Climate Change Vulnerabilities and Adaptation Interventions in BHUTAN

Jigme

National Environment Commission

BHUTAN

mpacts of Climate Change in BHUTAN

- Forests and Biodiversity
  - 70% cover and high diversity
- Agricultural Activities
  - 80% of population is agrarian
- Water Resources & Energy
  - 30,000 MW potential power generation
- Natural Disasters and Infrastructure
  - Glacial lake outbursts
  - landslides
- Human Health
  - Increase in tropical diseases and heat stress

Criteria for Selection & Ranking

Selection Criteria

1. **convincing threats of climate and climate change; level or degree of adverse effects of climate change**
2. **demonstrates fiscal responsibility (or cost effectiveness)**
3. **level of risk (doing nothing entails a certain amount of risk)**
4. **complements country goals (such as overcoming poverty, enhancing adaptive capacity, or other environmental agreements)**

Ranking Criteria	
Category	***Criteria***
Benefit 1	Human life and health saved by the intervention
Benefit 2	Arable land associated with water supply and productive saved by the intervention
Benefit 3	Essential infrastructure – existing and projected hydropower plants, communication systems, industrial complexes, cultural and religious sites
Negative benefit	Estimated cost of the proposed adaptation intervention measure/project

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dapted from Draft NAPA Document)

Proposed Projects	Main Objective	Main Outputs	Cost (USD)
1- Disaster Management Strategy – Planning for Food Security and Emergency Medicine to Vulnerable Communities	Implementation of Emergency Food Security and Medicine/First Aid components of National Disaster Management Strategies in some pilot districts (Eastern Bhutan)	Rapid communication, immediate response & distribution networks for emergency needs in place; Lives saved; Awareness on relationship between bad land management and disasters	0.62
2- Artificial Lowering of Thorthormi Lake	Glacier Lake Outburst Flood prevention: Lower water level of Thorthormi Lake by excavating artificial channel – widening of existing outlet channel	Required civil works built; Water level lowered and contained; Water level monitored; Staff trained to undertake similar projects elsewhere	3.12
3- Landslide Management & Flood Prevention (Pilot Schemes in Critical Area)	Effectively intervene in major landslide and flood affected areas before these become dangerous for human livelihood	Proper land management practices developed, implemented and shared by communities in a series of pilot districts including Chaskhar, Ramjar, Thimphu-Phuentsholing Highway, and Thimphu-Trashigang Highway	0.89

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4- Weather Forecasting System to Serve Farmers and Agriculture	Provide weather and seasonal forecasts in support of production decisions of farmers; Agro-meteorological early warning system against inclement weather, Special advisories at different production stages	Optimally distributed network of synoptic stations; More accurate weather forecasts for extended period based on operational meso-scale LAM model optimized for Bhutan; Associated extension services	0.42
5- Flood Protection of Downstream Industrial and Agricultural Area	Awareness raising for GLOF risks and possible preventive measures	High quality hazard zonation map delineating areas with high risk etc; areas; materials for public information; tools for the decision makers on spatial planning, building permits, etc.	0.45
6- Rainwater Harvesting	Safeguard farmers from water shortages during dry periods and irregularities in the monsoon rainfall, thereby improving household food security and income of farmers living in vulnerable areas	Higher crop and animal productivity under rainfed agriculture; Safe drinking water and less health problems; Increase in rural income; Synergy with actions under the Convention on Desertification; Environmental benefits (reduced soil erosion, recharge groundwater)	0.90

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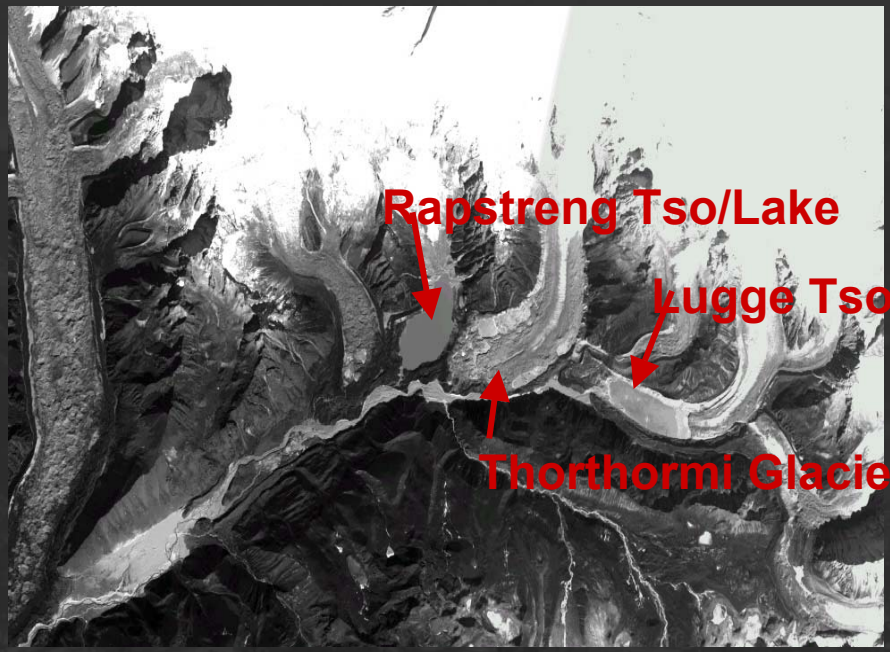
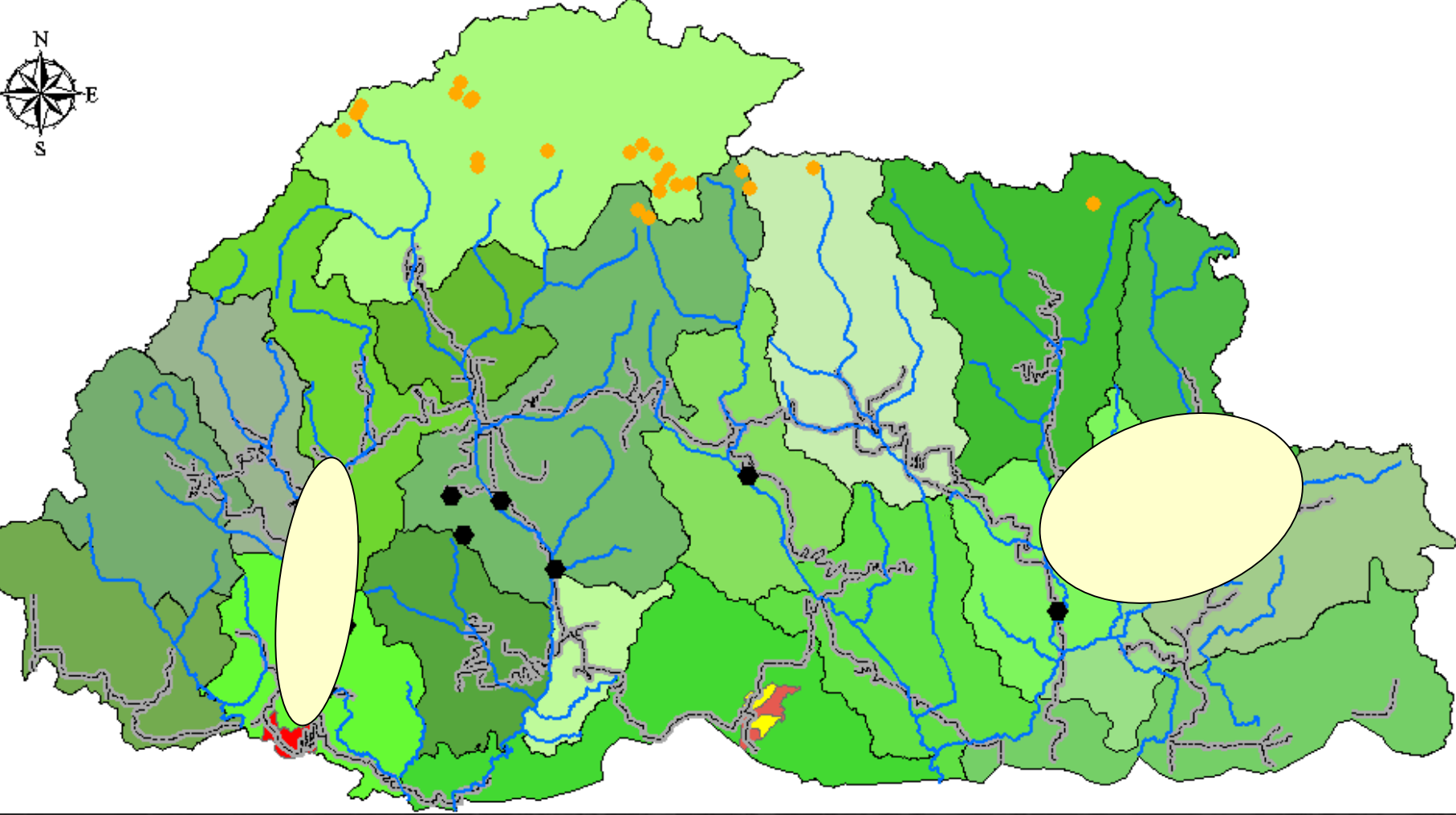
7- GLOF Hazard Zoning (Pilot Scheme - Chamkhar Chu Basin)	Awareness raising for GLOF risks and possible preventative measures	High quality hazard zonation map delineating areas with high risk etc. areas; materials for public information; tools for the decision makers on spatial planning, building permits, etc.	0.23
8- Installation of Early Warning System on the Pho Chhu Basin	Warning of Punakha valley settlement/ essential infrastructure in case of actual GLOF	Technical Early Warning System in place & operated; Hazard Zonation; Awareness across the valley	0.40
9- Promote Community-based Forest Fire Management and Prevention	Conserve land, water resources and wood production	Village level forest fire management institutionalized and implemented; Forest fire equipment well established and managed; Reduced incidence of fires	0.42

thank you !!!

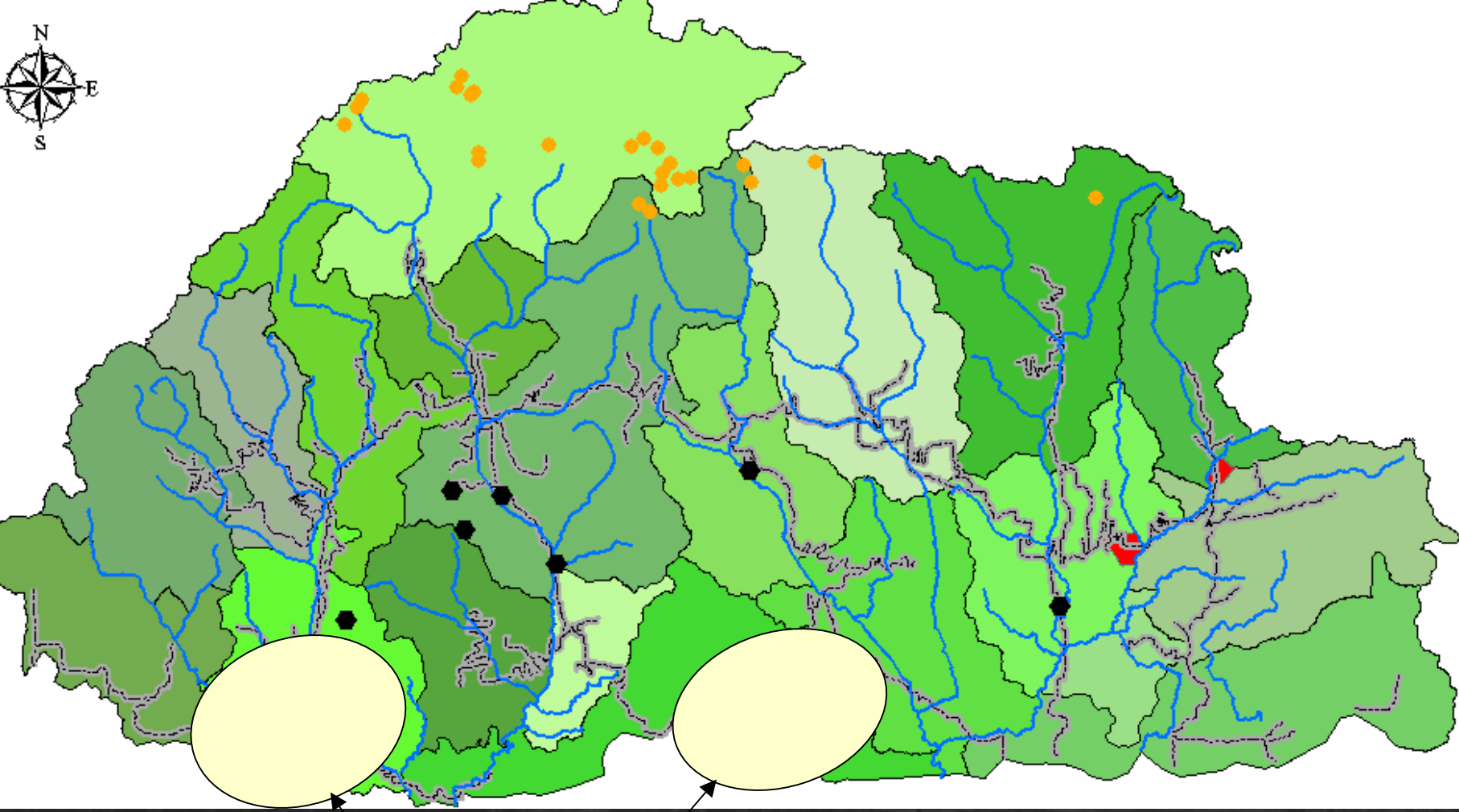


Worst Case Scenario: Combined GLOF of these lakes could result in a flow of over 53 million cubic meters of water.



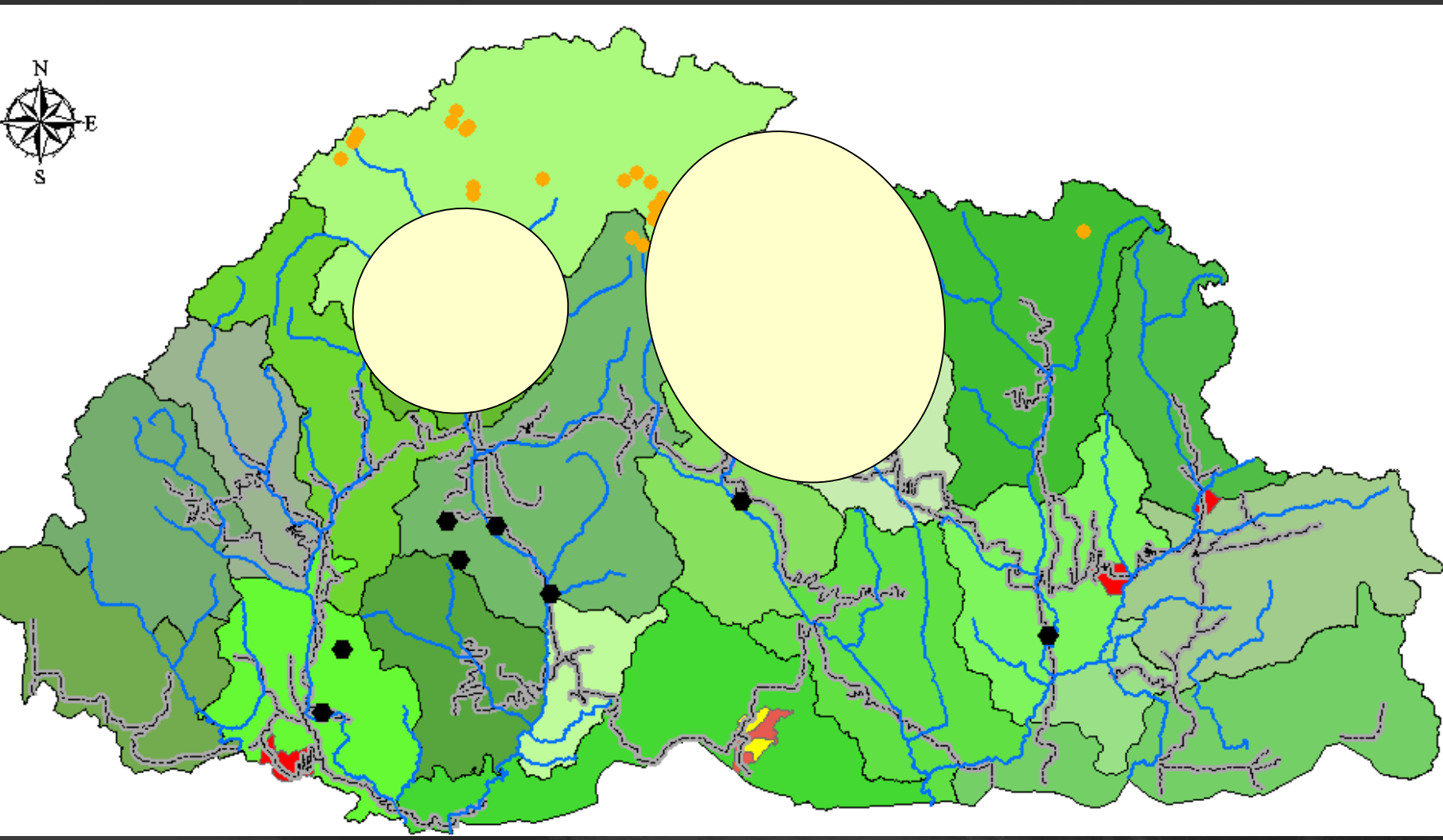
Two Communities

Two National Highways



Two Geogs (Blocks)

One Industrial Estate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