

12/10/2011

8th Meeting of the
GEOSS/AWCI International
Coordination Group (ICG)
and The 1st Climate Change
Assessment and Adaptation
(CCAA) Workshop

6th – 8th October, 2011

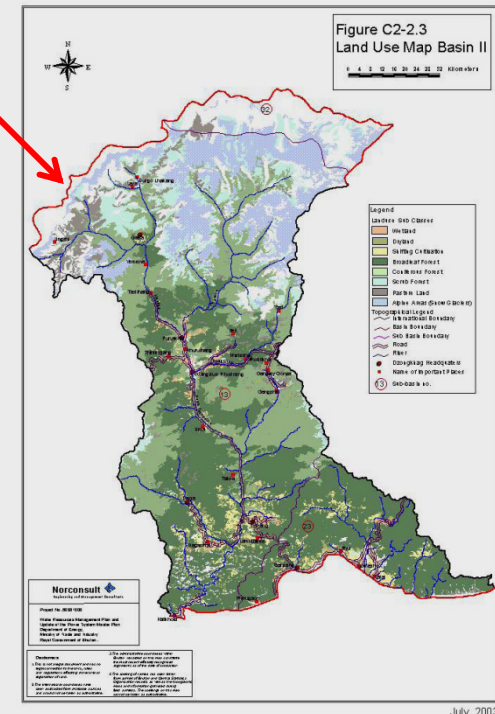
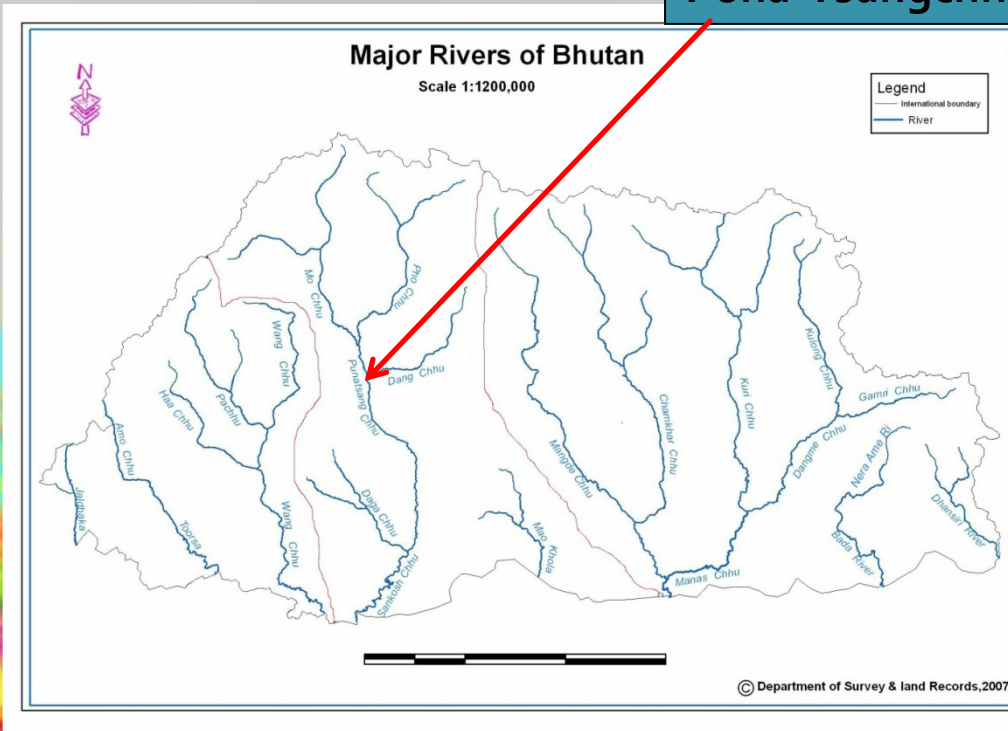
COEX, World Trade Center,
Seoul, South Korea



BHUTAN PRESENTATION

The Demonstration Basin: Puna-Tsangchhu Basin

Puna-Tsangchhu Basin



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Source: DoE, MoEA

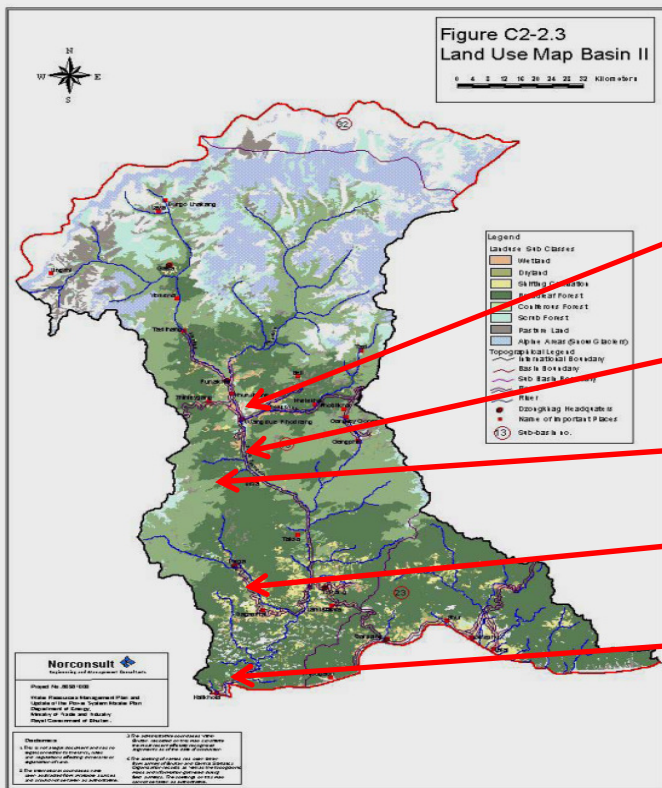
Basin Characteristics

Sl.No.	Name of the River	Punatsangchhu
1.	Main tributaries	Mochhu and Phochhu
2.	Length of the river in Bhutan	250 km
3.	Area covered by glaciers	506.11 km ²
4.	Basin area	13,263 km ²
5.	Population	162,071

DoE, WRMP(2003)

12/10/2011

Hydropower Development in Punatsangchhu



July, 2003

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



Why AWCID 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

Activities in the Demonstration Basin

- Project titled “**Reducing Climate Change Risks and Vulnerabilities in the Wangdue (DP) and Chamkhar Valleys**” being implemented. It is an activity identified in the National Adaptation Programme of Action (NAPA) and includes:
 - Installation of GLOF Early Warning System
 - Artificial Lowering of Thorthormi Lake
 - Awareness campaign

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

12/10/2011



Installation of GLOF Early Warning System



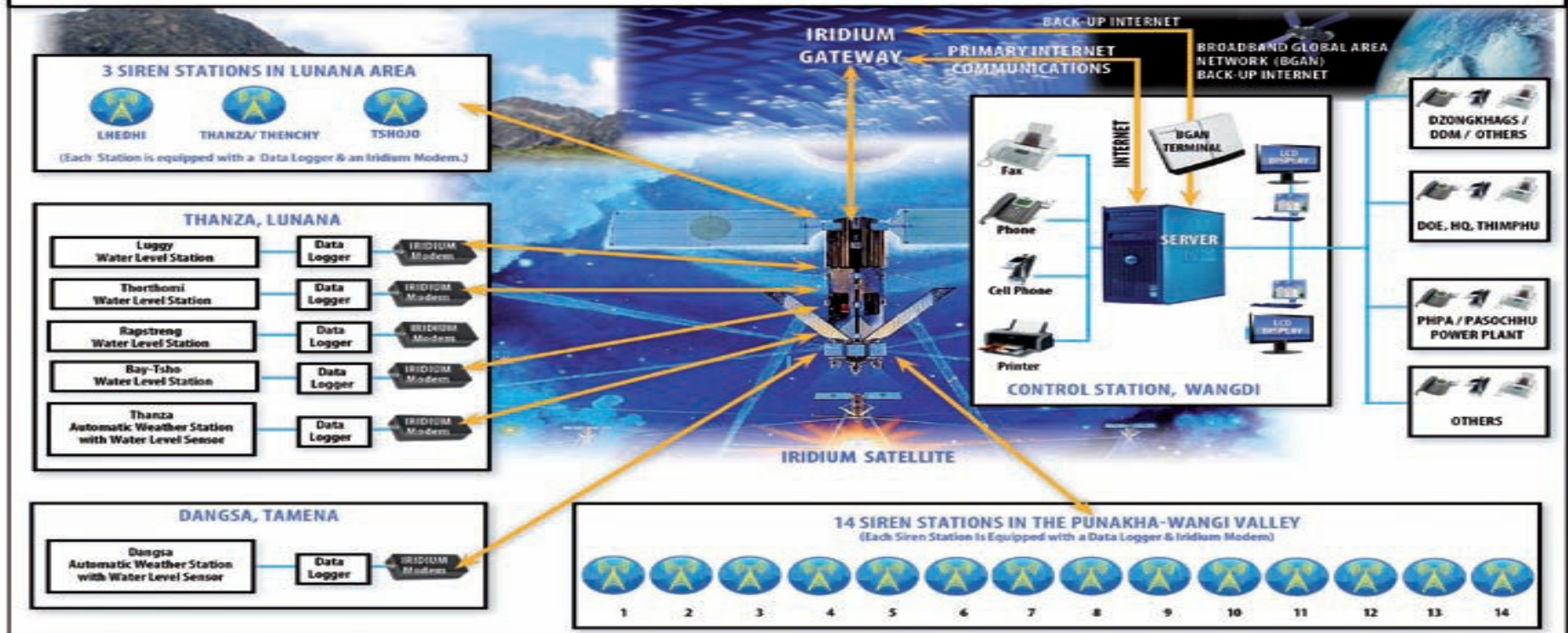
GLOF Early Warning System

17 siren stations have been set up across the basin. Sirens are triggered as stream thresholds are exceeded



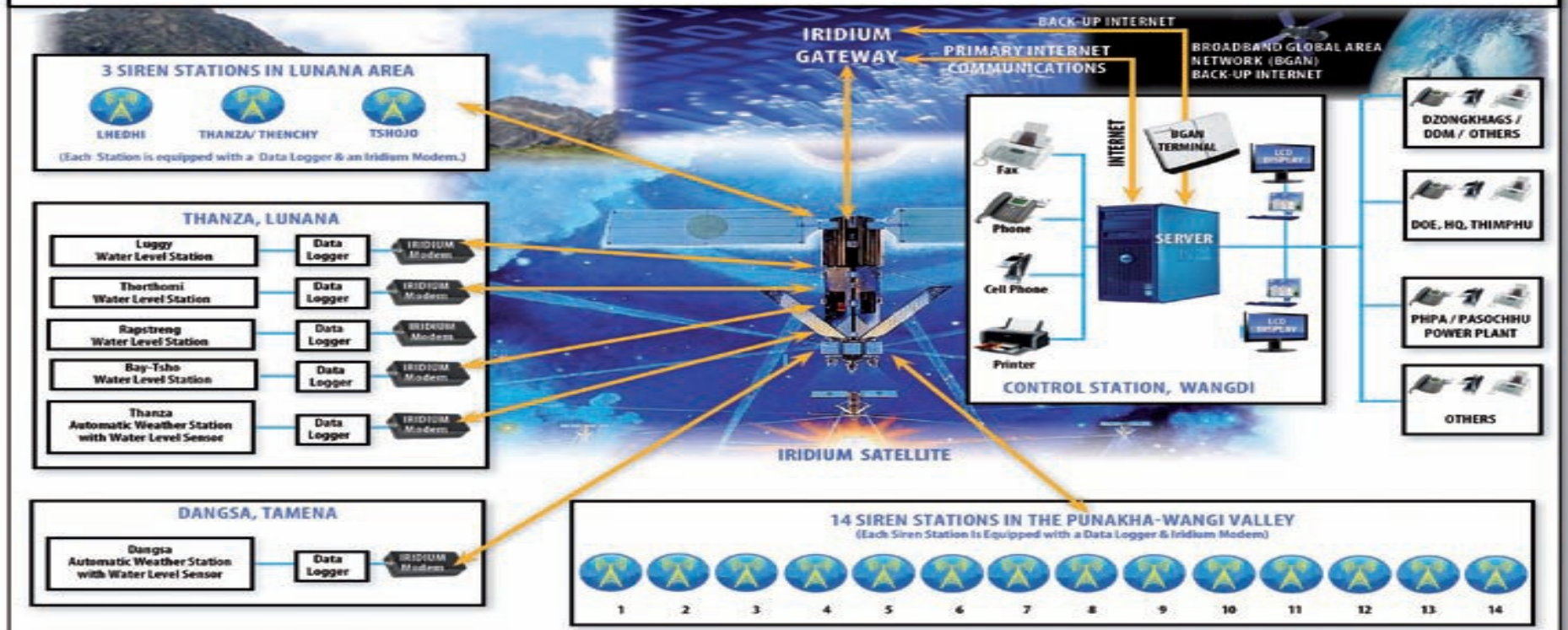
GLOF Early Warning System

GLOF EARLY WARNING SYSTEM - BLOCK DIAGRAM



GLOF Early Warning System

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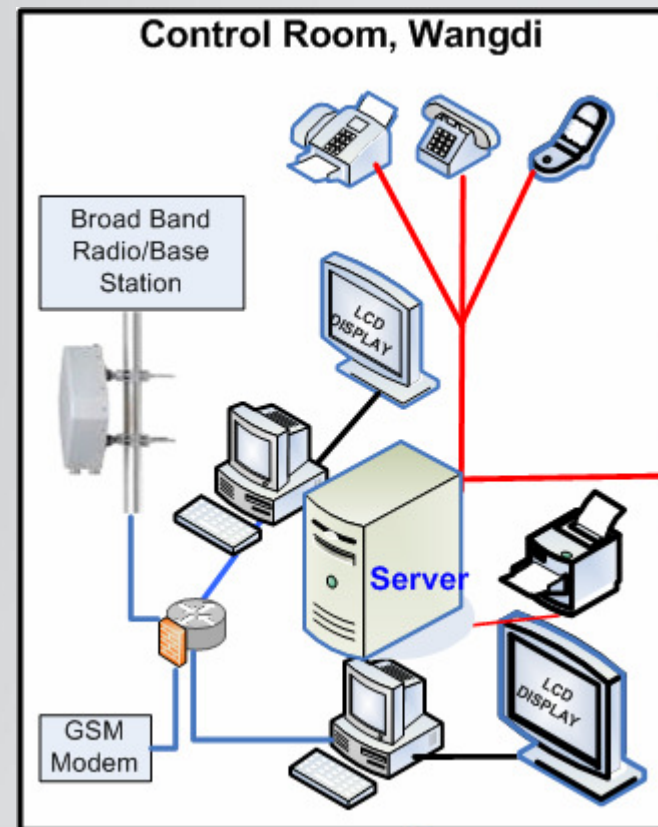


GLOF Early Warning System



Control Station in Wangdue

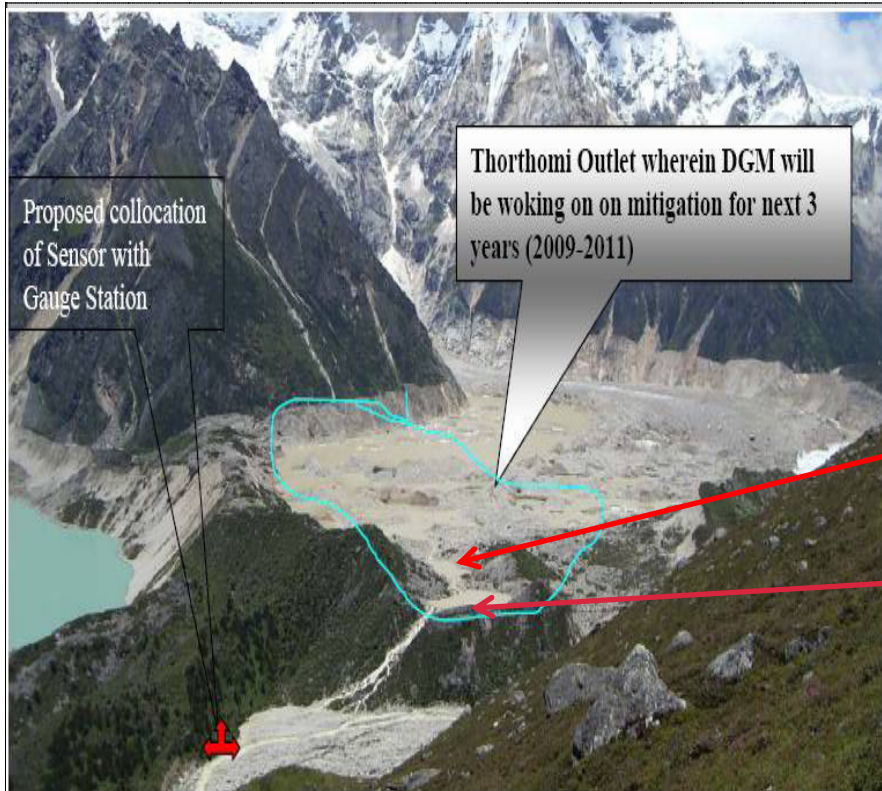
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Artificial Lowering of Thorthormi Lake



Artificial Lowering of Thorthormi Lake



- Manual lowering of Thorthormi Lake
- 3 Year project ending in 2011
- Aim – to reduce the lake level by 5 metres
-

Subsidiary Lake I

Subsidiary Lake II

Pic 3.2 showing the possible location of sensor and the existing gauge Station

Vulnerability and Adaptation Assessment

- The challenge for development and vulnerability of mountainous countries to climate change is well established and recognised in both the Convention and IPCC Assessment Reports. The adaptive capacity of mountainous countries like Bhutan is also very low due the fragility of the ecosystem and high costs of delivering services in a rugged terrain.

Climate Scenarios

- Short data length and limited spatial coverage limits adequate baseline assessment of climate
- However an analysis of observed data from 2000-2009 shows an increasing trend for both maximum and minimum temperatures but no apparent trends in precipitation pattern.

Climate Scenarios

- Future periods were modelled using ECHAM5 and HadCM3 A1B scenarios in PRECIS
 - Baseline period 1980-2009, mean annual temperature is projected to increase by 0.8 – 1.0 degree by 2010-2039 and 2.0-2.4 degree by 2040-2069
 - Summer temperatures may increase by up to 0.8°C in 2010-2039 and by 2.1°C in 2040-2069.
 - Winter temperatures see higher increases with projected increase of 1.2°C by 2010-2039 and 2.8°C by 2040-2069
 - Changes in mean annual precipitation is projected to increase 10% by 2010-2039, and 20% by 2040-2069 but with conditions getting wetter in the monsoon season and slightly drier in the winter season. These more extreme precipitation changes between seasons conform to the findings of the IPCC (2007) report for the Himalayan region of South-east Asia.

Projection – Water Resources

- Bhutan has one of the highest per capita availability of water, but not evenly distributed.
- WEAP (Water Evaluation and Planning) model indicate that water availability in the future under climate change will be adequate at a gross level (main rivers) despite increasing demand and evapo-transpiration.
- There are increasing reports of drying water sources throughout the country which is already a current vulnerability concern and may get worse with drier and warmer winters in the future.
- Bhutan has a 677 glaciers and 2674 glacial lakes. Glaciers in Bhutan are retreating rapidly from 8-10m/year for debris free glaciers and 30-40m/year for debris covered glaciers. Due to this rapid melting 25 glacial lakes are considered potentially dangerous with the threat of Glacial Lake Outburst Floods. Based on rates of glacial retreat, temperature trends in the area and trends in GLOF in the region, threats from GLOF are expected to increase in the future.

Water Resources- Adaptation Priorities

- Conduct comprehensive water resources assessment to improve understanding of water resource availability, the effects of climate change to develop appropriate adaptation measures
- Increase resilience to the impacts of climate change on water resources
- Water Resources Management through adoption and implementation of IWRM and eco-efficiency by using river basin framework for planning
- Strengthening Climate observation and network for early warning and forecasting of extreme events understanding climate change
- Mainstream CC & WR into national plans and programmes

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Involvement in the Next Stage of AWCI

- The necessary policy instruments are in place, the main being the Bhutan Water Act- enacted by the parliament in May, 2011.
- A National Water Board exists to oversee water sector activities.
- A project that may be proposed may need to look at:
 - Potential conflict resolution such as water sharing
 - Adaptation and mitigation mechanisms on a basin scale
 - Capacity building especially in Integrated Water Resources Management

THANK YOU

12/10/2011