



**CLIMATE CHANGE
ADAPTATION AND WATER
NEXUS**

**KARMA CHHOPHEL
HYDROMET SERVICES**

Bhutan National Adaptation Programme of Action

The NAPA was completed in 2006. Nine priority Projects were identified:

- Disaster Management Strategy – planning for food security and emergency medicine to vulnerable communities.
- Artificial Lowering of Thorthomi Lake.
- Weather Forecasting System to Serve Farmers and Agriculture.
- Landslide Management & Flood Prevention (Pilot Schemes in Critical Areas).
- Flood Protection of Downstream Industrial and Agricultural Areas
- Rainwater Harvesting
- GLOF Hazard Zoning (Pilot Scheme – Chamkhar Chu Basin)
- Installation of Early Warning System on Pho Chu Basin
- Promote Community-based Forest Fire Management and Prevention



Bhutan National
Adaptation
Programme of
Action

National Environment Commission
Royal Government of Bhutan
Post Box 406
Thimphu
Bhutan

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National Environment Commission
Royal Government of Bhutan

Three project are implemented under the Project “Reducing Climate Change Induced Risk and Vulnerabilities from Glacial Lake Outburst Floods in the Punakha, Wangdue and Chamkhar Valleys

Funded by

LDCF, United Nations Development Programme, Austrian Development Agency, and World Wildlife Fund-Bhutan.

Three projects are implemented under the Project “Reducing Climate Change Induced Risk and Vulnerabilities from Glacial Lake Outburst Floods in the Punakha, Wangdue and Chamkhar Valleys

- Artificial Lowering of Thorthormi Lake – Department of Geology and Mines
- Installation of GLOF Early Warning System - Hydromet Services
- .GLOF Hazard Zonation in Chamkharchhu – Department of Geology and Mines

Lowering of Thorthormi Lake

One of the three components of the project is to reduce the risk of GLOF from Thorthormi Lake.

This is a three year project and it is now in the last year, a team of 300 to 350 workers work every year from June to October to drain water out of the lake to release the pressure on the moraine dam .



Photo: UNDP, Bhutan

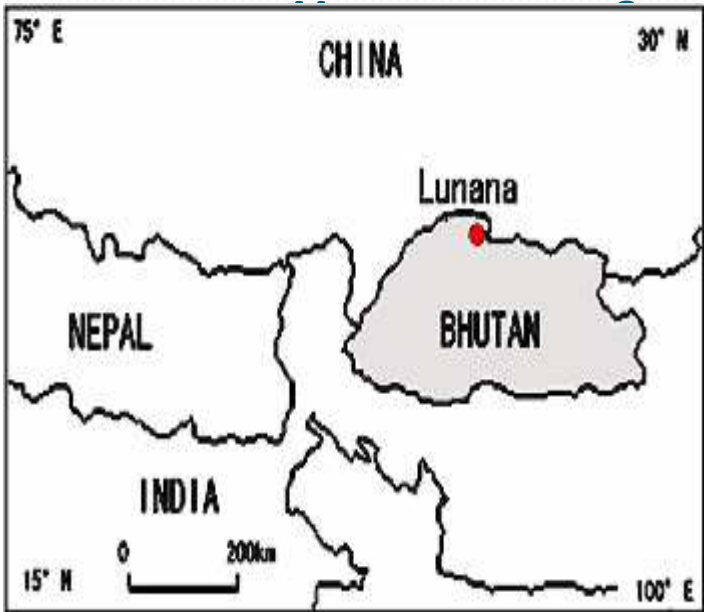
Installation of GLOF Early Warning System

PURPOSE:

To make a comprehensive early warning system for the Punatsangchhu basin that not only cater the needs of the people in Punakha- Wangdue valley but also to hydropower and other infrastructures projects downstream



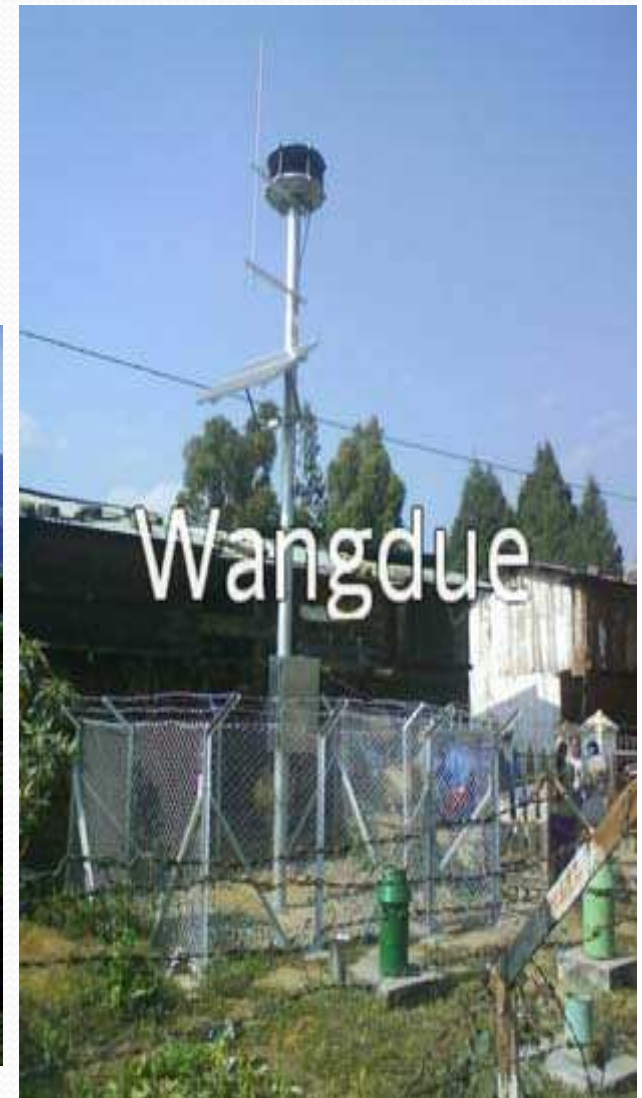
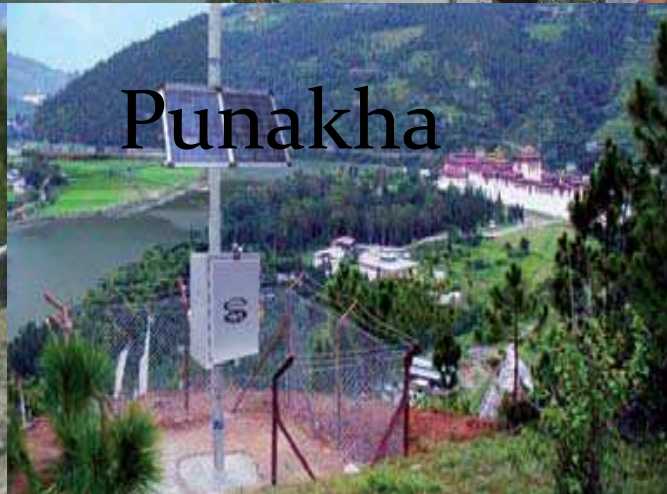
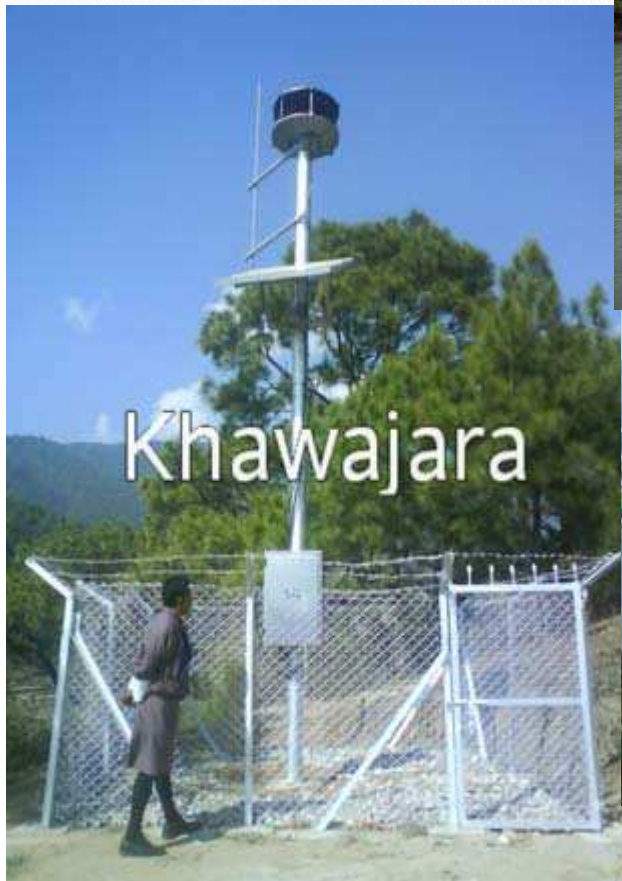
105 Earth-Warming Systems



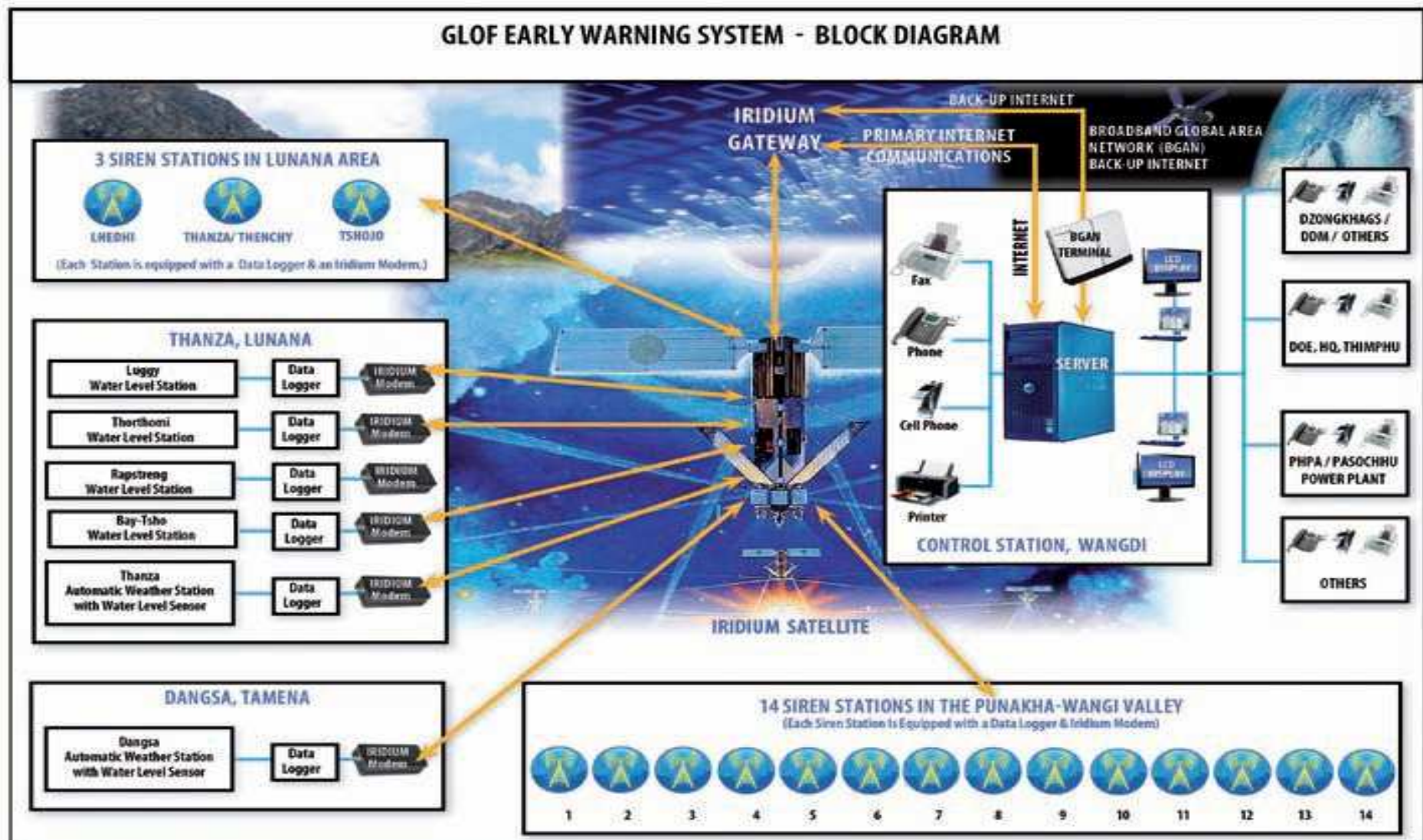
Beytsho

GLOF Early Warning System

Khawajara
Wangdue
Punakha



GLOF Early Warning System



Regional Initiatives

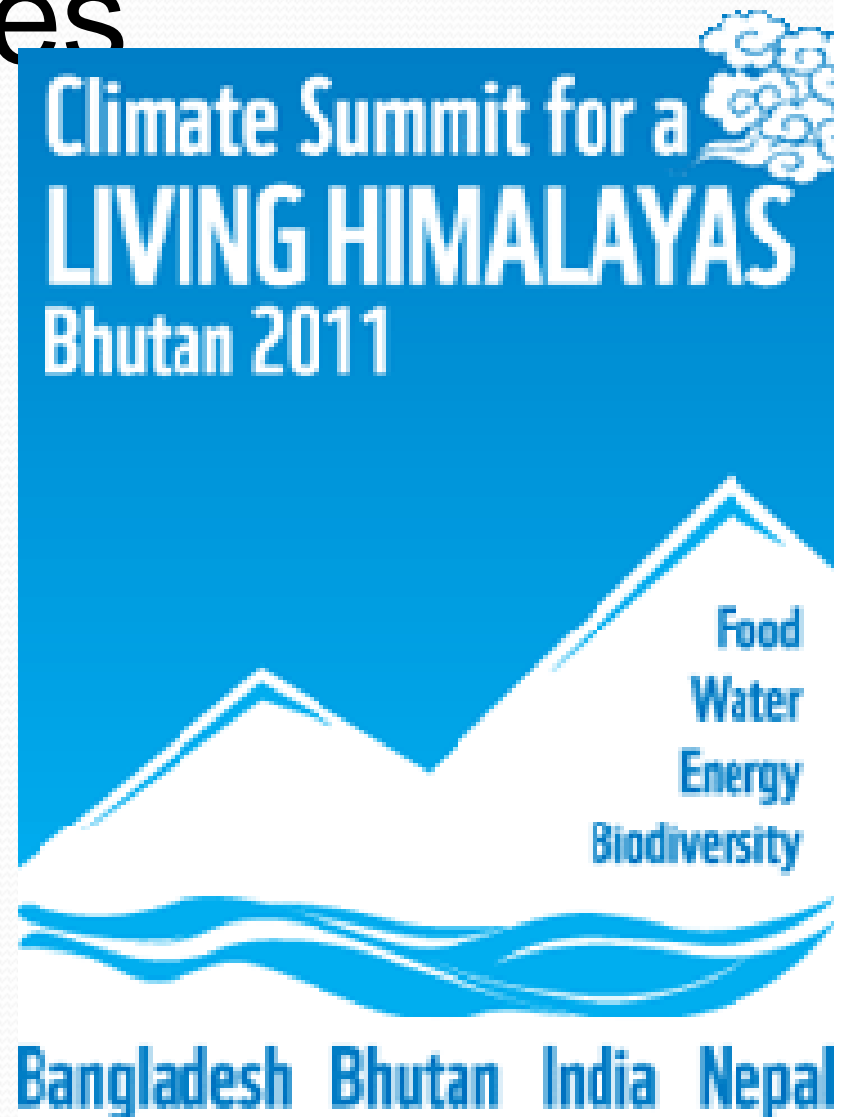
**“Bhutan Climate Summit
for a Living Himalayas”**

Areas:

- 1. Food Security**
- 2. Water Security**
- 3. Energy Security**
- 4. Biodiversity**

18th-19th November, 2011

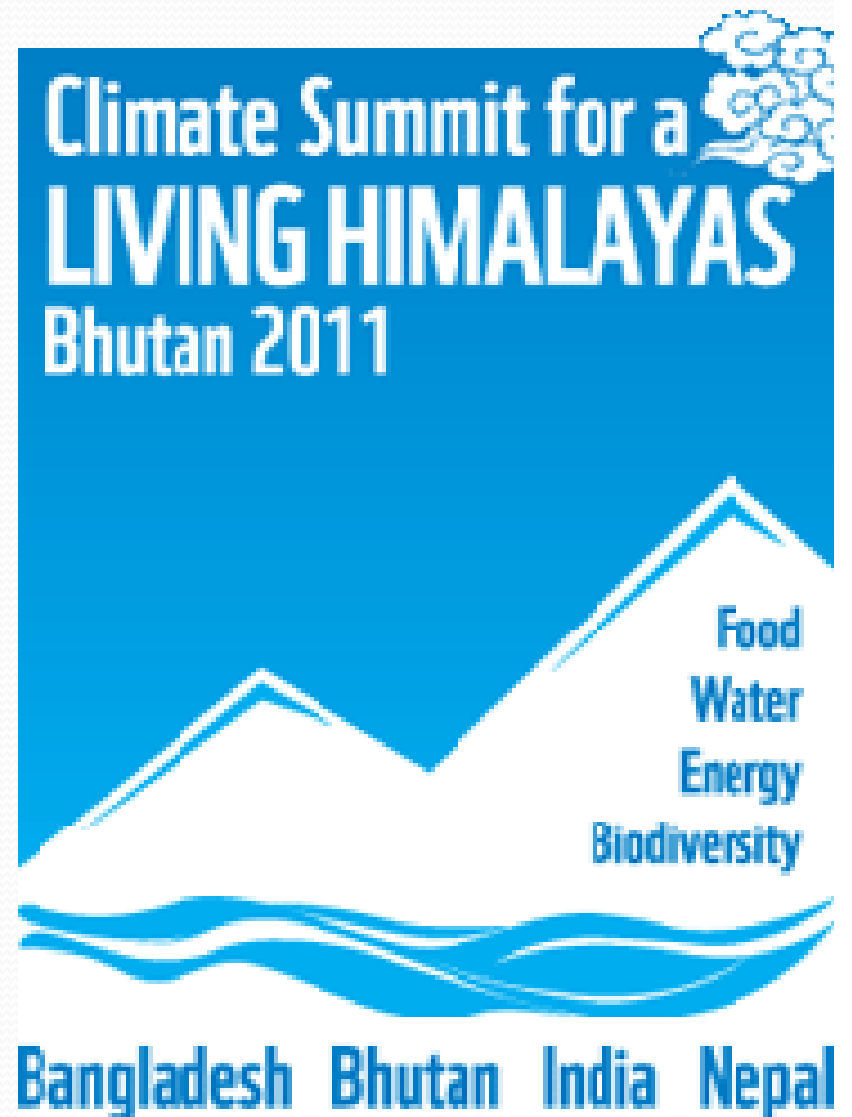
Thimphu: Bhutan



Goals

Road Map for the next 10 Years

- To improve understanding and increase awareness of the impacts of climate change on water resources.
- To increase resilience to respond to the impacts of climate change on water resources.
- Water Resources Management through adoption and implementation of IWRM and eco-efficiency.
- Mainstream Climate Change and Water Resources into national plans and programmes.





Securing the Natural Freshwater Systems of the Bhutan Himalayas

Climate Change and Adaptation measures on Water Resources in Bhutan

November, 2011



Second National Communication from Bhutan to the United Nations Framework Convention on Climate Change

Vulnerability and Adaptation Assessment
Volume 1: Technical Paper



National Environment Commission
Royal Government of Bhutan

Why AWCI Demonstration Basin ?

- **Background**

- Economic importance from both agricultural and energy generation
- Existing threats of glacial lakes burst due to increasing glacial melt

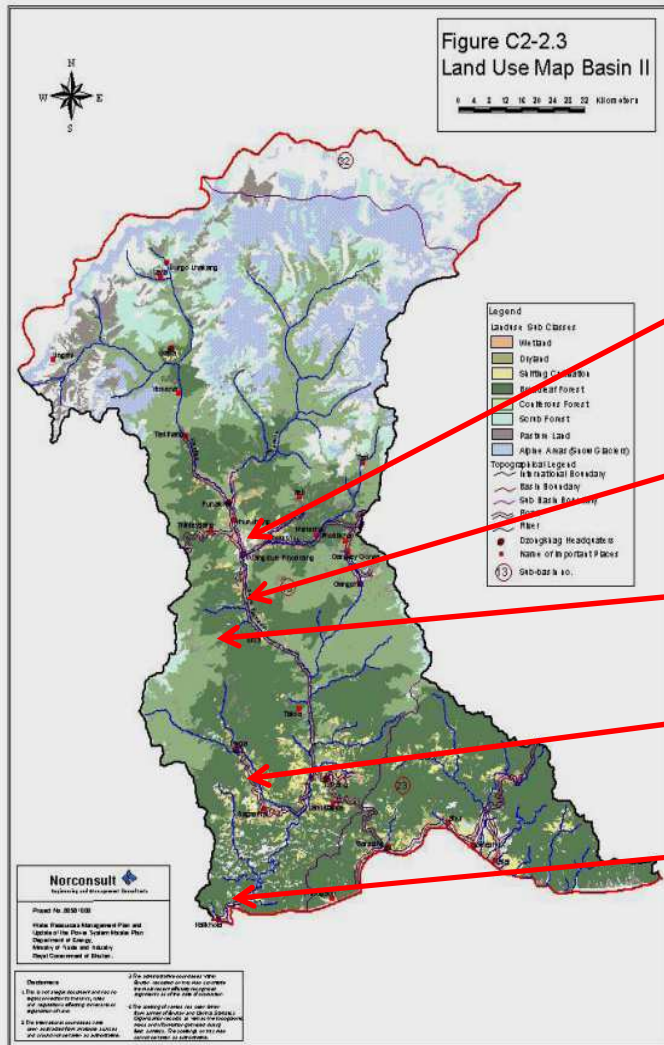
- **Issues to be addressed**

- Flood warning
- Impacts on hydropower generation
- Sediment transport

- **Objectives**

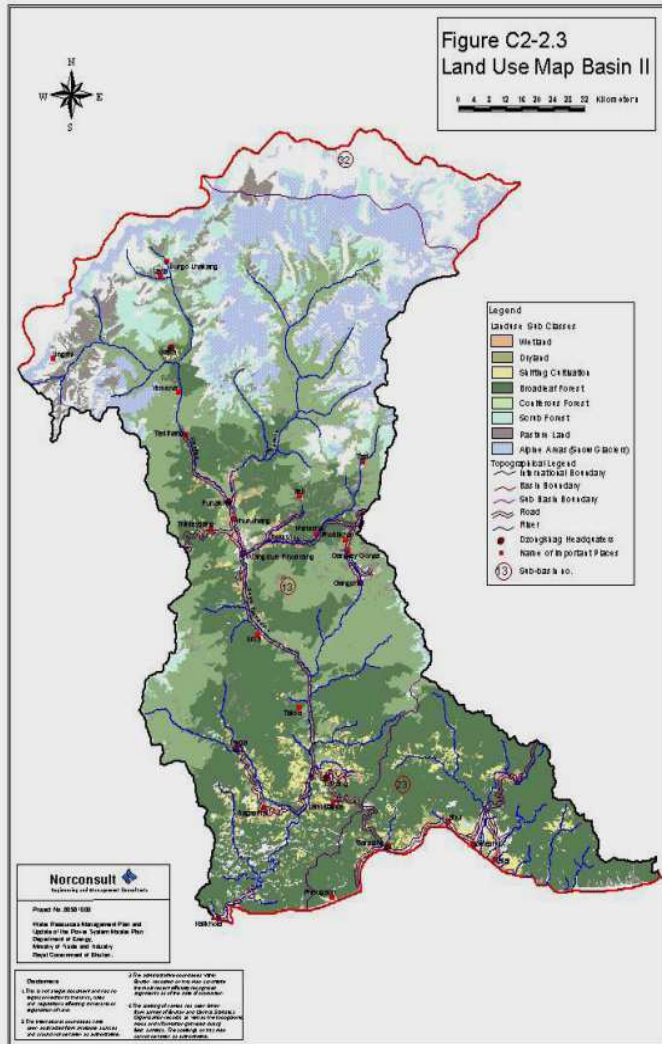
- Determination of an adequate warning system for floods and monitoring of flow changes

Hydropower Development in



Project Name	Capacity (MW)	Status
Punatsangchhu -I	1200	Under construction
Punatsangchhu -II	900	Under construction
Basochhu -I&II	24 & 40	Completed
Dagachhu	114	Under construction
Sunkosh	~2900	Planning stage

Sediment transport in Punatsangchhu



July, 2003

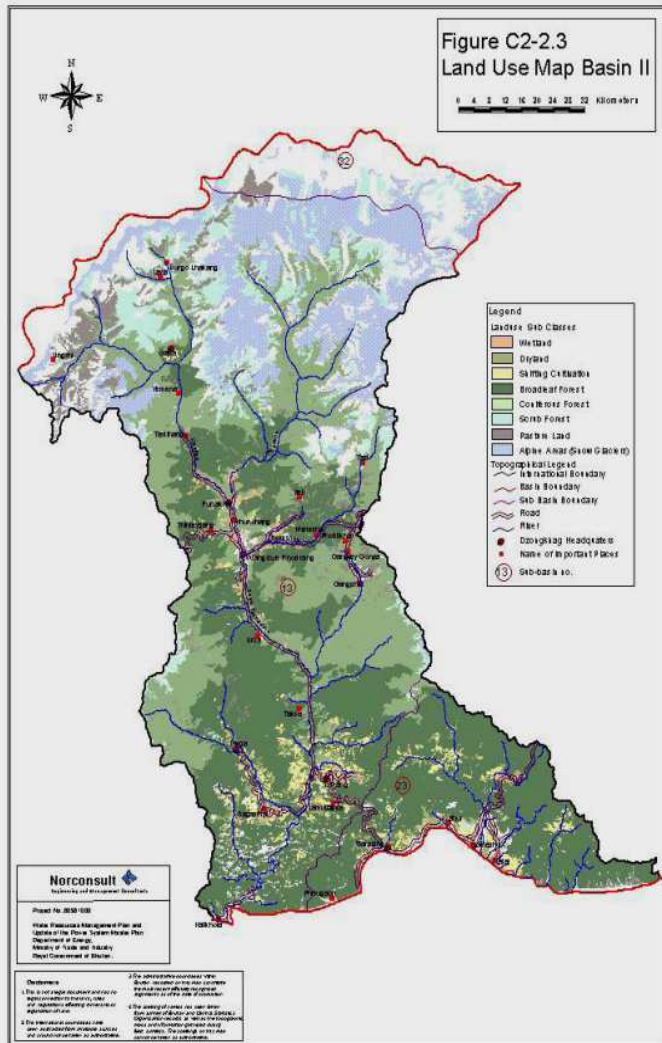
Sediment Transport Studies in Punatsangchu River, Bhutan

Sonam Choden



Water Resources Engineering
Department of Building and Environmental Technology
Lund University

Project



July, 2003

Reproduction from Country Implementation Plan

- Review of the adequacy of the existing hydro-meteorological network and data processing processes;
- Review of existing climate models and selection of appropriate modeling tools;
- Introduction of modern methods of water conservation techniques and water use efficiency; and
- Capacity building in terms of hydro-meteorological modeling and analysis of climate data.

Nexus

Climate change affect all sectors:

- water resources,
- agriculture,
- forestry and biodiversity,
- energy,
- glaciers and GLOFs
- and human health

Table 9.2.1. Cross-linkages between the targeted sectors.

SECTORS	Climate Change	Water Resources	Agriculture	Forestry and Biodiversity	Energy Production	Glaciers and GLOFs	Human Health
Climate Change	-	XXX	XXX	XX	XX	XXX	XX
Water Resources	XXX	-	XXX	XX	XXX	XX	XX
Agriculture	XXX	XXX	-	XXX	X	XX	XX
Forestry and Biodiversity	XX	XX	XXX	-	XX	XX	X
Energy Production	XX	XXX	X	XX	-	XX	X
Glaciers and GLOFs	XXX	XX	XX	XX	XX	-	XX
Human Health	XX	XX	XX	X	X	XX	-

Source: Bhutan Second National Communication to UNFCCC

X: Little Impact

XX: Significant Impact

XXX: Very Significant Impact



Adaptation Measures Across Sectors

Adaptation measures need to be holistic and needs integration.

Water Resources, Energy and Agriculture are key sectors to be impacted.

Addressing adaptation measure in one will facilitate others.



Thank you