

UNFCCC technical workshop on water and climate change impacts and adaptation strategies under the Nairobi work programme on impacts, vulnerability and adaptation to climate change

Session: 3

Assessment of climate change impacts on water resources, related sectors and ecosystems

Challenges of climate change impacts on water resources in mountain ecosystems

Rajan Kotru on 19th July, 2012

International Centre for Integrated Mountain Development

Kathmandu, Nepal

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Outline

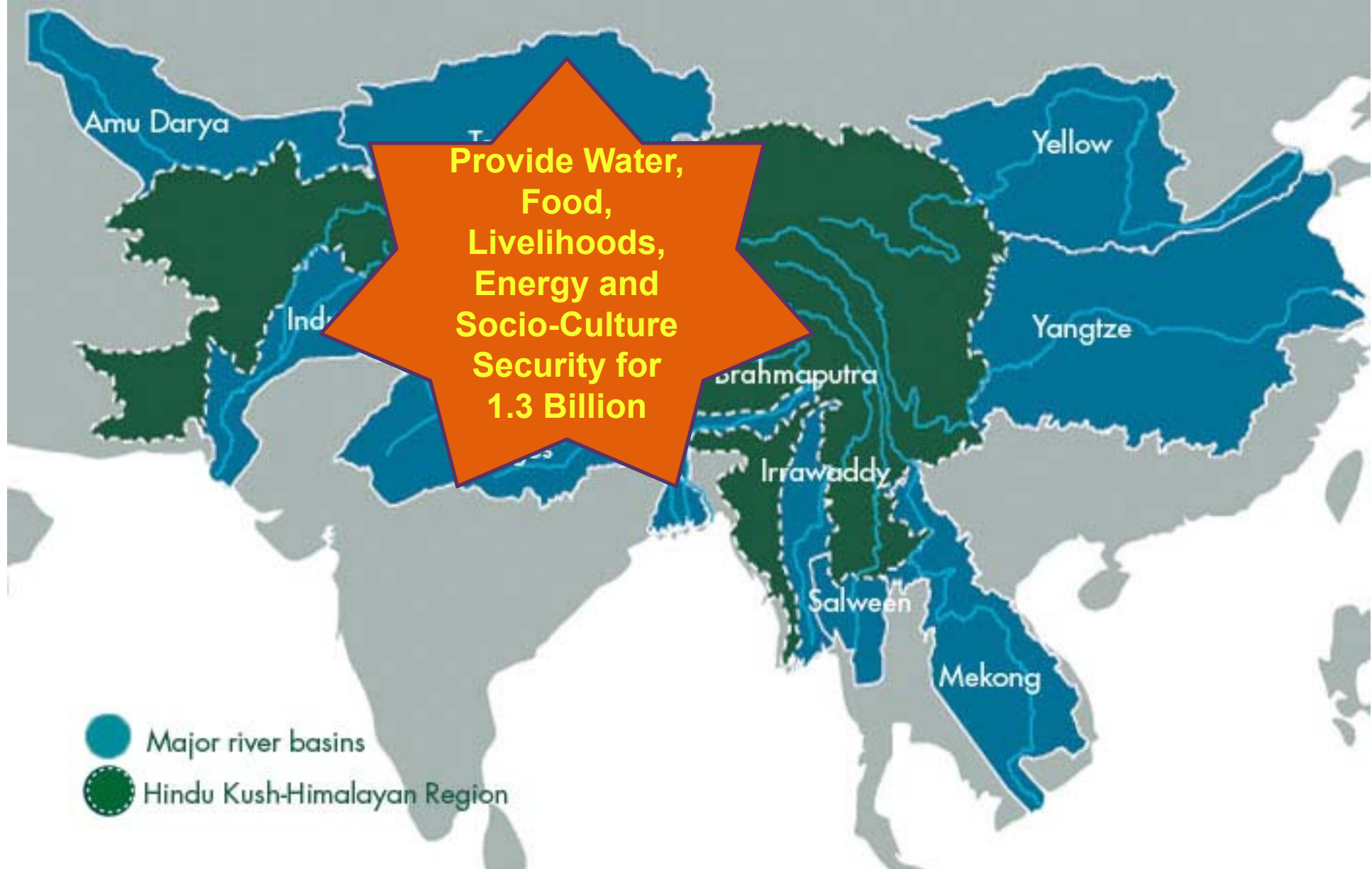
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- Observed climate trends
- Innovations
- Early Messages

Ten major River Basins of Asia

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Glaciers several thousands of years old are rapidly melting

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Mt. Everest

Glaciated area (approx):
HKH: 100,000 km²
Core Himalayas: 33,000 km²
Stored water in Himalayan glaciers: 12,000 km³

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Impact of Climate Change - Imja Glacier, Nepal

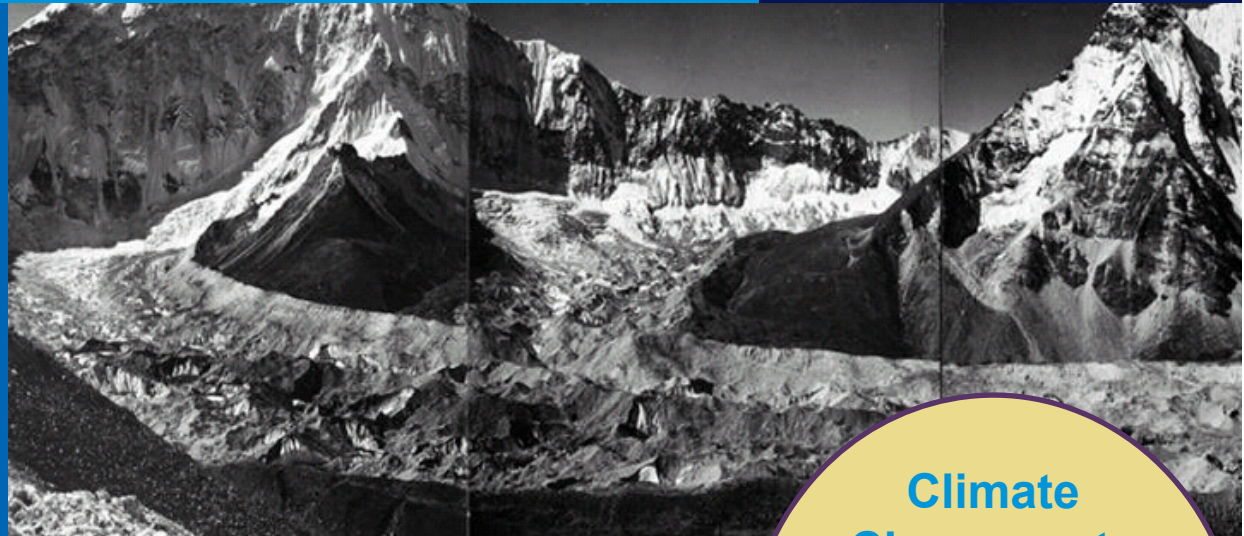
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1956

**photograph of Imja
glacier**

(Photo: Fritz Muller;
courtesy of Jack Ives)



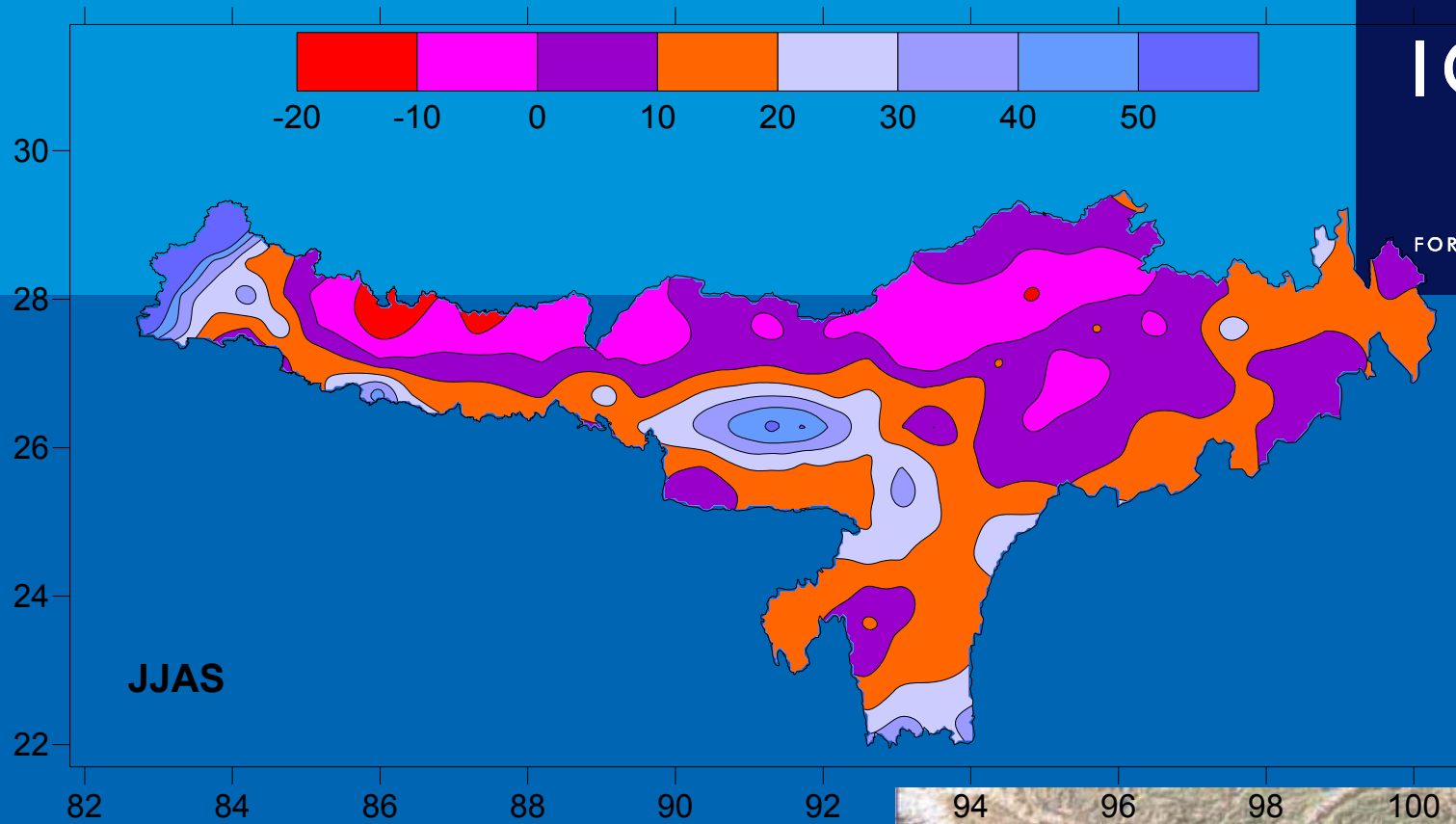
2006

**photograph of Imja
glacier**

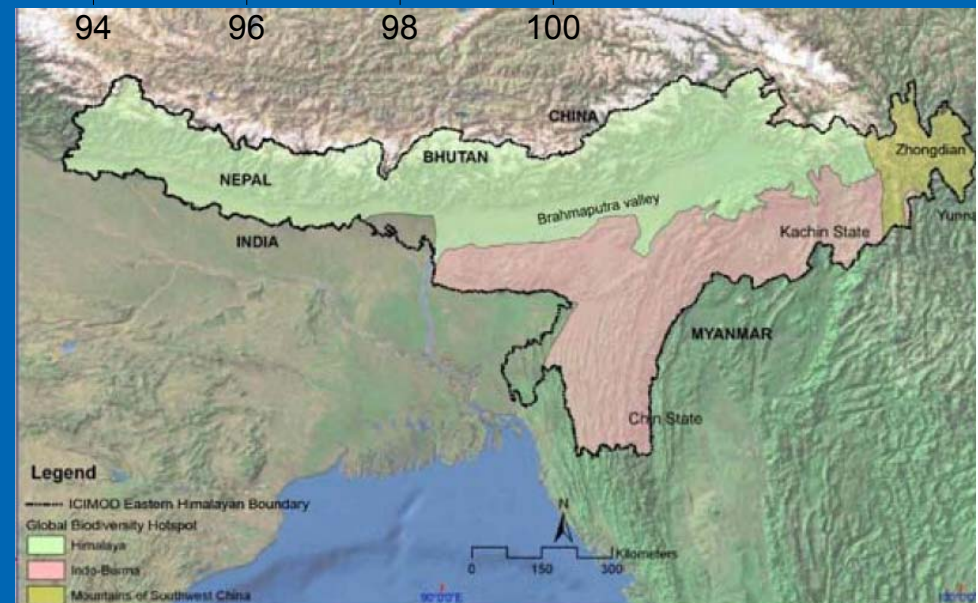
(Photo: Giovanni Kappenberger
courtesy of Alton C Byers)



**Climate
Change gets
a Name:
Glacial Lake
Outburst
Floods
(GLOF)**



Simulated Changes in Monsoon-Rainfall in % as per HadRM2 Model for the period 2041-2060; Trend: Increase in plains and, decrease in the higher altitudes



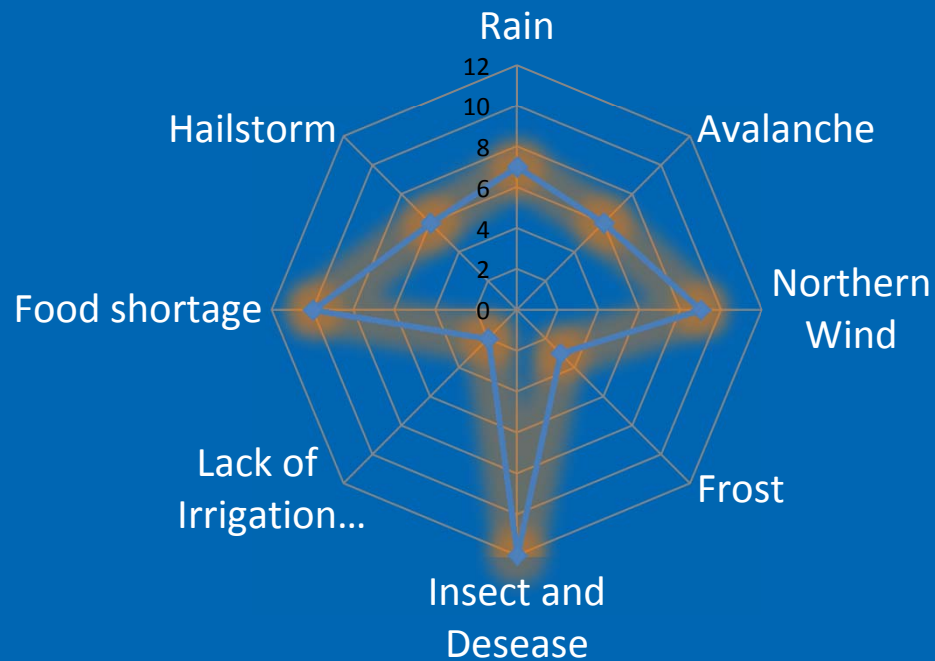
Statistical downscaling at *Jumla, Nepal* using GCM (HadCM3) predictors

	Maximum Temperature (C)			Minimum Temperature (C)			Rainfall (% of base period)		
	2020s	2050s	2080s	2020s	2050s	2080s	2020s	2050s	2080s
	B2 Scenarios								
Winter	1.04	2.10	3.22	0.27	0.50	0.77	-17	-32	-47
Spring	1.18	1.95	2.89	0.83	1.45	2.13	-15	-21	-31
Summer	0.58	1.14	1.61	0.88	1.87	2.78	8	16	12
Autumn	1.00	1.52	2.25	1.36	2.10	3.04	0	22	23
Annual	0.95	1.68	2.49	0.83	1.48	2.18	0	4	-2
	A2 Scenarios								
Winter	0.94	2.39	3.95	0.21	0.57	0.97	-13	-31	-54
Spring	1.28	2.48	4.50	0.97	1.93	3.29	-10	-17	-42
Summer	0.65	1.36	2.28	0.96	2.21	3.72	9	9	13
Autumn	0.81	1.80	3.08	1.08	2.36	4.24	19	20	10
Annual	0.92	2.01	3.45	0.80	1.77	3.05	4	1	-5

B2: Low emission scenario and A2: High emission scenario

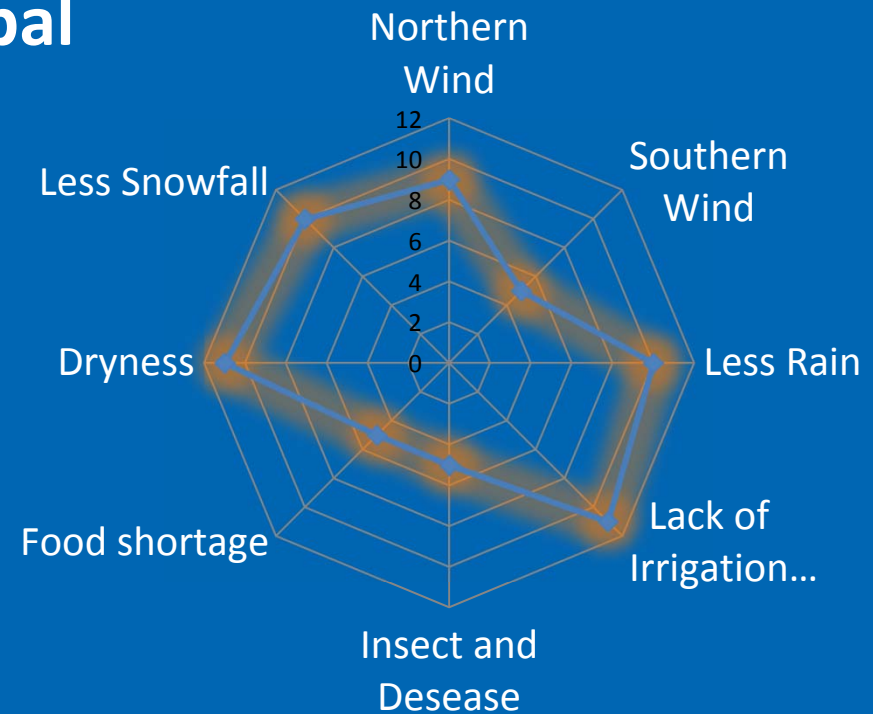
Impact is Location Specific

Marpha



**Mustang District
Nepal**

Pangling



Impact of Climate Change - Some Examples from Southern Himalayas

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**Natural springs and
water sources drying
up**



**Increased
scarcity of
drinking water**



Loss of productive lands

**Increased incidence
of forest fires**



**Habitat loss for wildlife and productive lands
for domestic animals**



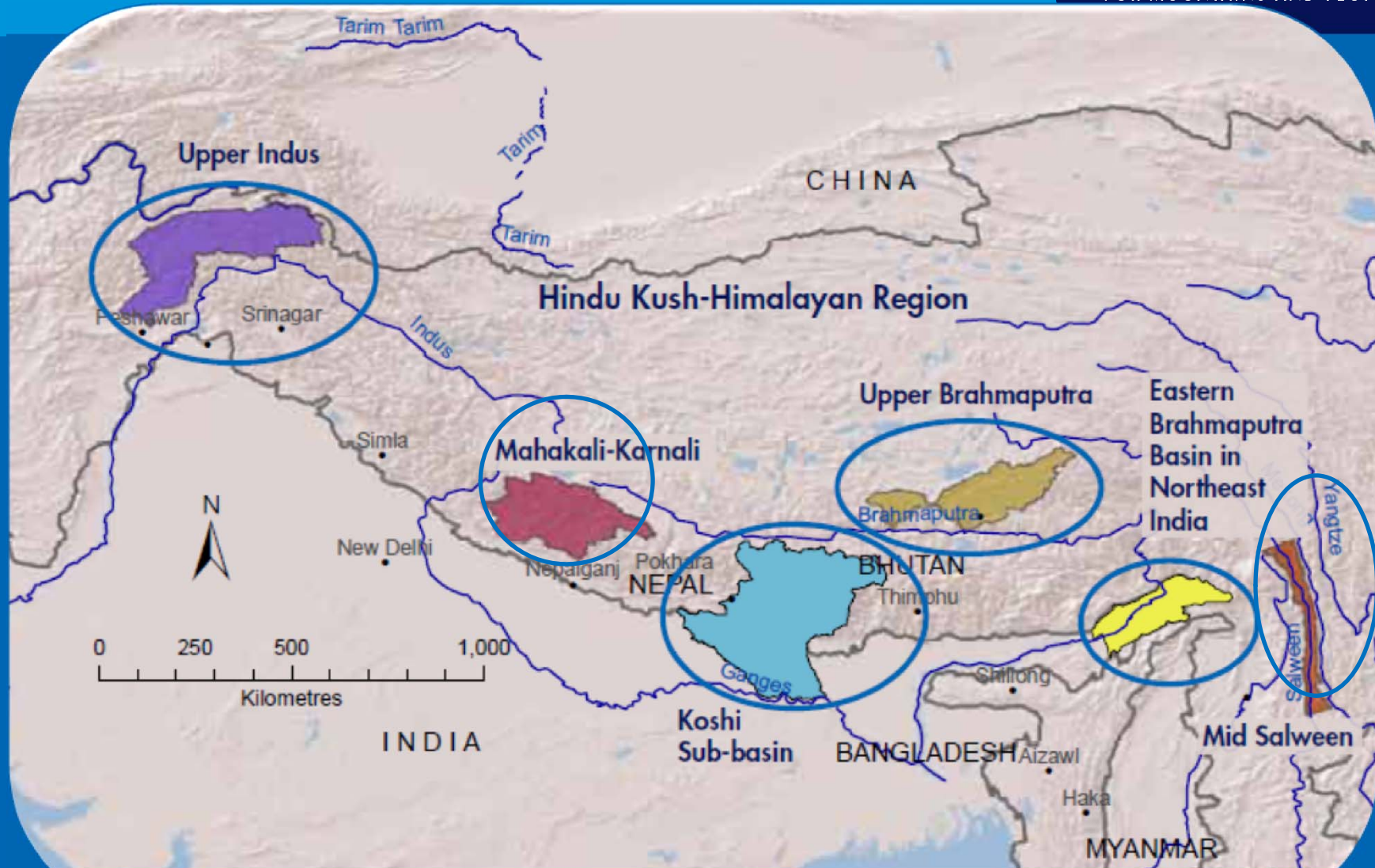
Investing in innovative Projects

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- Himalayan Climate Adaptation Programme (**HICAP**)
- HIMALI-CCA Participatory Action Research (High Mountain **Agribusiness** and Livelihood Improvement)
- Kailash Sacred Landscape Conservation Initiative (**TBL**)
- Establishment of a **Regional Flood Information System** in the Hindu Kush Himalayan Region (HKH-HYCOS)
- Glacial Lake **Mapping** and Glacial Lake Outburst Flood (**GLOF**) Risk Assessment in the Hindu Kush-Himalayas
- Livelihoods and Ecosystem Services in the Himalayas: Enhancing **Adaptation Capacity and Resilience** of the Poor to Climate and Socioeconomic Changes
- Mountain **Geo-Portal** as regional data hub

e.g. HICAP: Filling Data Gaps in sub basins



Base map source: ESRI Map and Data

Conceptual Framework

Climate Resilient Watershed Management in the Hindu Kush Himalayan Region

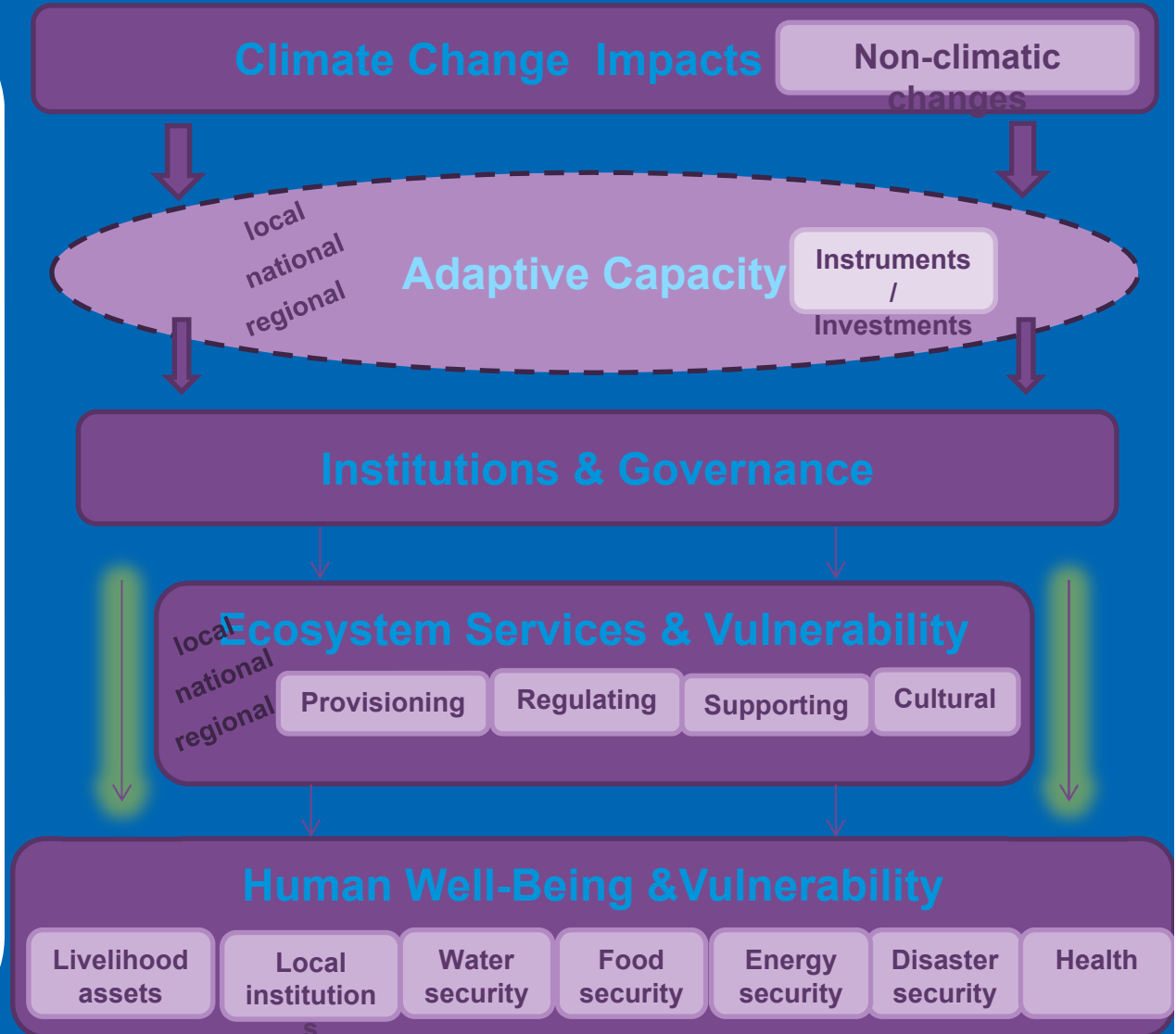
Customising Tools

Climate change
Downscaling
Modeling &
Monitoring

Community
Climate
Vulnerability
Assessment
Tool

Policy/Strate
gic/Governa
nce Deficit
Analysis
Tools

Climate
resilient
water
resources
management
on
sustainable
and
equitable
basis



HICAP Programme focus



GOAL

Contribute to enhanced resilience to change, particularly climate change, through improved understanding of vulnerabilities, opportunities and potentials for adaptation, and the development of strategies and policies based on scientific/evidence-based knowledge in the HKH.

OBJECTIVES

Reduce uncertainty through downscaling and customizing global climate change scenarios and develop water availability and demand scenarios for parts of major river basins

Develop knowledge and enhance capacities to assess, monitor and communicate the impacts of and responses to climate change (compounded with other drivers of change) on natural and socio-economic environments at local, national and regional level

Make concrete and actionable proposals for strategies and policies considering vulnerabilities, opportunities and potentials for adaptation, with particular reference to strengthening the role of women and local communities

COMPONENTS

1. Climate Scenario

2. Water Availability and Demand

3. Ecosystem Services

4. Food Security

5. Vulnerability and Adaptation

6. Women in Adaptation

7. Communication and outreach

Two Tier Approach

Top-down Approach

**Adaptation
Options**

Climatic and
Socio economic
scenarios

Impact
Assessment

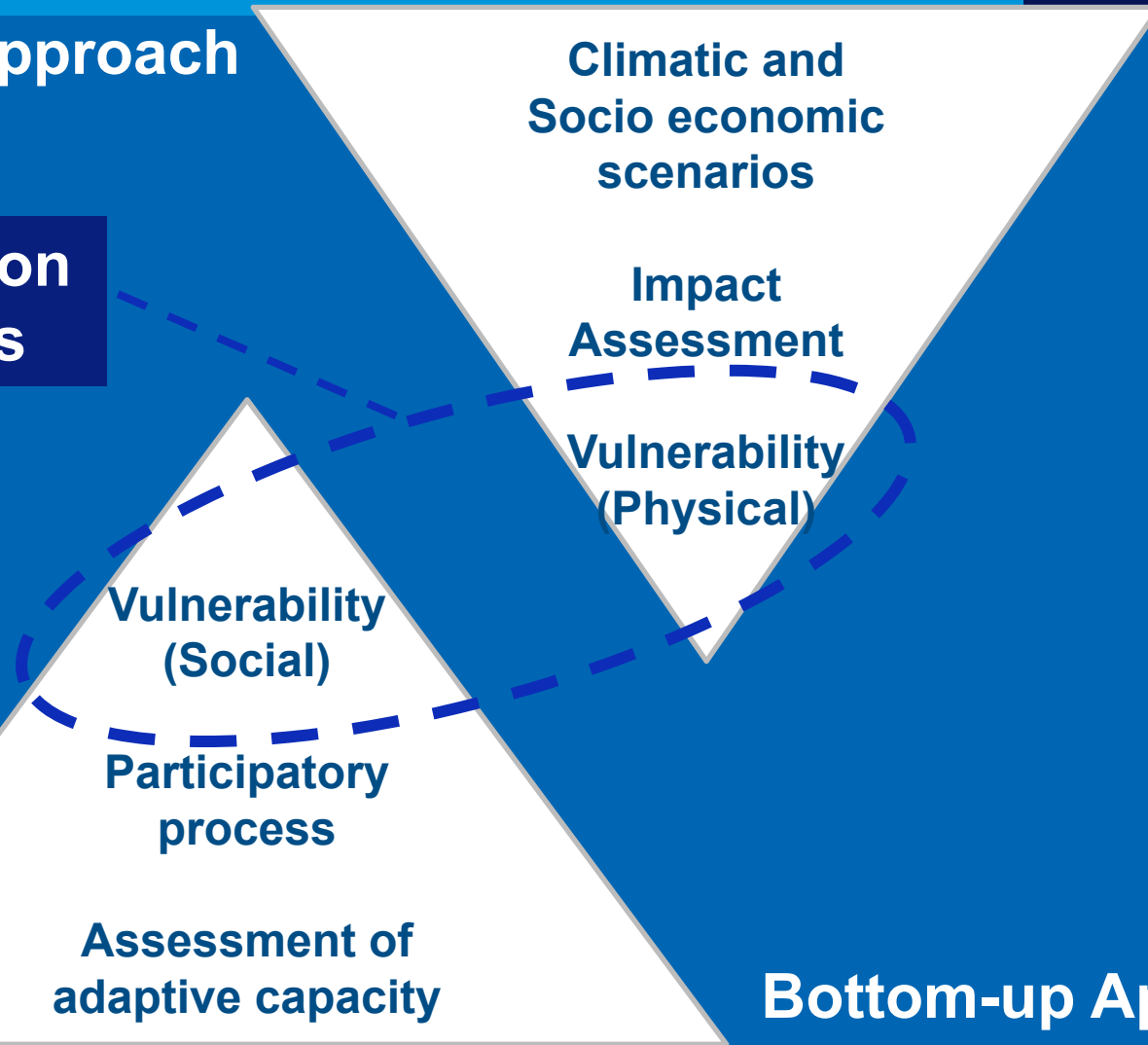
Vulnerability
(Physical)

Vulnerability
(Social)

Participatory
process

Assessment of
adaptive capacity

Bottom-up Approach



Strategising for CC at Local Level: *Patmara Village, Jumla*

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Vulnerability: *Less and late rainfall in summer, Lesser snow in winter, Warmer Spring and Dryness*

Observed effects: *Low moisture, Reduced farm productivity, More insects and flies, Drier water springs, dry water mills, No snakes, Uneasiness due to warmer climate, Apple size is reduced and low production*

Coping Strategy: *Manual to winter crops, Stress sale of livestock, Over-use of forests and hunting of wild animals, work as labor/porter, Weaving baskets,*

Adaptive Strategy: *Planting barren areas, Water use efficient agro-technologies, Digging water harvesting/recharging trenches, Shelterbelts, Plastic tunnels, water-rationing in irrigation i.e. Building on Climate Opportunities*

Early Messages from the field

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Message 1: *Livelihood diversification emerges as a central adaptation strategy but support through networked institutions and integrated policy arena is needed for long term sustainability of “Water Availability”*

Message 2: *Socio-cultural norms affect people’s adaptive behaviour; despite being deeply rooted, they can shift over time in response to the needs (customising traditions to change)*

Continue...

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Message 3: *Good governance and integrated planning that takes into account climate risk, water-use efficiency, and infrastructure development contribute to enhancing water/food security, and disaster management*

Message 4: *Adaptation requires striking an iterative balance between short-term priorities and long term gains, often that is a challenge (Convergence of R&D, Homogenization of data available, Sectoral coordination/Local Bodies)*

Continue..

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Message 5: *Need improved tools/methodologies that capture climate induced ecosystem changes, gender and poor people's adaptation needs and focus (Climate proofed watersheds)*

Message 6: *Improved and multiple modeling and monitoring techniques should lead to data (integrate climate and community science) collection (with coverage), consolidation, interpretation and dissemination (e.g. RBM, TBL at Policy and Practice levels)*

Thank you

Gracias

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www.icimod.org
rkotru@icimod.org
ICIMOD, GPO BOX 3226,
Kathmandu , Nepal

