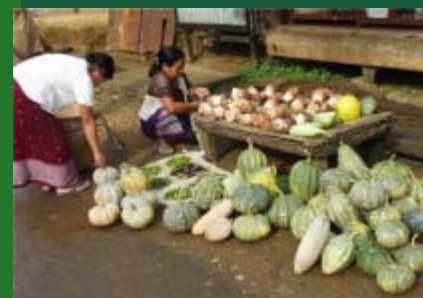
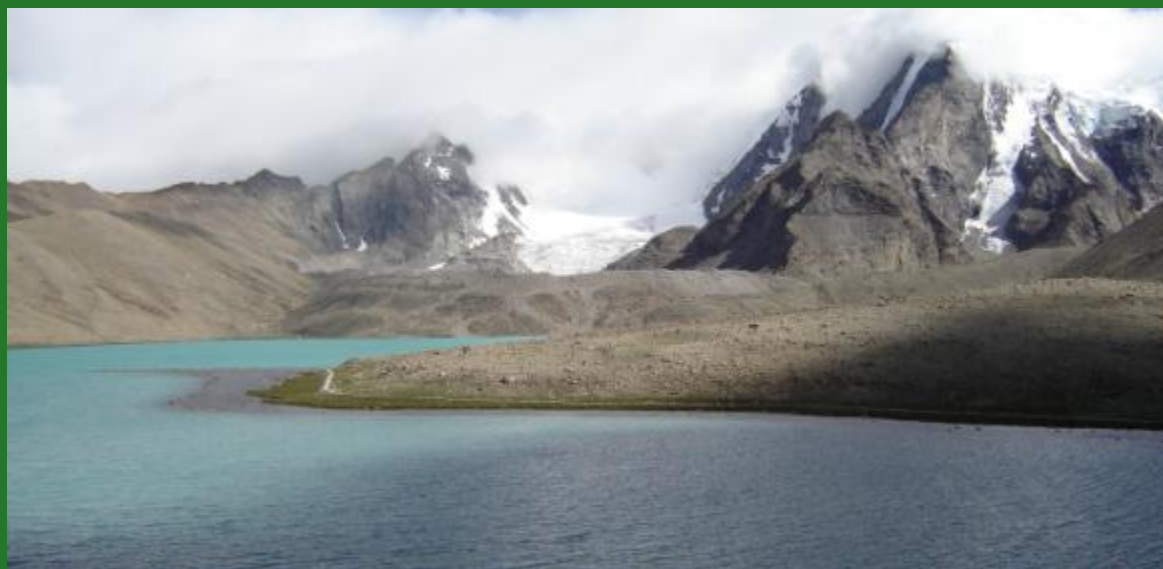


Biodiversity in the Hindu Kush-Himalayas – Trends, Perceptions and Impacts of Climate Change

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***Eklabya Sharma, Karma Tse-ring,**
Nakul Chettri and Arun Shrestha*

Presentation Outline

- Introduction
- Biodiversity Status in the Eastern Himalayas
- Climate Change Variability
- Sensitivity to Climate Change
- Transects and Landscape Approach

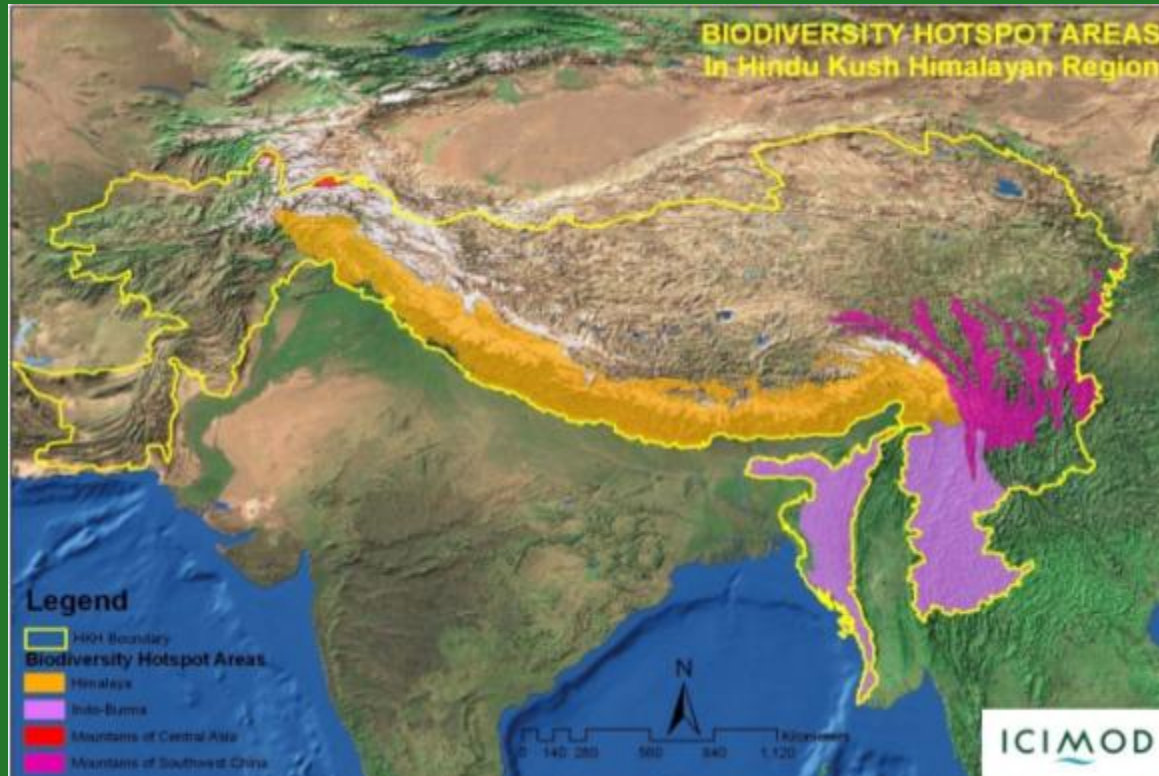
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Unique Global Biodiversity Centre

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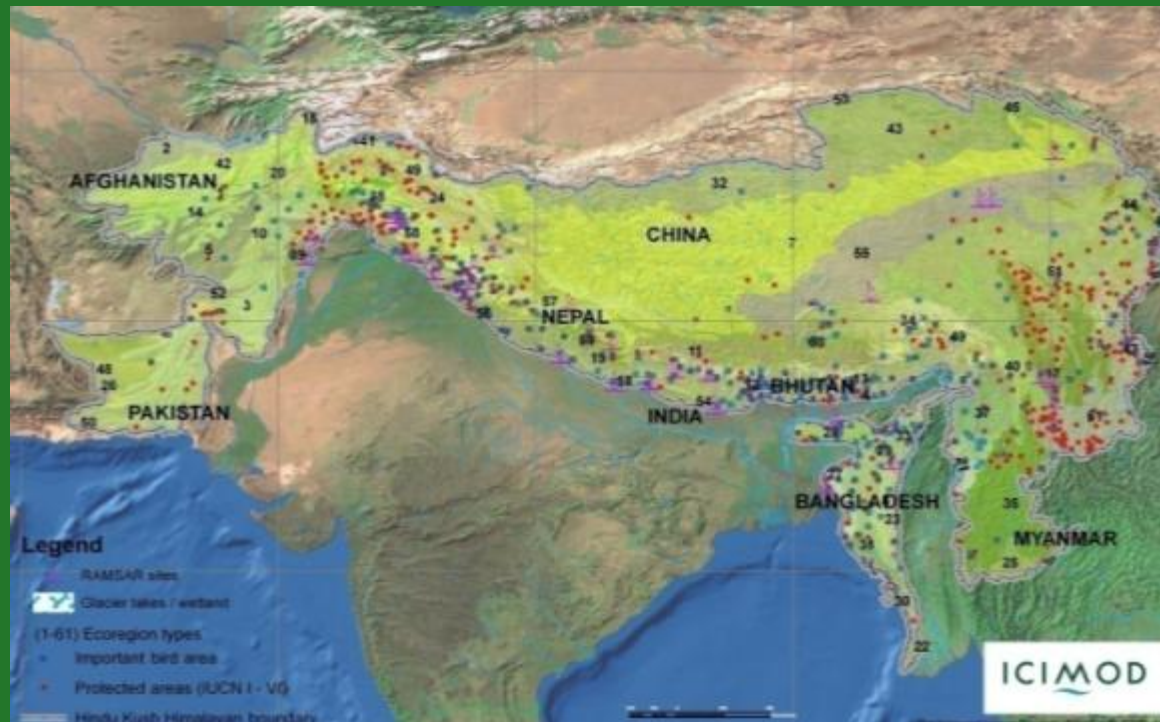
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4.3 mi sq km – geographical extension to Pamir, Karakoram, Tibetan plateau, Indo-Burma, CHT-Bangladesh, Southwest China Mountains; 200 mi population 1.3 bi in River Basin; 4 of 34 GBH; 8 countries; >1000 live language; Conflicts & Poverty

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Biodiversity Conservation and Management

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**32% area covered by 4 Global Hotspots; 488 PAs
39% area; 60 Ecoregions – 30 critical & 12 represent
Global 200 Ecoregions; 1106 IBAs; 3 UNESCO
Natural Heritage Sites; 30 Ramsar Sites**

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Conservation Trends – Linkage with People and Development

IUCN Category		
	No	Area (%)
I -	3	3
II -	43	2
III -	13	1
IV -	139	3
V -	189	41
VI -	27	36
Unset -	74	14

Landscape/ecosystem approach



1998

2006

Buffer zone/community based approach



1980

2002

Habitat/PA management approach



1970

2000

Charismatic species conservation

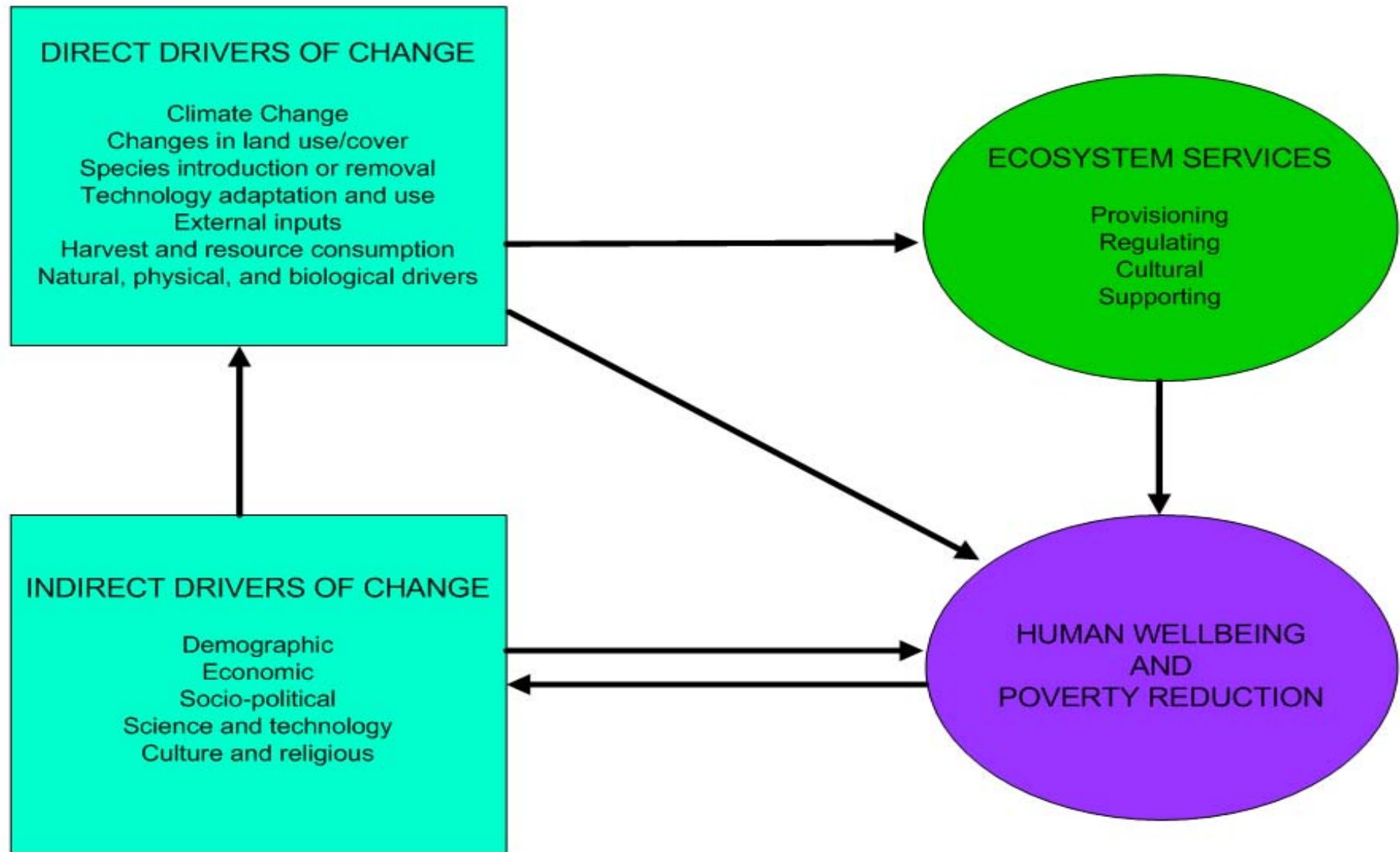


1930

1980

PA in HKH increased from 11 to 39% in last 12 years

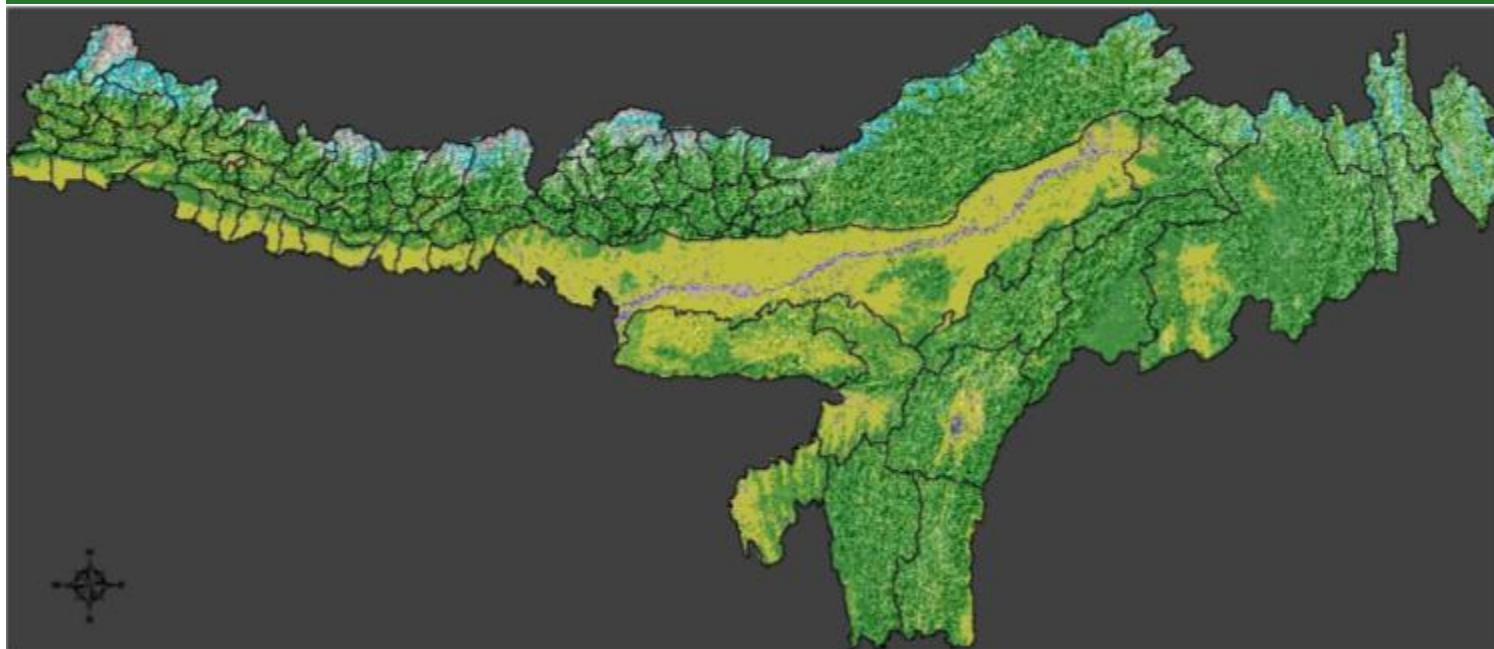
Drivers of Environmental Change



Source: MA 2005

Eastern Himalayas

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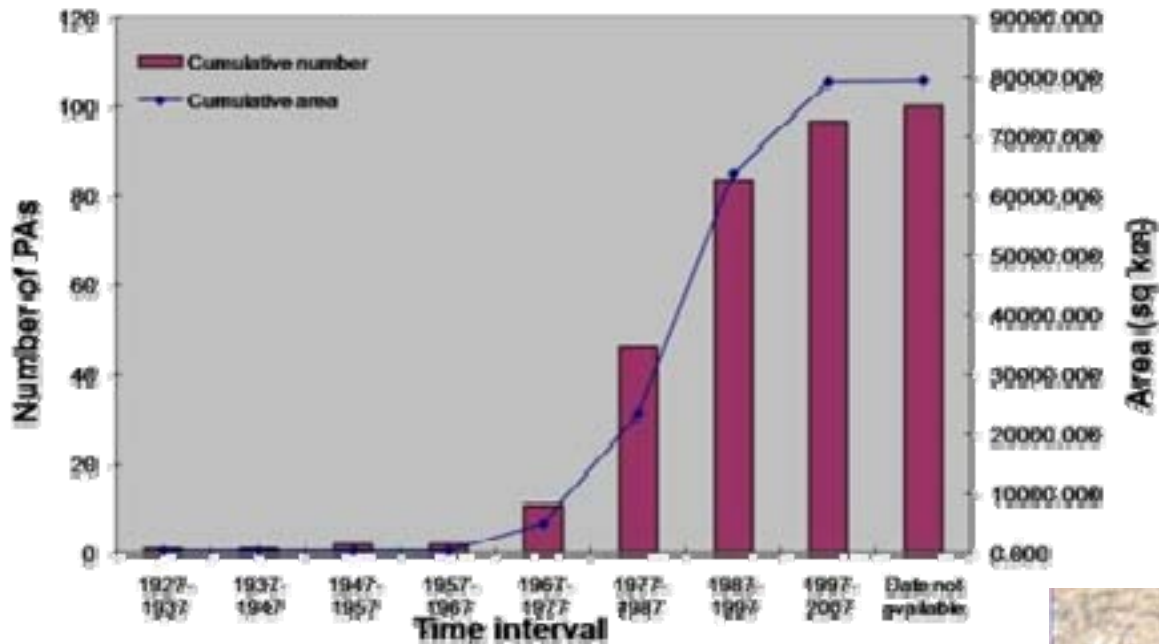
Global Hotspot contribution (%)– Himalaya (39), Indo-Burma (8) and Mountains of Southwest China (13) ...
60% of EH in Global Hotspot area

Area Coverage (%) – Bhutan (8), China (6), India (52), Myanmar (18) and Nepal (16)

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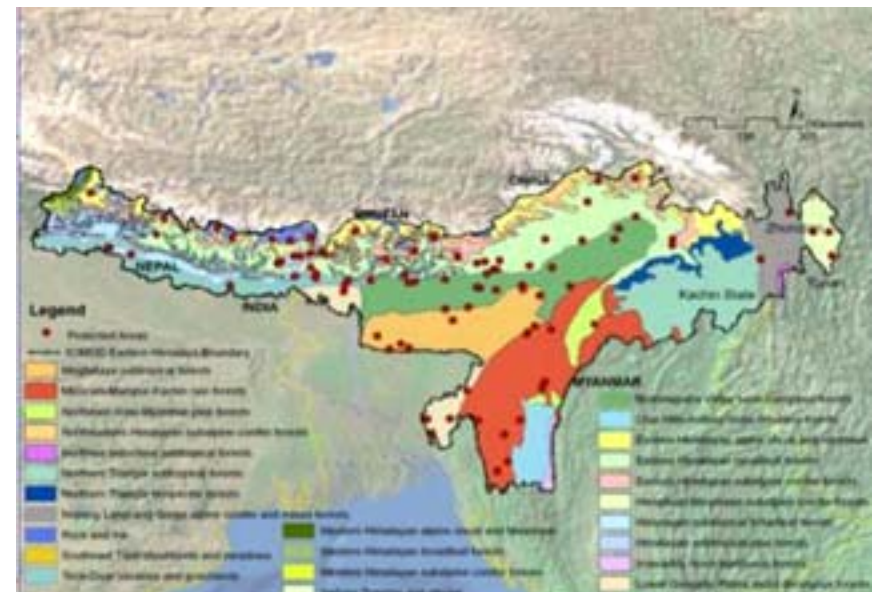
PA's and Ecoregions - EH

Cumulative growth in PA's in EH from 1927-2007



100 Protected Areas
79,000 sq km
15% coverage

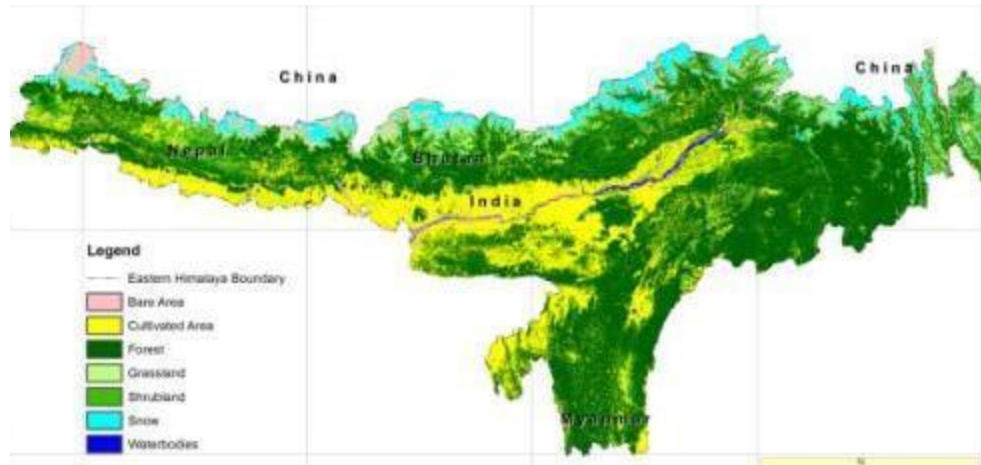
25 Ecoregions



Land Cover Change

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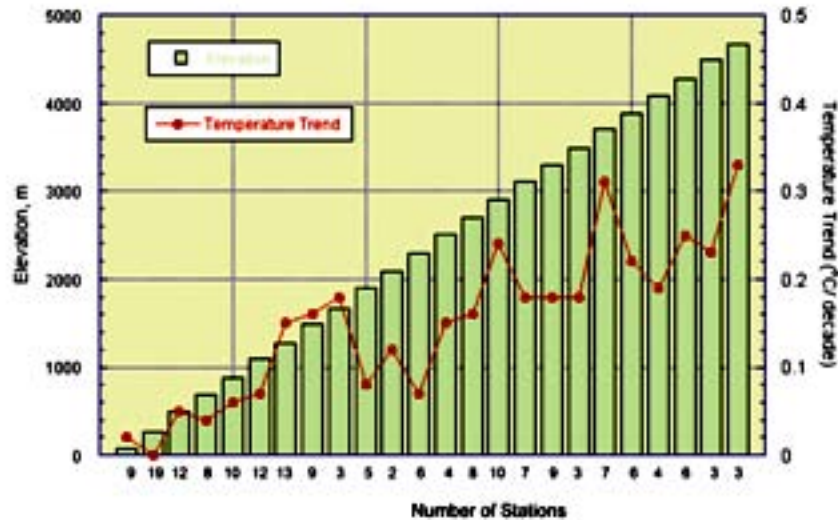
Total Change 3.7% (1970-2000)



(+) shrubland (90%), bare areas (7%), cultivated land (3%)

(-) snow cover (35%), grassland (17%), forest (48%) and water bodies (0.1%)

Temperature Trends



Greater warming
at higher elevation
– up to 0.32 (Tibet)

Nepal annual
range – 0.04 to
0.09 greater in
higher elevation

Regional Mean Temperature Trends for the period 1977-2000 (°C per year)

Regions	Seasonal				Annual Jan-Dec
	Winter	Pre-monsoon	Monsoon	Post-monsoon	
	Dec-Feb	Mar-May	Jun-Sep	Oct-Nov	
Trans-Himalaya	0.12	0.01	0.11	0.10	0.09
Himalaya	0.09	0.05	0.06	0.08	0.06
Middle Mountains	0.06	0.05	0.06	0.09	0.08
Siwalik	0.02	0.01	0.02	0.08	0.04
Terai	0.01	0.00	0.01	0.07	0.04
All-Nepal	0.06	0.03	0.051	0.08	0.06

Temperature Trends by Elevation Zones

Regional Mean Temperature Trends 1970-2000 (°C per year)

	Annual	DJF	MAM	JJA	SON
Level 1 (<1 km)	0.01	0.03	0.00	-0.01	0.02
Level 2 (1 km- 4km)	0.02	0.03	0.02	-0.01	0.02
Level 3 (> 4 km)	0.04	0.06	0.04	0.02	0.03

The Eastern Himalayas is experiencing widespread warming. The warming is generally higher than 0.01 °C/yr

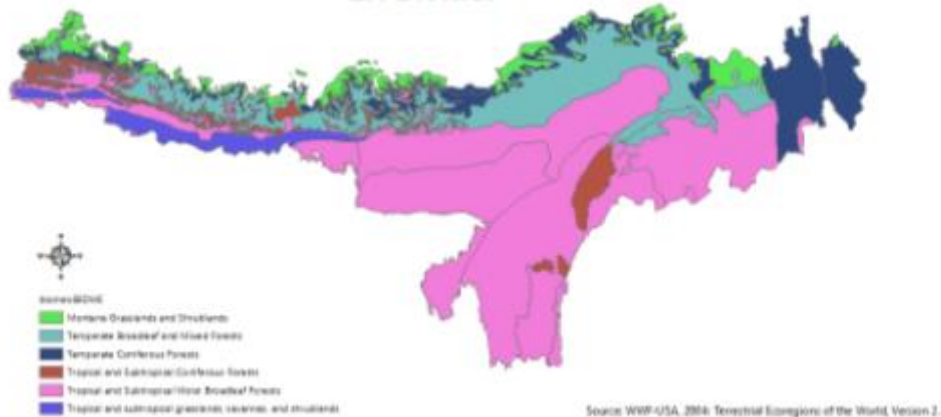
Trends of Temperature and Precipitation in the EH

- Greater warming with elevation, >4000m experiencing highest warming rate
- Higher rates in winter season, and lowest or even cooling observed in summer;
- Seasonal temperature variability is increasing and altitudinal lapse rate is decreasing
- Unlike, temperature precipitation does not show any consistent spatial trends
- Annual precipitation changes are quite variable, decreasing at one site and increasing at a site nearby
- Gaps in consistent and representative data; regional data centre required



Biomes and Endemics- EH

EH Biomes



Total Strict Endemics in the Region



**Six Biomes - dominated by
Tropical, Subtropical and
Temperate Broadleaf Forests**

**Rich in Strict Endemics – more
concentration in the south and
eastern parts – with 8 to 16
species**

Perception on Coping with Climate Change

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Actions Required	Per cent respondent
Intensify afforestation and reforestation program	12
Alternative options to forest produces	14
Awareness campaign and multi-media education	8
Land and water management	8
Local participation to mitigate effects of hazard	8
Recycling of waste materials	14
Reduction in settlement expansion	10
Reduction in use of firewood	6
Partnership, cooperation and collaboration to combat climate change	20

Sensitivity: Vulnerable Entities

Ecosystem/habitats:

- Critical Ecosystems -Ephemeral habitats (seasonal)
- Riverine island ecosystems e.g. Majuli of Assam
- Wetlands (beels) and associated biodiversity
- Sub-alpine and alpine transition zones (ecotone)
- Sub-alpine and alpine meadows
- Transboundary areas

Species:

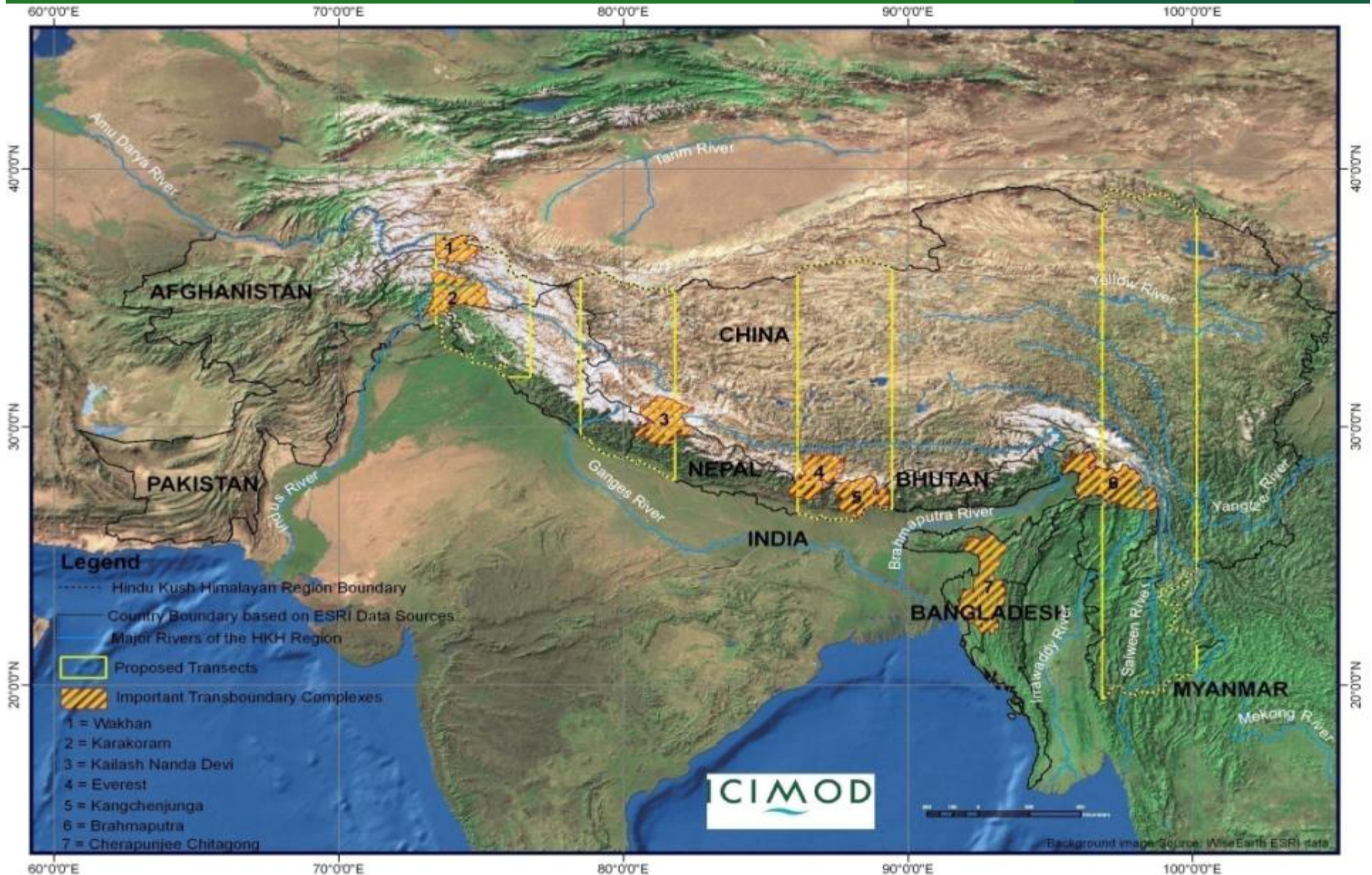
Endemic species (*Mantesia*, *Panax*, *Ilex khasiana*, *Osbeckia capitata*, insectivorous plants), Brahmaputra dolphins, alpine species

Genetic diversity:

Upland variety of rice (dryland/wetland in the entire north-east), indigenous bean varieties, cucurbits, citrus



Transects and Landscape Approach



Thank You

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