

BHUTAN



Planning Adaptation to Climate Change “Developing NAPs”



G. Karma Chhopel
Chief Environment Officer
National Environment Commission

**What happens here will dictate
the growth and development of
billions of people in Asia**



Content

- **Environment in Bhutan**
- **Climate Change process in Bhutan**
- **UNFCCC obligations**
- **Current trends of climate change impacts**
- **Impacts**
- **Challenges & Consequences**
- **Mitigation & Adaptation measures**
- **National Adaptation initiatives**
- **Conclusion**

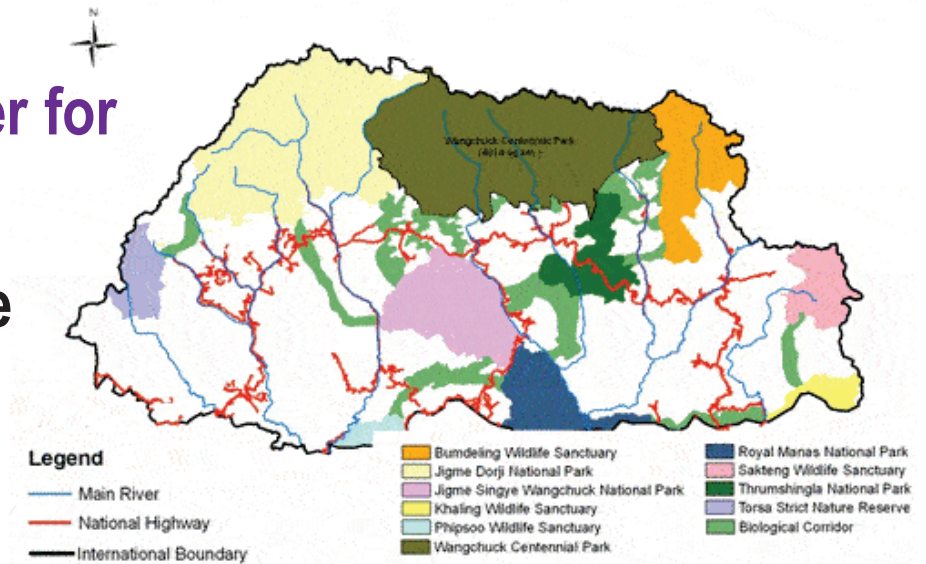
Environment in Bhutan

- **National Environment Commission – regulatory and overall monitoring**
- *National Environment Commission (NEC) acts as National Climate Change Committee*
- *NEC Secretariat is focal agency for UNFCCC*
- **All developmental projects mandatorily follow the comprehensive EIA process**
- **Protected Areas off limit for developmental activities**

Enabling Environment

- High-level political commitment
 - Constitution, 60% forest cover for all times
- 10 protected areas representative of diff ecosystems = 51.44%
 - 42.71% protected area
 - 8.61% biological corridors
 - 0.12% conservation area
- Pristine Environment–biodiversity hotspot
 - 72.5% forest cover - SINKS

National Protected Areas and Biological Corridors of Bhutan



Hydraena karmai

Enabling Environment

- **Gross National Happiness (GNH):** Environment is one of the pillars of GNH.
- **Bhutan as a Net Carbon Sink:** COP 15, Bhutan committed to remain carbon neutral forever and serve as a net carbon sink.
- **Regional Coordination on Climate Change:** At the 16th SAARC summit, climate change was adopted as the theme.
- **Environmental Laws and Regulations:** National Environment Protection Act 2007; EA Act 2000.
- **Incentivizing Green Economy:** Economic Development Policy and its complementary policies are very clear in their intent to ensure the growth & development of a green and sustainable economy.

Bhutan & CC process

- **United Nations Framework Convention on Climate Change (UNFCCC)**
 - **Signed at Rio 1992**
 - **Ratified by 73rd National Assembly in 1995**
- **Kyoto Protocol to the UNFCCC**
 - **Acceded on 26 August 2002**

Current trends

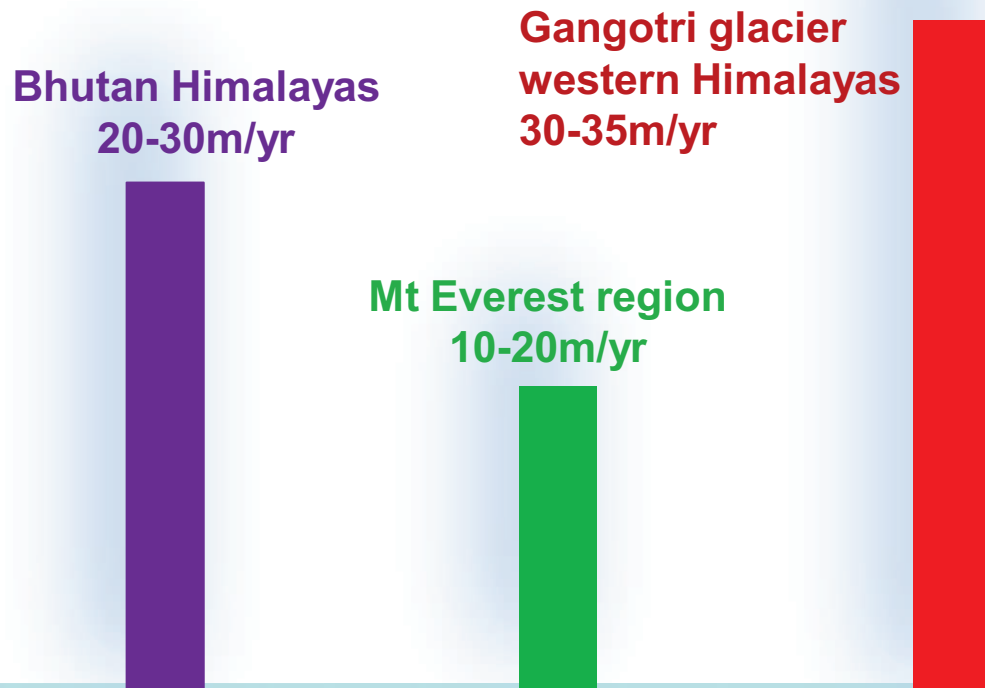
- **Changing weather pattern**
 - **Unpredictable rainfall patterns**
 - **Decreasing snowfall**
 - **Drying water bodies**
 - **Increasing frequency of drought, windstorm, rainstorm & thunderstorm**
 - **More than 1,400 houses in 10 Dzongkhags damaged**
 - **3 children injured, 2 persons hit by lightning from thunderstorm**

Source: BBS 15 April, 2011

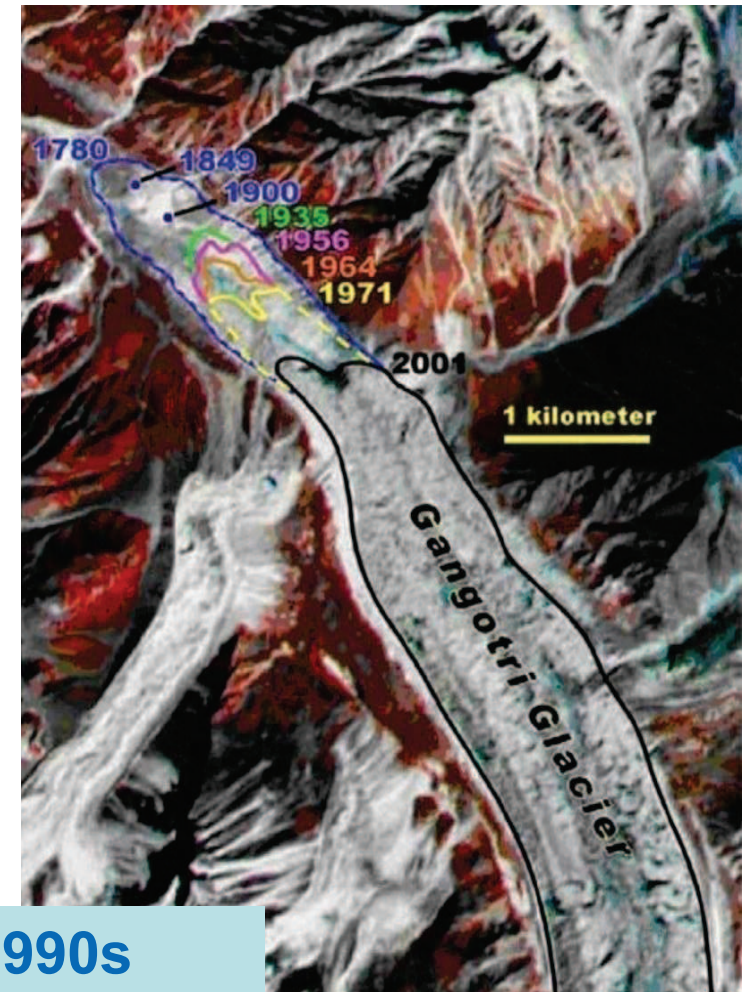


Current trends

- **Rising temperatures** (1°C since 1970s in Himalayas)
 - Rapid melting of glaciers (20-30 m annually)
 - Flash floods and GLOF
 - Reduced flows in river



Increased Glacier retreat since the early 1990s



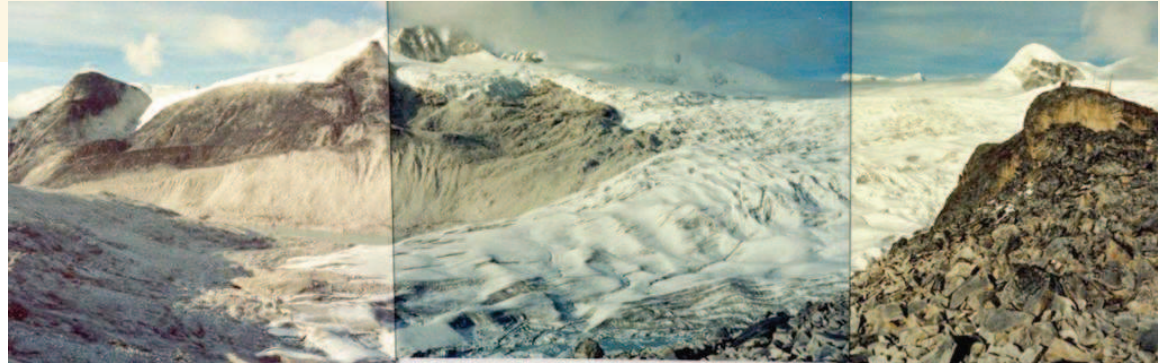
Repeat photography

Photo by Prof. Tsukihara

Photo by Dr. Naito

Northern side of
Rinchen-zoe La

1984

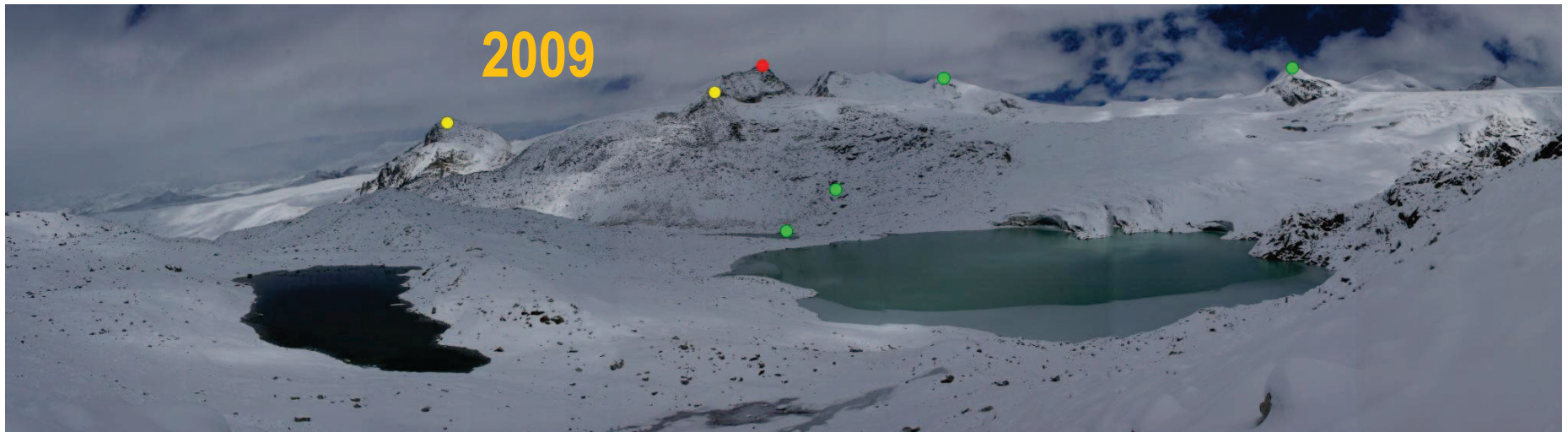


-In 1984, no water body
-After the formation of Lake,
rapid retreat observed

1999



2009



Roughly 500m retreat in 25 years

Impacts

- Loss of lives & property from natural disasters
- Changes in local environment
- Loss of habitat for humans and animals
- Spread of tropical diseases and heat stress into higher altitudes
- Increasing pests and diseases affecting the productivity of crops
- Migration of people

❖ Royal Bengal Tiger
4200m in JDNP



Mitigation measures

- Reducing carbon emissions
 - Switching over to non-polluting transport
 - Investing in solar, wind & bio-energy sources
 - Increasing plantation & rejuvenation of forests
 - Greening agriculture and industries
 - Promoting alternatives to timber & CGI sheets in housing
 - Promoting green infra-structure and supra-structure
(Eco-efficient WI strategy)



Adaptation measures

- Investing in alternative sources of energy (solar, wind, biogas)
- Establish flood & weather forecasting and advance warning systems
- Build check-dams & water reservoirs using natural contours of riverbeds
- Promote rainwater harvesting
- Promote dryland (conservation) agriculture



Adaptation measures (contd..)

- Establish gene banks for traditional crop varieties
- **Select drought resistant varieties of crops & livestock**
- Improve irrigation technologies
- **Efficient & eco-friendly grain and livestock products storage facilities**
- Place more areas under parks and protected areas
- **Protect watersheds and wetlands**
- Promote organic farming



Adaptation measures (contd..)

❖ Sustainable Land Management for agriculture- Sloping Agriculture Land Technology (SALT)

- 31% of the agriculture land is on slopes greater than 50% slope prone to sheet erosions.

- the degraded slopes are divided into strips of land for cultivation (4-6 m wide depending upon gradient) separated by double hedgerows of nitrogen fixing trees or bushes planted along the contour lines.

- These hedgerows are the key elements of the entire system. They act as erosion barriers and stabilizers for hill slopes. The hedgerows also contribute to soil fertility through nitrogen fixing and the biomass of the hedges is either used as fodder, mulch for soil cover and soil moisture conservation or as animal fodder to be recycled back into the soil as compost.

National adaptation initiatives

- **Adaptation Priorities for Water Sector and Climate Related Disasters**

Goal: Conduct comprehensive water resources assessment to improve understanding of water resource availability, the effects of climate change to develop appropriate adaptation planning. Short term; **Estimated cost USD 10m**

Adaptation Activities	Lead Agency	Barriers	Policy/Actions to reduce barriers
Survey, mapping and assessment of quality and quantity of water sources for various uses along with analysis of hydro-meteorological patterns	NEC in collaboration with other agencies	Finance & Manpower (number & quality/ climatologist/analysts)	Proper coordination
Analysis of glacial and seasonal snow covers to assess the contribution of snow melt to water flow of Bhutanese rivers	Ministry of Economic Affairs (Geology and Mines, Hydro-met & Energy)	Finance, accessibility and climate, no communication, lack of equipment and qualified staff	Installation of weather stations in high altitude and Glacier mass balance monitoring and study in Bhutan

National adaptation initiatives

Goal:Increase resilience to the impacts of climate change on water resources
Short term-Medium ; Estimated cost USD 35m

Adaptation Activities	Lead Agency	Barriers	Policy/Actions to reduce barriers
Installation of GLOF technical early warning systems with associated awareness-raising	Dept of Hydro-met Services	Finance and lack of in house technical capacity, reliable communication system	Use the experience of ongoing GLOF EWS set up in Punatsangchhu basin (Phochhu)
Build impoundments to store water for use during lean season (multi purpose)	MoWHS, MoAF	Finance and Terrain	Global/Regional experience
Study vulnerability of landslides & flood prone areas & implement prioritized projects focusing on roads & agriculture land	DGM	Lack of information, Finance	Road Act, EFRC guidelines, technical competency, EA Act 2000

National adaptation initiatives

- **Adaptation Priorities for Agriculture sector**

Goal: To improve postharvest facilities to increase shelf life of food products; S-M;1mUSD

Adaptation Activities	Lead Agency	Barriers	Actions to reduce barriers
Improve existing grain storage facilities	DoA/ FCB	Finance	Mobilize Fund
Construct cold storage facilities to store highly perishable agriculture produce	DoA/FCB	Finance	Mobilize Fund
Introduce zero-energy storage facilities at community level for seed storage	DoA/FCB	Finance	Mobilize Fund

National adaptation initiatives

Adaptation Priorities for Agriculture sector

**Goal: To increase access to improved irrigation systems;
S-M; Cost 3m USD**

Adaptation Activities	Lead Agency	Barriers	Actions to reduce barriers
Improve existing irrigation channels to reduce water losses	DoA/ DoE	Technology	Secure technology
Explore alternative irrigation technologies like drip, sprinkle	DoA	Institutional Capacity	Strengthen institutional capacity
Introduced water harvest technologies to make water available for off-season	DoA	finance	Mobilise fund

National adaptation initiatives

Adaptation Priorities for Energy sector

Goal: Measures to ensure energy security during lean season (due to projected shortfall of hydropower production in winter as a result of climate change)

Adaptation Activities	Agency	Barriers
Hydropower (Immediate actions) Feasibility studies & DPR for development of Storage, small & medium Hydro power plants	MoEA	Financial
Hydropower (Medium Term Actions) Pre- Construction of Storage, small and medium Hydro power plants	MoEA	Financial
Hydropower (Long Term Actions) Construction & Commissioning of Storage, small & medium Hydro power plants	MoEA	Financial

National adaptation initiatives

Adaptation Priorities for Forest & Biodiversity sector

Goal: Conduct comprehensive assessment to adequately monitor and understand the impacts of CC on the flora & fauna and ecosystems

Adaptation Activities	Lead Agency(ies)	Cost /Term	Level of activity
Assess and Monitor Spatial Distribution of CC Vulnerable Species	DoFPs, DoL, NBC, UWICE, NGOs	300,000 /S	All forest types, Biological Corridor and Thematic Areas
Guidelines/protocols for smart green infrastructure development within PAS	PPD-MoAF, DoFPs, NEC	100,000 /S	All forest types, Biological Corridor and Thematic Areas

Goal: Address risk of species loss from climate change by strengthening species conservation and management program.

Habitat for prioritized species (e.g: tiger, snow leopard, white bellied heron, Rufous-necked hornbill, Golden Mahseer, Snow Trout, etc) conserved and viable population maintained

DoFPs, DoL, NGOs, NBC

4,000,000 / L

All

National adaptation initiatives

Adaptation Priorities for Health sector

Goal: Ensure safe and adequate drinking water during the dry period

Adaptation Activities	Lead Agency(ies)	Cost / Term	Potential barriers
Increase number of/ Protect existing water resources (for RWS) and water treatment plants	MoH (PHED), Municipalities	NE/ SML	Land access problem, may not get suitable plot to set up water treatment plant.
Adopt Rainwater harvesting system & water pumping technologies.	MoH (PHED), Municipalities	NE / SML	Capacity building

Goal: To educate and enhance the level of awareness to cope with health risks by being better prepared.

Strengthen awareness of climate relevance to health amongst national policy makers/general population	NEC, MoH	NE/ SML	Increase awareness programs to target policy makers, general population and education sector
Review Health Care policies and programs to reduce likely future health burdens	MoH	NE/S ML	Awareness programs, Effective planning with adequate resources to improve coordination.

National adaptation initiatives

Adaptation Priorities for Glacier and GLOF

Goal: Enhancing preparedness and understanding for GLOFs triggered by CC

Adaptation Activities	Lead Agency	Cost / Term	Potential barriers
Study of other dangerous lakes at the headwaters of Amo Chhu, Kuri-Gongri Chhu, Mangdi Chhu, Kholong Chhu, Mangdechu	DGM	NE / S	Finance/ technology
Establish more automatic weather stations in high altitude including snow measurements as there is no data from high altitude	Dept of Hydromet	NE / S	Finance/ capacity
Hazard zonation maps and demarcation	DGM/D DM/ districts	NE/ S	
Installation of early warning system for downstream valleys and disaster preparedness	DoE/ DDM	S-M	Finance
Construction of protection wall along the river banks to protect the existing settlements & community assets	MoWHS, DDM	S-M	Finance

Conclusion

- **Events in HKH have global consequences (social, economy, ecology)**
- **Strong evidence of climate change**
- **Need to act now rather than later**
- **Investing for the world**





**Thank You
and
Tashi Delek!**