
TEEB-Bhutan

December 5, 2016
Cancun





Sign in

Home to iconic rivers of Asia

- The great Ganges
- The mighty Brahmaputra

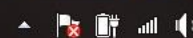


Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

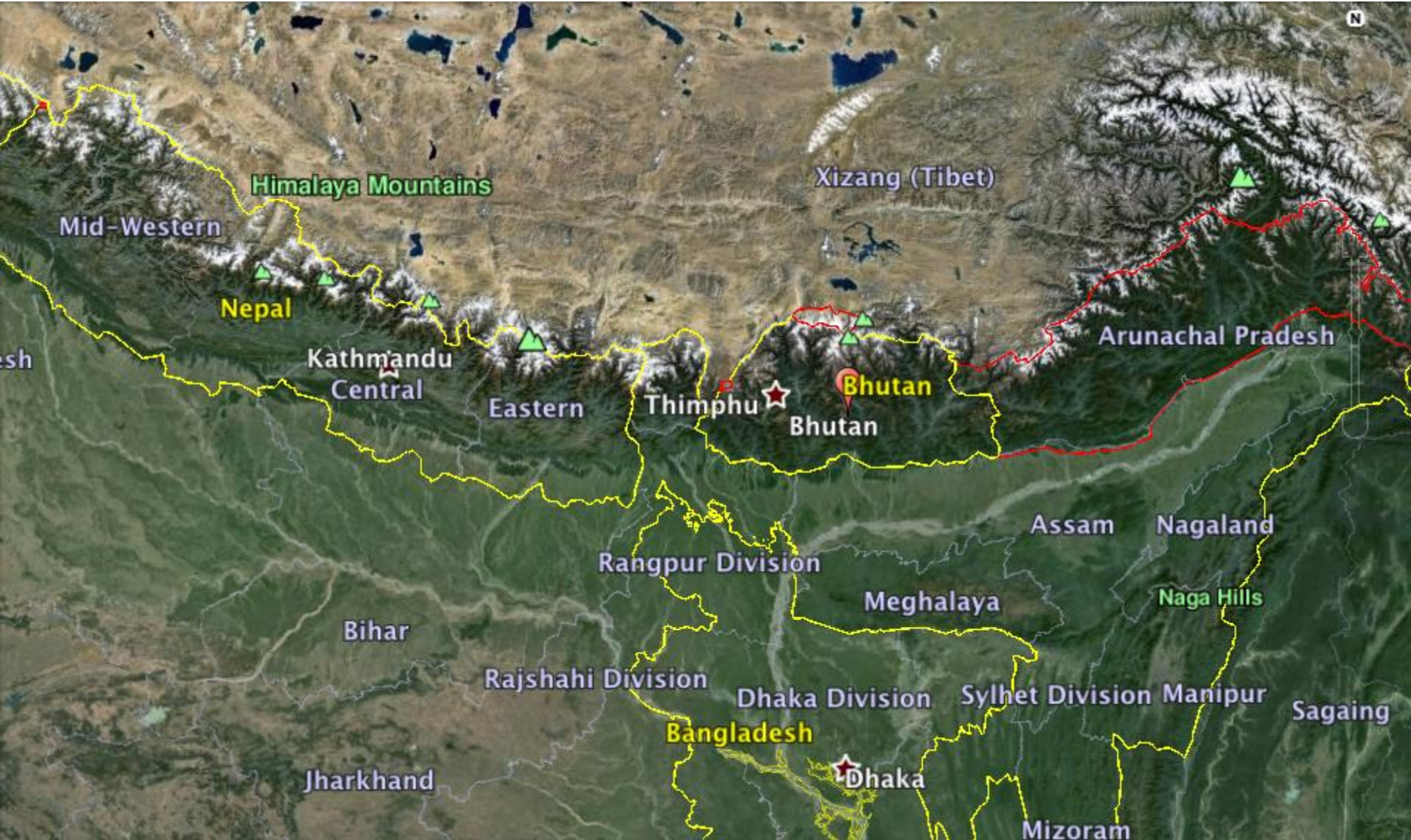
Google earth

Guide

24°20'29.86" N 95°13'41.83" E elev 233 m eye alt 1705.51 km



9:58 PM
11/7/201



Landlocked
Eastern Himalayas: A Fragile Mountainous Landscapes
Heavily Forested

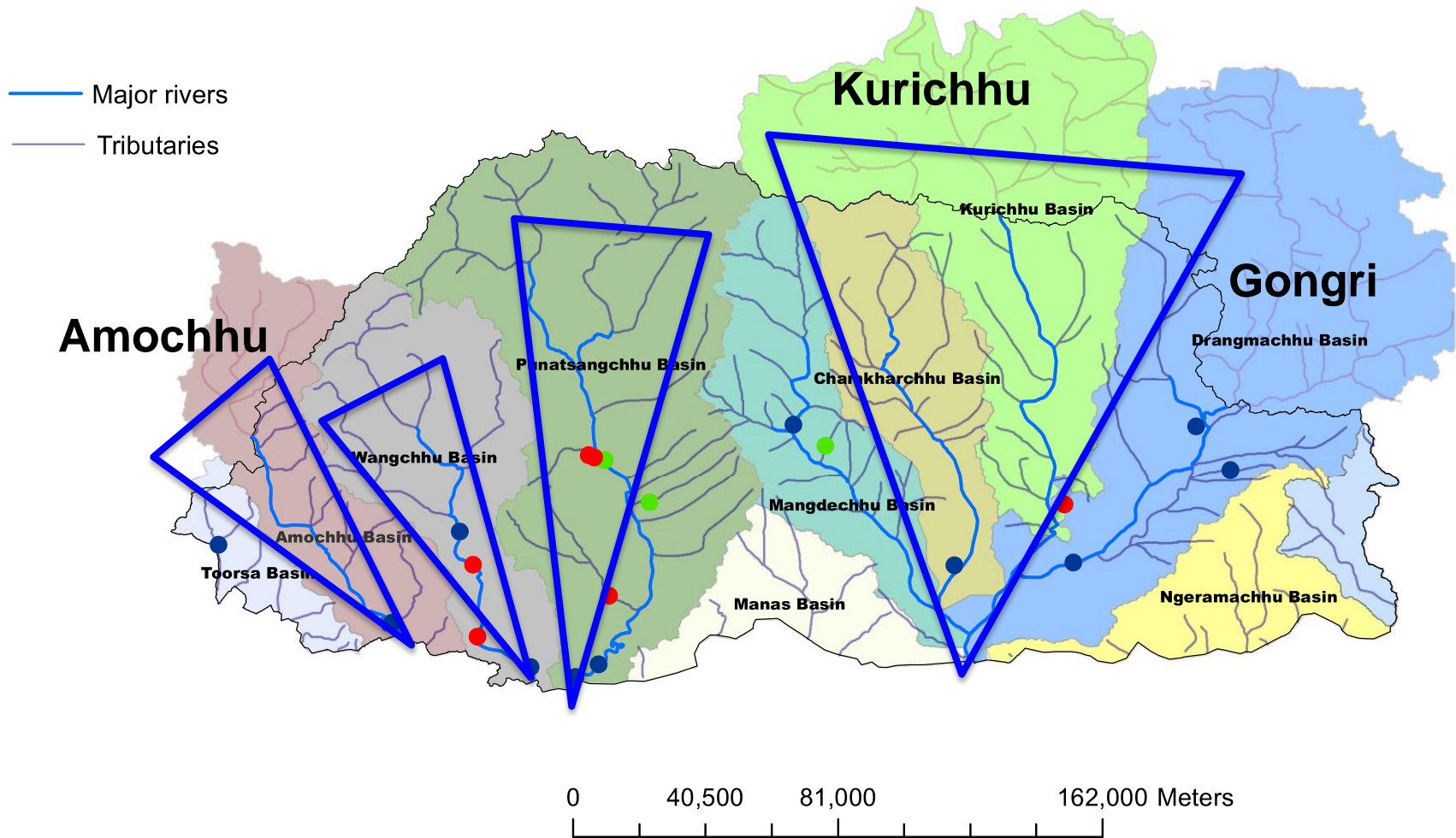
The collage consists of two main parts. On the left, a word cloud is centered around the word 'happiness' in large red letters. Other prominent words include 'National' in dark red, 'Gross' in yellow, 'economy' in green, 'wellbeing' in green, 'community' in dark red, 'shift' in yellow, 'measure' in green, 'index' in yellow, 'system' in red, 'governments' in red, 'society' in red, 'economic' in red, 'GDP' in red, 'mobility' in red, 'look' in green, 'based' in green, 'sustainable' in green, 'businesses' in green, 'paradigm' in green, 'goal' in green, 'health' in green, 'well' in green, 'values' in red, 'change' in red, 'sustainability' in red, 'initiative' in red, 'massive' in red, 'growth' in green, 'level' in red, 'subjective' in red, 'growth' in green, 'level' in red, 'subjective' in red, 'growth' in green, 'level' in red, 'subjective' in red. On the right, a white t-shirt is hanging. It has blue text in Tibetan script at the top and 'Perseus of Gross' in blue English text below it.

A white t-shirt is hanging on a hanger. The t-shirt has the text "In Pursuit of Gross National Happiness" printed on it in a blue, serif font. Above the English text, there is a line of text in Tibetan script. The background is a colorful, abstract painting. To the right of the t-shirt, there is a wooden structure, possibly a door or a frame, with some small, dark, indistinct markings on it.



PA Net work: 51.4 (42.7 + 8.6 + 0.1)

River System in Bhutan



Water Availability: 109,000 m³/capita



ཡུལ་དབང་ལྷུག་མཐའ་འཁོར་དང་ཉམས་སྲུང་སྤྱུལ་ཁང་།

Ugyen Wangchuck Institute for Conservation and Environment



HOME NEWS RESEARCH MEDIA CONTACT US

Government

Regulators

First National Workshop on The Economics of Ecosystems and Biodiversity

Posted on 20-02-2014 by uwiceadmin_it in News. 155 views

The MoAF in collaboration with the UNEP will be organising the First National Workshop on 'The Economics of Ecosystems and Biodiversity (TEEB)' from 10-12 March 2014. The workshop will be held at the Excellence Center, Thimphu.

Conservationist

Planners

Politicians

Business

NGOs



ཡུལ་དབང་ལྷུག་མཐའ་འཁོར་དང་ཉམས་སྲུང་སྤྱུལ་ཁང་།
Institute for Conservation and Environment



HOME NEWS RESEARCH EDUCATION PUBLICATIONS ABOUT US MULTIMEDIA

First Bhutan National Workshop on TEEB

Posted on 11-03-2014 by uwiceadmin_it in News. 151 views

The 1st Bhutan National workshop on 'The Economics of Ecosystems and Biodiversity (TEEB)' was held on 10-12 March 2014. The Minister for Agriculture and Forests, graced the opening session.

TEEB is an international initiative that provides evidence of economic and social benefits of ecosystems and the costs of their loss and degradation. Bhutan has expressed interest to be part of a TEEB project "The Economics of Ecosystems and Biodiversity (TEEB) National Scoping Workshop for Bhutan".

The main objective of the three days workshop is to identify the relevant stakeholders to the study and to identify the technical components of the study.

More than 25 officials from UNEP-TEEB office, WWF, DGPC, DoRE, NEC, MoF and MoAF participated in the workshop.

The workshop is jointly organised by Ministry of Agriculture and Forests and UNEP-TEEB (The Economics of Ecosystems and Biodiversity).

**The Economics of Ecosystems and Biodiversity
(TEEB)
National Scoping Workshop for Bhutan**

WORKSHOP REPORT

**10 – 13 March, 2014
Thimphu, Bhutan**

☐ **Politician**

- Honourable Agriculture Minister
- Honourable Chair Environment and Urban Development Committee

☐ **Non Governmental Organizations**

- WWF-Bhutan
- Royal Society for Protection of Nature
- UNDP
- Bhutan Trust Fund for Environmental Conservation
- Bhutan Foundation

☐ **Corporations**

- Druk Green Power Corporation
- Environment Section - Under Construction Hydro-power Plants
- Bhutan Power Corporation

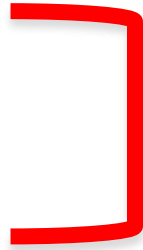
☐ **Tourism Council of Bhutan**

Government:

- ❑ Ministry of Agriculture and Forests
 - Policy and Planning Division
 - Department of Agriculture
 - Department of Forests and Park Services
 - Watershed Management Division
 - Forest Resources and Management Division
 - Ugyen Wangchuck Institute for Conservation and Environment
 - Nature Conservation Division
- ❑ Gross National Happiness Commission
- ❑ Ministry of Finance
 - Department of Public Accounts
- ❑ National Environment Commission
- ❑ National Land Commission
- ❑ National Statistical Bureau
- ❑ Ministry of Economic Affairs
 - Department of Hydro-power and Power Systems
 - Department of Renewable Energy
 - Department of Hydro-met Services

Economy

Hydropower
Agriculture



Heavily affected by
Climate Change

Hydropower: 27% of country's GDP
30,000 MW potential but 23,765 techno-
economically feasible.
6 % of the potential harnessed

Hydro-power

1. Introduction

- 1.1 The economy of the Kingdom of Bhutan is largely dependent on the development of Hydropower generation. Hydropower plants contribute significantly to the overall GDP growth and economy, both during construction and operation phases.
- 1.2 The domestic demand for electricity in the country is increasing at a rate that may soon exceed existing generation capacity that is presently available to meet such domestic demand, and hence, capacity augmentation is imperative. The surplus electricity is being exported to India from the existing hydropower generating plants. The revenue earned from export of electricity is a significant contributor to the overall revenues of the Kingdom. There is great potential for increasing such export and consequently earn substantial revenues. As part of the Framework Agreement entered between the Royal Government of Bhutan (RGoB) and the Government of India (GoI) for cooperation in the field of hydropower sector, GoI has agreed to a minimum import of 5,000 MW of electricity from Bhutan by the year 2020.
- 1.3 The RGoB intends to develop hydropower projects in an accelerated manner in order to have an installed capacity of at least 10,000 MW by 2020. The key reasons for acceleration of hydropower development are:
 - hydropower is the main source of revenue for the country and its development would help the country achieve its goal of economic self reliance, and
 - huge energy demand in the region offers a big opportunity for Bhutan to develop its rich hydropower resources for export.

TEEB- Bhutan

- Assess changes in ES under different hydropower diversification scenarios

- Inform:



Each Scenario would seek to achieve RGoB's goal for 2020

1. Sustainable Hydropower Development Policy 2008
2. Alternative Renewable Energy Policy 2013

Policies call for diversification of energy sources and sustainable expansion in hydropower capacity

TEEB- Bhutan

- Assess changes in ecosystem services provisioning under different hydropower diversification scenarios
 - ❑ Diversification - Large; Medium; Small etc.
 - ❑ 15 ES - Identified
- Recommend instruments, including PES and royalty fee changes to ensure benefits sharing with communities

Integrated Sustainable Water Resources Management

12.4 In order to utilize water resources in a sustainable manner for hydropower generation, it is important to protect water catchment areas by promoting sustainable agricultural/land use practices and nature conservation works. The MoA in collaboration with MoEA shall work out the modalities for integrated sustainable water resources management. A minimum of 1% of royalty energy in cash shall be made available on annual basis to MoA for this purpose.

Ugyen Wangchuck Institute
for Conservation and
Environmet

Department of Hydro-
power and Power Systems

Watershed Management
Division

Department of Renewable
Energy

Forest Resources and
Management Division

Druk Green Power
Corporation

NLCS

DoA

NSB

DoL

WWF

TCB

NEC

DHMS

GNHC

MoHCA

Data Sources

Review Committees

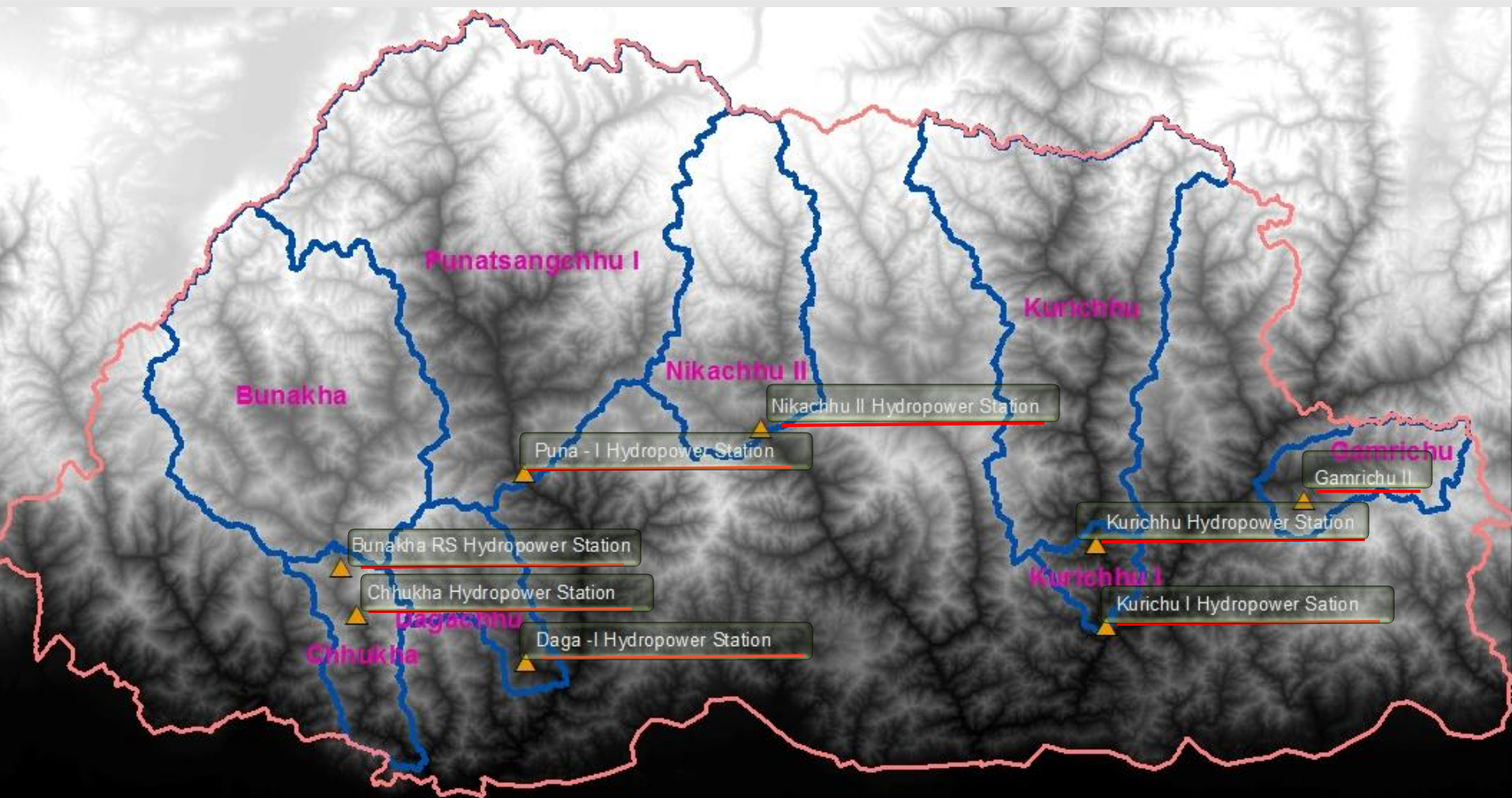
Chief Program Officer - Gross
National Happiness Commission

Country Representative – WWF
Bhutan

Chief Forestry Officer –
Watershed Management
Division

Chief Engineer – Hydropower
Development Division

Director Projects – Druk Green
Power Corporation



Sediment Load – PES

Commissioned:

1. Chhukha [336]
2. Kurichhu [60]
3. Dagachhu [126]

Under Construction:

1. Puna Tsangchhu I [1200]
2. Nikachhu II [118]

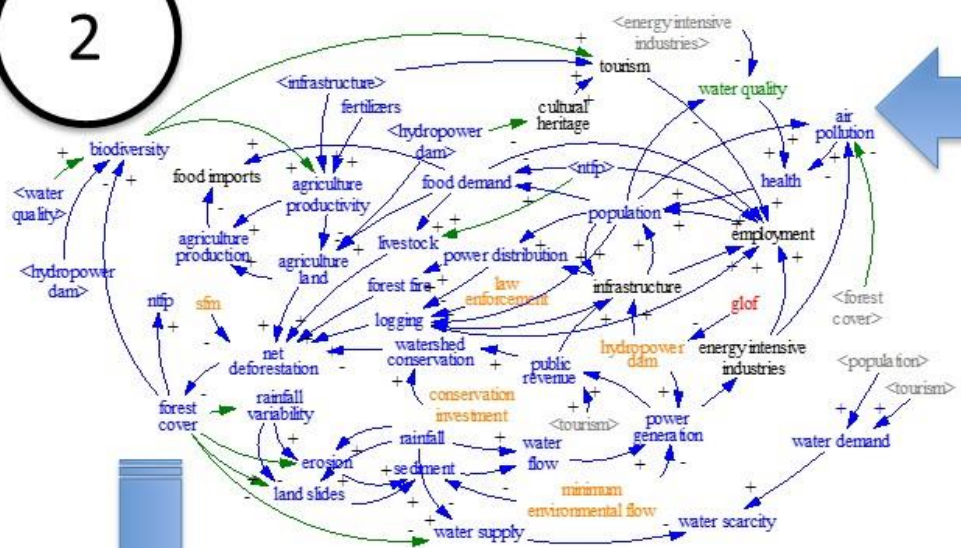
1. BAU

2. Dam Construction
3. Dam and Conservation

Planned:

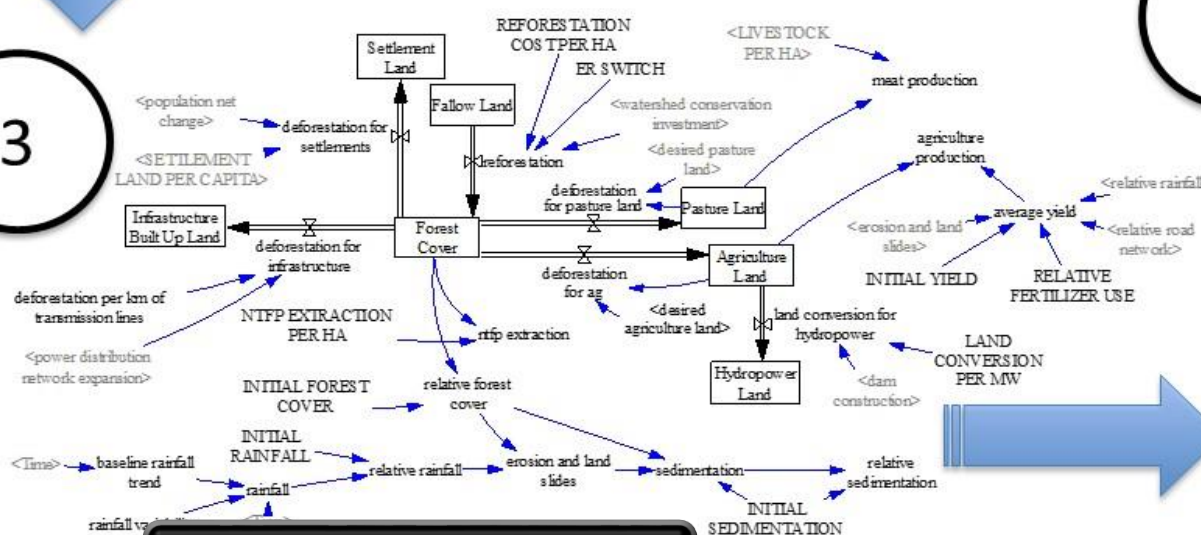
1. Kuri I [1230]
2. Gamri Chhu II [85]
3. Bunakha Reservoir [180]

2



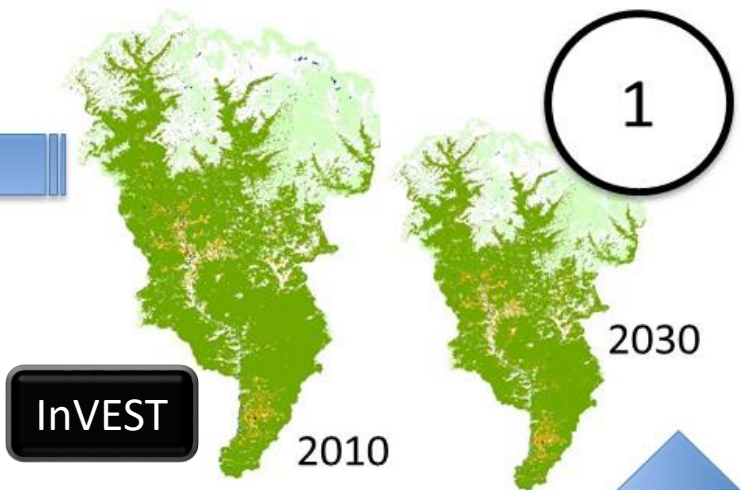
System Thinking

3



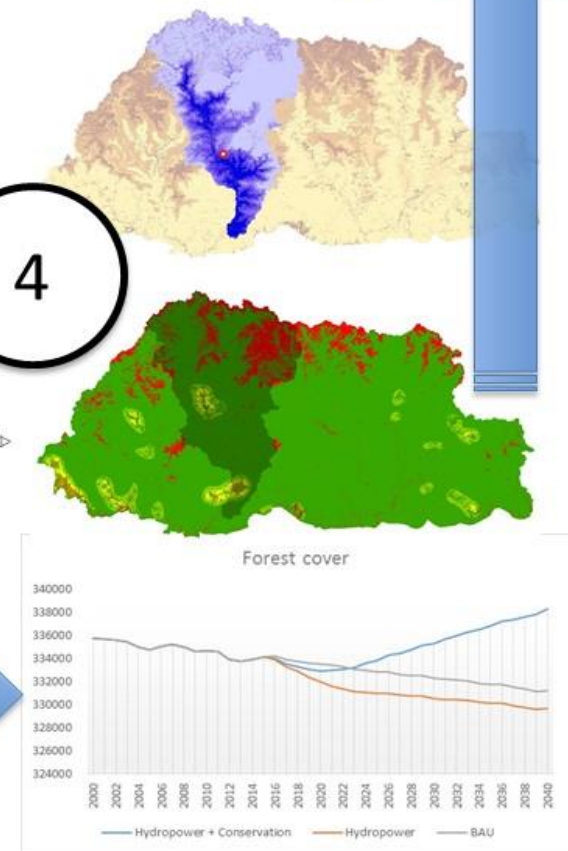
Green Economy Model

1



InVEST

4



Biophysical Models

Scenario
Generator
Proximity Based

Habitat Quality

Water Yield
Model

Carbon Model

Sediment
Delivery Ratio

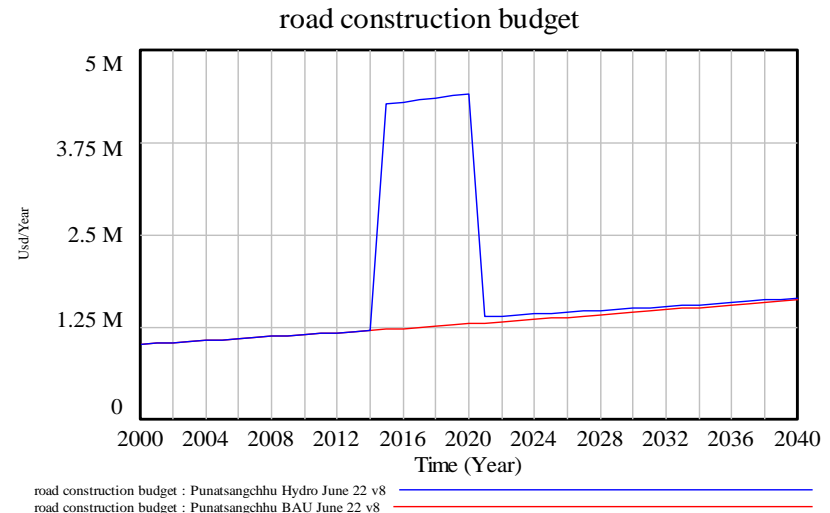
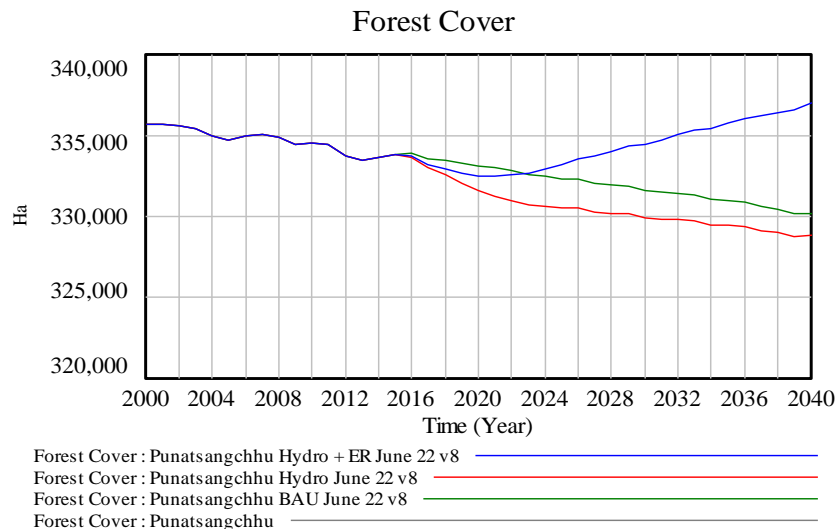
Nutrient
Delivery Ratio

Ecosystem Services

1. Provision of Food
2. Provision of fresh water (quality) – nitrogen
3. Provision of fresh water (quality) - phosphorus
4. Habitat for species
5. Regulation of carbon sequestration and storage
6. Genetic resources
7. Timber
8. Biological Control
9. Pollination

Ecosystem Services [Results]

- ❑ Bio-physical Changes projection for 2030 for the scenarios
 - BAU
 - Hydropower Construction
 - Hydropower Construction with Ecosystem Services
- ❑ Value of ES projection for the scenarios [By How Much]



ES	Estimation			Biophysical change (2010-2030): BAU	Hydro vs BAU	ES vs BAU	Economic value per unit	Economic valuation (year 2030)		Comments	
	InVEST	SD	Benefit transfer					Hydro vs BAU	ES vs BAU		
Provision of food		X		1,319 ton	-76	-80	739.86 US\$/ton	-\$421,692	-\$424,088	Systemic approach, with endogenous changes to population and land use	
					1,159	1,151		\$814,442	\$808,675	Sectoral approach with no change to land use, only yield	
Provision of freshwater (quality) - nitrogen		X		0.0410 mg/l	-1.96%	-1.92%	-	Below health threshold	Below health threshold	Assumes that all the land-related N loadings take place in 20% of the area (concerning the estimation of concentration)	
Provision of freshwater (quality) - phosphorus		X		0.0435 mg/l	-3.69%	-3.67%	-	Below health threshold	Below health threshold	Assumes that all the land-related N loadings take place in 20% of the area (concerning the estimation of concentration)	
Habitat for species			X	802 ha	-26	590	5,192 US\$/Ha	-\$133,045	\$3,065,470	Economic value per unit obtained from Kubiszewski et al. (2010)	
		X		91,633 persons	-3,535	-3,511	576 US\$/person	-\$2,036,106	-\$2,022,201	Assumes that a reduction in habitat quality has a proportional impact on tourism visits (it could also be assumed that expenditure per visit might change)	
Regulation of carbon sequestration and storage	X	X		-2,211,105 ton	-81,350	154,884	43 US\$/ton	-\$3,498,050	\$6,660,012	Upper values of carbon coefficients from IPCC Report 2006	
	X	X		-123,059 ton	-2,292	52,794	43 US\$/ton	-\$98,556	\$2,270,142	Lower values of carbon coefficients from IPCC Report 2006	
Genetic resources			X	802 ha	-26	590	19 \$US/ha/year	-\$487	\$11,218	Economic value per unit for temperate forest obtained from Kubiszewski et al. (2010)	
Timber			X	802 ha	-26	590	44 \$US/ha/year	-\$1,128	\$25,979	Economic value per unit for temperate forest obtained from Kubiszewski et al. (2010)	
Biological control			X	406 ha	-164	-163	28 \$US/ha/year	-\$4,599	-\$4,566	Economic value per unit for cropland obtained from Kubiszewski et al. (2010)	
			X	802 ha	-26	590	9 \$US/ha/year	-\$231	\$5,314	Economic value per unit for temperate forest obtained from Kubiszewski et al. (2010)	
Pollination			X	406 ha	-164	-163	19 \$US/ha/year	-\$3,121	-\$3,099	Economic value per unit for cropland obtained from Kubiszewski et al. (2010)	
			X	802 ha	-26	590	376 \$US/ha/year	-\$9,635	\$221,999	Economic value per unit for temperate forest obtained from Kubiszewski et al. (2010)	

[Recommendations]

- Land use type practices up-stream
- Institution of PES to up-stream land users
- Scale of hydro-power project and influence on ES
- Recommendations for planned projects

Tashi Delek