

Monsoon Asia Integrated Regional Study (MAIRS)

The logo for the Monsoon Asia Integrated Regional Study (MAIRS) features a stylized map of Asia in blue, with a dashed blue line indicating a monsoon pattern. The word "MAIRS" is written in large, bold, green capital letters across the map. The background consists of several curved, overlapping lines in shades of blue and purple, suggesting a globe or a monsoon system.

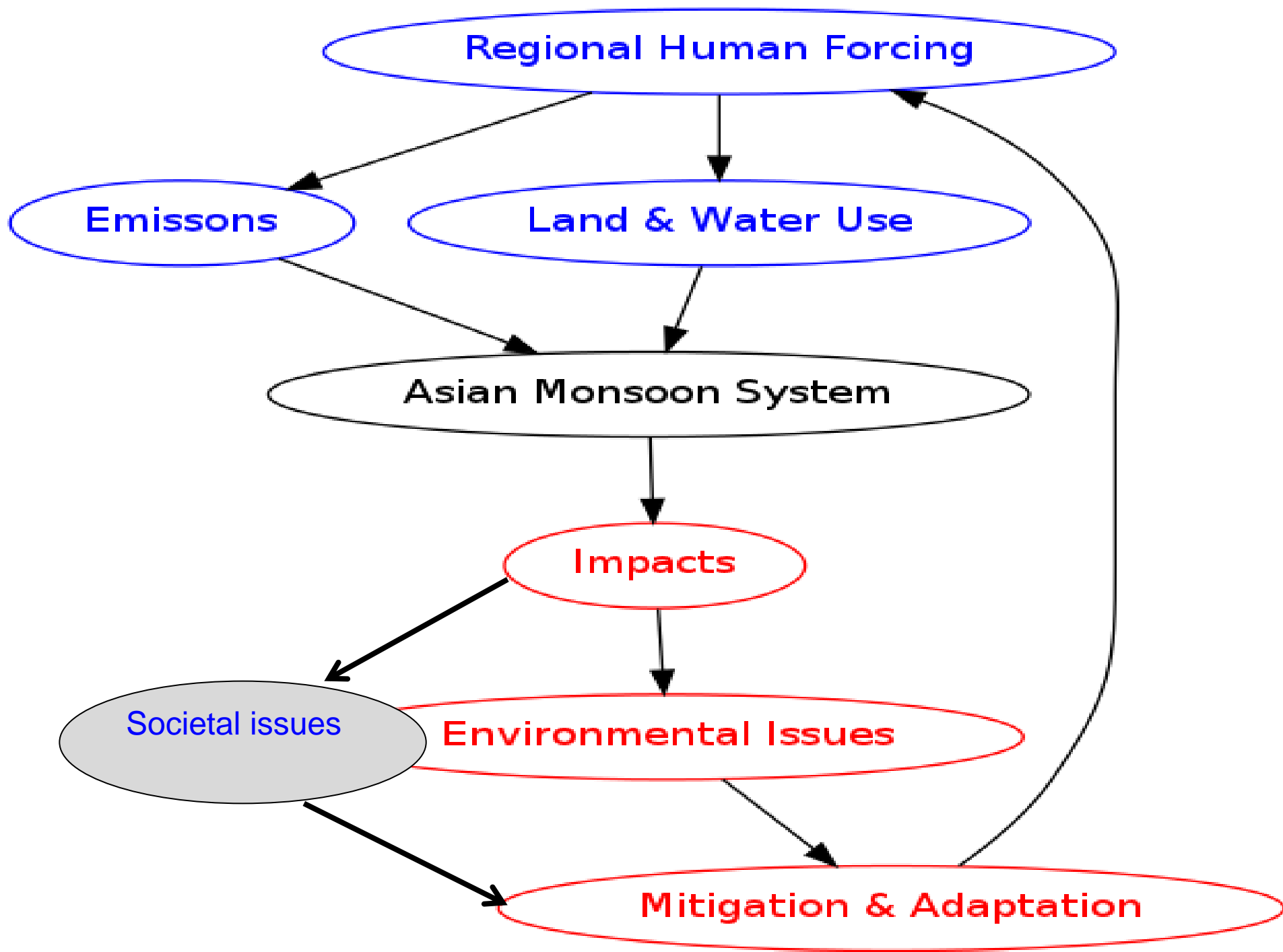
MAIRS

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Michigan State University, presenting on
behalf of:

Ailikun

Director of International Project Office



Integrated Studies

- *Integration* across
 - Disciplines
 - Sectors
 - Boundaries
 - Activities
- Collaboration and capacity building across the region

MAIRS Themes

- Multiple stresses in high *mountain* zones
- Vulnerable systems in *dryland* zones
- Rapid transformation in *coastal* zones
- Rapid development of *urban* zones
- *Modelling* and observations

Key Questions for Themes

- What are the major drivers for climate change and variability?
- What are the vulnerabilities of communities and ecosystems?
- What are the options for responding to those vulnerabilities?
- ***Case studies as demonstrations***

Drought Impact on Rangeland Herders in Inner Mongolia

- **Study by Xiaoyi Wang, CASS**

- Pastoral village of 80 households

- 10,000 livestock

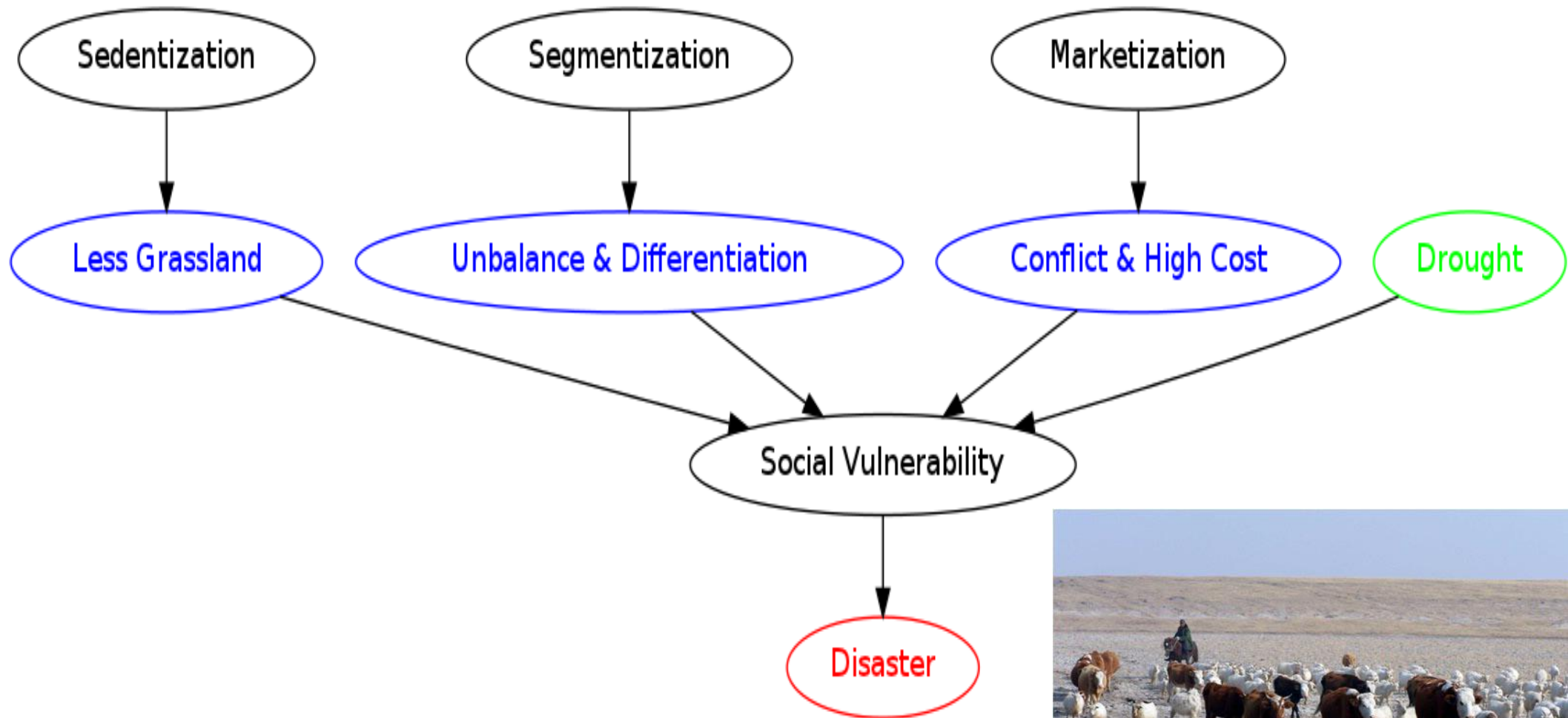
- Decade-long drought & rising temperature affected pasture & water availability

- Herders' incomes significantly reduced

- But there are social factors



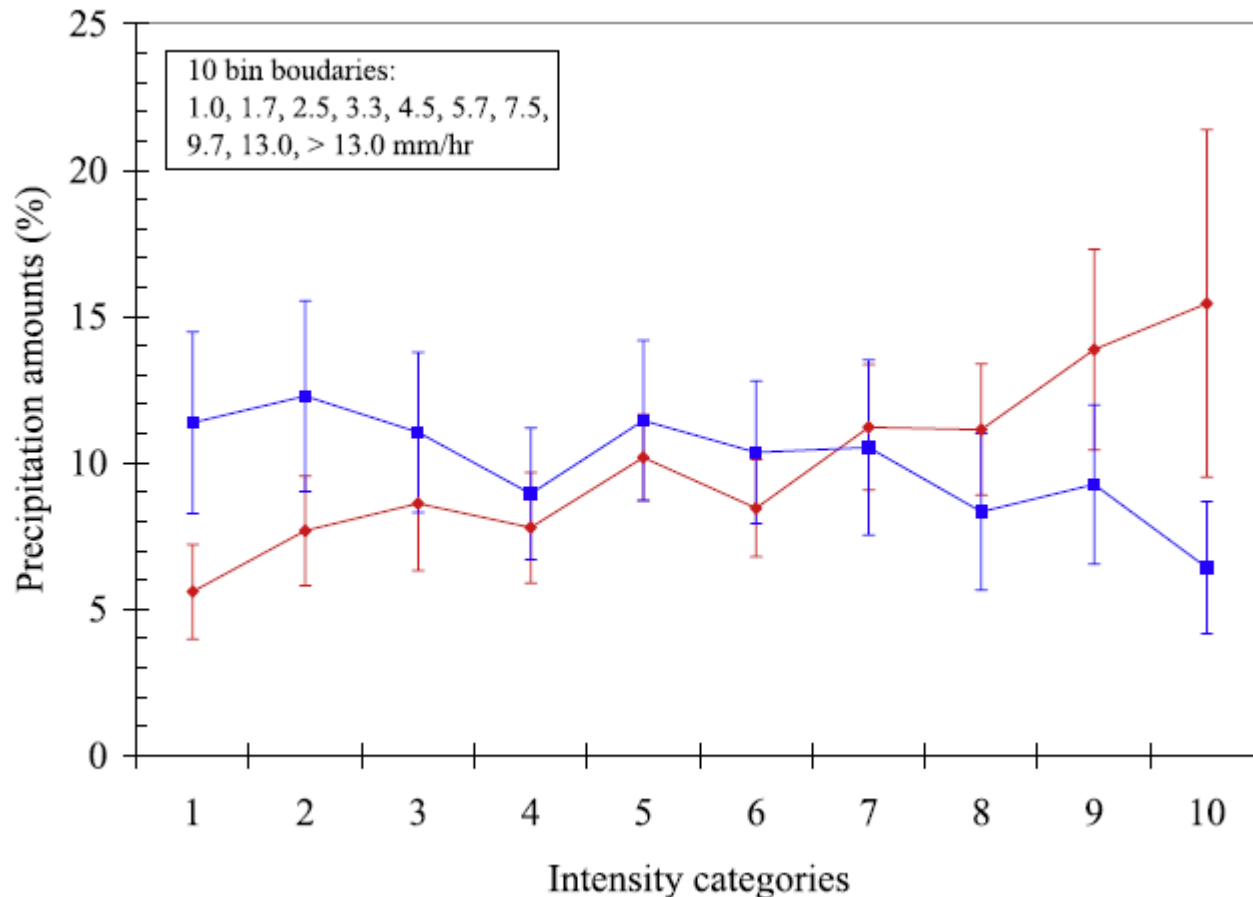
Social Factors interacting with Drought Impacts



New Dryland Projects

- CDKN project on “Climate Compatible Development in Dryland Systems of Mongolia and Surrounding Asian Systems”, D. Ojima, K. Gavin and Chuluun, 2012-2014
- MOST international project “Disaster and risk management in Mongolian Plateau”, Heqing HUANG, 2012-2015
- APN CAPaBLE: Capacity Building to Study and Address Climate Change-induced Extremes in Northern Asia (MAIRS-NEESPI joint activity)

Impact of Warming on Precipitation



Comparison of precipitation intensity in Taiwan for the two coolest years (blue) and two warmest years (red) over the period 1961-2005

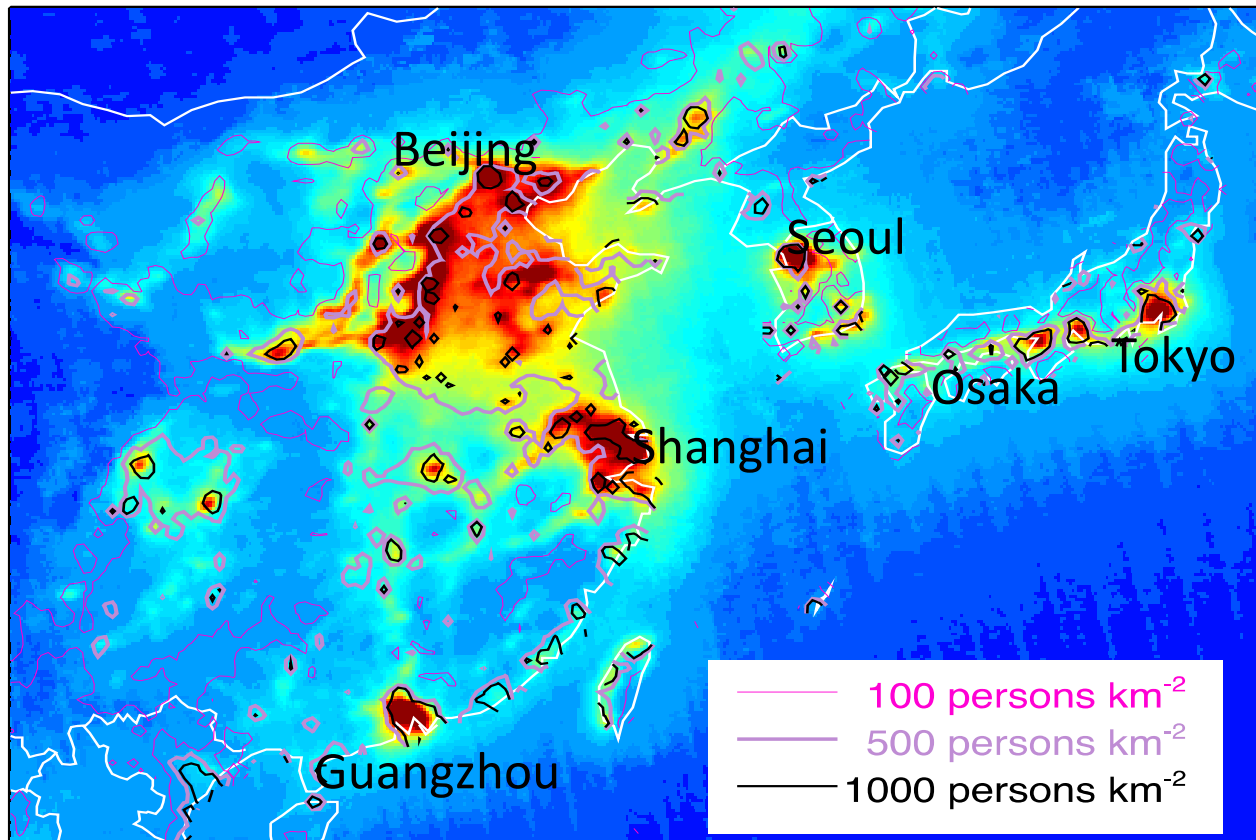
Find similar result for GPCP data

Response is larger than expected from Clausius-Clapeyron

Mountain Theme Workshops

- **June 2012, Pokhara, Nepal**
 - Joint with International Centre for Integrated Mountain Development (ICIMOD)
 - Drafted strategic plan
 - Rio+20 call for development of mountain zones
- **March 2013, Guangzhou, China**
 - Case studies in downstream region of Himalayas in Bangladesh; including AusAID adaptation projects (ANU & Monash), CAS international project on climate change in Koshi Basin

Air Pollution in Mega-Cities



Primary pollutant concentrations are expected to increase as:

$$C \sim N^{\beta}$$

where N: population
 $\beta = 0-1$

IGBP/IGAC Program

Parrish and Zhu, 2009, Science

Explosive Urbanization - Problems

Climate related

Monsoon rain,
Cyclones

Flooding

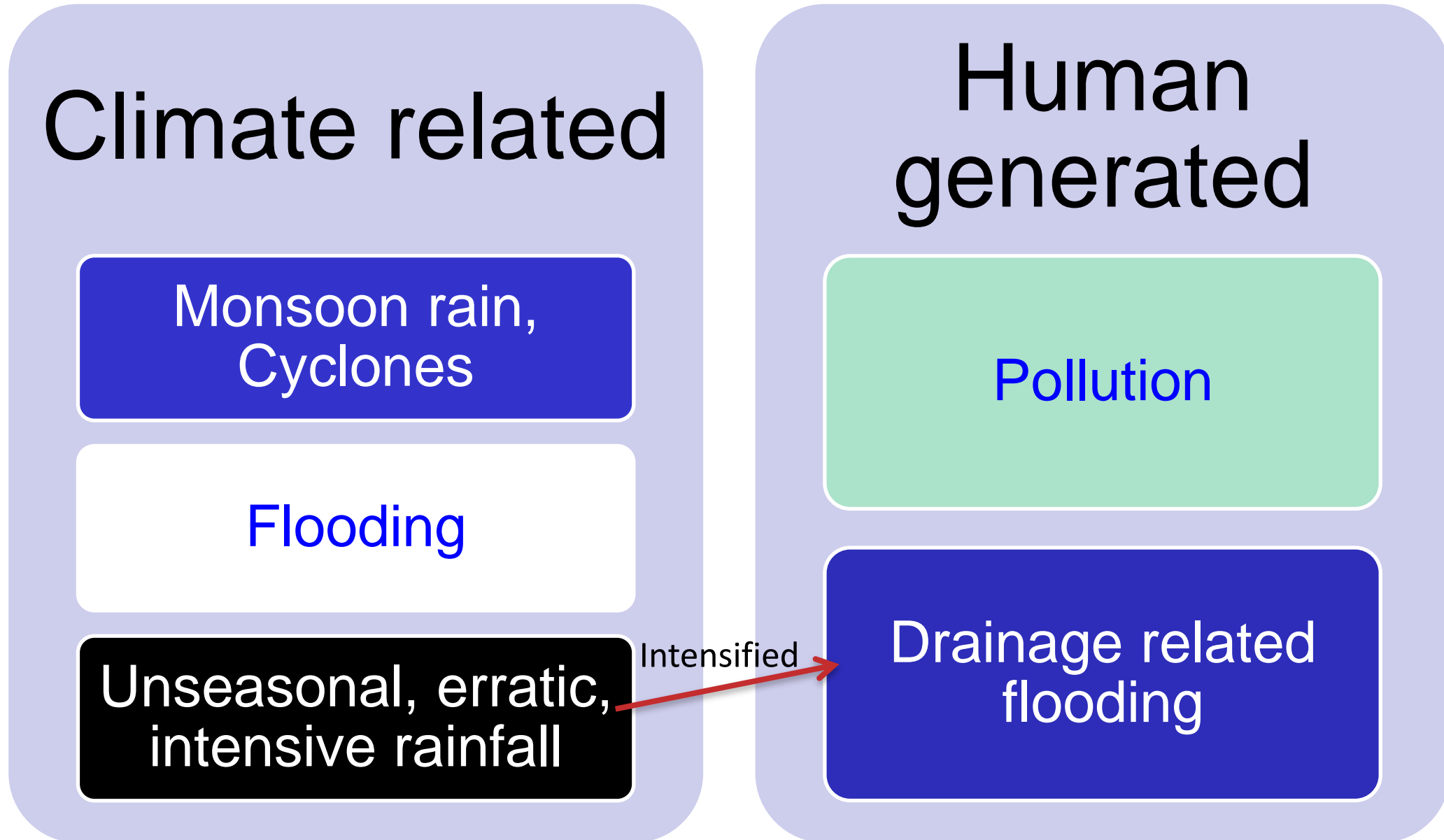
Unseasonal, erratic,
intensive rainfall

Intensified

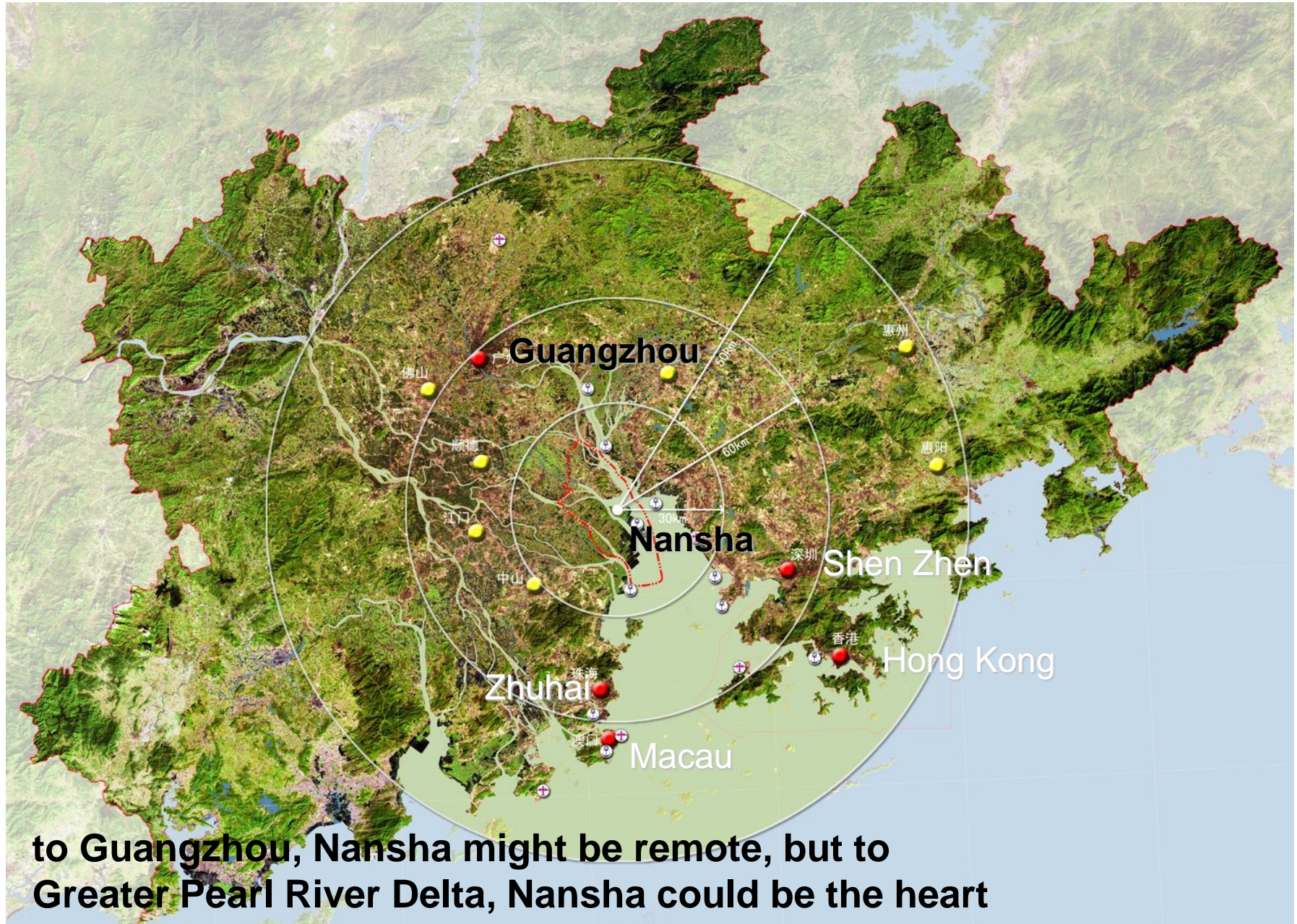
Human generated

Pollution

Drainage related
flooding



Urbanization in Pearl River Delta: Nansha's New Episode



to Guangzhou, Nansha might be remote, but to Greater Pearl River Delta, Nansha could be the heart

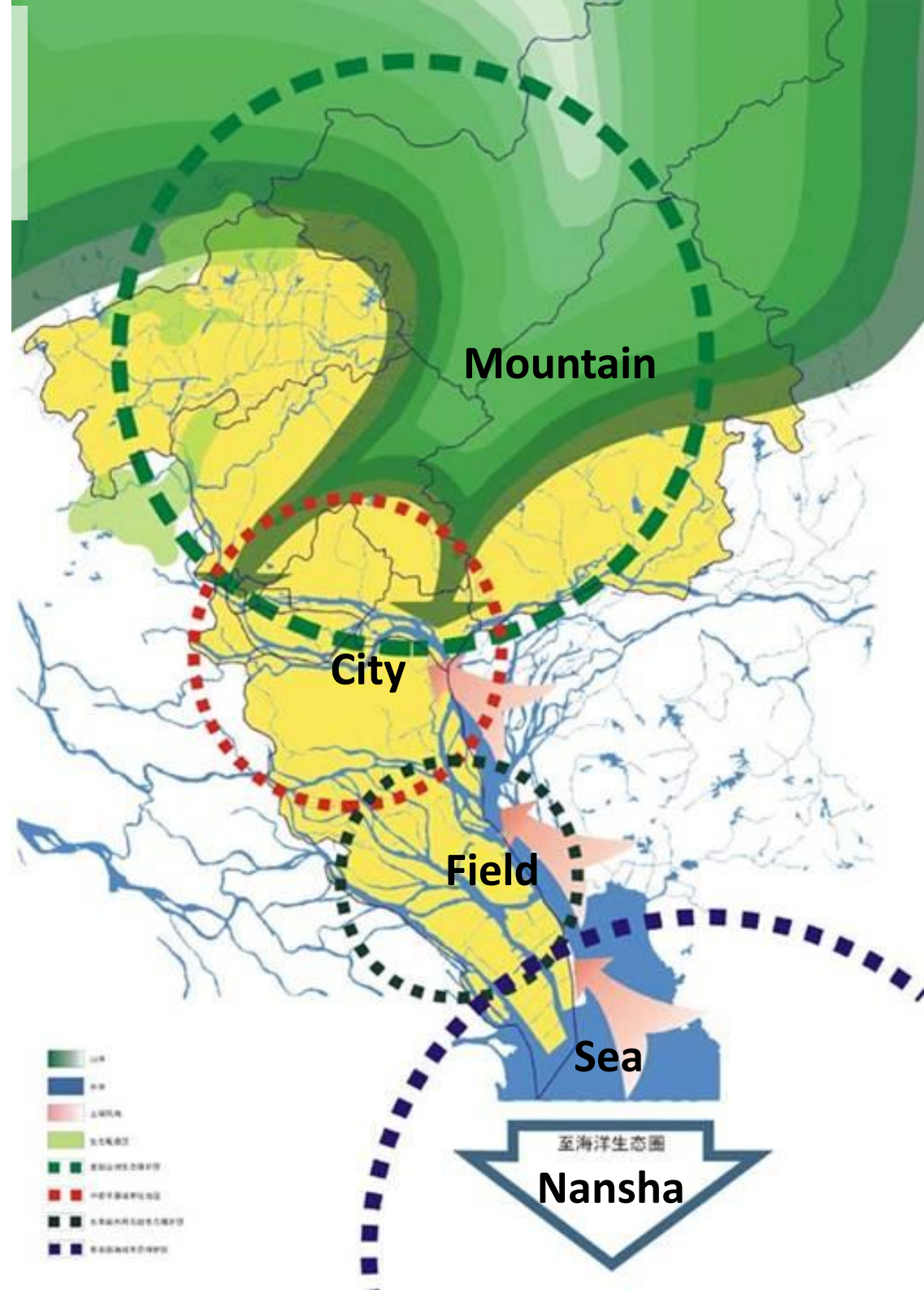
Expanding of Guangzhou ---Urban Case study

Going to deeper water ---
New Nansha Harbour
(100KM from city central)

Fresh water supply of
Nansha is rely on upstream
Xijiang river

Influence of sea level rise
and coastal erosion

Future scenario of cyclone
and urban flood in Pearl
River Delta



Urban Projects

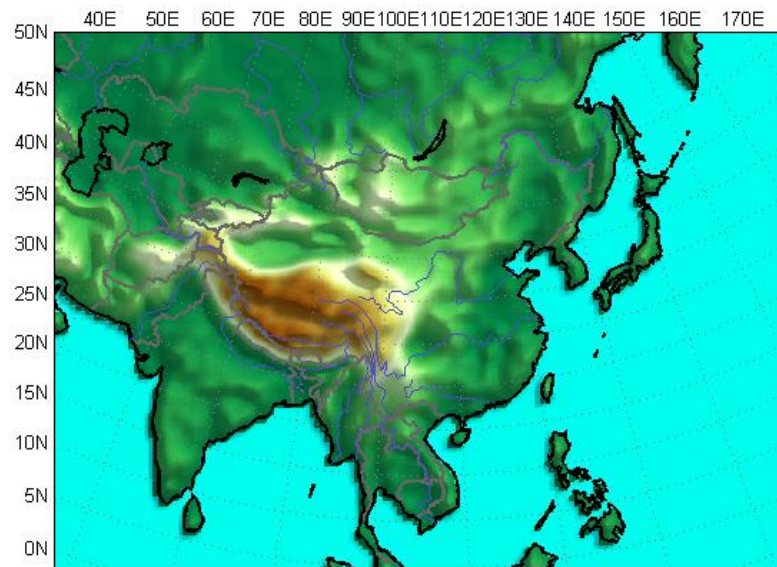
- APN ARCP project: Development of an integrated climate change impact assessment tool for urban policy makers, 2012-2015
- Chinese Academy of Science/Netherlands Organization for Scientific Research: climate change and water supply in Pearl River Delta, 2011-2014
- JST-MOST joint program: Impact of Asian Megacity Development on Local to Global Climate Change, 2010-2013

Modelling Studies

- Regional Modelling Inter-comparison Project (RMIP)
- Land surface (ecosystem) modelling inter-comparison (ADMIP)
- Regional urban climate modelling project (JST-MOST)

- Joint activity with WCRP CORDEX across monsoon Asia

RMIP Simulation Design



Integration Domain: (45-165E, 0-45N)

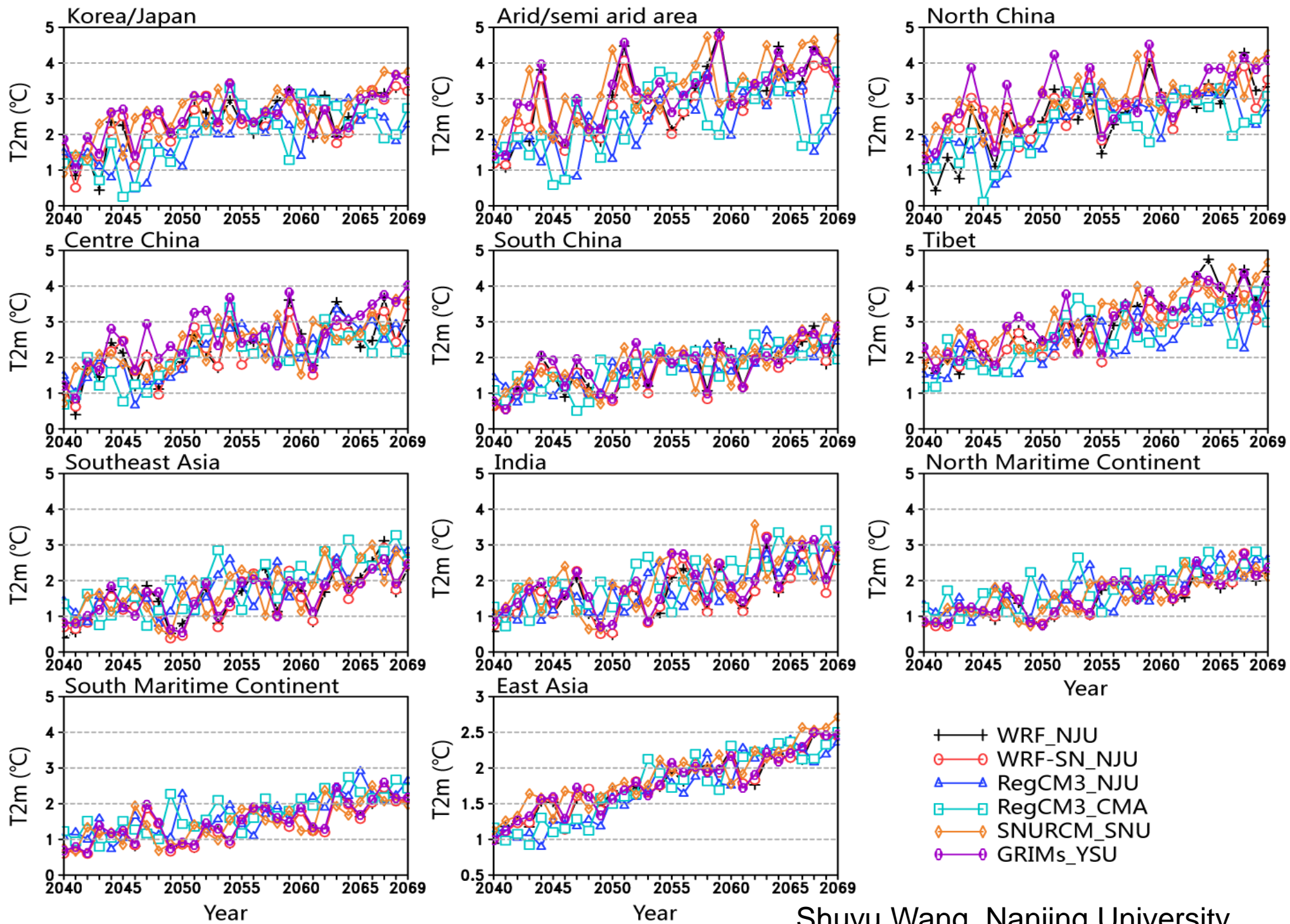
Resolution: 60KM (for whole area, downscaling to 30KM in some key areas)

Participating Countries: China, Japan, Korea, Australia, US

Regional Models: 6 models in RMIP II, and 9 models in RMIP III

Simulation Periods: 1978-2000 for control, 2038-2070 for projection, A 2-year spin-up time is applied to both control and projection runs

Changes of Interannual T2m [A1B(2040-2069)-20C(1980-1999 averaged)]

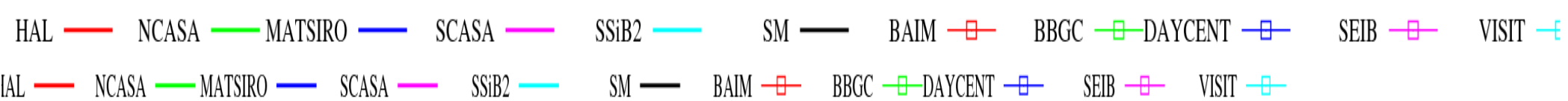


RMIP Activities

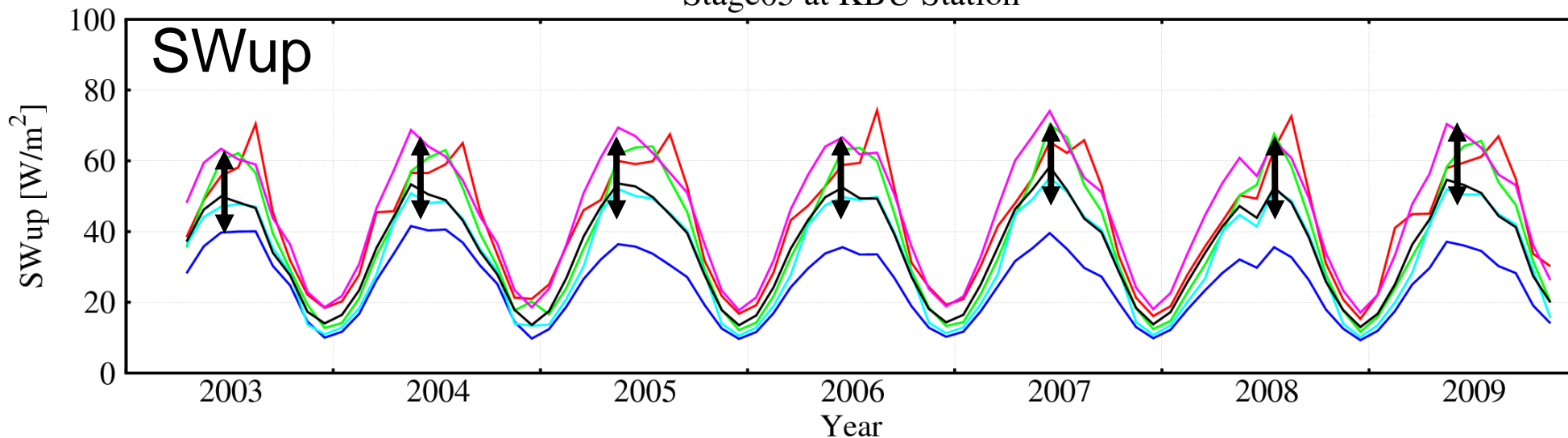
- Regional projections for 2040-2070 with uncertainties
- Data sharing
- Development of integrated assessment tool for urban policy and planning (UrbanCLIM – Yinpeng Li)
- High-resolution precipitation events
- High-resolution urban simulations
- High-resolution mountain simulations in collaboration with ICIMOD

Asian Dryland Model Intercomparison Project (ADMIP)

- Led by Jun Asanuma and Dennis Ojima
- Support from APN, MAIRS and MEXT-JSPS
- Few observations and relatively poor performance of LSM in Asian drylands
- Data from sites at Tongyu, China; Kherlen Bayan Ulaan, Mongolia (AsiaFlux)
- 7 LSMs and 7 TEMs from Japan, China, Korea, USA, Australia

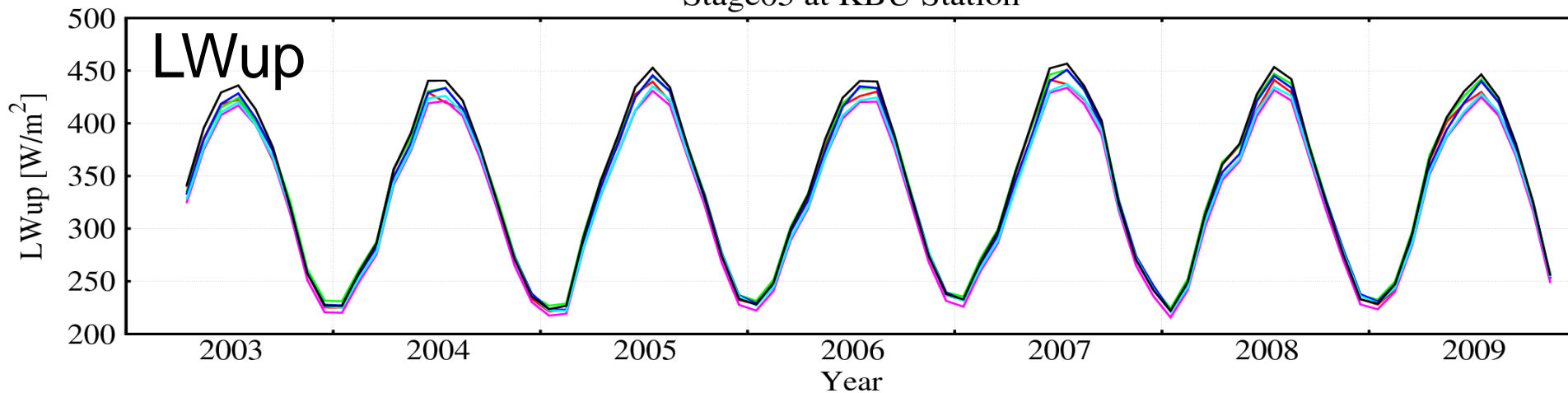


Stage05 at KBU Station



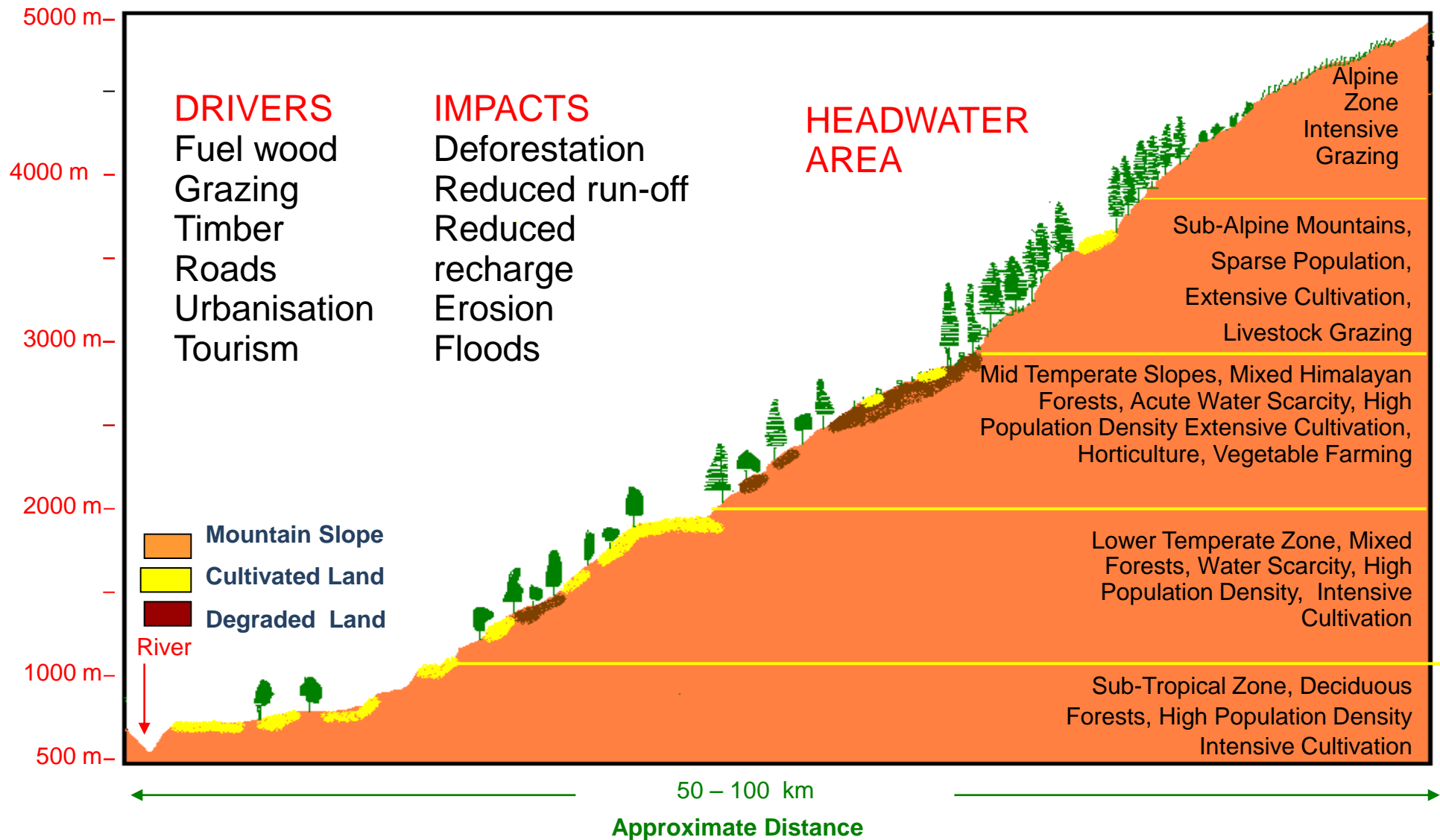
SWup and LWup differences among model results is 10 - 30 W/m^2 .

Stage05 at KBU Station



Adaptation of Communities in Himalayan Headwaters to Environmental Change

Prakash C Tiwari, Kumaon University, India



Community Responses & Adaptation

- 27% villages have replenished water sources through water conserving forestry and horticultural practices
- 25% villages managed depleting water through rainwater harvesting schemes based on local indigenous knowledge
- 19% families cultivated less water requiring and drought resistant food as well as cash crops
- 21% households altered traditional cropping pattern & adjusted crop rotation
- 11% households cultivated abandoned land
- 27% families relocated their agriculture.
- 7% families abandoned agriculture & switched over to secondary & tertiary activities
- 5% households out-migrated the region
- 11% decreased consumption of low productive and expensive food items



Conclusions

- MAIRS focuses on key global change issues for monsoon Asia
- Developed links between research groups across the region
- Established links across disciplines
- Established links between regional and global research
- Provided regional connection for Future Earth Program



MAIRS Open Science Conference 2014

Future Earth in Asia

April 7-10, 2014, Beijing, China

Objectives:

- ✓ To report the latest research on integrated studies in Asia-Pacific region
- ✓ To promote the research of both natural and social scientists
- ✓ To promote the research by young scientists from the region
- ✓ To promote multi-disciplinary studies and the new ICSU-ISSC Future Earth in Asia-Pacific region
- ✓ To discuss the implementation of the Future Earth initiative