRM will be agreed upon during the inception phase - when the targeted assessments is being conducted. Stakeholder will be in a position to raise a grievance at any time with the Project Management Office, the government party, UNDP, or the GEF.

- ? Institution of the Gender Action Plan. A Gender Action Plan has been developed during the PPG phase. It will guide all actions pertaining to SES implementation and gender-mainstreaming. The GAP provides specific recommendations to facilitate gender-responsive project implementation and a strategy to ensure meaningful representation in local institutions and CBOs and equitable sharing of its benefits.

- ? Institution of the Stakeholder Engagement Plan and development of an associated FPIC protocol The Stakeholder Engagement Plan that has been developed during the PPG phase will guide all actions pertaining

to SES implementation. The SEP includes a basic FPIC protocol which will be refined further to ensure all potential positive and negative consequences associated with the project are clearly conveyed to local communities in their local language. Community members and their representatives will be encouraged and given the time to explicitly reflect on this information and give their free prior informed consent (FPIC). The FPIC protocol will then be applied to each activity of the project, as communities will be allowed to provide their consent to part of them, ask for modifications, or withdraw their consent.

## Project SES risks and mitigation measures

<b>Risk Description</b> <b>(broken down by event, cause, impact)</b>	<b>Impact and Likelihood (1-5)</b>	<b>Significance (Low, Moderate Substantial, High)</b>	<b>Description of assessment and management measures for risks rated as Moderate, Substantial or High</b>
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<p>Exclusion of vulnerable groups and marginalized people</p> <p>Risk 1: Vulnerable groups<sup>[2]</sup> (Members of ethnic socio-cultural groups and women-headed households) may be excluded from fully participating in project activities, particularly, from membership and leadership roles in the various community-based institutions such as natural resource management and water users association Committees. This may result in these groups not benefiting equitably from project activities, and/or preventing them from participating in the decision making and design roles that these CBOs are expected to perform.</p> <p>(Checklist questions P6, P11, P13, P14, 6.1 )</p> <p>Principle 1: Leave no one behind</p> <p>Principle 2: Human Rights</p> <p>Principle 3: Gender Equality and Women's Empowerment</p> <p>Principle 5: Accountability</p> <p>Standard 6: Indigenous People</p>	<p>I = 4</p> <p>L = 2</p>	<p>Moderate</p>	<p>Communities will be engaged in the design, implementation and monitoring of project activities. During the PPG, local government representatives, village elders as well as women and members of socio-cultural groups living in the areas were invited to participate in the consultative meetings. Free Prior and Informed Consent (FPIC) protocols followed during the PPG process will be adhered to during project implementation to ensure communities, including women and vulnerable groups, participate in the project by their own free will. Furthermore, the project will ensure timely dissemination, and information sharing for informed decision making on matters related to risks and grievances.</p> <p>The Stakeholder Engagement Plan (SEP) and the Gender Analysis and Action Plan (GAP) developed as part of the Environmental and Social Management Framework (ESMF) during the PPG provides a framework for proactive facilitation and inclusive participation of the community, particularly women, vulnerable groups and members of socio-cultural groups on decisions related to all project activities</p> <p>A framework for the project Grievance Redressal Mechanism</p>
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		<p>(GRM) has been developed that will provide a mechanism to raise and manage programmatic and systematic concerns related to the project, which are to be resolved in a timely, fair and transparent manner. A robust GRM at all levels will be developed and updated periodically to ensure that the grievances and risks are addressed in a timely manner. All complaints and grievances received will be closely recorded and managed by maintaining a risk register with clear accountability</p>
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<p>Economic displacement and denial of access to natural resources and due to impact on private land</p> <p>Risk 2: Watershed restoration and conservation activities may result in temporary denial of communities or groups to traditional or customary use of forests. However, there are no communities in the project areas that depend largely on forestry resources from the forest areas identified for catchment watershed restoration, management or protection activities. Minor restrictions to stray grazing of local cattle may occur as result of strengthening existing community-based mechanisms to protect critical water catchment areas which is not foreseen to cause any economic displacement as productive cattle are usually not let out for stray grazing.</p>	<p>I = 3</p> <p>L = 3</p>	<p>Moderate</p>	<p>The project has been designed in accordance with FPIC principles, as outlined in the UNDP SES policy which have been adopted to undertake comprehensive consultation with communities while surveying and selection of sites for different interventions and decisions on the design and operation of water infrastructure. Further, the ESMF prepared for the project also includes provisions for FPIC which will be continued during the inception phase of the project and will also be guided by the SEP to ensure in-depth engagement with stakeholders and joint planning and design of the interventions. The latter will include site or activity-specific targeted assessments, which will be prepared during the early phase of the project (i.e. prior to commencing required site activities) and regularly monitored during project progress.</p> <p>Only those activities will be implemented which have the full support of the communities and target groups reinforced through a participatory approach of proper consultations and consent. Grazing areas and biomass collection areas of communities will be avoided but where this is impossible, alternate viable land in adjacent areas will be identified and provided for community use after consultation with the community for activities</p>
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<p>Risk 3: During project implementation, some sections of the pipeline will be routed through some of the private registered land, potentially causing disruption on use of land which is being used for agriculture purpose.</p> <p>(Checklist questions: P6, 1.7, 1.9)</p> <p>Principle 1: Leave no one behind</p> <p>Principle 2: Human Rights</p> <p>Principle 4: Sustainability &amp; Resilience</p> <p>Standard 1: Biodiversity Conservation &amp; Sustainable Natural Resource Management</p>	<p>I = 2</p> <p>L = 4</p>	<p>Moderate</p>	<p>related to restoration or reforestation.</p> <p>The GRM developed for the project additionally provides a formal avenue for individuals or groups to raise complaints which are not resolved at their own level to escalate the grievance for resolution at the community/gewog, at the Dzongkhag/PMU and finally at the central level.</p> <p>Project activities do not envisage the acquisition of private land. A detailed survey has been conducted during the PPG. Private land will be avoided during the installation of pipes as far as possible by routing them along the plot boundaries and burying them at least 1 meter into the ground to enable continued use of the land by the owner. Consultations with affected landowners have been carried out, information conveyed of possible temporary impacts and agreement of measures to be implemented has been secured from affected persons during the PPG phase.</p> <p>The water will be conveyed using pressurized pipe which will be buried underground, thus ensuring minimal damage to private land. The project shall ensure coordinated efforts for the construction work along the private land</p>
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		<p>is carried out during the non- agriculture season to avoid disruption of agricultural practices for private landowners. These measures will be included in the terms and conditions of the Contractual Agreements of the Contractors.</p> <p>Local processes of negotiation and consensus (consent through signed agreements) have been secured from private landowners led by the Local Government during the PPG phase</p> <p>The project will continue to meaningfully engage private landowners and stakeholders during implementation to address any emerging social-environmental challenges and grievances related to project activities</p>
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<p>Risk 4: Plantations to restore degraded lands may follow environmentally inappropriate methods leading to monocultures or promoting the spread of invasive species that threaten local biodiversity.</p> <p>(Checklist questions: 1.6 , 1.7, 1.8.)</p> <p>Standard 1: Biodiversity Conservation &amp; Sustainable Natural Resource Management</p>	<p>I = 4</p> <p>L = 2</p>	<p>Moderate</p>	<p>Forest personnel and local staff are well trained in plantation techniques and norms. They will implement plantation activities with Forestry User Group Committee members who will guide communities on appropriate plantation techniques while jointly implementing plantation activities. Forestry regulations and forest management plans require site managers to plant locally viable species. A newly prepared Code of Best Management Practices in forestry defines forest management regimes and standards including prescriptions for plantations. In areas where natural regeneration is promising, local rules encourage natural regeneration. The National Biodiversity Centre has documented a comprehensive list of invasive species in the country including measures to prevent pathways and control them. All site-based plantations will strictly follow the National Plantation Strategy, 2020; and local forest management plans. Measures will also be put in place by local forest offices to monitor plantation establishment as well as their successes to avoid monocultures and prevent pathways for invasive species.</p>
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<p>Animal and plant species habitat loss and development in/near protected areas and other construction-generated impacts</p> <p>Risk 5: The construction of infrastructure such as intake works, alignment of water pipes, reservoirs, BPTs etc. may cause temporary impacts to habitats. The sub-projects will be developed within or adjacent to protected areas potentially impacting biodiversity resources including endangered species, due to project activities.</p>	<p>I=3 L=3</p>	<p>Moderate</p>	<p>A Forest/ Environment clearance has been secured for the surveys conducted in the project landscape..</p> <p>Based on the Forestry/ Environmental Clearance and the ESMF prepared during the PPG, site or activity-specific targeted assessment will be prepared during the early implementation phase of the project and ESMPs will be prepared, implemented and monitored.</p> <p>The site or activity specific targeted assessments will incorporate measures to address such risks which may emerge from the construction process. Mitigation measures such as manual excavation or minimal use of machinery for trenching to embed drinking and irrigation water pipes will be adopted. Laying of water conveyance pipes underground will further ensure pipes are not exposed and subsequent restoration of excavated soil and regeneration of vegetative material in forested tracts.</p>
<p>Risk 6: In the two Payment for Ecosystem Services (PES) schemes planned under the project (at Khuchi, Tsirang and Okolumchu, Punakha) to secure the management of watersheds? natural resources namely forests, water sources and streams among others, the ecosystem providers (landowners) may face insecure tenure rights and restrictions in access to areas for food, fuel and products.</p> <p>(Checklist questions: 1.1, 1.2, 1.4, 1.6, 1.7,1.8, 1.9, 1.11, 3.1, 3.2)</p> <p>Principle 4: Sustainability and Resilience</p>	<p>I=2 L=3</p>	<p>Moderate</p>	<p>Communities will be closely involved in the design of the PES and several consultative meetings will be conducted with the providers of ecosystem services and users so that there is adequate information provided and constructive discussion and agreement</p>

Standard 1: Bio-diversity Conservation and Sustainable Natural Resource Management

on the payments for services.

The project will facilitate consultative processes between ecosystem providers and users so that they can share information, discuss, enter into written agreements specifying roles and responsibilities and payment for services besides establishing provider and user committees, bylaws etc.

<p>Climate change impacts</p> <p>Risk 7: Infrastructure developed under the project as well as nature-based solutions provided by the project can be damaged or destroyed by natural calamities.</p> <p>(Checklist questions: 2.1, 2.2)</p> <p>Principle 4: Sustainability &amp; Resilience</p> <p>Standard 2: Climate Change and Disaster Risks</p>	<p>I=3</p> <p>L=3</p>	<p>Moderate</p>	<p>The project will manage risks related to climate change and natural disasters mainly by incorporating climate-resilient design of infrastructure combining concrete infrastructure along with bio-engineering measures. The pipelines will be installed in trenches and buried to prevent pipes from being obstacles, to prevent damage and to ensure leakages do not erode slopes</p> <p>Designs of structures will incorporate scenarios based on climate projections.</p> <p>Other nature-based solutions such as sustainable land management techniques, spring revival activities, reforestation degraded areas are expected to enhance the capacity of the watershed to withstand effects of climate change</p>
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<p>Health, safety and working conditions</p> <p>Risk 8: Recruited workers may spread communicable diseases. Workers also may experience occupational health and safety issues at work because of contractors not providing them safe working conditions. Moreover, contractors may employ children and women at site and women may be paid less than their male counterparts.</p> <p>(Checklist questions: 3.4, 3.7, 3.8, 7.1, 7.3, 7.5, 7.6)</p> <p>Principle 2: Human Rights</p> <p>Principle 3: Gender &amp; Equality and Women's Empowerment</p> <p>Standard 3: Community Health, Safety and Security</p> <p>Standard 7: Labour and Working Conditions</p>	<p>I=3</p> <p>L=3</p>	<p>Moderate</p>	<p>Necessary medical examination for the recruitment and engagement of expatriate labourers at construction sites will be strictly implemented by the Project and adhered to by Contractors. Should a new pandemic emerge, to prevent its spread, standard guidance and operating procedures developed by the government will be followed.</p> <p>The project with the assistance of local health personnel (from hospitals and BHUs) will sensitize workers on STDs and HIV/AIDS. These measures will minimise spreading of diseases to communities resident proximate to labour camps.</p> <p>The Contractor will be informed of the provisions in the Labour &amp; Employment Act as well as the Occupancy Health &amp; safety Regulations on the minimum working conditions to create at site, working hours and occupational safety, prohibition of child labour and parity in wages for men and women workers at the work sites which will also be made explicit in the contract clauses including periodic monitoring for compliance.</p> <p>Proper and well stocked medical first aid kits at site and a SOP to follow in the event of accidents and</p>
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			injury to workers will be prepared and implemented for first aid and where required quick and safe evacuation of injured workers to a medical facility.
<p>Impact on cultural heritage</p> <p>Risk 9: The construction activities will entail excavation (though mostly as linear trenches) across terrain for laying pipes as well as during the construction of storage tanks, treatment plants, break pressure tanks etc. as well. As such, there may be a risk of chance finds during the construction period.</p> <p>(Checklist questions: 4.2)</p> <p>Standard 4: Cultural Heritage</p>	<p>I=2</p> <p>L=1</p>	Low	<p>During the implementation phase, in an unlikely event of chance finds, where artifacts are unearthed, procedures for chance find will be followed by informing the relevant authority.</p>

<p>Release of pollutants and wastes</p> <p>Risk 10</p> <p>The irrigation provided by the project will increase irrigated farming which in turn may encourage the use of inorganic fertilizers, pesticides, weedicides etc. polluting water sources and courses downstream</p> <p>(Checklist questions: 8.1, 8.2, 8.3, 8.5)</p> <p>Principle 4: Sustainability and resilience</p>	<p>I=2</p> <p>L=2</p>	<p>Low</p>	<p>The project will advocate use of integrated pest management practices for preventing and managing pests. Bio-pesticides is to be explored under the project for managing pests in paddy and vegetables as bio-pesticides are benign to human health and to the environment. Nutrient leaching will be addressed by the agriculture extension service recommendations and project activities such as mulching and application of compost in fields.</p>
<p>Standard 8: Pollution Prevention and Resource Efficiency</p> <p>Risk 11:</p> <p>Construction activities during project implementation may generate harmful waste and pollutants.</p> <p>(Checklist questions: 8.1, 8.2, 8.3, &amp;8.6)</p> <p>Standard 8: Pollution Prevention and Resource Efficiency</p>	<p>I=3</p> <p>L=3</p>	<p>Moderate</p>	<p>Excavated materials will be safely disposed in designated sites and water sprinkled near residential areas for dust control. Waste generated from the project sites will be managed in accordance with the Waste Prevention and Management Regulations of 2016. A project site specific waste management plan will be developed before implementation</p> <p>Excavated material from trenches will be retained carefully to prevent spilling down the slopes and polluting water bodies and later re-filled in the</p>

			trenches after laying the pipes. The management of soil will be closely monitored during the construction phase. The project will also implement nature based solutions including bio-engineering works to stabilize slopes where required
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[1] We understand 'marginalized/vulnerable communities' and/or 'marginalized/vulnerable groups' as a term which describes both the condition and the processes that prevent individuals or groups from reaching sustainable development goals, or fully participating in social, economic and political life. In this document 'vulnerable communities/groups' describes individuals or groups of people that face higher exposure to climate change, disaster risk and poverty, including but not limited to women, youth, children, elderly, differently-able people, indigenous peoples, disadvantaged families and those living in high risk areas and danger zones. 'Marginalized/Vulnerable' does not mean that the group is vulnerable per se, but that this vulnerability is the result of social, economic and political processes.

[2] Vulnerable group is a term which describes both the condition and the processes that prevent individuals or groups from reaching sustainable development goals, or fully participating in social, economic and political life. In this document 'vulnerable communities/groups' describes individuals or groups of people that face higher exposure to climate change, disaster risk and poverty, including but not limited to women, youth, children, elderly, differently-able people, indigenous peoples, disadvantaged families and those living in high risk areas and danger zones. 'Vulnerable' does not mean that the group is vulnerable per se, but that this vulnerability is the result of social, economic and political processes).

## 6. Institutional Arrangement and Coordination

**Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.**

Implementing Partner: The Implementing Partner (IP) for this project is the **Ministry of Works and Human Settlement (MOWHS)**. MOWHS will chair the PSC and will be responsible for the below tasks

- ? Project planning, coordination, management, monitoring, evaluation and reporting. This includes providing all required information and data necessary for timely, comprehensive and evidence-based



project reporting, including results and financial data, as necessary. The Implementing Partner will strive to ensure project-level M&E is undertaken by national institutes and is aligned with national systems so that the data used and generated by the project supports national systems.

- ? Risk management as outlined in this Project Document;
- ? Procurement of goods and services, including human resources;
- ? Financial management, including overseeing financial expenditures against project budgets;
- ? Approving and signing the multiyear workplan;
- ? Approving and signing the combined delivery report at the end of the year; and,
- ? Signing the financial report or the funding authorisation and certificate of expenditures

Responsible Parties: The Responsible Parties (RPs) are entities entrusted with the responsibility of implementing specific project components. These agencies will ensure technical support and timely delivery of project components as indicated. The names and roles of the RPs are:

The Ministry of Agriculture and Forests (MoAF) will manage component two of the project. It will be responsible for coordination of irrigation activities through the Department of Agriculture (DoA) and for coordination of watershed management under component two

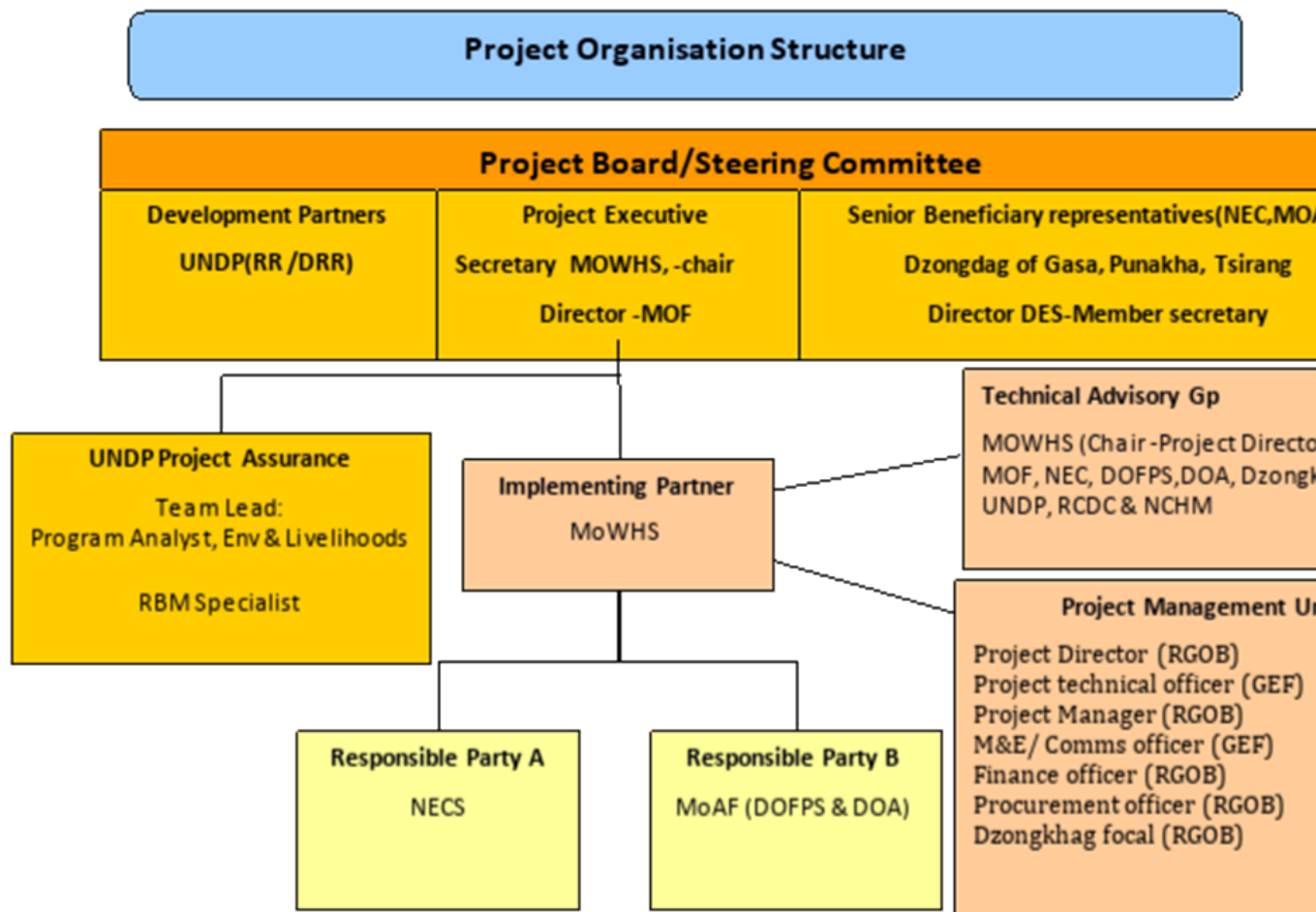
The National Environment Commission Secretariat (NECS) will have the overall responsibility of water governance and climate change policy and regulations. It will support planning, development, coordination and piloting of local water utilities and services. The NECS will also be involved in the establishment of RBC for the Punatsangchhu basin and support establishment of DWMCs in Dzongkhags of Gasa, Punakha and Tsirang. Finally the NEC will support preparation of Dzongkhag Water Master Plan for Gasa, Punakha and Tsirang and River Basin Management Plan for Punatsanhchhu.

Government agencies at the Dzongkhag level will largely comprise of staff from MoWHS, NECS, Department of Agriculture (DoA) and the Department of Forests and Park Services (DoFPS ). Their responsibilities will include developing and conducting training courses and curricular for local government and local institutions on sustainable water resources management, technical support for field work and surveys, introduction and demonstrations of new technologies, community mobilization and imparting hands on training including setting up of demonstration farms and monitoring and reporting on project activities, gender and social and environmental safeguards. Dzongkhag level staff engaged in the project will include planning officers, engineers, agricultural extension officers, gender focal persons and environmental officers.

**Project Executive:** The Gross National Happiness Commission (GHNC) will be the National Executing Agency and the chair of the Project Steering Committee for this project. The Ministry of Finance (MOF)

will oversee implementation quality and delivery against the project plan. The MOF will ensure coordination between other government agencies and NGOs to ensure synergy and cross learning between the projects and other sector plans and programs. It will have the responsibility of overall policy level guidance and oversight of the project.

Project Governance structure: The project will be implemented through the National Implemented Modality (NIM) by the Ministry of Works and Human settlement. The governance structure for the project is provided below.



The UNDP Resident Representative assumes full responsibility and accountability for oversight and quality assurance of this Project and ensures its timely implementation in compliance with the GEF-specific requirements and UNDP's Programme and Operations Policies and Procedures (POPP), its Financial Regulations and Rules and Internal Control Framework. A representative of the UNDP Country Office will

assume the assurance role and will present assurance findings to the Project Board, and therefore attends Project Board meetings as a non-voting member.

Direct Project Services as requested by the Government:

Following the standard practices, the project will organize joint annual progress review(s) to explore measures that may be needed to accelerate the implementation by the partners. The review will include the Implementing Partner, Responsible Parties, and Ministry of Finance and UNDP. While the NIM modality will be default implementation arrangement, UNDP may, on the basis of the annual review findings and at the request of the government, require to, in compliance with LDCF and UNDP policies, provide implementation support to ensure timely achievement of project results and financial delivery. Upon such a request, the estimated costs for such support services will be based on the UPL/LPL and agreed to in a standard agreement signed between the Implementation partner and UNDP

## **7. Consistency with National Priorities**

Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions from below:

NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

The project is aligned with several laws, policies, and strategies including international commitments, particularly those concerned with climate change, water resources management, agriculture, and management of forests, rangelands, and natural resources. This includes among others Economic Development Policy of Bhutan (EDP), 2016; Land Act. 1979; National Irrigation Policy, 2012; National Integrated Water Resource Management (IWRM) Plan, 2016. A summary is presented below with a detailed description in Annex 13d

**Bhutan's National Adaptation Programme of Action (NAPA)** identifies water as a vulnerable sector and flags increased sedimentation of rivers, water reservoirs, and distribution networks as issues affecting irrigation schemes, productivity and agricultural crop yields. The NAPA highlights the reduced ability of catchment areas to retain water and increased runoff with enhanced soil erosion leading to increased vulnerability of domestic water quality. It suggests the need for raising community awareness on sustainable use of water resources; improving land use planning in degraded water catchment areas to promote afforestation; improve watershed management; extending, improving and maintaining water supply infrastructure as urgent adaptation needs. The project interventions are directly aligned with these NAPA priorities. The cross-sectoral National Adaptation Plan process has been underway since 2015 and has received renewed impetus through funding from the GCF. The plan is expected to be completed by 2023.

The project will support the implementation of the country's **National Action Program (NAP) under UNCCD**, aligned with the national strategic plan and framework of the convention in 2014.[1] The Action Programme contributes to the overarching development philosophy of environmental sustainability. Its main goal is to "prevent and mitigate land degradation and through systems and practices of SLM that protects and maintains the economic, ecological and aesthetic values of our landscapes." The project is aligned with the following objectives of the NAP: 1) Conservation, rehabilitation, and sustainable use of forest resources to maintain well-functioning forest landscapes and watersheds; 2) Development and promotion of sustainable agricultural practices that enhance local livelihoods whilst maintaining the productivity and stability of agricultural lands; 3) Integration of environmental management measures in development activities that pose significant risks of land degradation; 4) Strengthening of systemic and institutional capacity to combat land degradation and its impacts and 6) Information, advocacy, and education to create increased policy and public support for sustainable land management.

The Project aligns with the country's **Land Degradation Neutrality Report (LDN)**, including; 1) By 2035, reforestation with native species in open areas will be realized on 25.00 km<sup>2</sup>. In addition, further productivity decline will be avoided through various means and SOC will be maintained at 50 ton/ha by 2030; 2) By 2030, wood substitute products will be promoted with subsidies and further declines in productivity will be avoided; 3) By 2025, improved pasture will be promoted on 0.50 km<sup>2</sup>. In the meantime, and beyond, by 2030, improved breeds will be promoted; 4) By 2025, SLM measures will be implemented as identified in the NAP on 35.07 km<sup>2</sup>. In addition, further productivity decline will be avoided through various means and SOC will be maintained at 50 ton/ha; 5) By 2035, plantations in open areas will be realized on 0.10 km<sup>2</sup> and 6) By 2035, restoration/reclamation of degraded areas will be realized on 0.50 km<sup>2</sup>.

The Project will support the implementation of **Bhutan's 12th Five-year Plan and 13th Five Year Plan** coinciding with Bhutan's "last mile" to LDC graduation in 2023, which places critical importance to the water sector through a dedicated Water Flagship Programme. The 12th Five Year Plan has 17 National Key Result Areas (NKRAs). The project intervention relates to seven of these NKRAs including NKRA 5 on Healthy Ecosystem Services Maintained; NKRA 6 on Carbon Neutral, Climate and Disaster Resilient Development Enhanced; NKRA 8 Food and Nutrition Security Ensured; NKRA 9 on Infrastructure, Communication, and Public Service Delivery Improved; NKRA 13 on Democracy and Decentralization Strengthened; NKRA on 14 Healthy and Caring Society Enhanced, NKRA 15 on Livability, Safety, and Sustainability of Human Settlements Improved; and NKRA 17: Sustainable Water Ensured. The watershed management program of the MoAF in the 12 FYP includes watersheds assessments including assessment of drying water sources, preparation of Watershed and wetland management plans, and climate-smart restoration of the watershed. The program has identified lake and spring revival and watershed management as a priority to be undertaken by the Watershed Management Division of the Department of Forest and Park Services with the aim to improve the availability and accessibility of water, making communities more resilient to climate change. The Food Self Sufficiency and Nutrition Security Program of MoAF includes the development of irrigation infrastructure for increased agriculture production. The project will support the climate adaptation interventions in the water sector to enhance resilience and sustainable economic well-being of the people. These themes are well aligned with the following national policies and priorities

**The Constitution of Bhutan** obliges the RGoB to protect, conserve and improve the pristine environment and safeguard the biodiversity of the country; prevent pollution and ecological degradation; Secure ecologically balanced sustainable development while promoting justifiable economic and social development; and ensure a safe and healthy environment.

**The Comprehensive Development Plan for Bhutan (CDP), 2030** identifies organizational coordination to optimize cross-sectoral structures; promote attractive water basins; study water resource conservation and OCT application in water management. These are integral parts of this project.

**The National Water Policy, 2003, and the Water Act 2011** aim to ensure that water is available in abundance to pursue socio-economic development mandating that water resources are protected, conserved and/or managed in an economically efficient, socially equitable, and environmentally sustainable manner. The Policy and Act are supported by Water Regulations, 2014 and Water Quality Standards, 2018.

**The National Land Use Zoning Implementation Guidelines, 2018** aim to protect and preserve watersheds, wetlands, and forest ecosystems that are important for adaptation.

**The National Sanitation and Hygiene Policy (NSHP), 2020** commits to achieving universal coverage and adoption of appropriate technology for sustainable sanitation systems.

**The National Environment Protection Act (NEPA), 2007** states a person has the fundamental right to a safe and healthy environment with equal and corresponding duty to protect and promote environmental well-being.

**The National Human Settlement Policy (NHSP) of Bhutan, 2019** requires environmentally sensitive areas, including bio-diversity hot-spot areas identified in the national land-use plan and in settlement areas to be protected including protection and management of watershed areas and water resources for consumption, farming, and conservation of ecosystems.

**The National Forest Policy of Bhutan**[\[2\]](#) emphasizes a decentralised and people-centered approach to forest governance and management with a strong agenda directed at poverty reduction through integration

of water, and climate change RGoB prepared the **Poverty Reduction Strategy Paper (PRSP)** in 2004,[3] aligning it with the 9<sup>th</sup> Five Year Plan. Since then, the Five-Year Plans served as the PRSP.

**The Climate Change Policy of the Kingdom of Bhutan (CCP)** adopted in 2020, aims to enable a climate-resilient and carbon neutral development. It sets four major objectives of pursuing carbon-neutral development; building resilience to climate change; ensuring adequate technology, capacity building means for implementation of the policy, and establishing an effective and coordinated action to address climate change. The *National Environment Strategy, 2020* . is important in guiding environmental conservation and giving equal importance to social, cultural and economic development. It will help all sectors in prioritising their plans and programmes within the ambit of the environmental concern. Bhutan's Third National Communications of Bhutan (TNC), 2020 include combating water shortages and drying up of water springs, ensuring access to safe domestic water and adequate water for irrigation as well as increasing resilience to prolonged dry periods under climate change.

Bhutan's Draft Country Work Program (CWP) for GCF has been prepared on existing policies, strategies, plans and Bhutan's Nationally Determined Contribution (NDC), a . Emphasis has been placed in three thematic areas that include ecosystem and agriculture; sustainable infrastructure and resilient communities. Investment priorities and action areas are identified under each thematic area.

The Project supports the implementation of **Bhutan's National REDD+ Strategy & Action Plan of Bhutan, 2020** which includes the establishment of plantations to provide sustainable wood-based products supply, increase carbon-stock, enhance biodiversity; and promotion of enterprises that sustainably manage NWFP. The strategy includes broadening opportunities for income generation from ecosystem services and developing climate-smart approaches in agriculture.

The project supports the implementation of Bhutan's **National Biodiversity Strategy and Action Plan (NBSAP) under UNCBD 2014**, particularly, target 8 on pollution from different sources, affecting biodiversity and ecosystem functions to be maintained within the national environmental standards; target 10 on identifying and strengthening adaptation measures for potential impacts of climate change on vulnerable ecosystems ; target 14 on key ecosystems and ecosystem services are identified, assessed and safeguarded for human well-being and target 15 on priority degraded ecosystems and habitats to be identified and rehabilitated.

**SDGs:** The project will contribute directly to the achievement of Sustainable Development Goal (SDG) 13 Climate Action, SDG 15 Life on Land and SDG 6 Clean Water and Sanitation. It will also contribute substantially to SDG 1: No Poverty; SDG 5: Gender Equality; and SDG 9: Industry, innovation, and infrastructure.

## 8. Knowledge Management

**Elaborate the "Knowledge Management Approach" for the project, including a budget, key deliverables and a timeline, and explain how it will contribute to the project's overall impact.**

Knowledge management activities of the project will be implemented through Component 4 outputs and activities. In addition, certain activities under component 1 and 2 that pertain to planning and development of guidelines will contribute to the knowledge management approach. See Table 7 for details of activities and budgets.

The knowledge management strategy for the project will result in capturing, disseminating and using the knowledge accumulated during project implementation and from partner projects identified for collaboration and cross learning. Key features of the knowledge management approach are presented below. Please refer to the component 4 description in this document and the section on South-South Triangular Cooperation in the ProDoc for additional details.

? The project delivery will be improved by capturing lessons learned from earlier projects (reviewed in the PIF and in Annex 13d), and during its implementation.

? The KM strategy is integrated with the Monitoring and Evaluation (M&E) framework of the ACREWAS project. The latter will use a mixed approach of participatory citizen sensing and scientific surveys to track impacts of activities on communities, water resources and watersheds.

? SMART indicators will be identified during the formalisation of work-plans at the inception phase of the project. Project staff and volunteers in communities will be trained in the documentation and reporting on these indicators.

? A clear communication strategy will be developed in the inception phase of the project to inform the awareness generation, sensitisation and sharing of information pertaining to project activities among all stakeholders.

? Clear, scientific baselines will be established during the assessments proposed in the inception phase of the project during the first year. These will build on existing surveys and reports prepared during the PPG phase.

? Gender responsive and participatory plans will be developed for restoration of watersheds, enhancement of water sources and off takes and for water infrastructure. These will be based on initial surveys and plans developed during the PPG process. Consultations with stakeholders will ensure the plans are reviewed and updated prior to implementation.

? Social and economic safeguards will be integrated with the design and siting of proposed interventions. This will be accompanied with a clear communications strategy and a grievance redress mechanism (GRM) which ensure communities are fully informed of the activities and facilitated in setting up GRM committees.

? The project will leverage mobile ICT to capture geo-tagged data including audio visual information from sites. This includes sensor-based systems and IoT instrumentation proposed for monitoring and management of the water infrastructure and distribution network. Data gathered from these networks will be analysed and reported on regularly and will feed into adaptive management of project activities.

? The project will support training of trainers where technical staff from local institutions are trained in new technologies in climate resilient water infrastructure design, planning and O&M, which are then replicated in Bhutan. This will enable state of the art technologies to be successfully replicated and up-scaled.

? The project will emphasise hands on training, learning by doing and demonstrations for both climate resilient irrigation and agriculture as well as for livelihood diversification and entrepreneurship training.

? Regular meetings, workshops and exchange visits between project beneficiaries and stakeholders at Gewogs, Dzongkhags and the national level will be facilitated. This will include representation from other relevant projects to facilitate cross learning.

? Formal liason with technical groups and academia operating in the national and regional level will be established to share technical information and data, particularly information about climate related hazards, forecasts and their integration with design and O&M of water infrastructure.

The overall impact of the knowledge management strategy will be to streamline and integrate project monitoring and reporting leading to efficient, timely and actionable information that informs adaptive management and facilitates documentation of experiences and lessons learned. The project will create opportunities for cross-learning between stakeholders both within themselves and with other communities and agencies at the national, regional and international level will help adoption of new approaches and strategies.

Integration of geospatial and participatory, methods for planning and monitoring will ensure verifiable, quantitative and granular monitoring of project impacts. This will be made possible through citizen sensing approaches wherein community facilitators will make measurements of ground conditions using mobile phones and relay these to the offices at the Dzongkhags. Robust, gender-responsive, quantitative and easily measured indicators will be identified to encompass bio-physical and socioeconomic parameters, including those for environmental and social safeguards. These innovations will be embedded in all components of the project, especially component 4, to ensure effective and efficient collection, collation, analysis, documentation and dissemination of successes and of lessons learned through the course of the project.



Community facilitators and volunteers within CBOs (mostly the water user associations) will be trained in the collection of this data on forms designed for automatic digitisation using tools such as the Open Data Kit (ODK), and on registers which can be photographed using smartphones. Project staff will be trained in the use of these tools to facilitate efficient and accurate reporting and surveying of field observations, including collection, recording and transmitting data collected by the community facilitators and volunteers.

A table summarizing the budget, deliverables and timeline is provided below. The timeline is described by the annual allocation of funds for each of the activities under the outputs.

Table 10 Activities and associated budgets related to knowledge management

A. No.	Sub-activity and output	Year1	Year2	Year3	Year4	Year5	Total
1.1.1	Develop gender responsive water safety plan for Gasa, Punakha and Tsirang including training on gender safeguards	0	0	0	0	13,500	13,500
	Develop guiding tool for Development of Water Master Plan	15,000	0	0	0	0	15,000
	Revise Drinking Water Quality Standard	3,000	9,000	0	0	0	12,000
1.1.2	Undertake participatory assessment of water resources and water issues within local watersheds	17,400	11,600	0	0	0	29,000
1.1.3	Formulate river basin management plan for Punatsangchhu river basin (1 RBMP)	0	2,400	9,600	0	0	12,000
	Water master plan for Gasa, Punakha and Tsirang Dzongkhags for each project site (3 Dzongkhag Master Plans)	0	6,000	6,000	0	0	12,000

1.2.2	Form/Strengthen of WUAs and enable their representation at the Gewog level	6,000	20,000	0	0	0	26,000
	Strengthen Dzongkhag Environment Committee to bear the role of water management committee at Dzongkhag level (Train DEC on legal and technical matters related to water governance, water allocation and management)	0	18,000	0	0	0	18,000
1.3.1	Study and recommend tariff system for Gasa town and Lobeyza, and document lessons learnt for policy feedback	0	0	0	2,500	0	2,500
	Study feasibility of introducing water tariff in rural and peri-urban area	0	12,000	0	0	0	12,000
1.3.2	Study and pilot two water utility service provisions through private or PPP arrangement (1 study and 1 pilot)	0	0	5,000	10,000	0	15,000
2.1.1	Revival of springs/streams/ponds and rehabilitation/restoration of degraded watershed areas through afforestation and assisted natural regeneration to enhance re-charge areas including sensitization and training on springshed assessment and management	8,000	0	0	0	0	8,000
2.1.2	Establish data monitoring met stations to be managed by local forest divisions	22,500	6,000	0	0	0	28,500
	SMART patrolling capacity and system in four project sites	1,500	3,000	3,000	3,000	3,000	13,500
	Training on data monitoring and management of monitoring stations	2,250	0	0	0	0	2,250

2.1.3	Assessment and Review of CF management plan for Rangzhin Kuenphen CF and Tashi Thogmen CF, Shingtalum, Gasa	8,000	0	0	0	0	8,000
	Prepare Local Forest Management Plan for Shingtalum watershed	10,500	1,500	1,500	1,500	1,500	16,500
	Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha	8,500	7,000	0	0	0	15,500
	Prepare Local Forest Management Plans for Kuchi watershed, Thakorling, Tsirang including biodiversity assessment	5,000	8,500	0	0	0	13,500
	Prepare Local Forest Management Plans for Chedachhu, Bulkey and Larichhu watershed in Sergithang, Tsirang including biodiversity assessment	6,500	11,000	0	0	0	17,500
2.2.1	Establish a new PES scheme for Okalum watershed between catchment communities of Toedpisa Gewog and downstream communities of Toepisa and Barp Gewogs and institutions within the gewogs including Lobeysa township.	0	0	10,000	0	0	10,000
	up-scale existing PES scheme between Thakhorling Community Forest Group of Patsaling gewog and residents of Damphu town, additional six gewogs, Mendrelgang satellite town and institutions within these gewogs	0	0	5,000	0	0	5,000

2.2.2	Install sprinklers and drip irrigation to improve water efficiency in Mendrelgang and Sergithang (Training and supply of sprinklers materials)	0	21,500	21,500	0	0	43,000
	Plant Grass slip/hedgerow in dryland agriculture for integrated fodder and soil stability measures (7 ? Chedachhu, 7 Ha)	1,350	0	0	0	0	1,350
	Promote of mulching technologies to conserve soil water in Kuchi watershed gewogs and Sergithang	46,375	46,375	46,375	46,375	0	185,500
2.2.3	Planning meetings and workshops	0	1,000	0	0	0	1,000
4.1.1	Document good practices on water conservation and sustainable water resources management and approaches for scale up	0	7,500	7,500	7,500	7,500	30,000
	Document information on the successes and lessons learned from innovative nature based solutions and financing mechanisms, implementation of PPP arrangements and private sector partnerships to deliver water utility services and Community based water and infrastructure management for climate resilience	0	0	0	7,500	7,500	15,000
	Prepare a communication plan on dissemination of lessons, best practices and other information to stakeholders	5,000	0	0	0	0	5,000

	Prepare videos / brochures/ flyers/poster and other communication materials on project success stories, progress, impacts, knowledge and practices for climate resilient water and watershed management, standards and tools based on output 1.3	2,400	2,400	4,800	8,400	6,000	24,000
	Study visit and exchange programs among farmers, community and local government functionaries	0	0	0	7,000	0	7,000
4.1.2	conferences and workshops to strengthen south-south cooperation and knowledge sharing	0	12,500	12,500	12,500	12,500	50,000
	exhibitions, workshops, events	0	0	0	0	15,000	15,000
	publication in websites of UNDP, MOWHS, NECS and Dzongkhag	0	0	0	0	1,200	1,200
	Study visit and exchange programs among local government functionaries	10,000	0	0	10,000	0	20,000
4.1.3	Gender safeguards	35,800	12,800	12,800	4,800	4,800	71,000
	Social and environmental safeguards	98,325	50,575	21,325	21,325	13,450	205,000
4.1.4	Support implementation of water resource management curriculum at tertiary education level including (2 tertiary institutions)	18,000	24,000	15,000	0	0	57,000
	Support technical capacity and skills in water supply engineering and Climate and hydrological modeling ( 5 officials)	0	107,000	0	0	0	107,000

	Training of trainers on climate resilient water infrastructure design, planning, implementation and O&M (10 officials, Ex country training)	0	214,000	0	0	0	214,000
4.1.5	Support diagnosis, analytical capacity and water quality testing capacities at 21 Primary Health Care Centers of 3 Dzongkhags	0	0	29,400	2,000	0	31,400
4.2.1	Develop harmonized comprehensive database on water resources and infrastructure within the Punatshangchhu river basin ( for water security index system on water for urban, rural, economic, environment, disaster and climate resilience)	0	0	31,500	0	0	31,500
4.2.2	Carry out overall situation analysis of river basin in terms of its ecological health and the social and economic circumstances including water security index and impact of climate change on water sector in Bhutan; Highlight of key issues faced in establishment and functioning of the agency for water utilities at national level, River Basin Management Committees (RBMCs), Dzongkhag Water Management Committees (DWMCs) and Water User Associations (WUAs)	0	0	13,500	0	0	13,500
	Develop a commonly agreed SOBR format and document SoBR for Punatsangchhu river basin and institute mechanism for regular reporting and sharing of data and reports on state of river basin	0	0	7,000	0	0	7,000

	Publish and disseminate State of the Basin Report (SOBR) for the Punatsangchu River Basin	0	0	4,590	4,455	4,455	13,500
4.1.3	Gender safeguards	5,000	5,000	5,000	5,000	0	20,000
	MTR and TE	0	0	56,500	0	61,000	117,500
	Project governance and monitoring	24,400	14,400	14,400	14,400	24,400	92,000
	Social and environmental safeguards	5,000	5,000	5,000	5,000	0	20,000
4.1.3	Project governance and monitoring	5,000	0	0	0	0	5,000
		<b>370,800</b>	<b>640,050</b>	<b>348,790</b>	<b>173,255</b>	<b>175,805</b>	<b>1,708,700</b>

## 9. Monitoring and Evaluation

### Describe the budgeted M and E plan

The project results, corresponding indicators and mid-term and end-of-project targets in the project results framework will be monitored annually and evaluated periodically during project implementation. If baseline data for some of the results indicators is not yet available, it will be collected during the first year of project implementation. The Monitoring Plan details the roles, responsibilities, and frequency of monitoring project results.

Project-level monitoring and evaluation will be undertaken in compliance with UNDP requirements as outlined in the UNDP POPP and UNDP Evaluation Policy. The UNDP Country Office is responsible for ensuring full compliance with all UNDP project monitoring, quality assurance, risk management, and evaluation requirements.

Additional mandatory GEF-specific M&E requirements will be undertaken in accordance with the GEF Monitoring Policy and the GEF Evaluation Policy and other relevant GEF policies[1]. The costed M&E plan included below, and the Monitoring plan in Annex 5, will guide the GEF-specific M&E activities to be undertaken by this project.

In addition to these mandatory UNDP and GEF M&E requirements, other M&E activities deemed necessary to support project-level adaptive management will be agreed during the Project Inception Workshop and will be detailed in the Inception Report.

## Additional GEF monitoring and reporting requirements:

Inception Workshop and Report: A project inception workshop will be held within 60 days of project CEO endorsement, with the aim to: a. Familiarize key stakeholders with the detailed project strategy and discuss any changes that may have taken place in the overall context since the project idea was initially conceptualized that may influence its strategy and implementation. b. Discuss the roles and responsibilities of the project team, including reporting lines, stakeholder engagement strategies and conflict resolution mechanisms. c. Review the results framework and monitoring plan. d. Discuss reporting, monitoring and evaluation roles and responsibilities and finalize the M&E budget; identify national/regional institutes to be involved in project-level M&E; discuss the role of the GEF OFP and other stakeholders in project-level M&E. e. Update and review responsibilities for monitoring project strategies, including the risk log; SESP report, Social and Environmental Management Framework and other safeguard requirements; project grievance mechanisms; gender strategy; knowledge management strategy, and other relevant management strategies. f. Review financial reporting procedures and budget monitoring and other mandatory requirements and agree on the arrangements for the annual audit. g. Plan and schedule Project Board meetings and finalize the first-year annual work plan. h. Formally launch the Project.

GEF Project Implementation Report (PIR): The annual GEF PIR covering the reporting period July (previous year) to June (current year) will be completed for each year of project implementation. Any environmental and social risks and related management plans will be monitored regularly, and progress will be reported in the PIR. The PIR submitted to the GEF will be shared with the Project Board. The quality rating of the previous year's PIR will be used to inform the preparation of the subsequent PIR.

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LDCF/SCCF Core Indicators: The LDCF/SCCF Core indicators included as Annex 15 will be used to monitor global environmental benefits and will be updated for reporting to the GEF prior to MTR and TE. Note that the project team is responsible for updating the indicator status. The updated monitoring data should be shared with MTR/TE consultants prior to required evaluation missions, so these can be used for subsequent ground truthing. The methodologies to be used in data collection have been defined by the GEF and are available on the GEF website.



Independent Mid-term Review section(MTR): The terms of reference, the review process and the final MTR report will follow the standard templates and guidance for GEF-financed projects available on the UNDP Evaluation Resource Center (ERC).

The evaluation will be ?independent, impartial and rigorous?. The evaluators that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. Equally, the evaluators should not be in a position where there may be the possibility of future contracts regarding the project under review.

The GEF Operational Focal Point and other stakeholders will be actively involved and consulted during the evaluation process. Additional quality assurance support is available from the BPPS/GEF Directorate.

The final MTR report and MTR TOR will be publicly available in English and will be posted on the UNDP ERC by June 2025 . A management response to MTR recommendations will be posted in the ERC within six weeks of the MTR report?s completion.

Terminal Evaluation (TE): An independent terminal evaluation (TE) will take place upon completion of all major project outputs and activities. The terms of reference, the evaluation process and the final TE report will follow the standard templates and guidance for GEF-financed projects available on the UNDP Evaluation Resource Center.

The evaluation will be ?independent, impartial and rigorous?. The evaluators that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. Equally, the evaluators should not be in a position where there may be the possibility of future contracts regarding the project being evaluated.

The GEF Operational Focal Point and other stakeholders will be actively involved and consulted during the terminal evaluation process. Additional quality assurance support is available from the BPPS/GEF Directorate.

The final TE report and TE TOR will be publicly available in English and posted on the UNDP ERC by January 2028. A management response to the TE recommendations will be posted to the ERC within six weeks of the TE report?s completion.

Final Report: The project's terminal GEF PIR along with the terminal evaluation (TE) report and corresponding management response will serve as the final project report package. The final project report package shall be discussed with the Project Board during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.

**Monitoring Plan:** The project results, corresponding indicators and mid-term and end-of-project targets in the project results framework will be monitored by the Project Management Unit annually, and will be reported in the GEF PIR every year, and will be evaluated periodically during project implementation. If baseline data for some of the results indicators is not yet available, it will be collected during the first year of project implementation. Project risks, as outlined in the risk register, will be monitored quarterly.

Results Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[1]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
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<p>Project objective : To enhance resilience for sustainable economic well-being of the people of Bhutan through climate adaptation of the water sector</p>	<p>Indicator 1: Direct project beneficiaries disaggregated by gender</p>	<p>EOP : 37,334 34 people (Male = 19,465 &amp; Female = 17,869)</p>	<p>EOP: 37,334 (a+b+c+d) a) 7,533 = Male and female population (PHCB, 2017) benefiting from domestic water scheme (population of Mendrelgang town, Damphu town, Toedpisa Gewog, Lobesa town, Goen Khatoed, Gasa town); b) 11,362 = Male and female population (PHCB, 2017) benefiting from integrated domestic and irrigation water (population of rural Mendrelgang, Patshaling, Tsholingkhar, Kikorthang, Rangthangling, Barshong and Sergithang Gewogs) c) 496 = Male and female population (PHCB, 2017) benefiting from irrigation water (population of rural Geon Khame) d) 17,943 = Male and female population (PHCB, 2017) benefiting from watershed services (population of Phuentsenchhu, Tsirangtoe, rural Baapisa, Talo,</p>	<p>Beneficiary list from Population and Housing Census of Bhutan (PHCB), 2017  Sample survey of beneficiaries</p>	<p>MTR and TE  MTR and TE  Annual</p>	<p>PMU  M&amp;E Officer  M&amp;E Officer</p>	<p>MTR and TE report  Beneficiary Survey report</p>	<p>Risk: Not foreseen  Assumption: all communities living in the area will benefit from water services</p>
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		MT R: 11,2 00 peop le (mal e = 5840 & fema le =53 61)	Guma Gewogs and Punakha town). These areas do not access domestic or irrigation water from the project assets but benefit from climate resilient water shed management of their water catchments. MTR: 30% of EOP Target				
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<p>Indicator 2: Area of land restored (under climate-resilient management) (ha): (GEF Indicator 3)</p>	<p>EOP : 41,910 Ha</p> <p>MT R: 16,746 Ha</p>	<p>EOP: 41,910 Ha (a+b+c+d+e+f)</p> <p>a) 14,762 Ha = area under watershed protection</p> <p>b) 7094 Ha = area under Watershed management</p> <p>c) 16662 Ha = area under watershed restoration</p> <p>d) 1816 Ha = cultivated dryland area that can be brought under winter cropping</p> <p>e) 1057 Ha under improved agriculture practices to conserve soil water such as mulching and efficient water use (Mendrelgang ? 296 Ha; Tsholongkhar-405 Ha; Sergithang ? 49 Ha; Kikhorthang ? 59 Ha; Rangthanling ? 41 Ha; Barshong ? 207 Ha)</p> <p>f) 519 ha = Fallow wetland and dryland (Ha) that can be brought under cultivation due to assured irrigation water</p> <p>MTR: 16,746 Ha (40% of EOP)</p>	<p>Data source for watershed areas: Project maps</p> <p>Collection method: Field verification</p>	<p>Annual</p>	<p>PMU</p>	<p>MTR/TE</p>	<p>Risk: Covid-19 pandemic norms may constrain implementation of SLM and watershed activities</p> <p>Assumption: beneficiaries are willing to cultivate on fallow land and adopt winter cultivation</p>
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<p>Project Outcome 1: Strengthened water governance, institutions, and financing mechanism in support of climate-resilient water management</p>	<p>Indicator 3: Number of local level institutions established for management of water resources</p>	<p>EOP : 18  MT R: 18</p>	<p>EOP = 18 Punatsangchhu River Basin Committee = 1 RBC Secretariat = 1 (at NEC) Water User Associations registered and strengthened = 5 (Kuchi Khola scheme; Lareychhu Scheme; Okalum Scheme; Gasa Khatoe scheme; Gasa Khome) Water User Groups = 11 (Tsholingkhar, Kilkhorthang, Rangthangling, Barshong, Patshaling, Mendrelgang, Sergithang, Toedpisa, Lobeyisa, Khame, Khatoe) MTR: 18 (same as EOP)</p>	<p>Data source: Dzongkhag records and PHCB  Data collection method: field monitoring</p>	<p>Annual</p>	<p>M&amp;E Officer</p>	<p>Geog and Dzongkhag records</p>	<p>Risk: Not foreseen  Assumption: River basin stakeholders including in non-project Dzongkhags agree to adopt RBC approach</p>
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<p>Indicator 4: No of district and basin level climate-risk informed policies and strategies</p>	<p>EOP : 13  MTR: 9</p>	<p>EOP: 143 1. Guideline for Water Resources Assessment = 1; 2. Revised national water quality standards including the Domestic Water Quality Standard = 1; 3. Water master plan for Gasa, Punakha and Tsirang Dzongkhags = 3; 4. River basin management plan for Punatsangchhu river basin = 1; 5. Water tariff system for Gasa town and provide feedback on national water tariff guidelines/criteria = 1; 6. LFM for Shingtalum; Kuchu Khola; Okalum; Chedachhu/Bulkey/Lareychu = 4 7. Community Forest Management plans for Rangzhin Kuenphen and Tashi Thogmen Community Forest Group in Khatoed Gewog of Gasa = 2  MTR: 9 1. Water master plan for Gasa, Punakha and Tsirang Dzongkhags = 3</p>	<p>Data Source: Dzongkhag and project records  Data collection method: field verification</p>	<p>MTR and TE</p>	<p>M&amp;E Officer</p>	<p>MTR and TE Report.</p>	<p>Risk: None  Assumption: River basin stakeholders including non-project Dzongkhags agree to adopt RBC approach</p>
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		<p>2. LFM for Shingtalum; Kuchu Khola; Okalum; Chedachhu/Bulkey/Lareychu = 4</p> <p>3. Community Forest Management plans for angzhin Kuenphen and Tashi Thogmen Community Forest Group in Khatoed Gewog of Gasa = 2</p>				
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<p>Outcome 2</p> <p>Vulnerable natural water catchments in the target river basin (Punatsangchu River Basin) restored, sustainably managed, protected and their ecosystem conditions improved</p>	<p>Indicator 5: Area of watersheds restored and protected (Ha)</p>	<p>EOP : 38,518 Ha</p> <p>MTR: 15,407 Ha</p>	<p>EOP = 38,518 (a+b+c)</p> <p>Hectares of watersheds managed (existing forest and watersheds under enhanced surveillance and management) = 14,762</p> <p>Hectares of watersheds restored (protected from erosion and mud-slips through soil conservation measures such as check dams, terraces, retaining walls, gabion walls, gully plugs combined with vegetative measures) = 7,094</p> <p>Hectares of watersheds protected (protection to water infrastructure from floods, landslides and mud-slips) = 16,662</p> <p>MTR = 40% of EOP</p> <p>? = 5,905 Ha</p> <p>? = 2,837Ha</p> <p>? = 6,665 Ha</p>	<p>Data source for watershed areas: Project maps and field visits</p>	<p>Annual</p>	<p>PMU</p>	<p>MTR and TE report</p>	<p>Risk: Covid-19 pandemic norms may constrain implementation of project activities</p> <p>Assumption: Local adopt communities project interventions</p>
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<p>Indicator 6: Number of watershed and local level climate-risk informed policies and strategies</p>	<p>EOP = 6 (a+b)  MTR = 6</p>	<p>EOP: 6 (a+b) a; catchment level watershed level Local Forest Management Plans developed based on local resource assessments and mapping (Kuchukhola, Lareychhu, Okalum, Shingtalum) = 4  b; Local Community Forest Management revised (Rangzhin Kuenphen and Tashi Thongmen CF in Gasa) = 2  MTR: 6</p>	<p>Data source: Gewog and project records  Data collection method: field monitoring</p>	<p>Annual</p>	<p>M&amp;E Officer</p>	<p>Geog and PMU</p>	<p>Risk: Not foreseen  Assumption: None</p>
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<p>Indicator 7: Hectares of agricultural land under climate-resilient practices</p>	<p>EOP = 3392 Ha  MTR = 1357 Ha</p>	<p>EOP = 3392Ha 9+b+c) ? Hectares of Cultivated dryland area that can be brought under winter cropping = 1816  ? Hectares of agr. under improved agriculture practices to conserve soil water such as mulching and efficient water use (Mendrelgang ? 296 Ha; Tsholongkhar-405 Ha; Sergithang ? 49 Ha; Kikhorthang ? 59 Ha; Rangthanling ? 41 Ha; Barshong ? 207 Ha) = 1057  ? Hectares of fallow wetland and dryland that can be brought under cultivation due to assured irrigation water = 519  MTR = 40% of EOP (a+b+c) 1. = 726 2. = 423 3. = 208</p>	<p>Data source: Dzongkhag Agriculture sector; project records  Collection method: Field verification and progress reporting</p>	<p>Annual</p>	<p>PMU</p>	<p>MTR/TE</p>	<p>Assumption: farmers are willing to adopt the new technologies</p>
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<p>Outcome 3</p> <p>Enhanced adaptive capacity of water infrastructure to climate-induced water shortages and quality deterioration through climate-proofing, private sector engagement, and technology deployment</p>	<p>Indicator 8: Number of persons with assured access to irrigation and domestic water through climate-proofing and enhancement of water infrastructure</p> <p>9a: Population benefiting from domestic water scheme</p> <p>9b: Population benefiting from integrated domestic water and irrigation</p> <p>9c: Population benefiting from irrigation</p>	<p>EOP = 19,391 (9,413 females)</p> <p>MT R = 5817 (2824 females)</p>	<p>EOP = 19,391 (a+b+c)</p> <p>? Male and female population (PHCB, 2017) benefiting from domestic water scheme (population of Mendrelgang town, Damphu town, Toedpisa Gewog, Lobesa town, Goen Khatoed, Gasa town) = 7533 (3578 females)</p> <p>? Male and female population (PHCB, 2017) benefiting from integrated domestic and irrigation water (population of rural Mendrelgang, Patshaling, Tsholingkhar, Kikorthang, Rangthangling, Barshong and Sergithang Gewogs = 11363 (5571 females)</p> <p>? Male and female population (PHCB, 2017) benefiting from irrigation water (population of rural Geon Khame) = 496 (264 females)</p> <p>NTR = 5817 (2824 females) ; 30% of EOP</p>	<p>Data source: PHCB, 2017, Geog records</p> <p>Collection methods:</p> <p>Sample survey of HH</p>	<p>MTR and TE</p>	<p>PMU / M&amp;E Officer</p>	<p>MTR and TE report</p> <p>Beneficiary Survey report</p>	<p>Risk: Not foreseen</p> <p>Assumption: None</p>
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		a = 2260 (1073 females)					
		b = 3409 (1671 females)					
		c = 149 (79 females)					

<p>Indicator 9: water infrastructure more resilient to climate variability and change</p> <p>9a: Km of domestic and irrigation water transmission and distribution lines climate proofed and automated with IoT and ICT based technologies</p> <p>9b: Cum. of domestic and irrigation water storage established</p>	<p>EOP</p> <p>9a: 74.14 Km</p> <p>9b: 1266 Cum</p> <p>MTR</p> <p>9a = 55.6 km</p> <p>9b = 949.5 Cum</p>	<p>EOP</p> <p>9a: Total length of pipe, underground-laid or suspended lines with reliable support structures along the transmission and distribution lines of domestic and irrigation schemes</p> <p>9b: Total volume of water storage in established along the transmission and distribution lines of domestic and irrigation schemes (excluding WTP volume)</p> <p>MTR</p> <p>9a: 75% of total length of pipe, underground-laid or suspended lines with reliable support structures along the transmission and distribution lines of domestic and irrigation schemes</p> <p>9b: 75% of total volume of water storage established along the water conveyance and distribution lines of domestic and irrigation schemes</p>	<p>Data source for agricultural land: Project maps and field visits</p> <p>Water quality monitoring report</p> <p>Progress report</p>	<p>Annual</p> <p>Monthly</p> <p>MTR/TE</p>	<p>PMU</p> <p>Health centers of Gasa and Lobeysa</p> <p>PMU</p>	<p>Project work completion report</p> <p>Monthly Water quality monitoring report</p> <p>PIRs/MTR/TE</p>	<p>Risk: new Covid-variant induced restriction might delay implementation</p> <p>Assumption- none</p> <p>Youth in the locality are interested in being trained and keen in establishing enterprises for technology management and O&amp;M components of water infrastructure</p>
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		(excluding WTP volume)					
		10c= Not indicated in the monthly water quality monitoring report for Gasa and Lobeyssa					



<b>Outcome 4:</b> Strengthened awareness and knowledge sharing mechanisms established	Indicator 10: Number of knowledge products generated and disseminated	EOP : 16            MTR = 8	EOP = 16 (a+b+c+8+e+f) a).Water resource management curriculum = 1  b) Dzongkhag surface and ground water assessment reports for Gasa, Tsirang and Punakha= 3  c) Policy feedback for institution of local utility services providers generated =1  d) Number of applications developed for communication and display of water management information on monitoring screens and mobile phones = 1  e) Number of State of the Basin Report (SOBR) for the Punatsangchu River Basin from year 3 onwards = 3  f) Baseline Survey and assessment report on all indicators in the results framework (year 1 and year 5) =2	Project records  Dzongkhag records	MTR and TE	PMU	Project reports
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		<p>f) Annual lesson learning report = 5</p> <p>MTR = 8 (a+b+c+d+e)</p> <p>a) Water resource management curriculum = 1</p> <p>b) Dzongkhag surface and ground water assessment reports for Gasa, Tsirang and Punakha= 3</p> <p>C) Number of State of the Basin Report (SOBR) for the Punatsangchu River Basin from year 3 onwards = 1</p> <p>d) Baseline Survey and assessment report on all indicators in the results framework (year 1 and year 5) = 1</p> <p>e) Annual lesson learning report = 2</p>			<p>Report on piloting of water utility services</p> <p>workshop proceedings and report</p>	<p>Assumptions: local private water utility service providers are interested</p>
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<b>Monitoring and Evaluation Budget for project execution:</b>		
<b>GEF M&amp;E requirements to be undertaken by Project Management Unit (PMU)</b>	<b>Indicative costs (US\$)</b>	<b>Time frame</b>
<b>Inception Workshop and Report</b>	10,000	Inception Workshop within 2 months of the First Disbursement
<b>M&amp;E required to report on progress made in reaching GEF core indicators and project results included in the project results framework</b>	19,000	Annually and at mid-point and closure.
<b>Preparation of the annual GEF Project Implementation Report (PIR)</b>	NA	Annually typically between June-August
<b>Monitoring of</b> ? Review of implementation of Gender Action Plan ? Review of implementation of Social and Environmental Safeguards	103,000	On-going.
<b>Supervision missions</b>	NA	Annually
<b>Learning missions</b>	NA	As needed
<b>Independent Mid-term Review (MTR)</b>	56,500	June 2025 
<b>Independent Terminal Evaluation (TE)</b>	61,000	January 2028
<b>TOTAL indicative COST</b>	249,500	

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[1] See [https://www.thegef.org/gef/policies\\_guidelines](https://www.thegef.org/gef/policies_guidelines)

## 10. Benefits

**Describe the socioeconomic benefits to be delivered by the project at the national and local levels, as appropriate. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCE/SCCF)?**

The list of global environmental benefits have been described earlier. In terms of socioeconomic benefits, the ACREWAS project will strategically targeted investments into mitigation and building resilience to impacts of climate change on water resources and water infrastructure. Climate concerns will be mainstreamed into relevant policies and integrated with their management, operation and maintenance at level of local community-based institutions as well as government agencies at the sub-national and national level. The project will address challenges of 1) quantity, quality and reliability of water sources; 2) resilience of water infrastructure; 3) sustained supply and sufficient quality and quantity of water for irrigation and domestic use; 4) efficiency of water distribution networks and their management; and 5) equity and optimal use of water at the level of domestic and agricultural users.

The project will equip communities and government agencies to leverage nature-based solutions and modern technologies and techniques that protect water resources and water infrastructure from impacts of extreme weather events. It will result in transformative approaches that enhance and protect natural ecosystems so their goods and services, particularly hydrologic services, are sustained in periods of drought as well as floods. Innovative financial mechanisms will be scaled up to ensure financial sustainability and autonomy of CBOs and private sector, both at the corporate and at the level of local entrepreneurs will be engaged to leverage modern ICT and IoT based systems for the management of water networks, distribution and metering.

It will directly benefit 37,334 persons (19,465?, 17,869 ?) residing across three Dzongkhags and four watersheds. Of these 19,391 will benefit from water supply and 17,943 from enhanced watershed services. 74.14 km of water transmission and distribution infrastructure will be "climate-proofed". Water supply will be augmented through small water storage through tanks (1 to 250 cubic meters) and two water treatment plants to ensure reliable supplies for both agricultural, drinking, and other domestic use.

3,392 hectares of agricultural land will be brought under assured irrigation and 38,518 hectares of watersheds will benefit from climate-resilient management which stabilise water yields under extreme events such as rainfall variability and long dry spells. PES models will be up-scaled to sustain restoration and management of critical catchments.

A river basin management plan will be prepared for the Punatsangchu River Basin which will be coupled with the strengthening of institutional capacities of nine watershed institutions. The project will set up three facilities for drinking water quality analysis and measurement of supply across both irrigation and domestic water distribution networks. The three project Dzongkhags will also be supported in adopting spatio-temporal water management information systems and using designs for irrigation and drinking water infrastructure based on modelling of climate scenarios developed under the project.

These socioeconomic benefits translate into supporting the following adaptation benefits of the LDCF:

## LDCF Objective 1: Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaptation

? Outcome 1.1: Technologies and innovative solutions piloted or deployed to reduce climate-related risks and/or enhance resilience.

- o Output 1.1.1. Physical assets made more resilient to climate variability and change
- o Output 1.1.2 Livelihoods and sources of income of vulnerable populations diversified and strengthened (gender disaggregated)
- o Output 1.1.3 Vulnerability to climatic hazards reduced through new or improved early warning systems (this output will be supported to an extent but is not a core benefit of the project)
- o Output 1.1.4. Vulnerable ecosystem services and natural resource assets strengthened in response to climate change impacts

? Outcome 1.2: Innovative financial instruments and investment models enabled or introduced to enhance climate resilience.

- o Output 2.1.1. Innovation incubators and/or accelerators introduced
- o Output 2.1.2. Investment models developed and tested

## LDCF Objective 2: Mainstream climate change adaptation and resilience for systemic impact

- ? Outcome 2.1 Strengthened cross-sectoral mechanisms to mainstream climate adaptation and resilience
- o Output 2.1.1. Development/sector policies and plans integrate adaptation considerations

### LDCF Objective 3 Foster enabling conditions for effective and integrated climate change adaptation.

- ? Outcome 3.1: Climate-resilient planning enabled by stronger climate information decision-support services, and other relevant analysis;
  - o Output 3.1.2. Regional, national and sector-wide policies, plans and processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures
  - o Output 3.1.3 Risk and vulnerability assessments conducted and updated
- ? Outcome 3.2: Institutional and human capacities strengthened to identify and implement adaptation measures
  - o Output 3.2.1 Adaptation actions/measures integrated into national, sectoral or subnational development strategies, plans and budgets
  - o Output 3.2.2 Strengthened capacity of institutions and humans to respond rapidly to extreme weather events (gender disaggregated)

#### 11. Environmental and Social Safeguard (ESS) Risks

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

#### Overall Project/Program Risk Classification\*

PIF	CEO Endorsement/Approval	MTR	TE
High or Substantial	Medium/Moderate		

Measures to address identified risks and impacts

Elaborate on the types and risk classifications/ratings of any identified environmental and social risks and impacts (considering the GEF ESS Minimum Standards) and any measures undertaken as well as planned management measures to address these risks during implementation.

The project is expected to have positive impacts on the resilience of communities to climate change by strengthening local institutions in supporting climate resilient agriculture and NRM. The project will strengthen the durability and resilience of watersheds, climate resilience of irrigation and domestic water systems and on improving overall community resilience through improved access to water supplies and improved livelihoods. Few project activities present potential social and environmental risks which are predictable, reversible and can be managed through the targeted assessments, environmental and social management framework, site specific environment and social management plans, stakeholder engagement plan, gender analysis and gender action plan developed for the project.

#### **Supporting Documents**

Upload available ESS supporting documents.

<b>Title</b>	<b>Module</b>	<b>Submitted</b>
<b>Annex 11 Gender Analysis</b>	<b>CEO Endorsement ESS</b>	
<b>Annex 10 ESMF</b>	<b>CEO Endorsement ESS</b>	
<b>Annex 9 Stakeholder Engagement Plan</b>	<b>CEO Endorsement ESS</b>	
<b>Annex 6 SES</b>	<b>CEO Endorsement ESS</b>	
<b>PIMS 6647_Bhutan ACREWAS 30April2021 - Clean</b>	<b>Project PIF ESS</b>	
<b>PIMS 6447_10779 review sheet 30April2021</b>	<b>Project PIF ESS</b>	
<b>TOC_Submitted 23April2021</b>	<b>Project PIF ESS</b>	

Title	Module	Submitted
PIMS 6647_Bhutan ACREWAS 23April2021	Project PIF ESS	
Climate_change_adaptation_results_framework Bhutan 23April2021	Project PIF ESS	
10779 Response to Review sheet 23April2021	Project PIF ESS	
PIMS 6447_10779 review sheet 16 April clean	Project PIF ESS	
PIMS 6647_Bhutan ACREWAS 16April clean	Project PIF ESS	
PIMS 6647 Bhutan Water SESP_March 17 2021_clean	Project PIF ESS	



**ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).**

This project will contribute to the following Sustainable Development Goal(s): SDG 1: No Poverty (target 1.5 - resilience of those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events); SDG 2: sustainable agriculture (target 2.4 - strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters); SDG 5: Gender Equality (target 5.a: equal rights to economic resources, access to ownership and control natural resources, in accordance with national laws); SDG6: Clean Water and Sanitation (target 6.1 -universal and equitable access to safe and affordable domestic water; 6.4 - increase water-use efficiency and reduce number of people suffering from water scarcity; 6.5 - integrated water resources management; 6.6 - protect and restore water-related ecosystems; 6.b - participation of local communities in improving water and sanitation management); SDG 13: Climate Action (target 13.1 - resilience and adaptive capacity to climate-related hazards and natural disasters); SDG 15: Life on Land (Target 15.1- conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services)				
The project also contributes to UNDP Strategic Plan (2022-2025) and five of the six signature solutions viz. 1: Poverty and Inequality; 2: Governance; 3: Resilience; 4: Environment and 6: Gender Equality This project will contribute to the following country outcome (UNSDPF): Outcome 2: access to water sanitation and hygiene services (2.3- Improved policies and strategies for health, nutrition, water, sanitation and hygiene); Outcome 4: communities and its economy are more resilient to climate-induced and other disasters (4.1: Inclusive, risk-informed systems and capacities to benefit from sustainable management of natural resources; 4.2- innovative financing, inclusive business environment and improved livelihoods through climate resilient and nature-based solutions)				
	<b>Objective and Outcome Indicators</b>	<b>Baseline</b>	<b>Mid-term Target</b>	<b>End of Project Target</b>
Project Objective: To enhance resilience for sustainable economic well-being of the people of Bhutan through climate adaptation of the water sector	Mandatory Indicator 1: Direct project beneficiaries disaggregated by gender	0	11,200 people (male = 5,840 & female =5,361)	37,334 people (Male =19,465 & Female = 17,869)
	Mandatory Indicator 2: Area of land restored (Ha under climate-resilient management); GEF Indicator 3	0	16,746 Ha	41,910 Ha
Project Component 1	Water governance and institutions			
Project Outcome 1: Strengthened water governance, institutions and financing mechanism in support of climate-resilient water management	Indicator 3: Number of local level institutions established for adaptive management of water resources	0	18	18
	Indicator 4: No of district and basin level climate-risk informed policies and strategies developed and endorsed	0	9	13
Outputs to achieve Outcome 1	1.1 Relevant national and local policies and strategies aligned with sustainable and climate resilient water management. 1.2 Institutional & community level capacity for climate-smart water and watershed management strengthened. 1.3 Innovative financing mechanisms for both watershed management and water infrastructure introduced			
Project Component 2	Nature-based solutions for sustainable and climate-resilient watersheds, and livelihood enhancement			
Outcome 2 Vulnerable natural water catchments in the target river basin (Punatsangchu River Basin) restored, sustainably managed, protected and their ecosystem conditions improved	Indicator 5: Area of watersheds restored and protected (Ha)	0 Ha	15,407 Ha	38,518 Ha
Outputs to achieve Outcome 2	Indicator 6: Number of watershed and local level climate-risk informed policies and strategies	0	6	6
	Indicator 7: Hectares of agricultural land under climate-resilient practices	8 = 0	8 = 1,357 Ha	8 = 3,392 Ha
Outputs to achieve Outcome 2	2.1 Nature-based solutions for watershed restorations implemented aimed at yielding stable spring/stream flows. 2.2 Forest/Ground cover in catchment watersheds managed and maintained through the engagement of local communities and private/corporate sector			
Project Component 3	Efficient, adequate, sustainable supply, distribution, and utilisation of water			
Outcome 3 Enhanced adaptive capacity of water infrastructure to climate-induced water shortages and quality deterioration through climate-proofing, private sector engagement, and technology deployment	Indicator 8: Number of persons with assured access to irrigation and domestic water through climate-proofing and enhancement of water infrastructure	0	5,817 (2,824 females)	9: 19,391 (9,413 females)
	Indicator 9: water infrastructure more resilient to climate variability and change 9a: Km of domestic and irrigation water transmission and distribution lines climate proofed and automated with IoT and ICT based technologies Cum. of domestic and irrigation water storage established 9b: Cumecs of domestic and irrigation water storage established	9 a: = 0  9b: = 0	9a: = 55.6 km  9b: = 949.25 Cum	9a: = 74.14 Km  9b: = 1,266 Cum
	Outputs to achieve Outcome 3	3.1 Climate proofing measures implemented in multi-purpose storage, conveyance, and distribution network of domestic and irrigation water 3.2 Efficient drought-resilient water management technology tested and upscaled through private sector (youth-based start-up enterprises)		
Project Component 4	Knowledge management			
Outcome 4 Strengthened awareness and knowledge sharing mechanism established	Indicator 10: Number of knowledge products generated and disseminated	0	8	16
Outputs to achieve Outcome 4	4.1 Communication strategy developed and implemented on water conservation and sustainable management developed and implemented 4.2 Publication of a State of the Basin Report (SOBR) for the Punatsangchu River Basin institutionalised			

**ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).**

Review comments	Response
<b>STAP REVIEW (26 MAY 2021)</b>	

<p><b>Climate Scenario</b></p> <p>?Consider more than one future climate scenario. As the climate is probabilistic, future precipitation and temperature are uncertain. Changes may be greater or less than in the single scenario selected. STAP suggests the project review existing climate projections and consider a plausible scenario where impacts are more significant and another where impacts are somewhat less than in the current scenario. This will allow the project team to select and implement interventions that are robust across a range of possible futures.?</p>	<p>Thank you for the comment.</p> <p>We have done two types of analysis based on available data and have reviewed recent literature on different climate projections over Bhutan.</p> <p>For the latest IPCC-6 report which uses the CMIP-6 datasets at the regional level, we have used multiple scenarios (RCPs 2.6, 7.0, 4.5 and 8.5) and three projection periods (near term 2021-2040, medium term: 2041-2060 and long term 2081-2100).</p> <p>For climate projections at the level of individual sites, we have used the CMIP-5 datasets from NEXGDDP (CMIP-6 data is not currently available). This analysis has been done for two scenarios (RPC 4.5 and 8.5) for the near, medium and long term.</p> <p>We have also reviewed published literature and used two scenarios (RPC 4.5 and 8.5) reported across multiple periods.</p> <p>These are presented in the Climate Case section of the Feasibility Study (Annex 13). The findings are summarised in the ProDoc and the CEO-ER. We have included analysis based on the latest IPCC report as well as the published CMIP-5 data for site specific projection.</p>
<p><b>Indicators:</b></p> <p>Develop qualitative indicators for project outcomes one and four to allow for the tracking of progress and project outcomes.</p>	<p>We thank the reviewer for the suggestion. We have revised the indicators during the PPG process and have provided indicators as suggested. These are presented in Section-V Results Framework, of the ProDoc. Further explanations on the indicators are provided below (Section 1.2.1.1.3).</p>

### ***Climate Risks to Project Implementation***

Articulate the climate risks to project implementation. As the PIF identifies current variability and its impacts as an immediate threat to people and the environment in Bhutan, it is important to consider how such impacts might affect the project and identify steps to mitigate those impacts.

Indeed the climate risks to project implementation are an important risk. We have done a comprehensive review and update of the risks under Section IV - Subsection Risks in the ProDoc. The risks listed and mitigation and avoidance measures now include climate induced hazards and states: Climate induced hazards may damage water infrastructure or obstruct and delay work. The risk is listed as moderate and mitigation measures proposed are:

1. Infrastructure constructed as part of the project will be designed in accordance with updated projections of potential climate change induced hazards. Infrastructure will additionally be protected through slope stabilisation and support structure and water conservation measures and laying pipes trenches for.
2. In order to minimise impacts of inclement weather on project deliverables, all activities will be planned keeping in mind the likely seasonal weather disruptions. Movement of materials and all infrastructural interventions will be made during the dry season and based on local forecasts.

In addition, Annex 6 SESP further elaborates on the risk: Infrastructure developed under the project as well as nature-based solutions provided by the project can be damaged or destroyed by natural calamities. Despite climate proofing of infrastructure as measures to prepare for any untoward climatic events, infrastructure developed under the project can be damaged by natural calamities which may occur such as episodes of excessive rain which could trigger floods and landslides. Further, nature-based interventions like spring revival, watershed improvements which will be instituted by the project can be affected by droughts or excessive rain. Suggested mitigation measures are:

- a. The project will manage risks related to climate change and natural disasters mainly by incorporating climate-resilient design of infrastructure combining concrete infrastructure along with bio-engineering measures as a means to enhance strength and resilience of infrastructure against landslides and floods such as use of pipes supported by pillars or suspended pipes at stream crossings, reinforcement with concrete protection walls at intakes, reservoirs, bio-engineering techniques in instable areas) .
- b. The pipelines will be installed in trenches and buried to prevent pipes from being obstacles, to prevent damage and to ensure leakages do not erode slopes. The pipe alignment for the Sergithang sub-project similarly will require attention (bioengineering both above and below the alignment, check dams where there are small streams) since certain pipeline sections traverse across unstable zones. Other nature-based solutions such as sustainable land management techniques, spring revival activities, reforestation degraded areas are expected to enhance the capacity of the watershed to withstand effects of climate change

## *Scaling Up*

Articulate a more robust plan for the scaling up of results. This includes defining exactly what organizations/groups might take up useful lessons, and how.

Thank you for this suggestion. We have followed the guidance during the PPG design. Section II - Subsection: Innovativeness, Sustainability and Potential for Scaling Up summarises the strategy as follows. Relevant text repeated below:

1. Close involvement of government institutions and departments in the project's development and implementation processes will ensure the replication of successful approaches. The strengthening of capacities among government stakeholders will ensure continued mainstreaming of climate considerations into planning and decision-making in the water sector. This will be further strengthened by facilitating cross learning and exposure through visits and through extensive training and capacity building of local communities and technical staff on adaptation interventions.

2. There is also potential for replication of livelihood diversification interventions, both nationally and internationally. These interventions may be easily replicated in other villages with relatively small investment. The project will actively share experience about approaches, techniques, successes and failures to facilitate adoption and replication. The project will pilot and scale up the following innovative strategies for a transformational impact on the management of water resources and on the O&M of water infrastructure and services.

3. The project will test and adapt relevant technologies and innovative practices to local conditions in Bhutan. This includes those in which the private sector can play a crucial role in delivering.

a. Payment for ecosystem services will be used to sustain watershed management and monitoring. These will scale-up existing PES arrangements between upstream communities and Dhamphu town, for which exchange visits and cross learning will be facilitated. Furthermore, PES systems will be piloted wherein farmers using irrigation water contribute in terms of in-kind contributions into O&M of water infrastructure and catchment restoration efforts.

b. Public private partnerships will be piloted in the three project dzongkhags. Two areas of partnerships will be explored: 1) The development and introduction of new technologies in water service management, as well as measurements and monitoring of discharges and off-takes; and 2) Plantations and greening of degraded catchment areas and barren lands. This will be done in collaboration with private agencies who have spearheaded development and deployment of such innovative technologies across Bhutan.

c. Incubators will be set up using the PPP mechanism to facilitate training of entrepreneurs in the water service and O&M sector. Youth and women will be encouraged to participate in these training modules and provided support in establishing commercial units.

d. Scaling up of IoT based sensors, SCADA systems for monitoring and metering of water distribution and supply networks will bring a number of new technologies that have the potential to

	<p>transform the water service sector by bringing in new levels of efficiency and cost effectiveness. Municipalities with operational SCADA systems in other parts of Bhutan will be engaged in the transfer of such technologies through a process of training and hand holding.</p> <p>e. Formal collaborations with research and extension agencies for access to latest technologies and techniques for climate resilient agriculture will be explored. This includes i) new and suitable varieties of crops (cereals, pulses and vegetables); ii) indigenous species of trees, shrubs and grasses for horticulture, agro-forestry and watershed restoration; iii) quick growing varieties of fuel, fodder and multiuse species of trees for plantations in barren areas and homesteads and iv) drought resilient varieties of livestock, milch animals and small ruminants. The project will additionally tie up with research agencies for access to the latest IPM techniques and veterinary and animal health technologies.</p> <p>f. In-situ trials and demonstrations of new technologies will be the primary vehicle for imparting training and scaling up. This will additionally ensure appropriate testing and adaptation of new technologies to local conditions. The project will replicate lead farmer and demonstration based training models for imparting knowledge on climate resilient agriculture and techniques for watershed management, including soil and water conservation measures and vegetative restoration techniques.</p> <p>g. The project use contemporary design and techniques that maximise the use of locally available materials and labour while undertaking repair and enhancement of water infrastructure. This will enhance local incomes and skills and ensure that capacities for O&amp;M are available within communities. The use of alternative energy sources and modern lining materials to improve efficiency of water distribution will be combined with micro-irrigation and water saving techniques</p>
<p><b><i>Gender Disaggregation</i></b></p> <p>Disaggregate the beneficiaries of the project by gender and other relevant social categories to ensure that a range of beneficiaries, who might have different needs, are represented in project design and M&amp;E</p>	<p>We appreciate this comment and have ensured that beneficiaries and stakeholders are disaggregated by gender in all indicators. The proposal also clearly identifies vulnerable groups and these are referred to specifically in activities in which they are to be involved. Furthermore the PPG package include a comprehensive Gender Analysis and Action Plan (Annex 11), Stakeholder Engagement Plan (Annex 9), a Social and Environmental Screening (Annex 6) and a Environmental and Social Management Framework (Annex 10). These documents provide details of social categories, potential risks of exclusion and strategies and plans to ensure they are meaningfully consulted and engaged in the project.</p>
<p><b>COUNCIL COMMENTS (18 June. 2021)</b></p>	

**Germany**

Germany appreciates the clear adaptation

rationale of the proposed project. The components as outlined in the proposal

appear logical, detailed and comprehensive, with specific targets and

deliverables, and integration of gender aspects across outputs. Germany also

appreciates the detailed monitoring and evaluation plan along with associated

budgets.

?

As stated in the proposal, COVID-19 has

triggered reverse urban-rural migration, wherein urban dwellers have started to

move to rural homesteads to pursue agriculture, resulting in further pressure

on irrigation water needs in rural agriculture areas. This may provide an

avenue to explore livelihood diversification opportunities in synergy with

output 1.3 on strengthening community level capacity for climate-smart water and watershed management.

Indeed, there has been reverse urban-rural migration as a consequence of the impacts of the COVID-19 and measures taken by the government to control and contain the pandemic. We have summarised these impacts and described how the project would contribute to the recovery process in the note presented as Annex 13: Response to the COVID-19 Pandemic. The project does explore livelihood diversification opportunities in synergy with strengthening community level capacity for climate-smart water and watershed management. A summary is provided below:

Under Activity 2.2.2: Introduce and expand existing climate smart agricultural techniques and restore degraded lands. A total of 1,144 ha will be brought under sustainable land management and 300 persons, including women and marginalized groups trained in these techniques. This will also generate local employment in these villages.

Under Activity 2.2.3: Engage corporate, private and civil society entities to work with local communities in carrying out plantation activities. This is linked to activity 2.2.2 and will provide the necessary training and build networks between agencies who could contribute to the implementation of the restoration activities.

Under Activity 3.1.3: Demonstrate climate-resilient integrated drinking water and dryland irrigation water supply scheme for Patshaling, Barshong, Men-drelgang, Rangthangling, Tsholingkhar and Kilkhorhang gewogs in Tsirang. As a result, farming communities in the gewog will be able to irrigate and utilise fallow lands and to pursue winter cultivation of high-value crops. The activity will build on existing tail-end water distribution systems in these six gewogs, with additional investments leading to climate resilience of the target communities.

Under Activity 3.1.4: Demonstrate climate-resilient integrated drinking water and dryland irrigation water supply for Sergithang gewog in Tsirang. The Mudali/Lareychhu catchment will be tapped to provide irrigation water to Tashithang and Sergithang. This will facilitate farmers to resume and expand the remunerative livelihoods which included cultivation of winter vegetable such as chilli, organic beans, quinoa as well as fishery, poultry and piggery.

Under Activity 3.2.2: Support youth-based start-up enterprises for automated water infrastructure management. The activity will support youth based private enterprises to manage the technology components or other forms of water utility services and support the overall O&M of water infrastructure for a service fee. The project will pilot financial tools such as outsourcing portion of infrastructure maintenance and operations budget to private sector and strengthen private sector engagement in adaptation. Specific attention to participation of women and vulnerable groups in these enterprises will be a focus.



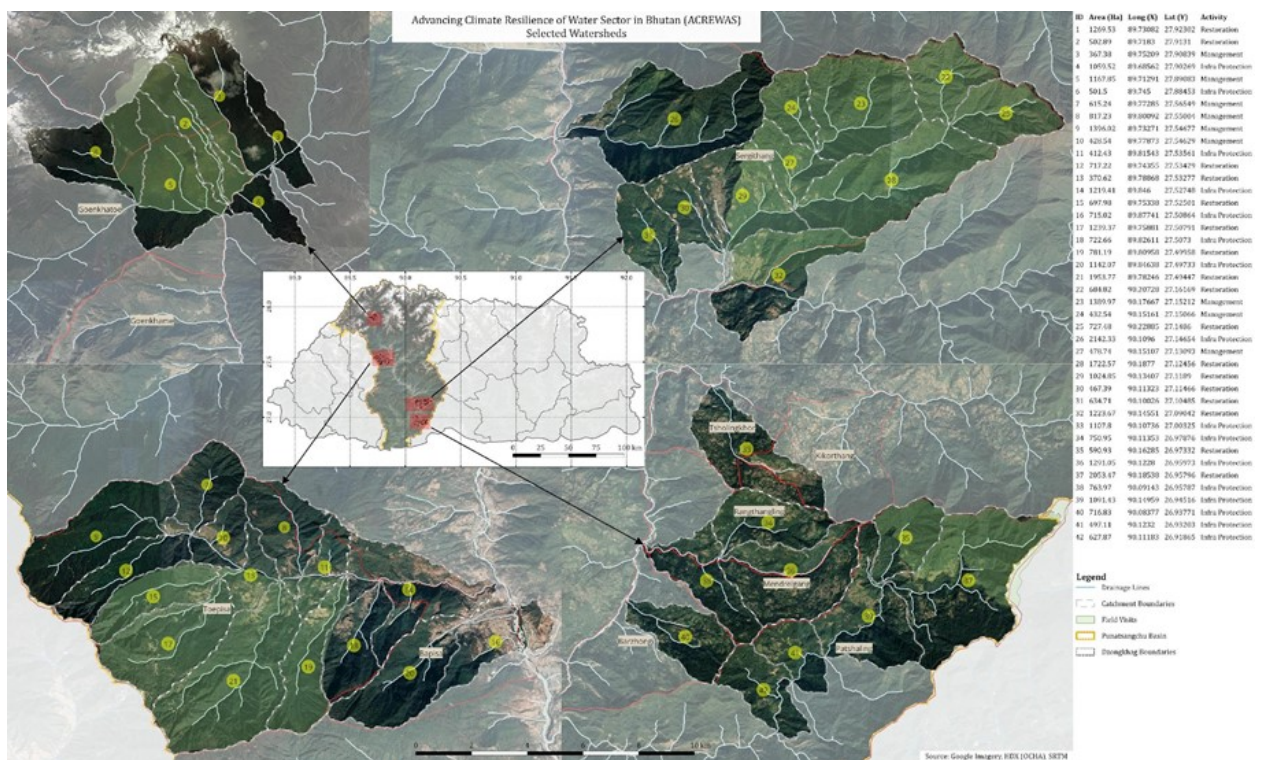
**ANNEX C: Status of Utilization of Project Preparation Grant (PPG).**  
**(Provide detailed funding amount of the PPG activities financing status**  
**in the table below:**

<b>Project Preparation Activities Implemented</b>	<b>LDCF Amount (\$)</b>		
	<b>Budgeted Amount</b>	<b>Amount Spent</b>	<b>Amount Committed</b>
<i>Activities include ProDoc Formulation, data collection, validation workshop, etc.</i>			
International Consultants:  -One International Specialist for GEF Project Development  -One International Climate Change Modelling Specialist	44,000	38,500	5,500
Local Consultants:  -One National Specialist for GEF Project Development  -One National Safeguard Experts (Environment & Gender)  -One Economist  -One Watershed/SLM expert  -Two Engineer-One for drinking water design specialist , and one engineer - irrigation design specialist	100,000	65,280	31,586
Professional Services:  -Assessing capacity of Implementing Partner (executing partner) : Ministry of Work and Human Settlement and Gross National Happiness Commission	5,000	2,362	-

Meetings, workshops included travel cost			
-Consultation workshops, national task force team meeting, focus group meeting (USD 47,250)	51,000	56,772	-
-International and local consultants travel (USD 9,522)			
<b>Project total</b>	<b>200,000</b>	<b>162,914</b>	<b>37,086</b>

## ANNEX D: Project Map(s) and Coordinates

Please attach the geographical location of the project area, if possible.



## ANNEX E: Project Budget Table

Please attach a project budget table.



Expenditure Category	Detailed Description	Component (US\$eq.)							Total (US\$eq.)	Responsible Entity (Executing Entity receiving funds from the GEF Agency) [1]
		Component 1	Component 2	Component 3	Component 4	Sub-Total	M&E	PMC		
Equipment	Information Technology Equipment Output 1.2, Activity 1.2.1: Establishment of RBC secretariat for Punatsangchhu Item: Office equipment for RBC Secretariat Calculation: unit cost @ 7000 X 1 (LS) No. years: 1 (Year 1: 7000) Sub-total = 7000	7,000				7,000			7,000	MoWHS
Equipment	Materials&Goods Output 2.1, Activity 2.1.1: Implementation of infrastructure protection intervention or climate proofing measures to enable climate resilience of physical assets Item: Length of drainage protection interventions Calculation: unit cost @ 1200 X 12.3 (KM) X Km (ha) No. years: 2 (Year 2: 7380 Year 3: 7380) Sub-total = 14760		14,760			14,760			14,760	MoWHS
Equipment	Materials&Goods Output 2.1, Activity 2.1.1: Revival of springs/streams/ponds and rehabilitation/restoration of degraded watershed areas through afforestation and assisted natural regeneration to enhance re-charge areas including sensitization and training on springshed assessment and management Item: Watershed area under physical and biological measures to enhance re-charge areas. Calculation: unit cost @ 1200 X 50 (Area) X Ha (ha) No. years: 2 (Year 2: 30000 Year 3: 30000) Sub-total = 60000		60,000			60,000			60,000	MoWHS
Equipment	Output 2.1, Activity 2.1.2: Establish data monitoring met stations to be managed by local forest divisions Item: Flow gauges Calculation: unit cost @ 1500 X 4 (No of Flow gauges) No. years: 1 (Year 2: 6000) Sub-total = 6000		6,000			6,000			6,000	MoWHS
Equipment	Output 2.1, Activity 2.1.2: Establish data monitoring met stations to be managed by local forest divisions Item: Portable meteorological stations Calculation: unit cost @ 4500 X 5 (No of Met stations) No. years: 1 (Year 1: 22500) Sub-total = 22500		22,500			22,500			22,500	MoWHS
Equipment	Materials&Goods Output 2.2, Activity 2.2.2: Develop fodder/pasture on private land (25 acres, Khuchi-Thakorling, 2 Ha in Bulkey and Chedachhu Item: Area under fodder. Calculation: unit cost @ 300 X 7.5 (Ha) No. years: 2 (Year 2: 1125 Year 3: 1125) Sub-total = 2250		2,250			2,250			2,250	MoWHS
Equipment	Materials&Goods Output 2.2, Activity 2.2.2: Install sprinklers and drip irrigation to improve water efficiency in Mendreigang and Serigthang (Training and supply of sprinklers materials) Item: Smart irrigation materials supply Calculation: unit cost @ 43000 X 1 (LS) No. years: 2 (Year 2: 21500 Year 3: 21500) Sub-total = 43000		43,000			43,000			43,000	MoWHS
Equipment	Materials&Goods Output 2.2, Activity 2.2.2: Plant Grass slip/hedge row in dryland agriculture for integrated fodder and soil stability measures (7 – Chedachhu, 7 Ha) Item: Planting materials per area. Calculation: unit cost @ 450 X 3 (Ha) No. years: 1 (Year 1: 1350) Sub-total = 1350		1,350			1,350			1,350	MoWHS
Equipment	Output 2.2, Activity 2.2.2: Promote of mulching technologies to conserve soil water in Kuchi watershed gewogs and Serigthang Item: Area under mulching Calculation: unit cost @ 600 X 300 (Ha) No. years: 4 (Year 1: 45000 Year 2: 45000 Year 3: 45000 Year 4: 45000) Sub-total = 180000		180,000			180,000			180,000	MoWHS
Equipment	Information Technology Equipment Output PMC, Activity 4.1.3: Establish PMU Item: IT equipment. Calculation: unit cost @ 3000 X 8 (No of staff) No. years: 2 (Year 1: 19200 Year 3: 4800) Sub-total = 24000					0		24,000	24,000	MoWHS
Equipment	Output PMC, Activity 4.1.3: Establish PMU Item: Audio visual equipment Calculation: unit cost @ 15000 X 1 (local staff) No. years: 2 (Year 1: 12000 Year 2: 3000) Sub-total = 15000					0		15,000	15,000	MoWHS
Contractual Services – Individ	Output 1.1, Activity 1.1.3: Water master plan for Gasa, Punakha and Tsiang Dzongkhags for each project site (3 Dzongkhag Master Plans) Item: Short term expert – water master plan including travels. Calculation: unit cost @ 400 X 45 (No of days) No. years: 2 (Year 2: 9000 Year 3: 9000) Sub-total = 18000		18,000			18,000			18,000	MoWHS
Contractual Services – Individ	Output 1.3, Activity 1.3.2: Study and pilot two water utility service provisions through private or PPP arrangement (1 study and 1 pilot) Item: Contractual services for water utility service provider start up capacity support. Calculation: unit cost @ 5000 X 1 ( ) No. years: 1 (Year 4: 5000) Sub-total = 5000		5,000			5,000			5,000	MoWHS
Contractual Services – Individ	Output 4.1, Activity 4.1.1: Prepare videos / brochures/ flyers/poster and other communication materials on project success stories, progress, impacts, knowledge and practices for climate resilient water and watershed management, standards and tools based on output 1.3 Item: Contractual services for communication expert including travel. Calculation: unit cost @ 400 X 60 (No of days) No. years: 5 (Year 1: 2400 Year 2: 2400 Year 3: 4800 Year 4: 8400 Year 5: 6000) Sub-total = 24000				24,000	24,000			24,000	MoWHS
Contractual Services – Individ	Output PMC, Activity 4.1.3: Establish PMU Item: Project M&E/Coms Calculation: unit cost @ 1250 X 60 (No of months) No. years: 5 (Year 1: 15000 Year 2: 15000 Year 3: 15000 Year 4: 15000 Year 5: 15000) Sub-total = 75000					0		75,000	75,000	MoWHS
Contractual Services – Individ	Output PMC, Activity 4.1.3: Establish PMU Item: Project Officer/Technical Expert. Calculation: unit cost @ 1250 X 60 (No of months) No. years: 5 (Year 1: 15000 Year 2: 15000 Year 3: 15000 Year 4: 15000 Year 5: 15000) Sub-total = 75000					0		75,000	75,000	MoWHS
Contractual Services-Compar	Output 1.1, Activity 1.1.3: Formulate river basin management plan for Punatsangchhu river basin (1 RBMP) Item: Contractual services for development river basin plan including travel costs. Calculation: unit cost @ 400 X 60 (No of days) No. years: 1 (Year 3: 24000) Sub-total = 24000		24,000			24,000			24,000	MoWHS
Contractual Services-Compar	Output 2.1, Activity 2.1.2: SMART patrolling capacity and system in four project sites Item: Contractual work on establishment of patrolling outpost. Calculation: unit cost @ 20000 X 1 (No of outposts) No. years: 1 (Year 2: 20000) Sub-total = 20000		20,000			20,000			20,000	MoWHS
Contractual Services-Compar	Output 2.1, Activity 2.1.2: SMART patrolling capacity and system in four project sites Item: SMART Patrolling system acquiring. Calculation: unit cost @ 4000 X 4 (LS) No. years: 1 (Year 2: 16000) Sub-total = 16000		16,000			16,000			16,000	MoWHS
Contractual Services-Compar	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Sningtalum watershed Item: Signages Calculation: unit cost @ 150 X 10 (No of signages) No. years: 1 (Year 3: 1500) Sub-total = 1500		1,500			1,500			1,500	MoWHS
Contractual Services-Compar	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha Item: Signages. Calculation: unit cost @ 150 X 2 (No of signages) No. years: 1 (Year 2: 300) Sub-total = 300		300			300			300	MoWHS
Contractual Services-Compar	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha Item: Waste facilities along the highway within watershed. Calculation: unit cost @ 6000 X 2 (No of waste drop off facilities) No. years: 1 (Year 2: 12000) Sub-total = 12000		12,000			12,000			12,000	MoWHS
Contractual Services-Compar	Output 2.2, Activity 2.2.2: Terracing of farmland on slopes (Bulkey, 7 Ha, Sathmulay, 5 Ha, Rangbari, 1.5 Ha), Serigthang Item: Labour saving equipment charges. Calculation: unit cost @ 450 X 7 (Ha) No. years: 1 (Year 1: 3150) Sub-total = 3150		3,150			3,150			3,150	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.1: Occupational health safety (OHS) measures Item: Occupational health and safety measures for Gasa. Calculation: unit cost @ 21500 X 1 (LS) X LS (ha) No. years: 1 (Year 2: 21500) Sub-total = 21500			21,500		21,500			21,500	MoWHS

Contractual Services-Compar	Output 3.1, Activity 3.1.1: Operation and maintenance for one year as liability period Item: Operation and maintenance for one year as liability period. Calculation: unit cost @ 1600 X 12 (No of months) X LS (ha) No. years: 1 ( Year 4: 19200) Sub-total = 19200	19,200	19,200	19,200	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.1: Water distribution network (valves, thrust blocks, pipes and supports, fire hydrants, HH meter connections, distribution tanks and augmentation) Item: Water distribution network (valves, thrust blocks, pipes and supports, fire hydrants, HH meter connections, distribution tanks and augmentation) Calculation: unit cost @ 297100 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 297100 Year 2: 133695 Year 3: 133695) Sub-total = 297100	297,100	297,100	297,100	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.1: water intake at Shinglalum (reinforced cement concrete/RCC) with intake protection structures (Gabion walls upstream of intake to block debris during monsoon) Item: Contractual services for water intake, sand trap and intake protection. Calculation: unit cost @ 63100 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 63100 Year 2: 28395 Year 3: 28395) Sub-total = 63100	63,100	63,100	63,100	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.1: water transmission line (2.5kms of 150mm DI pipe laid through 1.2 m trenching (to avoid pipe breakage and to protect from freezing during winters). Suspended pipes to be supported with pipe support pillars, bends and slopes protected by thrust blocks Item: Contractual service for water conveyance line (clearing, materials, trenching, pipe laying, valves and fittings, thrust blocks, pipe supports, sand bedding. Calculation: unit cost @ 116 X 2500 (Meters) X M (ha) No. years: 3 (Year 1: 29000 Year 2: 130500 Year 3: 130500) Sub-total = 290000	290,000	290,000	290,000	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.1: Water treatment plant with a capacity of 1.4 MLD (Stilling chamber, sand filter, Tanks, Disinfection unit, LAB and office, Monitoring outpost, site development including access road to the WTP) Item: Contractual service for Water treatment plant with a capacity of 1.4 MLD (Stilling chamber, sand filter, Tanks, Disinfection unit, LAB and office, Monitoring outpost, site development including access road to the WTP). Calculation: unit cost @ 164100 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 164100 Year 2: 73845 Year 3: 73845) Sub-total = 164100	164,100	164,100	164,100	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.2: Consolidation of water intake at the catchment Item: Contractual service for consolidation of water intake at the catchment. Calculation: unit cost @ 34650 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 34650 Year 2: 15592 Year 3: 15592) Sub-total = 34650	34,650	34,650	34,650	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.2: Contractual service for distribution augmentation including tanks in Lobeyasa Item: Contractual service for distribution augmentation including tanks. Calculation: unit cost @ 67000 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 67000 Year 2: 30150 Year 3: 30150) Sub-total = 67000	67,000	67,000	67,000	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.2: Contractual service for Water treatment plant with a capacity of 2 MLD (Stilling chamber, sand filter, Tanks, Disinfection unit, LAB and office, Monitoring outpost, site development including access road to the WTP) Item: Contractual service for Water treatment plant with a capacity of 2 MLD (Stilling chamber, sand filter, Tanks, Disinfection unit, LAB and office, Monitoring outpost, site development including access road to the WTP). Calculation: unit cost @ 400000 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 400000 Year 2: 180000 Year 3: 180000) Sub-total = 400000	400,000	400,000	400,000	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.2: Establish 17 Kms transmission main line from Okalum source to WTP with DT points for supply to communities within Toedpsa upto Lobeyasa in Barp gewog Item: Contractual service for water transmission line (clearing, materials, trenching, pipe laying, valves and fittings, thrust blocks, pipe supports, sand bedding. Calculation: unit cost @ 64.5 X 17000 (Meters) X LS (ha) No. years: 3 (Year 1: 1096500 Year 2: 493425 Year 3: 493425) Sub-total = 1096500	1,096,500	1,096,500	1,096,500	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.2: Occupational health safety (OHS) measures Item: Occupational health safety (OHS) measures. Calculation: unit cost @ 24354 X 1 (LS) X LS (ha) No. years: 1 (Year 1: 24354) Sub-total = 24354	24,354	24,354	24,354	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.2: Operation and maintenance for one year as liability period Item: Operation and maintenance for one year as liability period. Calculation: unit cost @ 1600 X 12 (No months) X LS (ha) No. years: 1 ( Year 4: 19200) Sub-total = 19200	19,200	19,200	19,200	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Intake Structure, Collection Tank, Gabion Wall and Barbed wire fencing with gate at the Source/Catchment Area of Khuchi Khola, Main Pipe Line from Khuchi Khola Source to Dhupi and 2 RCC Main Reservoir of 250 Cum each) Item: Contractual service for intake structures and protection at Kuchi source. Calculation: unit cost @ 35726 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 35726 Year 2: 25008 Year 3: 25008) Sub-total = 35726	35,726	35,726	35,726	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Intake Structure, Collection Tank, Gabion Wall and Barbed wire fencing with gate at the Source/Catchment Area of Khuchi Khola, Main Pipe Line from Khuchi Khola Source to Dhupi and 2 RCC Main Reservoir of 250 Cum each) Item: Contractual service for materials and laying of raw water pipe line. Calculation: unit cost @ 69.5 X 13210 (Meters) X LS (ha) No. years: 3 (Year 1: 91809 Year 2: 642666 Year 3: 642666) Sub-total = 918095	918,095	918,095	918,095	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Intake Structure, Collection Tank, Gabion Wall and Barbed wire fencing with gate at the Source/Catchment Area of Khuchi Khola, Main Pipe Line from Khuchi Khola Source to Dhupi and 2 RCC Main Reservoir of 250 Cum each) Item: Contractual service for RCC reservoir (250 cum) at Dhubi. Calculation: unit cost @ 54120 X 2 (Numbers) X LS (ha) No. years: 3 (Year 1: 108240 Year 2: 75768 Year 3: 21648) Sub-total = 108240	108,240	108,240	108,240	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main from the proposed Service Reservoirs at Dhupi to Existing FCRs of Barshong Gewog Item: Contractual service to Pipe and pipe installation from Dhupi to Barshong gewog, FCR, lower Chuzomsa, Pangthang Chiwog under Patsihaling Gewog. Calculation: unit cost @ 14.5 X 8080 (Meters) X LS (ha) No. years: 3 (Year 1: 11716 Year 2: 82012 Year 3: 23432) Sub-total = 117160	117,160	117,160	117,160	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the reservoirs at Dhupi to Existing FCRs of Mendreigang High School & Primary School and 2 RCC reservoirs of 250Cum each Item: Contractual service for providing and laying of pipes from Dhupi to Mendreigang PS & CS. Calculation: unit cost @ 38.5 X 4990 (Meters) X LS (ha) No. years: 3 (Year 1: 19211 Year 2: 134480 Year 3: 38424) Sub-total = 192115	192,115	192,115	192,115	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the reservoirs at Dhupi to Existing FCRs of Mendreigang High School & Primary School and 2 RCC reservoirs of 250Cum each Item: Contractual service for RCC reservoir (250 cum) at Mendreigang. Calculation: unit cost @ 14256 X 2 (Numbers) X LS (ha) No. years: 3 (Year 1: 28512 Year 2: 19958 Year 3: 5703) Sub-total = 28512	28,512	28,512	28,512	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the reservoirs at Dhupi to Y - Point of Rangthangling, Tsholingkhar, Kikhorthang Ge-wogs & then to Y-Point of Drugchugang, Tsholingkhar and Menchuna, Kikhorthang and 1 RCC Main reser-voir of 250Cum. Item: Contractual service for providing and laying of pipes. Calculation: unit cost @ 63 X 3884 (Meters) X LS (ha) No. years: 3 (Year 1: 24469 Year 2: 171284 Year 3: 48939) Sub-total = 244692	244,692	244,692	244,692	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the reservoirs at Dhupi to Y - Point of Rangthangling, Tsholingkhar, Kikhorthang Ge-wogs & then to Y-Point of Drugchugang, Tsholingkhar and Menchuna, Kikhorthang and 1 RCC Main reser-voir of 250Cum. Item: Contractual service for RCC Main Reservoir (250Cum) and protection works at Rangthangling Y Point Calculation: unit cost @ 51360 X 1 (Numbers) X LS (ha) No. years: 3 (Year 1: 5136 Year 2: 35952 Year 3: 10272) Sub-total = 51360	51,360	51,360	51,360	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the service reservoirs at Dhupi to Existing FCRs of Trashipang Chiwog under Mendrel-gang Gewog and 2 RCC Break Pressure Tank (BPT - 5 cum) Item: Contractual service for providing and laying of pipes from Dhupi to Trashipang. Calculation: unit cost @ 23.5 X 2840 (Meters) X LS (ha) No. years: 3 (Year 1: 6674 Year 2: 46718 Year 3: 13348) Sub-total = 66740	66,740	66,740	66,740	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the service reservoirs at Dhupi to Existing FCRs of Trashipang Chiwog under Mendrel-gang Gewog and 2 RCC Break Pressure Tank (BPT - 5 cum) Item: RCC BPT (5Cum) along the line. Calculation: unit cost @ 8945 X 2 (Numbers) X LS (ha) No. years: 3 (Year 1: 17890 Year 2: 12523 Year 3: 3578) Sub-total = 17890	17,890	17,890	17,890	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the Y-Point of Drugchugang, Tsholingkhar and Menchuna, Kikhorthang to the existing FCR (for Upper Menchuna) below IB Guest House Item: Contractual service for providing and laying of pipes from Y point of Drugchugang to Menchuna (above IB). Calculation: unit cost @ 10 X 3814 (Meters) X LS (ha) No. years: 3 (Year 1: 3814 Year 2: 26698 Year 3: 7628) Sub-total = 38140	38,140	38,140	38,140	MoWHS



Contractual Services-Compar	Output 3.1, Activity 3.1.3: Main Pipe Line from the Y-Point of Drugchugang, Tsholingkhar and Menchuna, Kikhorhang to the pro-posed FCR (for Drugchugang, Batasay & Lower Menchuna) below VVIP Guest House Item: Contractual service for providing and laying of pipes from Y point of Drugchugang to VVIP GH & one FCR. Calculation: unit cost @ 174940 X 1 (LS) X LS (ha) No. years: 3 (Year 1: 17494 Year 2: 122458 Year 3: 34983) Sub-total = 174940	174,940	174,940	174,940	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Occupational health safety (OHS) measures Item: Occupational health safety (OHS) measures. Calculation: unit cost @ 16455 X 1 (LS) No. years: 1 (Year 2: 16455) Sub-total = 16455	16,455	16,455	16,455	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.3: Operation and maintenance for one year as liability period Item: O&M Calculation: unit cost @ 1600 X 12 (Months) X LS (ha) No. years: 2 (Year 3: 9600 Year 4: 9600) Sub-total = 19200	19,200	19,200	19,200	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: 1 RCC Main Reservoir (250Cum) at Bhulkay top Item: 1 RCC Main Reservoir (250Cum) at Bhulkay top Calculation: unit cost @ 61730 X 1 (LS) No. years: 2 (Year 2: 37038 Year 3: 24692) Sub-total = 61730	61,730	61,730	61,730	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: Intake structure and Collection Tank, with gate at the Source/Catchment Area of Kharpani Khola, RCC sand trap and protection Item: Contractual service for Intake at Kharpani Khola source. Calculation: unit cost @ 50950 X 1 (LS) X LS (ha) No. years: 2 (Year 2: 30570 Year 3: 20380) Sub-total = 50950	50,950	50,950	50,950	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: Main Pipe Line (Integrated-Drinking & Irrigation) from the Source to proposed Reservoir Area at Bhulkay Top for Tashithang Item: Pipe & pipe installations. Calculation: unit cost @ 126.7 X 8950 (Meters) X LS (ha) No. years: 2 (Year 2: 680379 Year 3: 453586) Sub-total = 1133965	1,133,965	1,133,965	1,133,965	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: O&M, Sergithang Item: O&M Calculation: unit cost @ 1600 X 12 (Months) No. years: 2 (Year 3: 4800 Year 4: 14400) Sub-total = 19200	19,200	19,200	19,200	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: OHS, Sergithang Item: Occupational health safety (OHS) measures Calculation: unit cost @ 20137 X 1 (LS) No. years: 1 (Year 2: 20137) Sub-total = 20137	20,137	20,137	20,137	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: Pipe Lines to Bholay Khoicha, Dajay Irrigation Channel, Sathmolay Khoicha, Mokaray Dara and Sathmulay Irrigation Intake Point in Tashithang Chiwog including 1 RCC Main Reservoir (250Cum), 1 RCC Break Pres-sure Tank (BPT - 5 cum) and 16 delivery chambers and outlet chambers Item: BPT - 5 Cum. Calculation: unit cost @ 8945 X 1 (LS) X LS (ha) No. years: 2 (Year 2: 5367 Year 3: 3578) Sub-total = 8945	8,945	8,945	8,945	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: Pipe Lines to Bholay Khoicha, Dajay Irrigation Channel, Sathmolay Khoicha, Mokaray Dara and Sathmulay Irrigation Intake Point in Tashithang Chiwog including 1 RCC Main Reservoir (250Cum), 1 RCC Break Pres-sure Tank (BPT - 5 cum) and 16 delivery chambers and outlet chambers Item: Delivery chambers Calculation: unit cost @ 13738 X 16 (Numbers) X LS (ha) No. years: 2 (Year 2: 131884 Year 3: 87924) Sub-total = 219808	219,808	219,808	219,808	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: Pipe Lines to Bholay Khoicha, Dajay Irrigation Channel, Sathmolay Khoicha, Mokaray Dara and Sathmulay Irrigation Intake Point in Tashithang Chiwog including 1 RCC Main Reservoir (250Cum), 1 RCC Break Pres-sure Tank (BPT - 5 cum) and 16 delivery chambers and outlet chambers Item: Pipe & pipe installations. Calculation: unit cost @ 59 X 5116 (Meters) X LS (ha) No. years: 2 (Year 2: 181106 Year 3: 120738) Sub-total = 301844	301,844	301,844	301,844	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: Supervision and Monitoring, Sergithang Item: Supervision and monitoring Calculation: unit cost @ 3000 X 5 (No of years) X LS (ha) No. years: 3 (Year 2: 6000 Year 3: 6000 Year 4: 3000) Sub-total = 15000	15,000	15,000	15,000	MoWHS
Contractual Services-Compar	Output 3.1, Activity 3.1.4: Two Drinking Water Supply Distribution main pipe lines Item: Pipe & pipe installations for domestic water. Calculation: unit cost @ 4.05 X 3080 (Meters) X LS (ha) No. years: 2 (Year 2: 7484 Year 3: 4990) Sub-total = 12474	12,474	12,474	12,474	MoWHS
Contractual Services-Compar	Output 3.2, Activity 3.2.1: Integrate, in collaboration with private sector entities, automation of irrigation and drinking water assets using IoT, AI, micro-controller and sensor based data science within water intake at source, water storage tanks, WTP facilities, main transmission lines and subsidiary distribution lines. It will involve use of sensors, electric valves, gauges, flow meters, fire hydrants, balancing units, and weather monitoring stations that are linked to main control Item: Installation of IoT/ICT based system for automated management of water supply, Punakha. Calculation: unit cost @ 94000 X 1 (LS) X LS (ha) No. years: 2 (Year 2: 37600 Year 3: 56400) Sub-total = 94000	94,000	94,000	94,000	MoWHS
Contractual Services-Compar	Output 3.2, Activity 3.2.1: Integrate, in collaboration with private sector entities, automation of irrigation and drinking water assets using IoT, AI, micro-controller and sensor based data science within water intake at source, water storage tanks, WTP facilities, main transmission lines and subsidiary distribution lines. It will involve use of sensors, electric valves, gauges, flow meters, fire hydrants, balancing units, and weather monitoring stations that are linked to main control Item: Installation of IoT/ICT based system for automated management of water supply, Gasa. Calculation: unit cost @ 160000 X 1 (LS) X LS (ha) No. years: 2 (Year 2: 64000 Year 3: 96000) Sub-total = 160000	160,000	160,000	160,000	MoWHS
Contractual Services-Compar	Output 4.1, Activity 4.1.4: Support implementation of water resource management curriculum at tertiary education level including (2 tertiary institutions) Item: Water analysis equipment. Calculation: unit cost @ 4500 X 2 (LS (no of institutes)) No. years: 1 (Year 2: 9000) Sub-total = 9000	9,000	9,000	9,000	MoWHS
Contractual Services-Compar	Output 4.1, Activity 4.1.5: Support diagnosis, analytical capacity and water quality testing capacities at 21 Primary Health Care Centers of 3 Dzongkhags Item: Ecol test sets Calculation: unit cost @ 1400 X 21 (No of sets) No. years: 1 (Year 3: 29400) Sub-total = 29400	29,400	29,400	29,400	MoWHS
Contractual Services-Compar	Output 4.2, Activity 4.2.1: Develop harmonized comprehensive database on water resources and infrastructure within the Punatshangchu river basin (for water security index system on water for urban, rural, economic, environment, disaster and climate resilience) Item: Local Consultant - System development expert Calculation: unit cost @ 400 X 45 (No of days) No. years: 1 (Year 3: 18000) Sub-total = 18000	18,000	18,000	18,000	MoWHS
International Consultants	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: International consultant Safeguards Expert. Calculation: unit cost @ 700 X 45 (No of days) No. years: 4 (Year 1: 7875 Year 2: 7875 Year 3: 7875 Year 4: 7875) Sub-total = 31500	31,500	31,500	31,500	MoWHS
International Consultants	Output M&E, Activity 4.1.3: MTR and TE Item: International Consultant to conduct Independent Terminal Evaluation of GEF-financed and co-financed activities in line with UNDP/GEF requirements Calculation: unit cost @ 1000 X 30 (No of days, including travel) No. years: 1 (Year 5: 30000) Sub-total = 30000	0	30,000	30,000	UNDP
International Consultants	Output M&E, Activity 4.1.3: MTR and TE Item: International consultant for Independent Mid-term Review of GEF-financed and co-financed activities in line with UNDP/GEF requirements, and incorporate recommendations of MTR into revised project plans (management response) following PSC's approval). Calculation: unit cost @ 1000 X 30 (No of days, including travel) No. years: 1 (Year 3: 30000) Sub-total = 30000	0	30,000	30,000	UNDP

International Consultants	Output 4.1, Activity 4.1.4: Support implementation of water resource management curriculum at tertiary education level including (2 tertiary institutions) Item: International Consultant – Training of trainers on engineering curriculum. Calculation: unit cost @ 1000 X 30 (No of days) No. years: 2 ( Year 2: 15000 Year 3: 15000) Sub-total = 30000		30,000	30,000		30,000	MoWHS
Local Consultants	Output 1.3, Activity 1.3.1: Study and recommend tariff system for Gasa town and Lobeyasa, and document lessons learnt for policy feedback Item: National Consultancy – Study and recommend tariff system for Gasa town and Lobeyasa, and document lessons learnt for policy feedback. Calculation: unit cost @ 400 X 60 (No of days) No. years: 2 ( Year 3: 7200 Year 4: 16800) Sub-total = 24000	24,000		24,000		24,000	MoWHS
Local Consultants	Output 1.3, Activity 1.3.2: Study and pilot two water utility service provisions through private or PPP arrangement (1 study and 1 pilot) Item: Local Consultancy-PPP model assessment and training. Calculation: unit cost @ 400 X 60 (No of days) No. years: 2 ( Year 3: 12000 Year 4: 12000) Sub-total = 24000	24,000		24,000		24,000	MoWHS
Local Consultants	Output 4.1, Activity 4.1.3: Gender safeguards Item: Local consultant – Gender expert. Calculation: unit cost @ 4000 X 6 (No of months) No. years: 5 (Year 1: 4800 Year 2: 4800 Year 3: 4800 Year 4: 4800 Year 5: 4800) Sub-total = 24000		24,000	24,000		24,000	MoWHS
Local Consultants	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: Local consultant Safeguards Expert. Calculation: unit cost @ 4000 X 9 (No of months) No. years: 5 (Year 1: 7200 Year 2: 7200 Year 3: 7200 Year 4: 7200 Year 5: 7200) Sub-total = 36000		36,000	36,000		36,000	MoWHS
Local Consultants	Output M&E, Activity 4.1.3: MTR and TE Item: Local consultant to support MTR process. Calculation: unit cost @ 400 X 35 (No of days, including travel) No. years: 1 ( Year 3: 14000) Sub-total = 14000			0	14,000	14,000	UNDP
Local Consultants	Output M&E, Activity 4.1.3: MTR and TE Item: Local Consultant to support Terminal Evaluation process. Calculation: unit cost @ 400 X 40 (No of days, including travel) No. years: 1 ( Year 5: 16000) Sub-total = 16000			0	16,000	16,000	UNDP
Training, Workshops, Meeting	Output 1.1, Activity 1.1.1: Develop gender responsive water safety plan for Gasa, Punakha and Tsirang including training on gender safeguards Item: Workshops and travels on water safety plan (1 workshop in each dzongkhag including training on gender safeguards = 3 days workshop for 30 persons each) Calculation: unit cost @ 4500 X 3 (No of workshops) No. years: 1 ( Year 5: 13500) Sub-total = 13500	13,500		13,500		13,500	MoWHS
Training, Workshops, Meeting	Output 1.1, Activity 1.1.1: Develop guiding tool for Development of Water Master Plan Item: Meetings/Workshops on guiding tool for Development of Water Master Plan Calculation: unit cost @ 1500 X 2 (LS) No. years: 1 (Year 1: 15000) Sub-total = 15000	15,000		15,000		15,000	MoWHS
Training, Workshops, Meeting	Output 1.1, Activity 1.1.1: Revise Drinking Water Quality Standard Item: Meetings and workshops (2 for revision of standards) and for sensitization (3 for sensitization). Calculation: unit cost @ 4000 X 3 (No of workshops) No. years: 2 (Year 1: 3000 Year 2: 9000) Sub-total = 12000	12,000		12,000		12,000	MoWHS
Training, Workshops, Meeting	Output 1.1, Activity 1.1.2: Undertake participatory assessment of water resources and water issues within local watersheds Item: Survey and assessment of surface and ground water for 3 dzongkhags including training of enumerators. Calculation: unit cost @ 29000 X 1 (LS) No. years: 2 (Year 1: 17400 Year 2: 11600) Sub-total = 29000	29,000		29,000		29,000	MoWHS
Training, Workshops, Meeting	Output 1.1, Activity 1.1.3: Formulate river basin management plan for Punatsangchhu river basin (1 RBMP) Item: Meetings/Workshops for RBMP. Calculation: unit cost @ 4000 X 3 (No of Meetings/Workshops) No. years: 2 ( Year 2: 2400 Year 3: 9600) Sub-total = 12000	12,000		12,000		12,000	MoWHS
Training, Workshops, Meeting	Output 1.1, Activity 1.1.3: Water master plan for Gasa, Punakha and Tsirang Dzongkhags for each project site (3 Dzongkhag Master Plans) Item: Meetings/Workshops for Dzongkhag water master plans. Calculation: unit cost @ 4000 X 3 (No of workshops) No. years: 2 ( Year 2: 6000 Year 3: 6000) Sub-total = 12000	12,000		12,000		12,000	MoWHS
Training, Workshops, Meeting	Output 1.2, Activity 1.2.1: Establish River Basin Committee (RBC) for Punatsangchhu Item: Meetings/Workshops to establish River Basin Committee (RBC) and the RBC Secretariat for Punatsangchhu river basin (1 workshop involving 5 dzongkhag+2 preparatory workshops with central agencies). Calculation: unit cost @ 4000 X 4 (No of workshops) No. years: 2 (Year 1: 4800 Year 2: 11200) Sub-total = 16000	16,000		16,000		16,000	MoWHS
Training, Workshops, Meeting	Output 1.2, Activity 1.2.2: Form/Strengthen of WUAs and enable their representation at the Gewog level Item: Community level Meetings/workshops to form/Strengthen of WUAs and enable their representation at the Gewog level including training of WUA members. Calculation: unit cost @ 2000 X 7 (No of workshops) No. years: 1 (Year 2: 14000) Sub-total = 14000	14,000		14,000		14,000	MoWHS
Training, Workshops, Meeting	Output 1.2, Activity 1.2.2: Form/Strengthen of WUAs and enable their representation at the Gewog level Item: Sensitization and TOT workshops for Dzongkhags, Gewogs and community leaders on strengthening and formal registration of WUAs. Calculation: unit cost @ 4000 X 3 (No of workshops) No. years: 2 (Year 1: 6000 Year 2: 6000) Sub-total = 12000	12,000		12,000		12,000	MoWHS
Training, Workshops, Meeting	Output 1.2, Activity 1.2.2: Strengthen Dzongkhag Environment Committee to bear the role of water management committee at Dzongkhag level (Train DEC on legal and technical matters related to water governance, water allocation and management) Item: Training Workshops for Dzongkhag Environment Committee to Gasa, Punakha, Tsirang and Wangdue. Calculation: unit cost @ 4500 X 4 (No of workshops) No. years: 1 ( Year 2: 18000) Sub-total = 18000	18,000		18,000		18,000	MoWHS
Training, Workshops, Meeting	Output 1.3, Activity 1.3.1: Study and recommend tariff system for Gasa town and Lobeyasa, and document lessons learnt for policy feedback Item: Meetings/Workshops on tariff system for Gasa town and Lobeyasa. Calculation: unit cost @ 2500 X 1 (No of Meetings/Workshops) No. years: 1 ( Year 4: 2500) Sub-total = 2500	2,500		2,500		2,500	MoWHS
Training, Workshops, Meeting	Output 1.3, Activity 1.3.1: Study feasibility of introducing water tariff in rural and peri-urban area Item: Meetings/Workshops for feasibility of introducing water tariff in rural and peri-urban area and update draft guidelines of NEC. Calculation: unit cost @ 4000 X 3 (No of workshops) No. years: 1 ( Year 2: 12000) Sub-total = 12000	12,000		12,000		12,000	MoWHS
Training, Workshops, Meeting	Output 1.3, Activity 1.3.2: Study and pilot two water utility service provisions through private or PPP arrangement (1 study and 1 pilot) Item: Meetings/Workshops for studying feasibility of PPP based enterprise and areas of O&M that can be maintained by private enterprises. Calculation: unit cost @ 2500 X 4 (No of workshops) No. years: 2 ( Year 3: 5000 Year 4: 5000) Sub-total = 10000	10,000		10,000		10,000	MoWHS
Training, Workshops, Meeting	Output 1.3, Activity 1.3.2: Study and pilot two water utility service provisions through private or PPP arrangement (1 study and 1 pilot) Item: Training Calculation: unit cost @ 7000 X 1 (No of Training Workshops) No. years: 1 ( Year 4: 7000) Sub-total = 7000	7,000		7,000		7,000	MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.1: Revival of springs/streams/ponds and rehabilitation/restoration of degraded watershed areas through afforestation and assisted natural regeneration to enhance re-charge areas including sensitization and training on springshed assessment and management Item: Sensitization and training on springshed assessment and management Calculation: unit cost @ 2000 X 4 (No of trainings) No. years: 1 (Year 1: 8000) Sub-total = 8000	8,000		8,000		8,000	MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.2: SMART patrolling capacity and system in four project sites Item: Meetings/Workshops Calculation: unit cost @ 1500 X 1 (LS) No. years: 1 (Year 1: 1500) Sub-total = 1500	1,500		1,500		1,500	MoWHS



	Output 2.1, Activity 2.1.2: Training on data monitoring and management of monitoring stations Item: Training on data retrieval. Calculation: unit cost @ 150 X 15 (No of people trained) No. years: 1 (Year 1: 2250) Sub-total = 2250					2,250	2,250	2,250 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Assessment and Review of CF management plan for Rangzhin Kuenphen CF and Tashi Thogmen CF, Shingtalum, Gasa Item: Survey, assessment with mapping and training workshop (CF) Calculation: unit cost @ 2000 X 2 (LS) No. years: 1 (Year 1: 4000) Sub-total = 4000					4,000	4,000	4,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Assessment and Review of CF management plan for Rangzhin Kuenphen CF and Tashi Thogmen CF, Shingtalum, Gasa Item: Workshops/Meetings Calculation: unit cost @ 1000 X 4 (No of workshops) No. years: 1 (Year 1: 4000) Sub-total = 4000					4,000	4,000	4,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Shingtalum watershed Item: Advocacy workshop Calculation: unit cost @ 1000 X 1 (No of workshops) No. years: 1 (Year 1: 1000) Sub-total = 1000					1,000	1,000	1,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Shingtalum watershed Item: LFM Planning workshop Calculation: unit cost @ 1500 X 2 (No of workshops) No. years: 1 (Year 1: 3000) Sub-total = 3000					3,000	3,000	3,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Shingtalum watershed Item: Support to community based waste management during cordyceps collection season. Calculation: unit cost @ 1500 X 4 (LS for no. of seasons) No. years: 4 (Year 2: 1500 Year 3: 1500 Year 4: 1500 Year 5: 1500) Sub-total = 6000					6,000	6,000	6,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Shingtalum watershed Item: Survey, assessment with mapping and training workshop (Shingtalum) Calculation: unit cost @ 6500 X 1 (LS) No. years: 1 (Year 1: 6500) Sub-total = 6500					6,500	6,500	6,500 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha Item: Advocacy workshops Calculation: unit cost @ 1500 X 1 (No of workshops) No. years: 1 (Year 1: 1500) Sub-total = 1500					1,500	1,500	1,500 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha Item: LFM Planning workshop Calculation: unit cost @ 3500 X 2 (No of workshops) No. years: 2 (Year 1: 3500 Year 2: 3500) Sub-total = 7000					7,000	7,000	7,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha Item: Support to initiate community based waste management. Calculation: unit cost @ 3000 X 1 (LS) No. years: 1 (Year 3: 3000) Sub-total = 3000					3,000	3,000	3,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plan for Okalum watershed in Toepisa Gewog, Punakha Item: Survey, assessment with mapping and training workshop (Okalum) Calculation: unit cost @ 7000 X 1 (LS) No. years: 2 (Year 1: 3500 Year 2: 3500) Sub-total = 7000					7,000	7,000	7,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plans for Kuchi watershed, Thakoring, Tsiarang including biodiversity assessment Item: Advocacy workshop Calculation: unit cost @ 1500 X 1 (No of workshops) No. years: 1 (Year 1: 1500) Sub-total = 1500					1,500	1,500	1,500 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plans for Kuchi watershed, Thakoring, Tsiarang including biodiversity assessment Item: LFM Planning workshop Calculation: unit cost @ 2500 X 2 (No of workshops) No. years: 1 (Year 2: 5000) Sub-total = 5000					5,000	5,000	5,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plans for Kuchi watershed, Thakoring, Tsiarang including biodiversity assessment Item: Survey, assessment with mapping and training workshop Calculation: unit cost @ 7000 X 1 (LS) No. years: 2 (Year 1: 3500 Year 2: 3500) Sub-total = 7000					7,000	7,000	7,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plans for Chedachhu, Bulkey and Larichhu watershed in Serghthang, Tsiarang including biodiversity assessment Item: Advocacy workshops Calculation: unit cost @ 1500 X 1 (No of workshops) No. years: 1 (Year 1: 1500) Sub-total = 1500					1,500	1,500	1,500 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plans for Chedachhu, Bulkey and Larichhu watershed in Serghthang, Tsiarang including biodiversity assessment Item: LFM Planning workshop Calculation: unit cost @ 3000 X 2 (No of workshops) No. years: 1 (Year 2: 6000) Sub-total = 6000					6,000	6,000	6,000 MoWHS
Training, Workshops, Meeting	Output 2.1, Activity 2.1.3: Prepare Local Forest Management Plans for Chedachhu, Bulkey and Larichhu watershed in Serghthang, Tsiarang including biodiversity assessment Item: Survey, assessment with mapping and training workshop (Larichhu) Calculation: unit cost @ 10000 X 1 (LS) No. years: 2 (Year 1: 5000 Year 2: 5000) Sub-total = 10000					10,000	10,000	10,000 MoWHS
Training, Workshops, Meeting	Output 2.2, Activity 2.2.1: Establish a new PES scheme for Okalum watershed between catchment communities of Toepisa Gewog and downstream communities of Toepisa and Barp Gewogs and institutions within the gewogs including Lobeysa township. Item: Establishment of PES scheme in Okalum Calculation: unit cost @ 10000 X 1 (No PES scheme) No. years: 1 (Year 3: 10000) Sub-total = 10000					10,000	10,000	10,000 MoWHS
Training, Workshops, Meeting	Output 2.2, Activity 2.2.1: up-scale existing PES scheme between Thakoring Community Forest Group of Patsaling gewog and residents of Damphu town, additional six gewogs, Mendrelgang satellite town and institutions within these gewogs Item: Upscaling of existing PES scheme in Tsiarang Calculation: unit cost @ 5000 X 1 (No PES scheme) No. years: 1 (Year 3: 5000) Sub-total = 5000					5,000	5,000	5,000 MoWHS
Training, Workshops, Meeting	Output 2.2, Activity 2.2.2: Promote of mulching technologies to conserve soil water in Kuchi watershed gewogs and Serghthang Item: Consultation and training on use and management of mulching materials, on water harvesting promotion, on water harvesting, efficient use of water, use of sprinklers and drip irrigation. Calculation: unit cost @ 30 X 100 (No of farmers trained) No. years: 4 (Year 1: 750 Year 2: 750 Year 3: 750 Year 4: 750) Sub-total = 3000					3,000	3,000	3,000 MoWHS
Training, Workshops, Meeting	Output 2.2, Activity 2.2.3: Planning meetings and workshops Item: Planning meetings/workshops Calculation: unit cost @ 2800 X 1 (No of Meetings/Workshops) No. years: 1 (Year 1: 2800) Sub-total = 2800					2,800	2,800	2,800 MoWHS
Training, Workshops, Meeting	Output 2.2, Activity 2.2.3: Planning meetings and workshops Item: Training on plantation and maintenance of plantation Calculation: unit cost @ 20 X 50 (No of people trained) No. years: 1 (Year 2: 1000) Sub-total = 1000					1,000	1,000	1,000 MoWHS
Training, Workshops, Meeting	Output 3.1, Activity 3.1.1: Local consultations, travels and assessments Item: Local consultations, travels and assessments Calculation: unit cost @ 3000 X 5 (No of years) No. years: 4 (Year 1: 3000 Year 3: 3000 Year 4: 6000 Year 5: 3000) Sub-total = 15000					15,000	15,000	15,000 MoWHS
Training, Workshops, Meeting	Output 3.1, Activity 3.1.2: Local consultations, travels and assessments Item: Local consultations, travels and assessments Calculation: unit cost @ 3000 X 5 (No of years) No. years: 5 (Year 1: 3000 Year 2: 3000 Year 3: 3000 Year 4: 3000 Year 5: 3000) Sub-total = 15000					15,000	15,000	15,000 MoWHS
Training, Workshops, Meeting	Output 3.1, Activity 3.1.3: Local consultations, travels and assessments Item: Local supervision & monitoring Calculation: unit cost @ 3000 X 5 (Years) No. years: 4 (Year 1: 3000 Year 2: 6000 Year 3: 3000 Year 4: 3000) Sub-total = 15000					15,000	15,000	15,000 MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.1: Document good practices on water conservation and sustainable water resources management and approaches for scale up Item: Workshops/Meetings Calculation: unit cost @ 7500 X 4 (No of workshops) No. years: 4 (Year 2: 7500 Year 3: 7500 Year 4: 7500 Year 5: 7500) Sub-total = 30000					30,000	30,000	30,000 MoWHS

Training, Workshops, Meeting	Output 4.1, Activity 4.1.1: Document information on the successes and lessons learned from innovative nature based solutions and financing mechanisms, implementation of PPP arrangements and private sector partnerships to deliver water utility services and Community based water and infrastructure management for climate resilience Item: Consultation workshop. Calculation: unit cost @ 7500 X 2 (No of workshops) No. years: 2 ( Year 4: 7500 Year 5: 7500) Sub-total = 15000							15,000	15,000			15,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.1: Prepare a communication plan on dissemination of lessons, best practices and other information to stakeholders Item: Communication planning workshop. Calculation: unit cost @ 5000 X 1 (No of workshops) No. years: 1 (Year 1: 5000) Sub-total = 5000							5,000	5,000			5,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.1: Study visit and exchange programs among farmers, community and local government functionaries Item: Study tour. Calculation: unit cost @ 7000 X 1 (No of Study tours) No. years: 1 ( Year 4: 7000) Sub-total = 7000							7,000	7,000			7,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.2: conferences and workshops to strengthen south-south cooperation and knowledge sharing Item: Conferences and workshops to strengthen south-south cooperation and knowledge sharing (5 person per conference/workshop). Calculation: unit cost @ 12500 X 4 (No of conferences) No. years: 4 ( Year 2: 12500 Year 3: 12500 Year 4: 12500 Year 5: 12500) Sub-total = 50000							50,000	50,000			50,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.2: exhibitions, workshops, events Item: Events for dissemination and awareness. Calculation: unit cost @ 5000 X 3 (No of events) No. years: 1 ( Year 5: 15000) Sub-total = 15000							15,000	15,000			15,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.2: publication in websites of UNDP, MoWHS, NECS and Dzongkhag Item: Publication in websites of UNDP, MoWHS, NECS and Dzongkhag Calculation: unit cost @ 500 X 4 (Web publication design) No. years: 1 ( Year 5: 1200) Sub-total = 1200							1,200	1,200			1,200	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.2: Study visit and exchange programs among local government functionaries, local technical staff. Item: Study visit and exchange programs among local government functionaries, local technical staff. Calculation: unit cost @ 10000 X 2 (No of Study tours) No. years: 2 (Year 1: 10000 Year 4: 10000) Sub-total = 20000							20,000	20,000			20,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Gender safeguards Item: Review and revise GAP during the first 6 months of implementation period. Calculation: unit cost @ 15000 X 1 (LS) No. years: 1 (Year 1: 15000) Sub-total = 15000							15,000	15,000			15,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Gender safeguards Item: Training on gender safeguards (i. Understanding basic gender terms, changing attitudes, norms, stereotypes, basic gender parental responsibilities, behaviours and practices to promote gender equality and prevent domestic and gender-based violence (GBV) ii. Awareness on sexual harassment - various Acts and regulations related to sexual harassment and reporting mechanism iii. Awareness on the need for gender mainstreaming). Calculation: unit cost @ 8000 X 4 (No workshops) No. years: 3 (Year 1: 16000 Year 2: 8000 Year 3: 8000) Sub-total = 32000							32,000	32,000			32,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: ESMP, Archeological and chance find mechanism cost Calculation: unit cost @ 25000 X 1 (LS) No. years: 4 (Year 2: 6250 Year 3: 6250 Year 4: 6250 Year 5: 6250) Sub-total = 25000							25,000	25,000			25,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: ESMP, Updating the social and environmental management framework and Stakeholder engagement plan during first six months of the project (Stakeholders and community consultations, participation of communities in assessments, GRM etc.) Calculation: unit cost @ 20000 X 1 (LS) No. years: 1 (Year 1: 20000) Sub-total = 20000							20,000	20,000			20,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: ESMP for activity and location water supply scheme Calculation: unit cost @ 6500 X 9 (workshops/writeshop) No. years: 2 (Year 1: 29250 Year 2: 29250) Sub-total = 58500							58,500	58,500			58,500	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: KM - Training on Safeguards and gender orientation to project staff and stakeholders. Calculation: unit cost @ 7000 X 1 (No of Training Workshops) No. years: 1 (Year 1: 7000) Sub-total = 7000							7,000	7,000			7,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: KM - Training to project staff and local stakeholders on the project GRM process. Calculation: unit cost @ 100 X 110 (No of participants) No. years: 1 (Year 1: 11000) Sub-total = 11000							11,000	11,000			11,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.3: Social and environmental safeguards Item: Site and activity specific ESIA for the four schemes after finalization of activity designs Calculation: unit cost @ 4000 X 4 (LS per sites) No. years: 1 (Year 1: 16000) Sub-total = 16000							16,000	16,000			16,000	MoWHS
Training, Workshops, Meeting	Output M&E, Activity 4.1.3: Gender safeguards Item: Annual implementation review of Gender Action Plan Calculation: unit cost @ 2500 X 8 (No of Meetings/Workshops (4 meeting each for safeguards and gender)) No. years: 4 (Year 1: 5000 Year 2: 5000 Year 3: 5000 Year 4: 5000) Sub-total = 20000								0	20,000		20,000	MoWHS
Training, Workshops, Meeting	Output M&E, Activity 4.1.3: MTR and TE Item: Field consultations and meetings related to MTR. Calculation: unit cost @ 2500 X 5 (No of workshops/consultations) No. years: 1 ( Year 3: 12500) Sub-total = 12500								0	12,500		12,500	UNDP
Training, Workshops, Meeting	Output M&E, Activity 4.1.3: MTR and TE Item: Field consultations and meetings related to Terminal Evaluation. Calculation: unit cost @ 2500 X 6 (No of workshops/consultations) No. years: 1 ( Year 5: 15000) Sub-total = 15000								0	15,000		15,000	UNDP
Training, Workshops, Meeting	Output M&E, Activity 4.1.3: Project governance and monitoring Item: Annual Planning and review workshop which includes plan preparation and monitoring of indicators in project results framework for adaptive management, annual lesson learning session among project stakeholders; Complete annual PIR and conduct mid-year review of annual work plan implementation status for adaptive management of project activities Calculation: unit cost @ 3000 X 20 (No of workshops) No. years: 5 (Year 1: 12000 Year 2: 12000 Year 3: 12000 Year 4: 12000 Year 5: 12000) Sub-total = 60000								0	60,000		60,000	MoWHS
Training, Workshops, Meeting	Output M&E, Activity 4.1.3: Project governance and monitoring Item: Baseline Survey and assessment as necessary to update all indicators in the results framework at mid-term and end of project. Calculation: unit cost @ 10000 X 2 (Baseline surveys) No. years: 2 (Year 1: 10000 Year 5: 10000) Sub-total = 20000								0	20,000		20,000	MoWHS
Training, Workshops, Meeting	Output M&E, Activity 4.1.3: Project governance and monitoring Item: Technical Advisory Committee meetings and sessions. Calculation: unit cost @ 200 X 10 (No to meetings/workshops) No. years: 5 (Year 1: 2400 Year 2: 2400 Year 3: 2400 Year 4: 2400 Year 5: 2400) Sub-total = 12000								0	12,000		12,000	MoWHS
Training, Workshops, Meeting	Output M&E, Activity 4.1.3: Social and environmental safeguards Item: Annual implementation review of social and environment safeguards and GRM. Calculation: unit cost @ 2500 X 8 (No of Meetings/Workshops (4 meeting each for safeguards and gender)) No. years: 4 (Year 1: 5000 Year 2: 5000 Year 3: 5000 Year 4: 5000) Sub-total = 20000								0	20,000		20,000	MoWHS
Training, Workshops, Meeting	Output PMC, Activity 4.1.3: Project governance and monitoring Item: Convene project inception workshop within first 60 days of the project to review, update and elaborate project plans and management arrangements. Calculation: unit cost @ 5000 X 1 (No of workshops) No. years: 1 (Year 1: 5000) Sub-total = 5000								0		5,000	5,000	MoWHS
Training, Workshops, Meeting	Output PMC, Activity 4.1.3: Project governance and monitoring Item: 30 sessions. Calculation: unit cost @ 1000 X 10 (No of workshops) No. years: 5 (Year 1: 2000 Year 2: 2000 Year 3: 2000 Year 4: 2000 Year 5: 2000) Sub-total = 10000								0		10,000	10,000	MoWHS



	Output 4.1, Activity 4.1.4. Support implementation of water resource management curriculum at tertiary education level including (2 tertiary institutions) Item: Meetings/Workshops – water resource management curriculum at tertiary education level including (2 tertiary institutions) Calculation: unit cost @ 4500 X 4 (No to meetings/workshops) No. years: 1 (Year 1: 18000) Sub-total = 18000						18,000	18,000						18,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.4. Support technical capacity and skills in water supply engineering and Climate and hydrological modeling ( 5 officials) Item: Training – Technical capacity and skills in water supply engineering and Climate and hydrological modeling Calculation: unit cost @ 21400 X 5 (No of people trained) No. years: 1 ( Year 2: 107000) Sub-total = 107000						107,000	107,000						107,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.4. Training of trainers on climate resilient water infrastructure design, planning, implementation and O&M (10 officials, Ex country training) Item: Training of trainers - on climate resilient water infrastructure design, planning, implementation and O&M Calculation: unit cost @ 21400 X 10 (No of people trained) No. years: 1 ( Year 2: 214000) Sub-total = 214000						214,000	214,000						214,000	MoWHS
Training, Workshops, Meeting	Output 4.1, Activity 4.1.5. Support diagnosis, analytical capacity and water quality testing capacities at 21 Primary Health Care Centers of 3 Dzongkhags Item: Training on water testing Calculation: unit cost @ 40 X 50 (No of people trained) No. years: 1 ( Year 4: 2000) Sub-total = 2000						2,000	2,000						2,000	MoWHS
Training, Workshops, Meeting	Output 4.2, Activity 4.2.1: Develop harmonized comprehensive database on water resources and infrastructure within the Punatsangchu river basin ( for water security index system on water for urban, rural, economic, environment, disaster and climate resilience) Item: Training Workshop-information sharing and reporting mechanism and information system (30 participants*5 days*3 times* Calculation: unit cost @ 4500 X 3 (No of workshops) No. years: 1 ( Year 3: 13500) Sub-total = 13500						13,500	13,500						13,500	MoWHS
Training, Workshops, Meeting	Output 4.2, Activity 4.2.2: Carry out overall situation analysis of river basin in terms of its ecological health and the social and economic circumstances including water security index and impact of climate change on water sector in Bhutan; Highlight of key issues faced in establishment and functioning of the agency for water utilities at national level; River Basin Management Committees (RBMCs), Dzongkhag Water Management Committees (DWMs) and Wa-ter User Associations (WUAs) Item: Survey/workshop – situational analysis of river basin in terms of its ecological health and the social and economic circumstances including water security index and impact of climate change on water sector in Bhutan. Calculation: unit cost @ 4500 X 3 (No of workshops) No. years: 1 ( Year 3: 13500) Sub-total = 13500						13,500	13,500						13,500	MoWHS
Training, Workshops, Meeting	Output 4.2, Activity 4.2.2: Develop a commonly agreed SOBR format and document SOBR for Punatsangchu river basin and institute mechanism for regular reporting and sharing of data and reports on state of river basin Item: Workshop/meetings for SOBR format and process. Calculation: unit cost @ 7000 X 1 (No workshops) No. years: 1 ( Year 3: 7000) Sub-total = 7000						7,000	7,000						7,000	MoWHS
Training, Workshops, Meeting	Output 4.2, Activity 4.2.2: Develop a commonly agreed SOBR format and document SOBR for Punatsangchu river basin and institute mechanism for regular reporting and sharing of data and reports on state of river basin Item: Workshop/meetings for SOBR format and process. Calculation: unit cost @ 4500 X 3 (No of workshops) No. years: 3 ( Year 3: 4590 Year 4: 4455 Year 5: 4455) Sub-total = 13500						13,500	13,500						13,500	MoWHS
Travel	Output 2.1, Activity 2.1.2: SMART patrolling capacity and system in four project sites Item: SMART Patrolling system monitoring costs Calculation: unit cost @ 12000 X 1 (LS ) No. years: 4 ( Year 2: 3000 Year 3: 3000 Year 4: 3000 Year 5: 3000) Sub-total = 12000					12,000								12,000	MoWHS
Travel	Output 2.2, Activity 2.2.2: Promote of mulching technologies to conserve soil water in Kuchi watershed gewogs and Sertghang Item: Field monitoring of mulching activities. Calculation: unit cost @ 2500 X 1 (Yearly) No. years: 4 (Year 1: 625 Year 2: 625 Year 3: 625 Year 4: 625) Sub-total = 2500					2,500								2,500	MoWHS
Travel	Output PMC, Activity 4.1.3: Establish PMU Item: Project Transport Hire Calculation: unit cost @ 750 X 60 (No of months) No. years: 5 (Year 1: 9000 Year 2: 9000 Year 3: 9000 Year 4: 9000 Year 5: 9000) Sub-total = 45000												0	45,000	MoWHS
Travel	Output PMC, Activity 4.1.3: Establish PMU Item: Staff travels Calculation: unit cost @ 500 X 60 (No of months) No. years: 5 (Year 1: 3000 Year 2: 6300 Year 3: 8400 Year 4: 7800 Year 5: 4500) Sub-total = 30000												0	30,000	MoWHS
Supplies	Output PMC, Activity 4.1.3: Establish PMU Item: Stationary Calculation: unit cost @ 10407 X 1 (local staff) No. years: 5 (Year 1: 2081 Year 2: 2081 Year 3: 2081 Year 4: 2081 Year 5: 2083) Sub-total = 10407												0	10,407	MoWHS
Other Operating Costs	Audio Visual&Print Prod Costs Output PMC, Activity 4.1.3: Establish PMU Item: Advertisements, notifications, announcements. Calculation: unit cost @ 6531 X 1 (LS) No. years: 5 (Year 1: 1306 Year 2: 1306 Year 3: 1306 Year 4: 1306 Year 5: 1307) Sub-total = 6531												0	6,531	MoWHS
Other Operating Costs	Output PMC, Activity 4.1.3: Project governance and monitoring Item: Conduct Annual NIM Audit Calculation: unit cost @ 2000 X 4 (No of audit sessions) No. years: 4 ( Year 2: 2000 Year 3: 2000 Year 4: 2000 Year 5: 2000) Sub-total = 8000												0	8,000	MoWHS
															UNDP
						287,000	504,860	6,669,022	918,100	8,378,982	249,500	303,938	8,932,420		

## ANNEX F: (For NGI only) Termsheet

Instructions. Please submit a finalized termsheet in this section. The NGI Program Call for Proposals provided a template in Annex A of the Call for Proposals that can be used by the Agency. Agencies can use their own termsheets but must add sections on Currency Risk, Co-financing Ratio and Financial Additionality as defined in the template provided in Annex A of the Call for proposals. Termsheets submitted at CEO endorsement stage should include final terms and conditions of the financing.

## ANNEX G: (For NGI only) Reflows

Instructions. Please submit a reflows table as provided in Annex B of the NGI Program Call for Proposals and the Trustee excel sheet for reflows (as provided by the Secretariat or the Trustee) in the Document Section of the CEO endorsement. The Agency is required to quantify any expected financial return/gains/interests earned on non-grant instruments that will be transferred to the GEF Trust Fund as noted in the Guidelines on

the Project and Program Cycle Policy. Partner Agencies will be required to comply with the reflows procedures established in their respective Financial Procedures Agreement with the GEF Trustee. Agencies are welcomed to provide assumptions that explain expected financial reflow schedules.

**ANNEX H: (For NGI only) Agency Capacity to generate reflows**

Instructions. The GEF Agency submitting the CEO endorsement request is required to respond to any questions raised as part of the PIF review process that required clarifications on the Agency Capacity to manage reflows. This Annex seeks to demonstrate Agencies' capacity and eligibility to administer NGI resources as established in the Guidelines on the Project and Program Cycle Policy, GEF/C.52/Inf.06/Rev.01, June 9, 2017 (Annex 5).