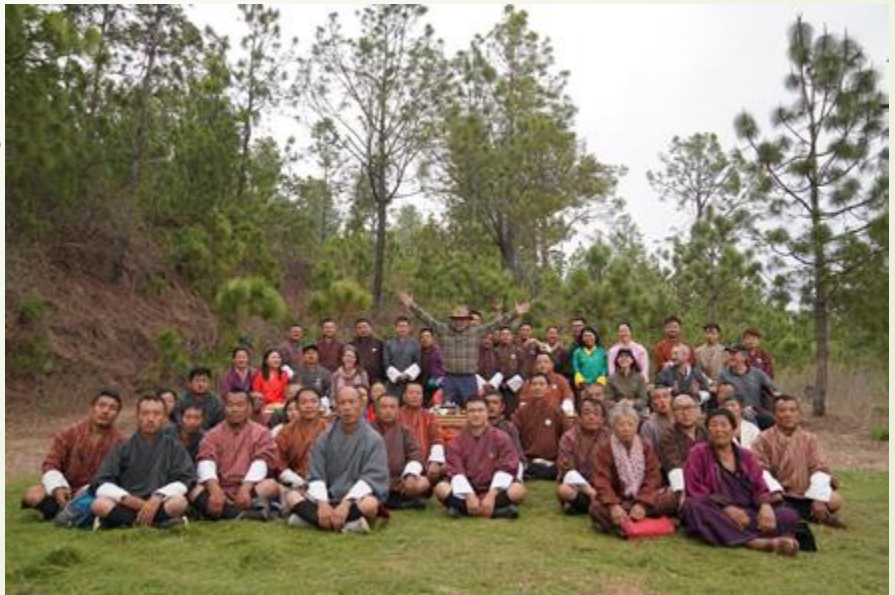
Experience sharing: Advancing Climate Resilience of the Water Sector in Bhutan.



Thinley Choden

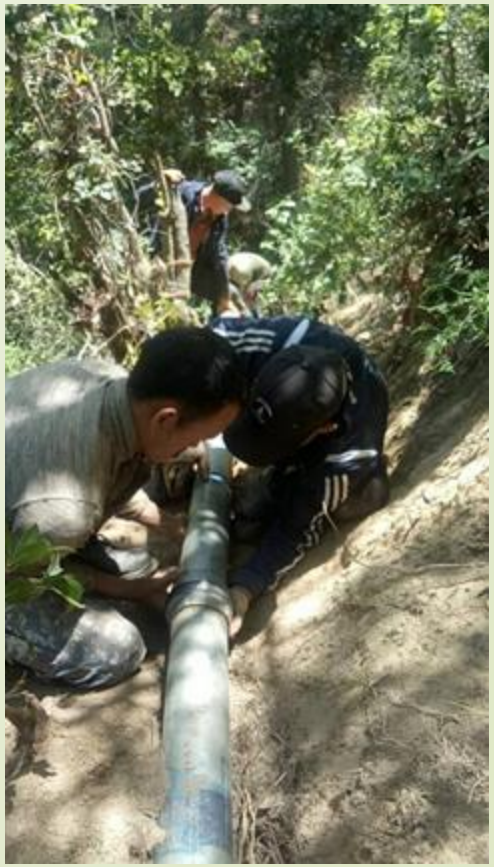
Water and Sanitation Division

Department of Infrastructure Development

Ministry of Infrastructure and Transport

PRESENTATION OUTLINE

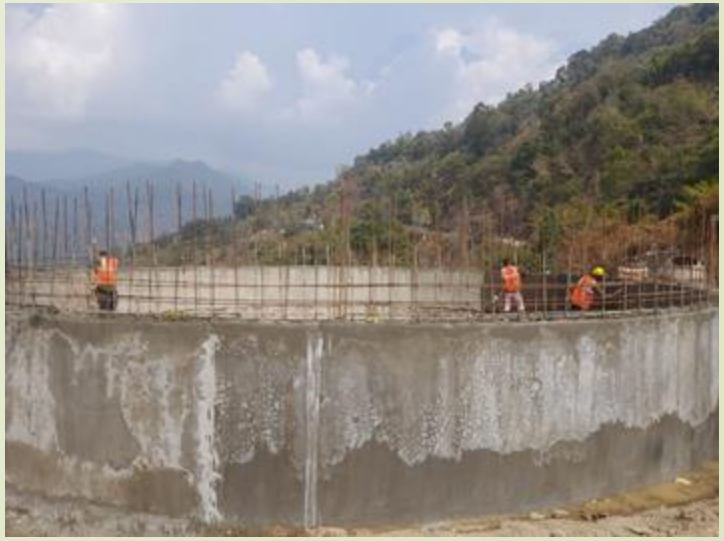
- Background
- Drinking Water Supply
- Challenges in Water Sector
- Project Overview
- Overarching Principles
- Component/Outcome/output
- Project Objectives
- Project Activities
- Lesson Learned



BACKGROUND

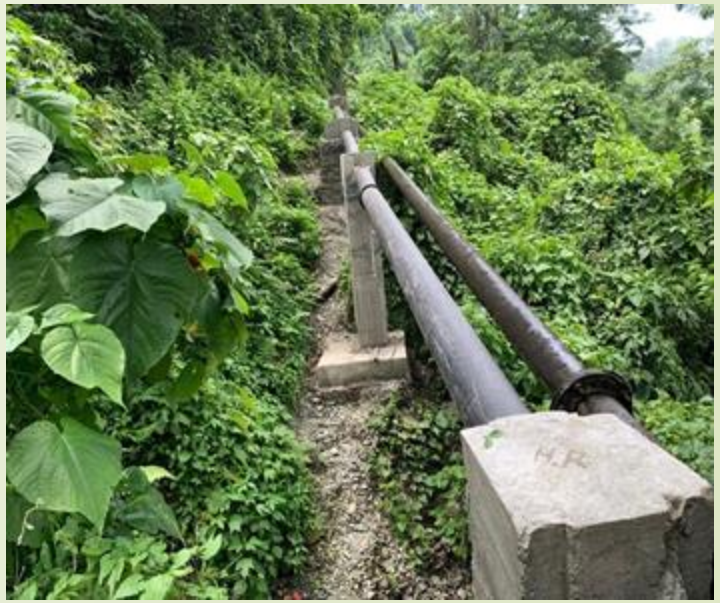
WSD under Department of Infrastructure Development, Ministry of Infrastructure and Transport. The mandates of the Division are as follows;

- Lead engineering division for water and sanitation infrastructure.
- Plan, design and construct water and sanitation infrastructure.
- Promote innovative, cost effective, sustainable infrastructure/technologies for drinking water and sanitation.
- Develop technical standards, Sops and guidelines for water and sanitation related infrastructure.



DRINKING WATER SUPPLY

- ✓ Almost all HH (99.9%) have access to improved water sources.
- ✓ 78.1 % (Urban HH) and 86.2% (Rural HH) have 24 hours access to drinking water. (Bhutan Living Standard Survey , 2022).
- ✓ Almost every urban town is provided with a conventional water treatment plant (sedimentation, filtration (slow sand filter/rapid sand filter/pressure filter) and disinfection).
- ✓ However, the Rural water supply scheme consists of an intake structure, ferro-cement reservoirs and break pressure tanks and public tap stands.

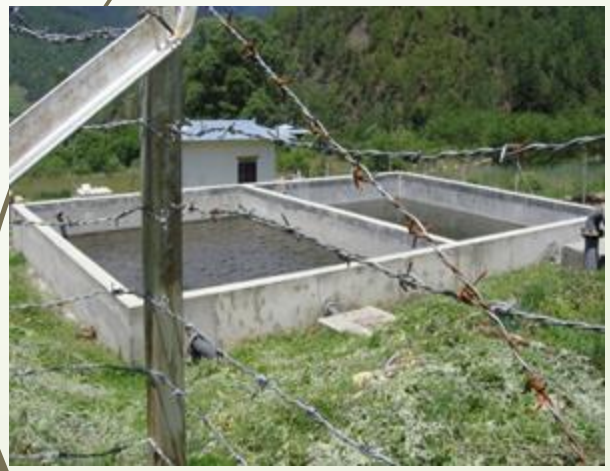


DRINKING WATER SUPPLY

DI/GI Pipes

Flocculation Tank

Sedimentation Tank



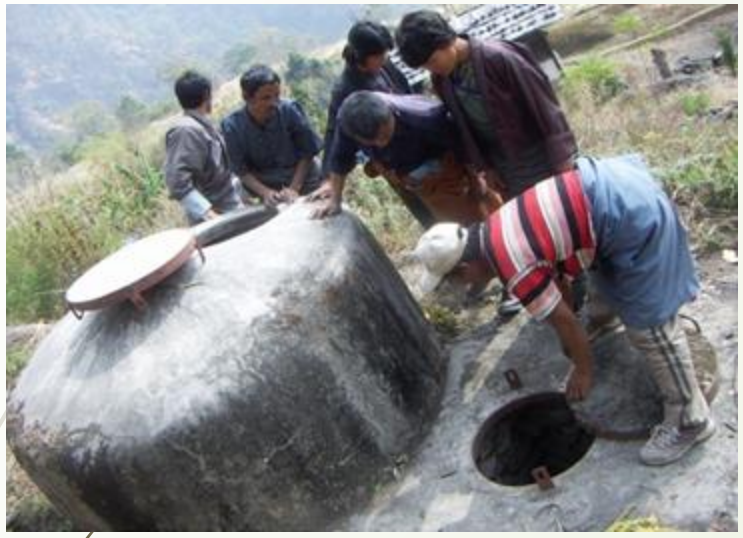
Slow Sand Filter

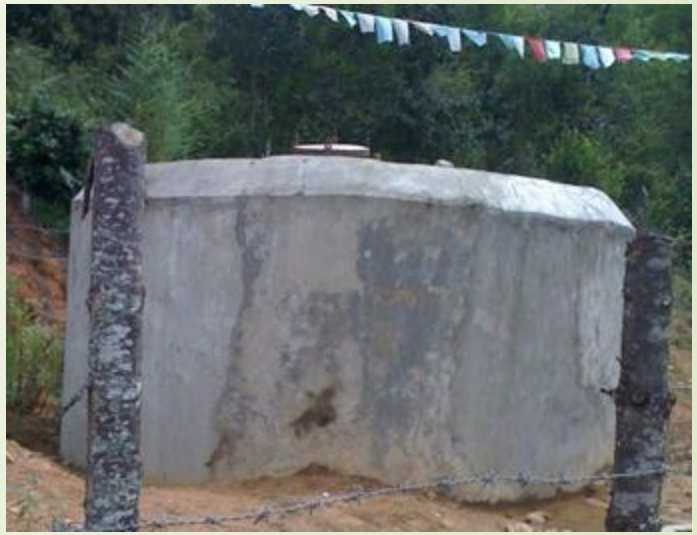
Pressure Filter

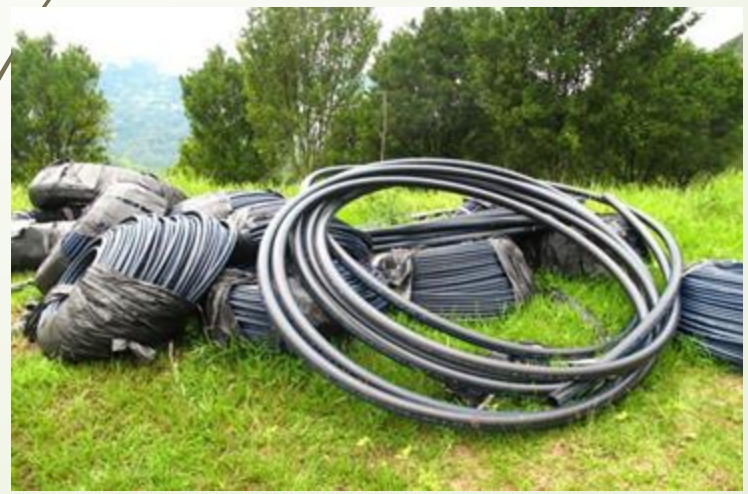
Reservoirs (Steel/RCC)

DRINKING WATER SUPPLY

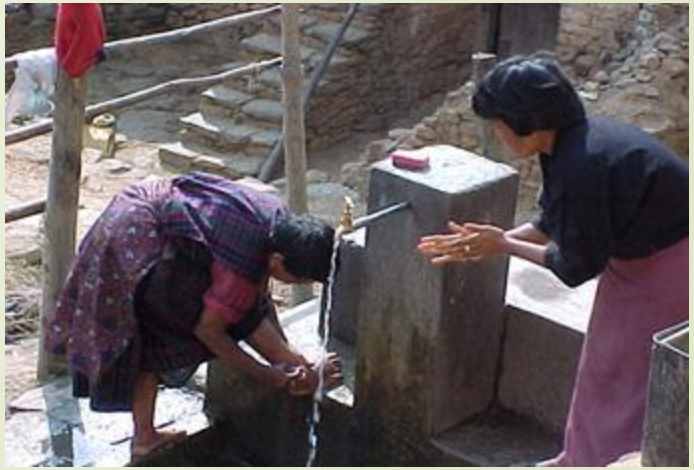
Ferro-Cement Reservoirs







HDPE/PVC Pipes



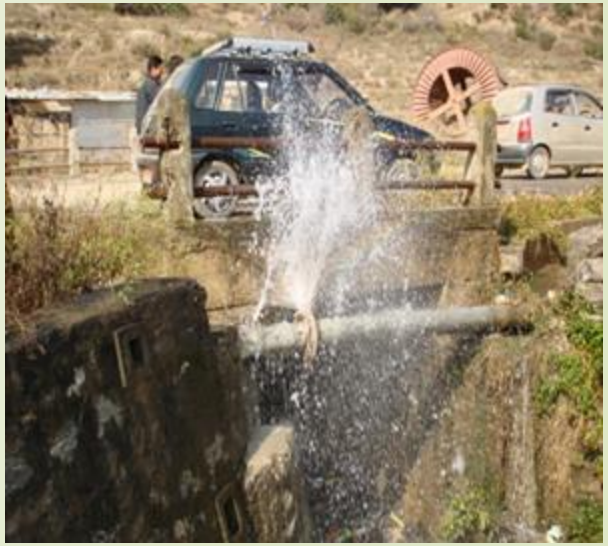
Public Tap Stand

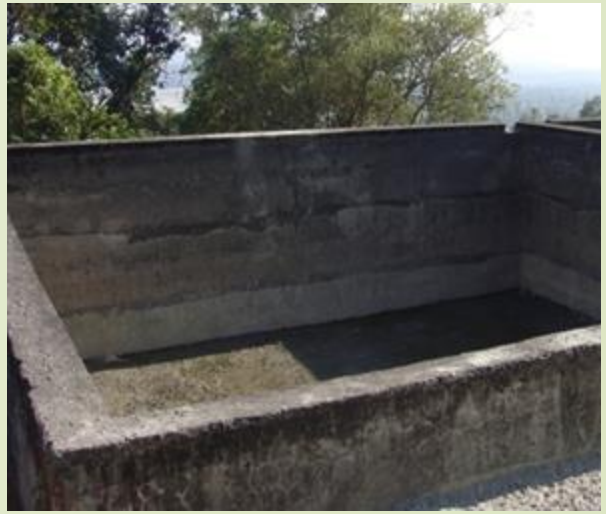
CHALLENGES IN WATER SECTOR

- ✓ Climate change (drying up of water sources, flooding, landslides etc.).
- ✓ Urbanization (Planning, budgets and infrastructure are failing to serve most urban residents especially water and sanitation services).
- ✓ Non-revenue water (NRW) is **water that has been produced and is "lost" before it reaches the customer.** Losses can be real losses (through leaks) or apparent losses (for example through theft or metering inaccuracies).
- ✓ Inadequate management/maintenance of existing water infrastructure (O&M).
- ✓ Low tariff rates (poor O&M)

CHALLENGES IN WATER SECTOR

- ✓ Inefficient water infrastructures (leakages, poor construction quality, poor maintenance and unlined channels, etc.)
- ✓ Economic development- The demand for water has increased due to population growth, changes in lifestyle, and economic advancements.
- ✓ Lack of capacity (human and financial).
- ✓ Inadequate planning time.
- ✓ Lack of data (existing water infrastructure, coverage etc.)
- ✓ Inequitable water distribution due to absence of proper hydraulic zoning.





PROJECT OVERVIEW

Advancing Climate Resilience of the Water Sector in Bhutan

GEF-

Least Developed Country Fund

August 2023- August 2028

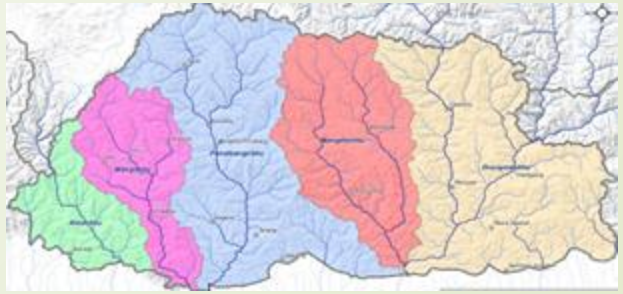
Duration: 60 months

Budget: USD 8.9 m

Ministry of Infrastructure and Transport (PMU)

Ministry of Energy and Natural Resource (DOW and DOFPS)

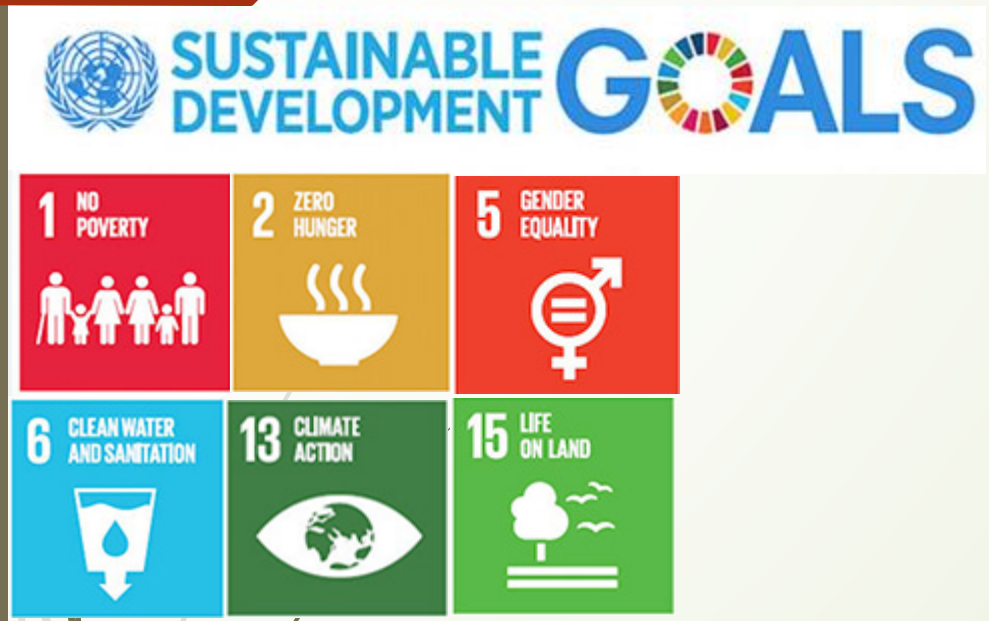
Ministry of Agriculture and Livestock (DoA)



- Tsirang
- Punakha
- Gasa

National Implementation Modality

OVERARCHING PRINCIPLES



UNDP Strategic Plan (2022-2025) and Five of the Six signature solutions 1. Poverty and Inequality; 2: Governance; 3: Resilience; 4: Environment and 6: Gender Equality

UNSDPF Outcome 2 and 4 : 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)

NKRA:
3 (Reduce poverty and inequality), 6(Carbon neutrality, Climate and Disaster), 8 (Food and Nutrition Security), 17 (Sustainable water)

COMPONENT/ OUTCOME/OUTPUT

Component 1: Water governance and institutions

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

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.

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.

2.1 Nature based solutions for watershed restorations implemented aimed at yielding stable spring/stream flows.

COMPONENT/ OUTCOME/OUTPUT

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

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.

3.1 Climate proofing measures implemented in multi-purpose storage, conveyance & distribution network of drinking & irrigation water.

3.2 Efficient drought-resilient water management technology tested and upscaled through private sector (youth-based start-ups).

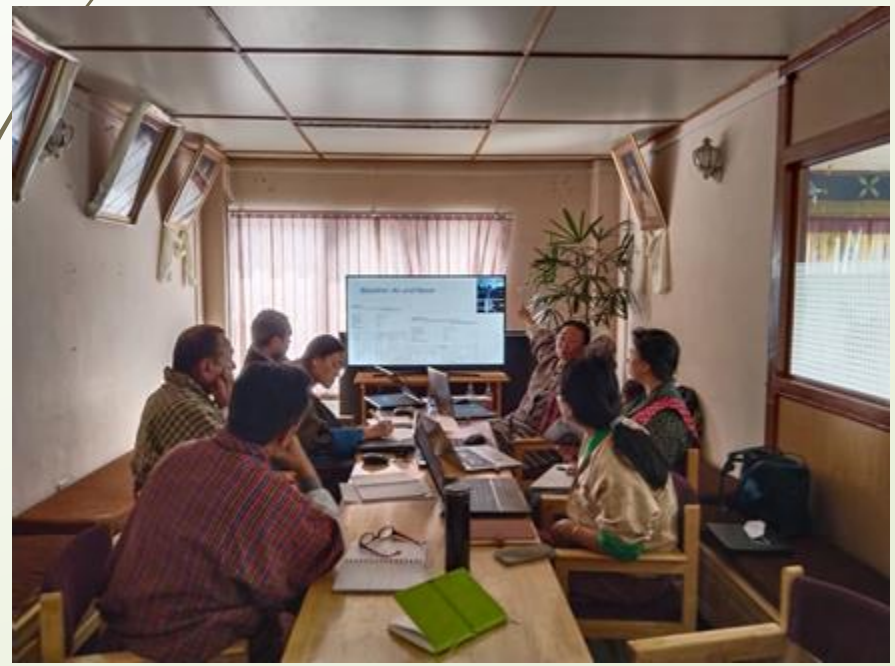
COMPONENT/ OUTCOME/OUTPUT

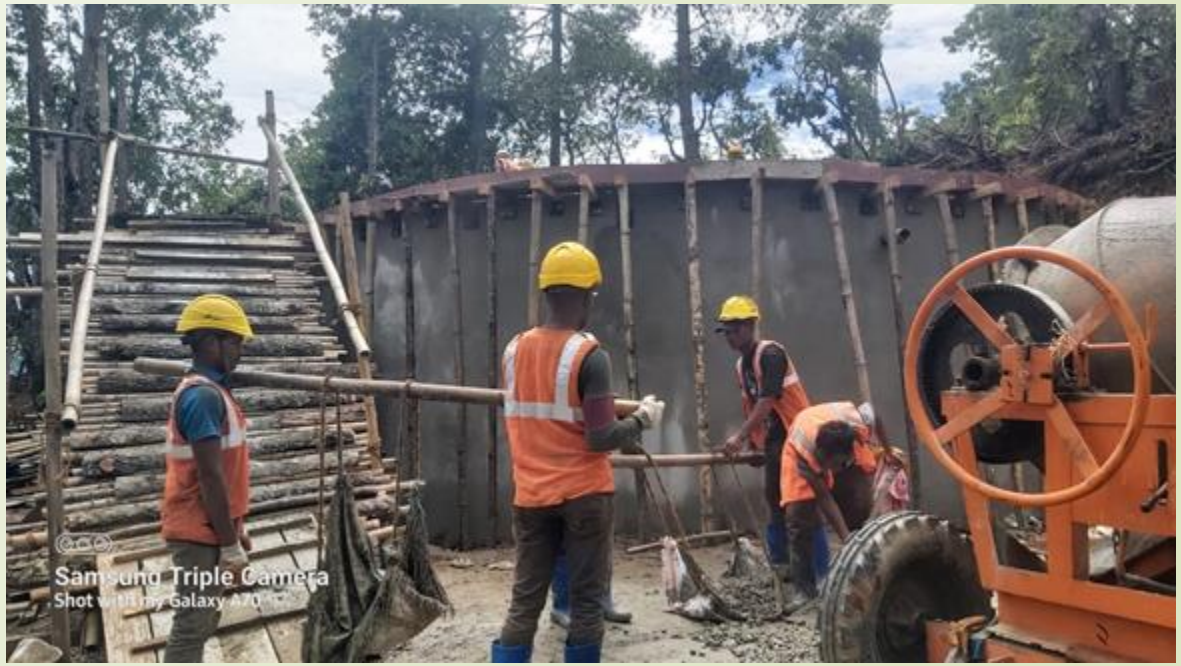
Component 4: Knowledge Management

Outcome 4: Strengthened awareness and knowledge sharing mechanism established.

4.1 Communication strategy developed and implemented on water conservation & sustainable management developed & implemented.

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





PROJECT OBJECTIVES

- ✓ Climate change-induced hazards are serious threat to Bhutan primarily because of its fragile mountain ecosystem and socio-economy.
- ✓ The mountainous terrain is highly vulnerable to diverse extreme weather events such as floods, landslides, seasonal drought, and glacial lake outburst floods (GLOFs).
- ✓ Bhutan's economy, largely dependent on agriculture, hydropower, and tourism, is intricately linked to its natural resources, making it highly susceptible to climate variability and extremes.
- ✓ Hence, risk-informed adaptation measures targeted to the vulnerable sectors and communities can help avoid losses caused by disasters and enhance the resilience of the country.
- ✓ Thus, ACREWAS project was developed with the objectives; To enhance the resilience and sustainable economic well-being of the people of Bhutan by supporting climate adaptation interventions in the water sector.

PROJECT OBJECTIVES

Directly benefit 37,334 person (19,465 male, 17,869 Female)

19,391 (Water Supply) 17,943 (Watershed services)

Restore, manage and protect 38,518 hectares of critical catchments.

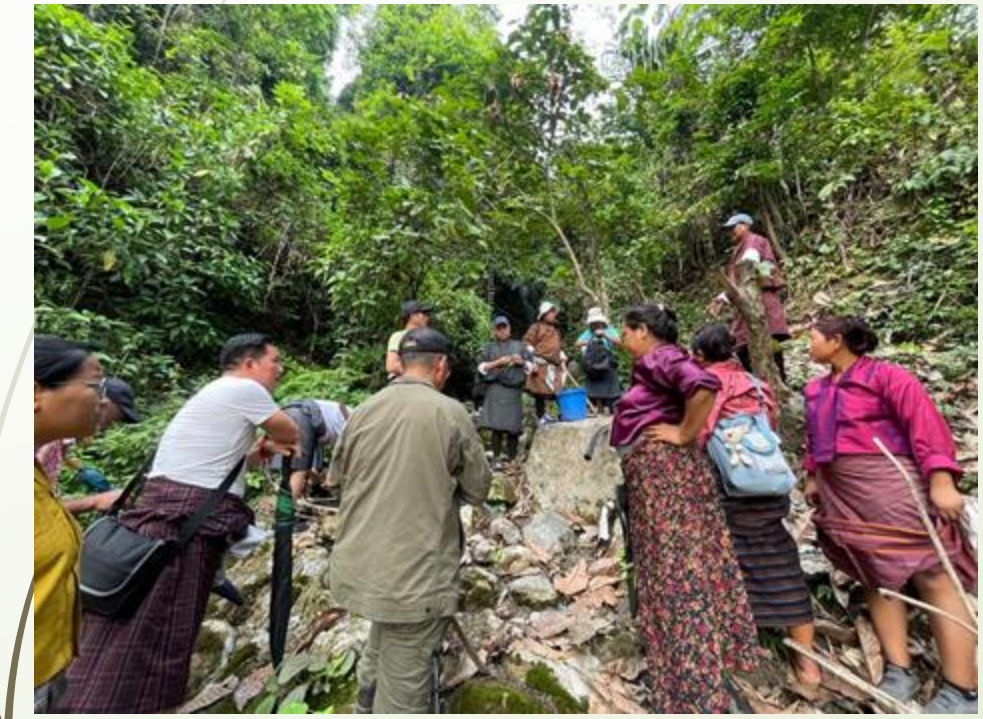
Achieved through various interventions : catchment restoration and management, climate proofing of small-scale water infrastructure, enhancing institutional capacities in O&M of infrastructure, Management of catchments, adaptation of climate smart agriculture technologies, strengthening governance etc.

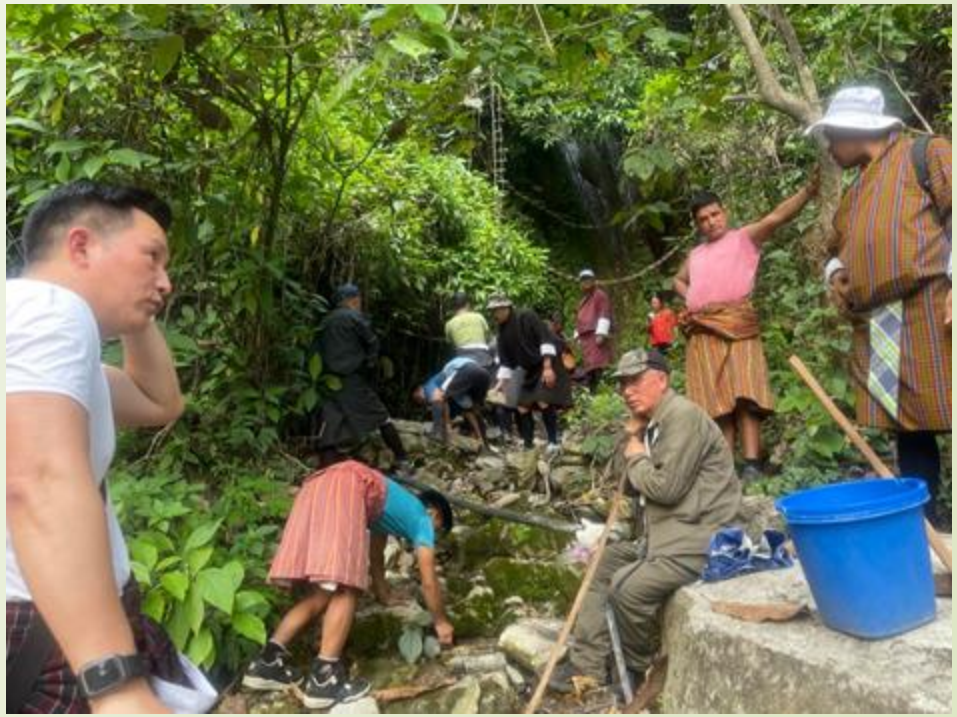
Climate Resilient Water Infrastructure

- ✓ Making infrastructure climate resilient is not just about the technologies adopted, but also about how we plan and incorporate nature-based solutions (NBS) with the conventional water supply infrastructure.
- ✓ Nature-based solutions (NBS) for water resources management involve the planned and deliberate use of ecosystem services to improve water quantity and quality and to increase resilience to climate change.
- ✓ NBS includes source water protection, watershed management, agricultural best management practices, afforestation, local forest management etc.
- ✓ Consequently, site-specific knowledge will be important in implementing NBS as the links between NBS and biodiversity are complex.

Project Activities

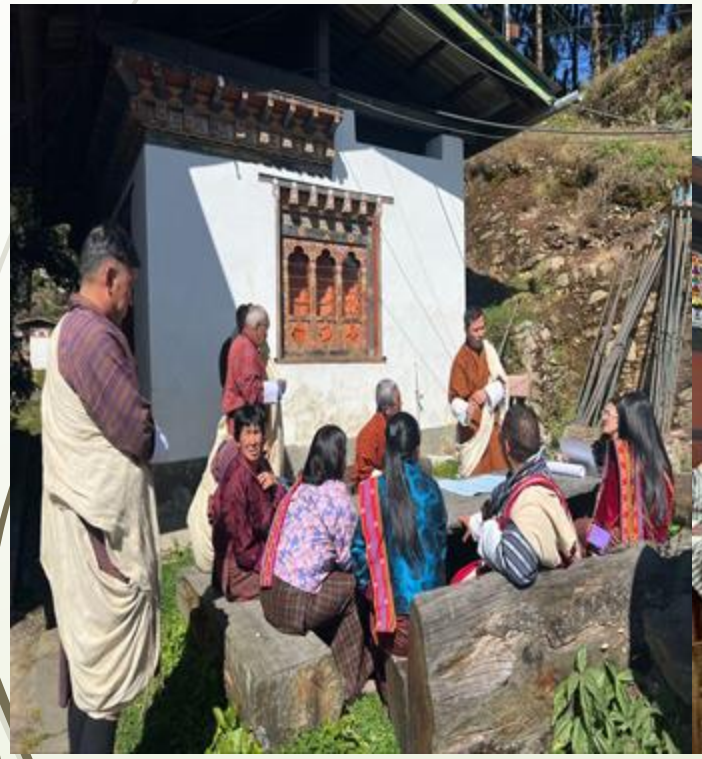
Water Source Protection (NBS); water source protection activities, includes forest protection, fencing and reforestation on lands near water sources.

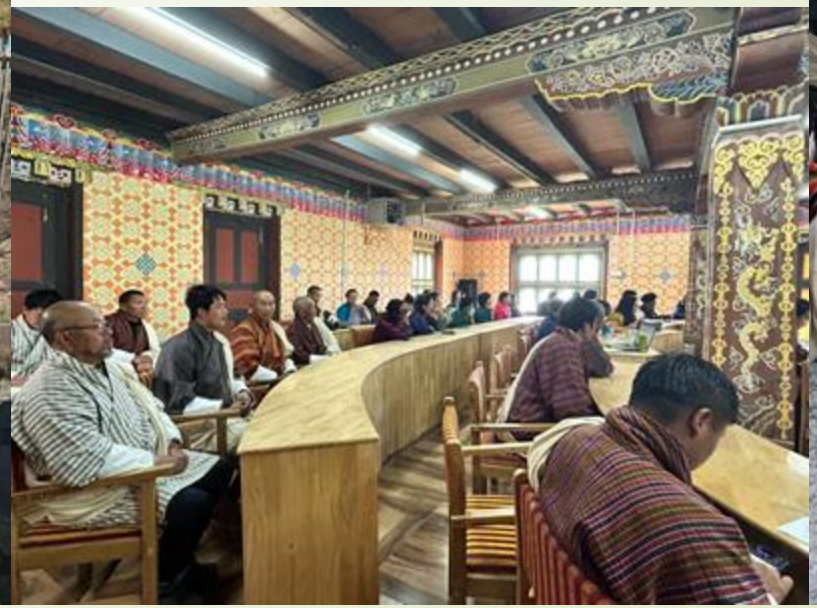


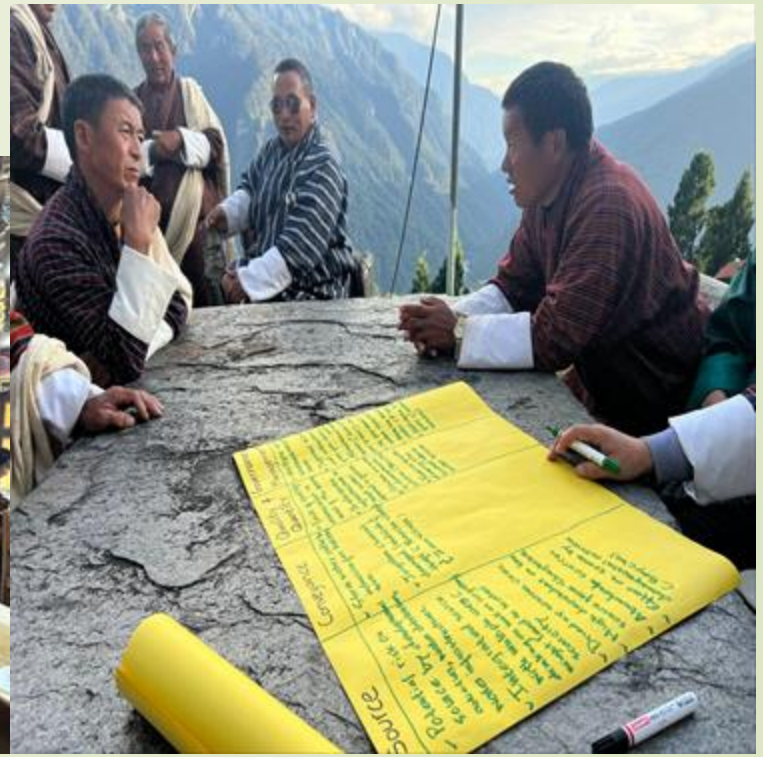


Project Activities cont.

Watershed Management (NBS): is the process of studying and managing the characteristics of a watershed to ensure the sustainable distribution of its resources.

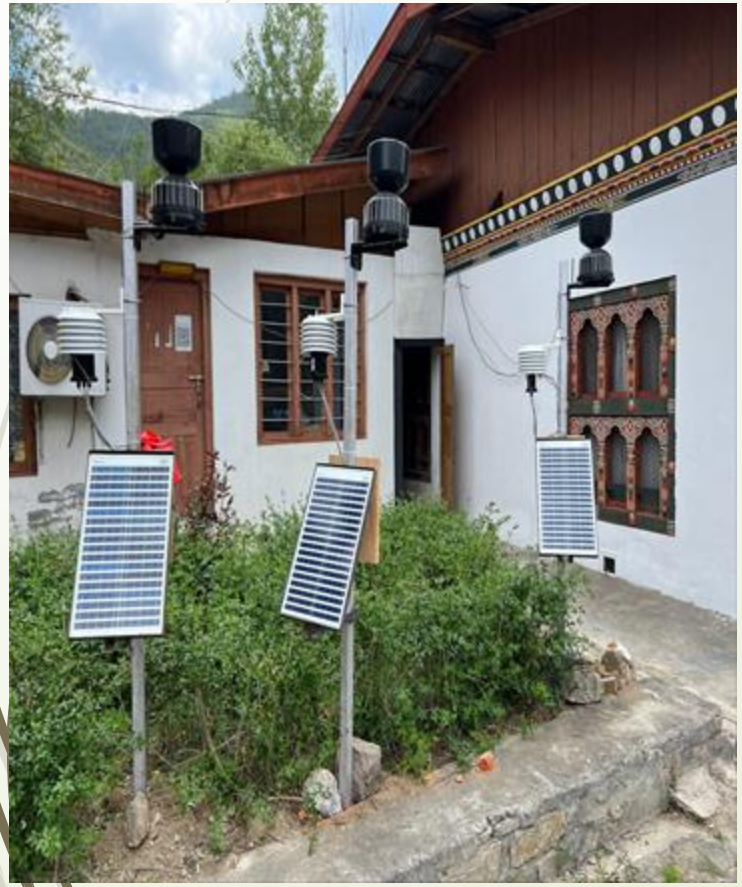


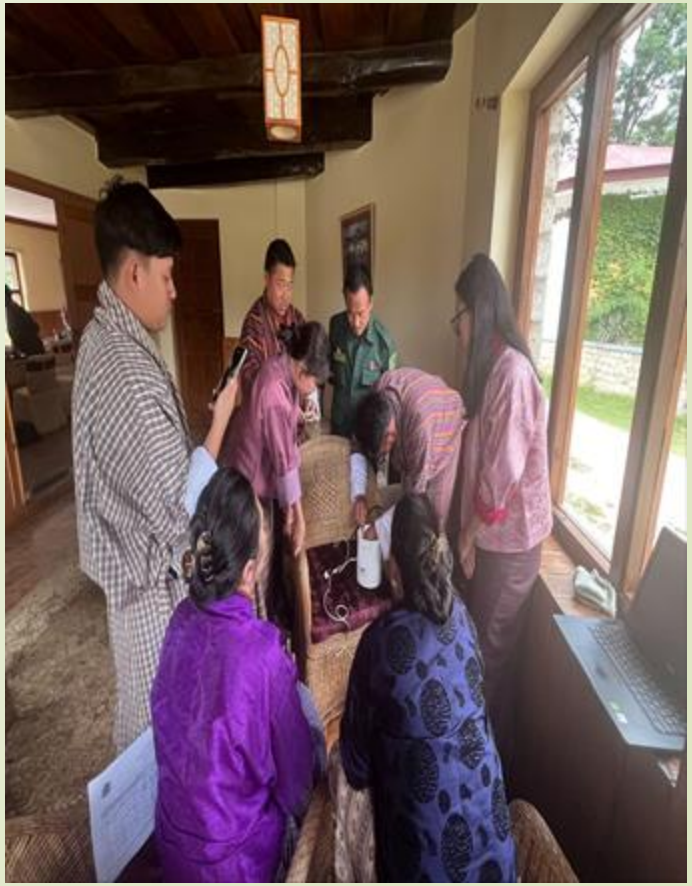




Project Activities cont.

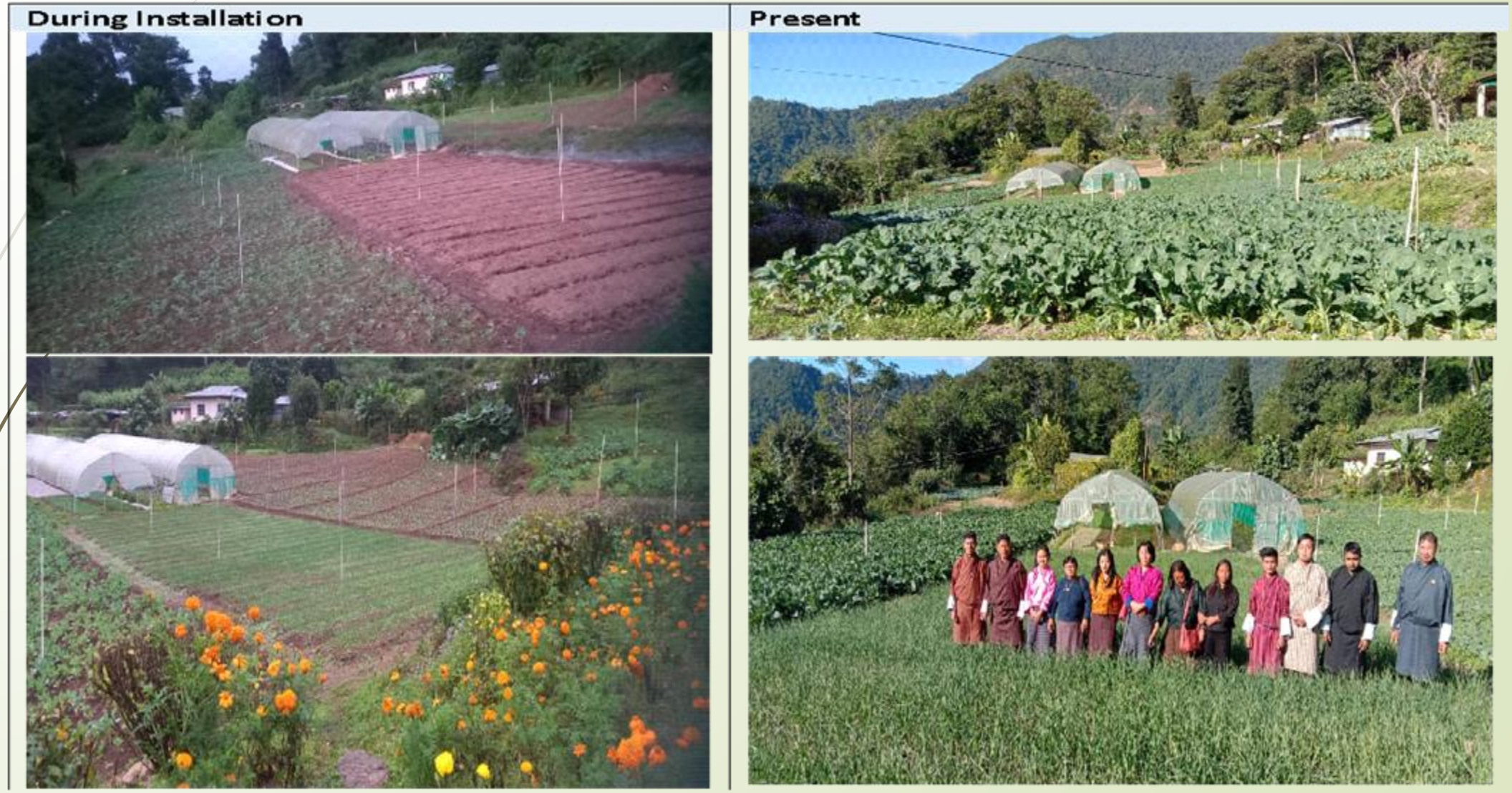
Watershed Management (NBS): Met-stations installation & monitoring for the watershed, Payment for ecosystem services (PES) for watershed protection.





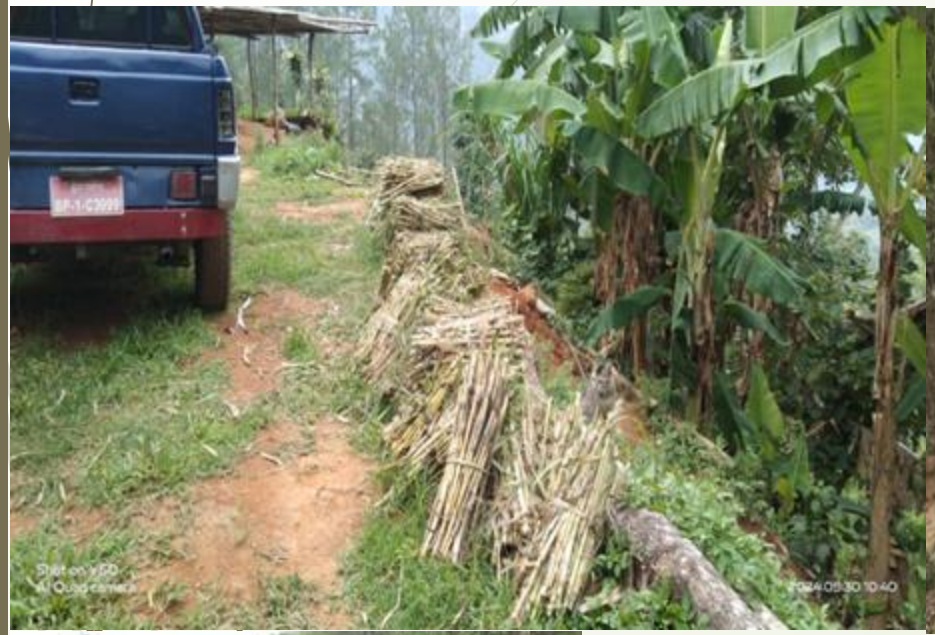
Project Activities cont.

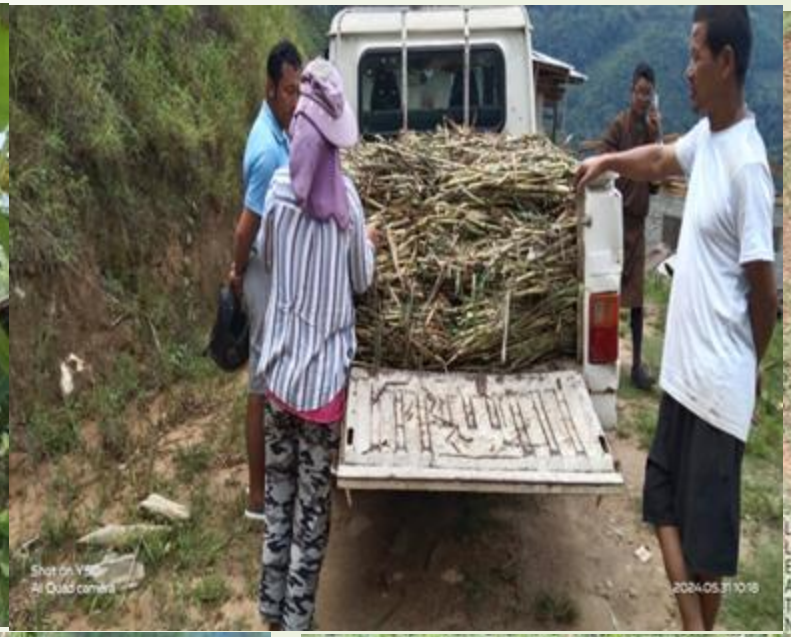
Agriculture best management practices (NBS): Use of sprinklers and drip irrigation to increase water efficiency.

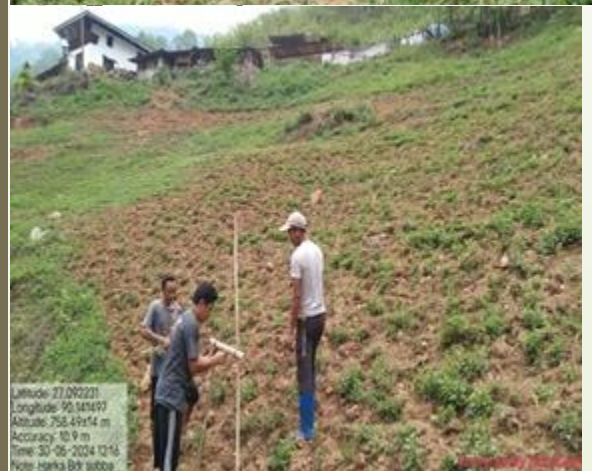


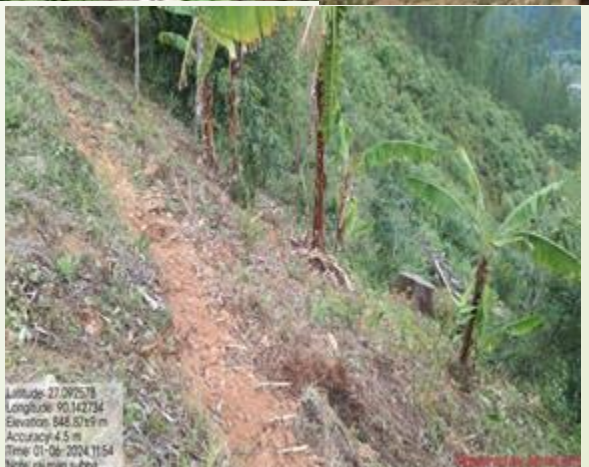
Project activities cont.

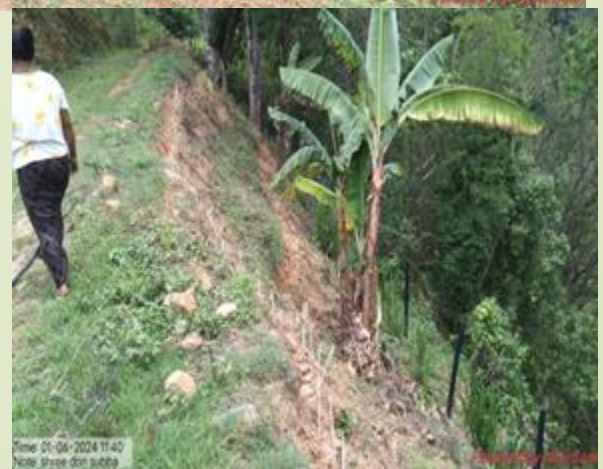
Agriculture best management practices (NBS): Terracing (hedge row plantation). This method enhances water retention and reduces soil erosion, making it an essential practice in regions with hilly terrains.









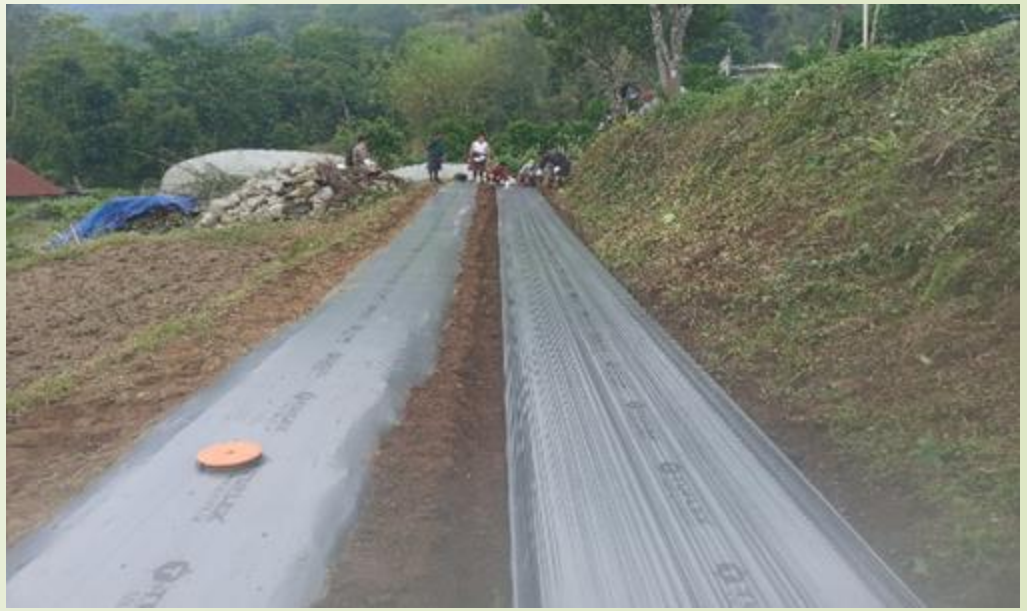


Project Activities cont.

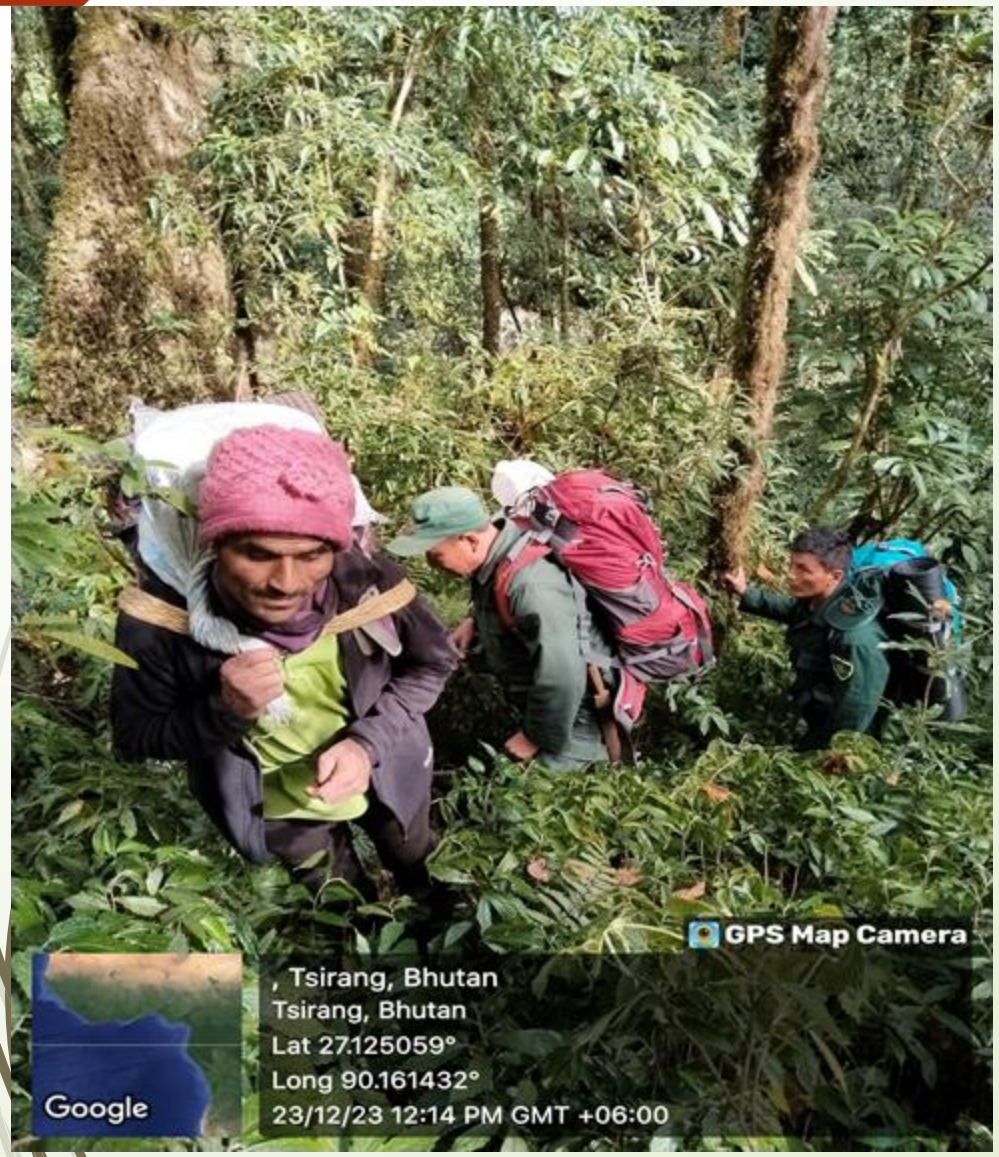
Agriculture best management practices (NBS):

The sloping topography makes it prone to soil erosion and loss of fertile topsoil. Furthermore, climate variability and climate change aggravate this situation. Thus, mulching is an affordable, sustainable agricultural technology used for sustainable soil and land management.

Mulching is a covering material of soil surface with organic/inorganic material (soil structure improvement, conserving soil moisture, control soil temperature , reduce nutrient loss, salinity and erosion problems).



Project Activities cont.



Local Forest Management :

LFMP is developed to regulate the forest resources to meet the needs of the society and industry, while preserving the forest health.

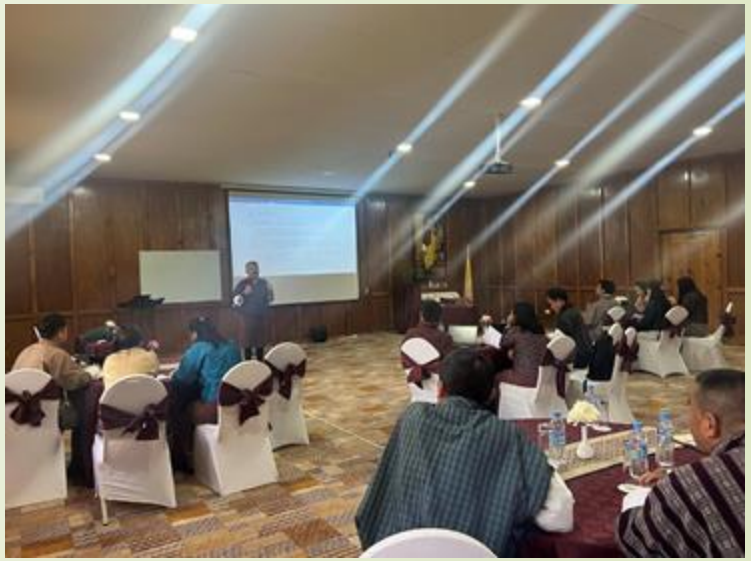
Forest management plays a crucial role in preserving the ecological, economic, and social functions of our forests.

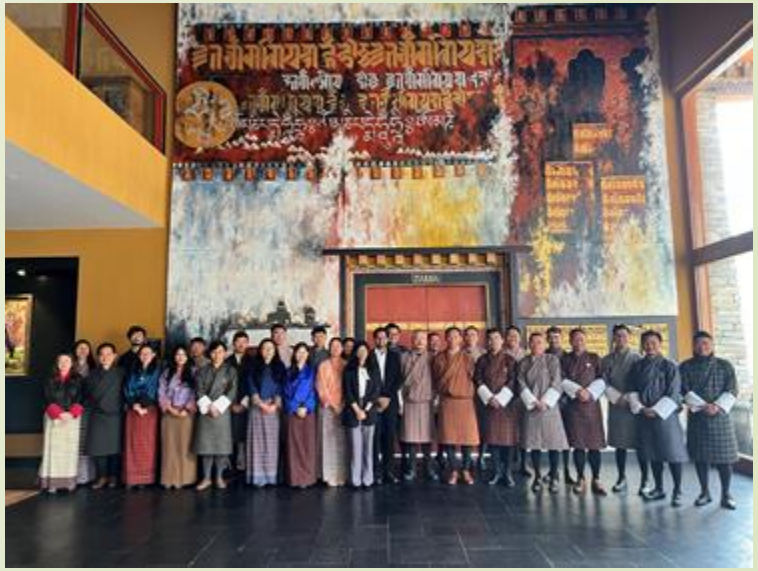
Forests function as carbon sinks, absorbing carbon dioxide from the atmosphere. Additionally, forest conservations results in natural filtration by trapping pollutants and sediments, recharging springs etc.

Project Activities cont.

Strengthen Water Governance

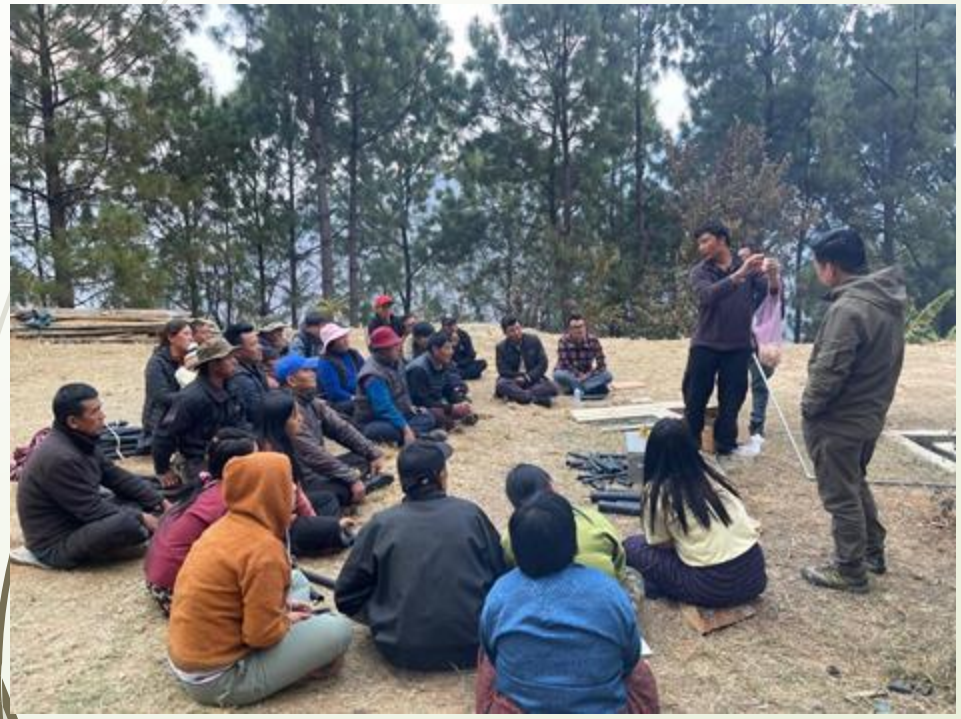
- ✓ Water governance refers to the overall framework and processes for decision-making and implementation of policies related to the use and management of water resources.
- ✓ Effective water governance is critical to ensure the sustainable and efficient use of water resources, address water-related challenges, and promote equitable access to water services.
- ✓ Thus, some of the activities implemented under the project are water tariff study, Development of water master plan, Establishment of WUA, River Basin Management, Study the feasibility of PPP in water management etc.

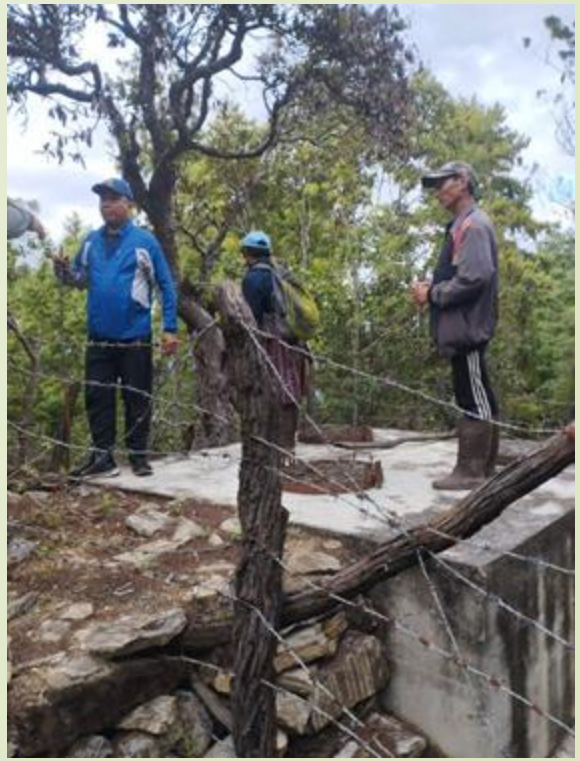




Project Activities cont.

Water Safety Plan; is a plan to ensure the safety of drinking water through comprehensive risk assessment and risk management approach that encompasses all steps in a drinking-water supply chain, from catchment to consumer.





Project Activities cont.

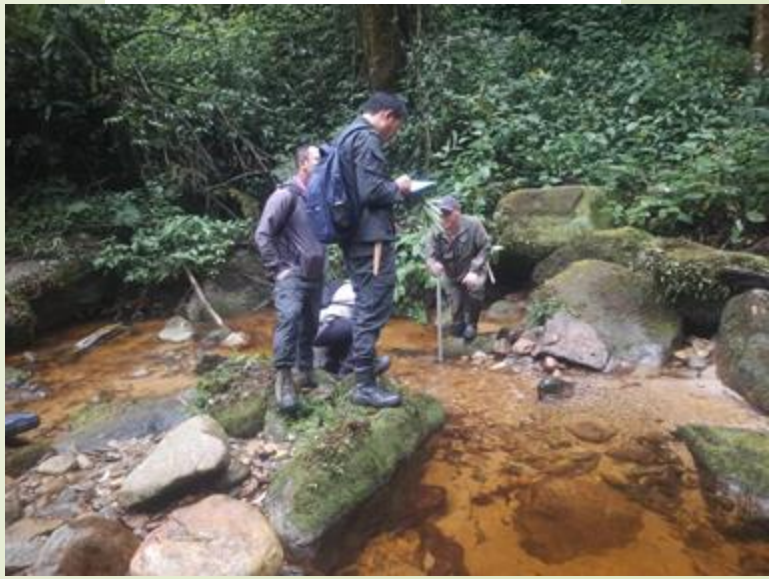
✓ **Source selection**

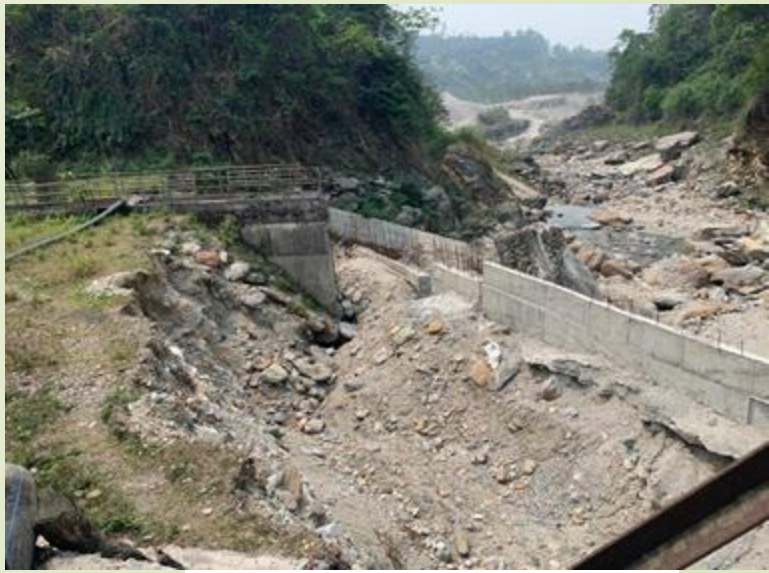
Historical information from the local communities
Yield measurement during lean seasons (April- May)
Water quality testing during monsoon (to check for turbidity)
Avoiding climate hazards (landslides, flooding etc.)

✓ **Intake**

Using RCC for the intake structures
Screens provided to filter out the debris

Yield measurement





Location on intake

Project Activities cont.

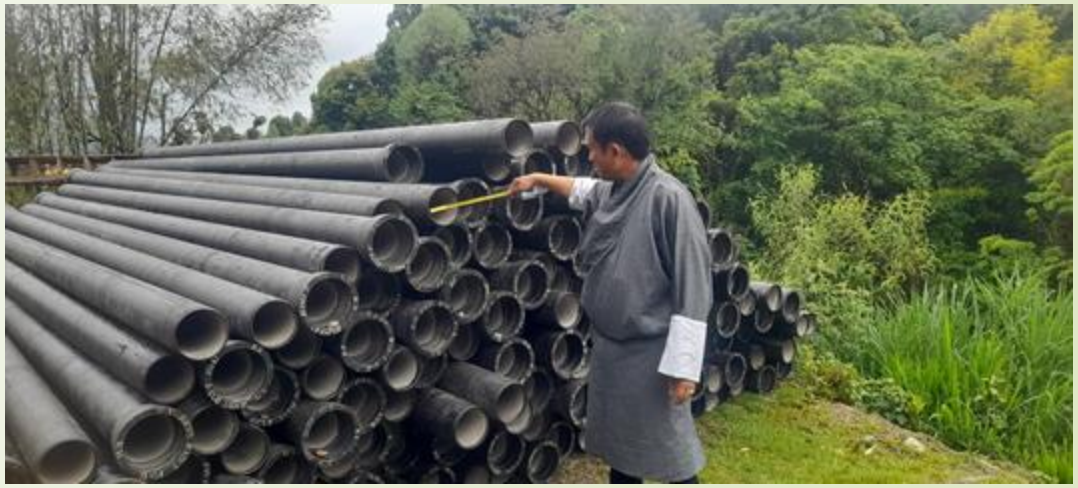
✓ **Transmission mains**

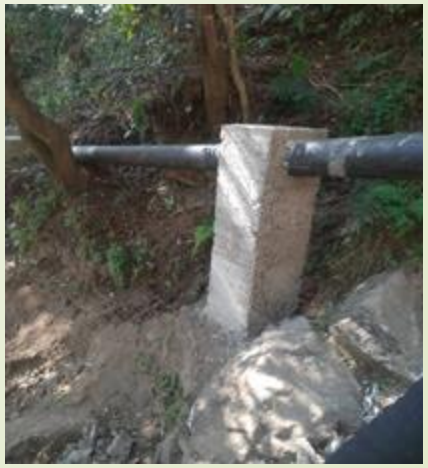
DI pipes provided to resist forest fires.

Burying adequately underground to avoid freezing temperatures, landslide and forest fires. Also to minimize impacts due to falling boulders and trees.

Appropriate appurtenances such as scour valves with chambers, RCC thrust blocks etc. are provided.

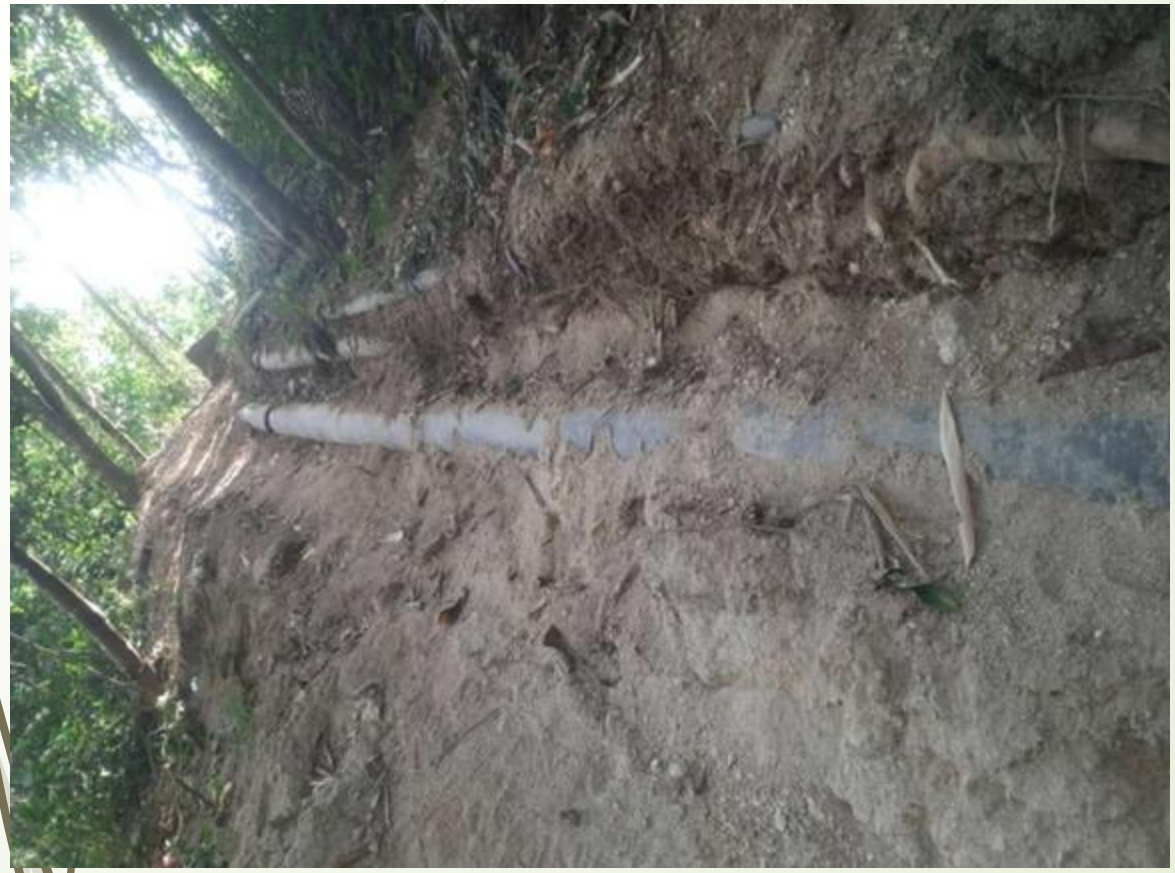
Avoiding climate hazards (landslides, flooding etc.)

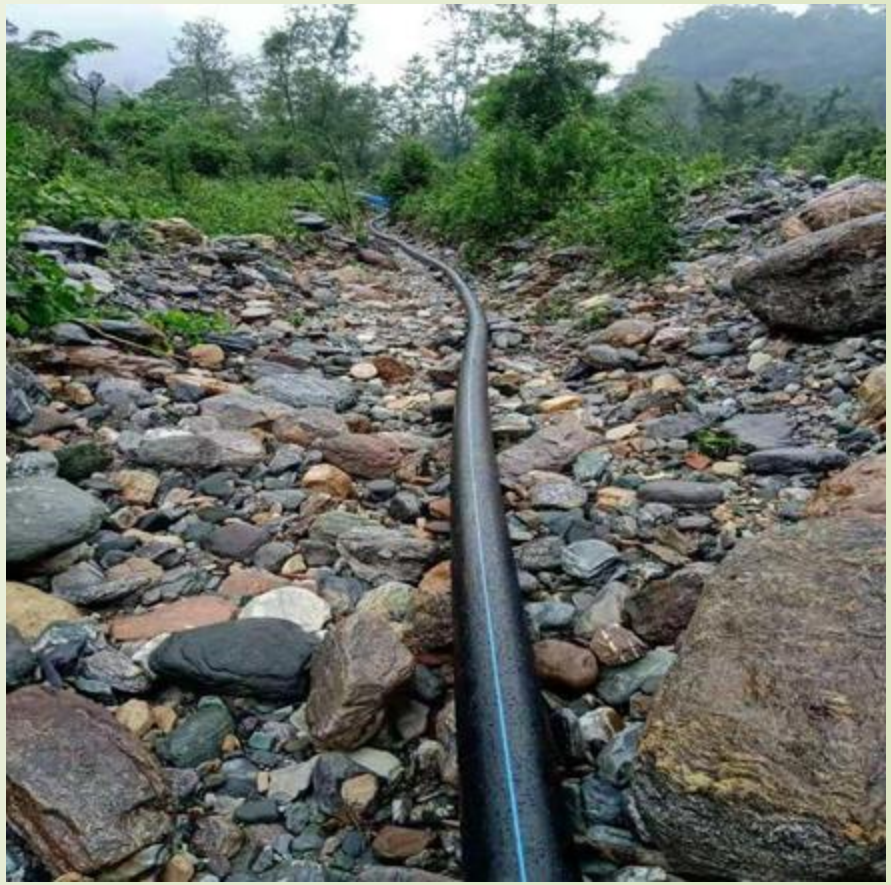




Thrust blocks

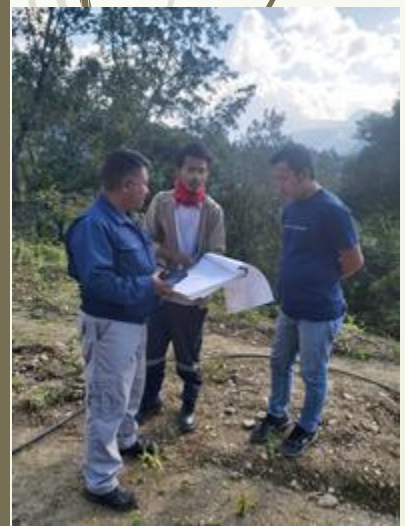
Project Activities cont.





Exposed pipes

Project Activities cont.



✓ **Water Treatment Plant/ Storage**

Appropriate treatment units such as coagulation, flocculation, clarification, filtration and disinfections provided.

Enhancing the storing capacity of the water reservoirs/tanks. (variability in precipitation patterns, rising water supply demands, climate change).

Using RCC for construction of storage tanks/reservoirs.

Provide adequate drainage to prevent water stagnation, landslides etc.

Note:

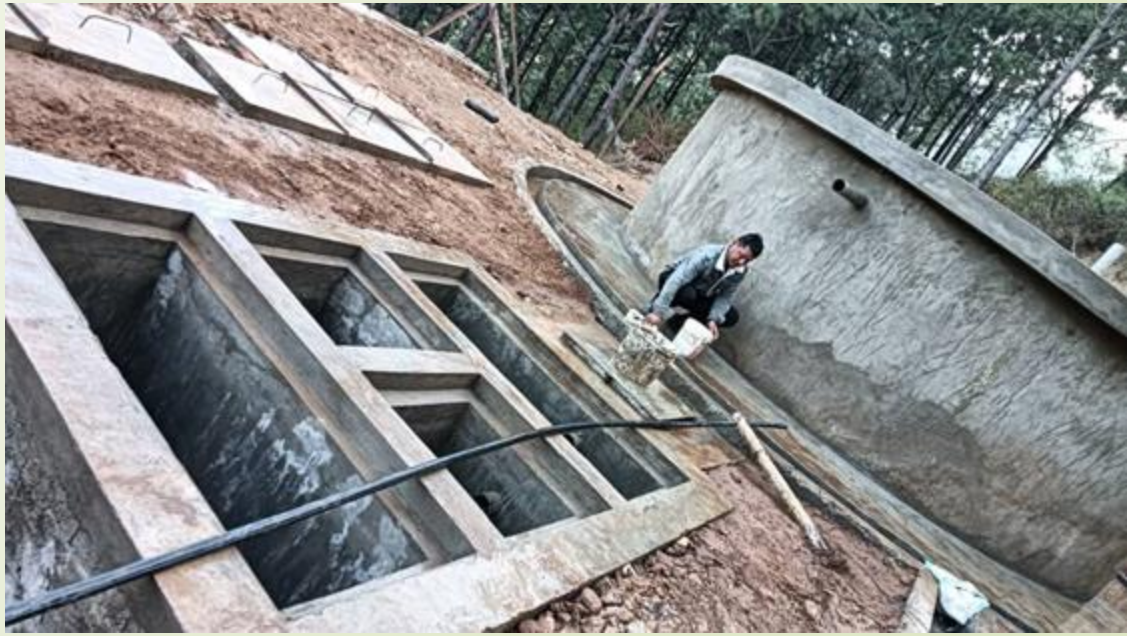
During construction, regular monitoring is being carried out for quality control.

Incorporation of SCADA for effective Operation and Monitoring.

Prepare ESMP before implementation of the project activities to mainstream gender , to identify and mitigate climate risks.

Lesson Learned

- ✓ Importance of indigenous knowledge and historical data (discharge, rainfall etc.)
- ✓ Stakeholder engagement including local communities starting from the project inception till the project completion.
- ✓ Documentation, knowledge sharing and learning.
- ✓ Timely project monitoring (progress as well as quality).
- ✓ Effective co-ordination between the relevant agencies.
- ✓ Inclusion of budget for skills development of the relevant agencies responsible for project implementation and Operation & Management of the infrastructures to ensure sustainability.



THANK YOU FOR YOUR ATTENTION