

An holistic approach to adaptation



HIGHNOON:

Adaptation to changing water resources availability in Northern India with Himalayan glacier retreat and changing monsoon

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Partners: **TERI, IITD, IITK, Uni. Nagoya, Met Office, Max Planck Institute, Uni. Geneva, Uni Salford**



Delhi, 28 Nov. 2011

Roundtable discussion on bi and multilateral Indo-European
Co-operation on Climate Research and innovation

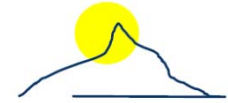




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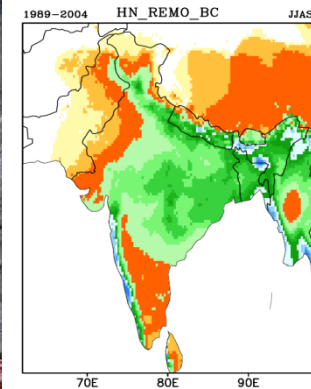
CC & Adaptation



HIGHNOON:

Adaptation to changing water resources availability in Northern India with Himalayan glacier retreat and changing monsoon

- Assessment of impact of Himalayan glaciers retreat and possible changes of the Indian summer monsoon on the spatial and temporal distribution of water resources of the Ganges
- Recommendations for appropriate and efficient response strategies for adaptation to hydrological extreme events, including droughts, floods and glacier lakes outburst floods
- Improvement of climate forecast skills at regional scale by improving process knowledge and downscaling techniques
- Integration of socio-economic drivers in climate change studies

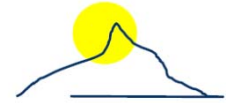




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Challenge:

To support adaptation measures for different sectors:

➤ There is a need for time and space specific CC projections to determine changes in water availability.



➤ There is a need to explore socio-economic scenarios to assess changes in water demand.



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SEVENTH FRAMEWORK
PROGRAMME



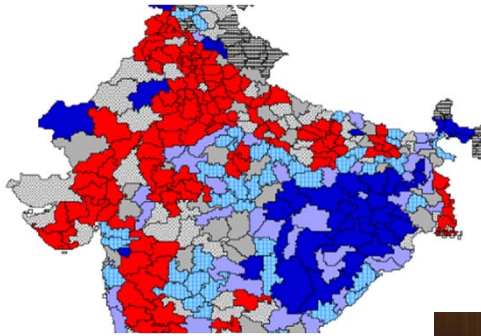
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Approach: Future changes in water demand



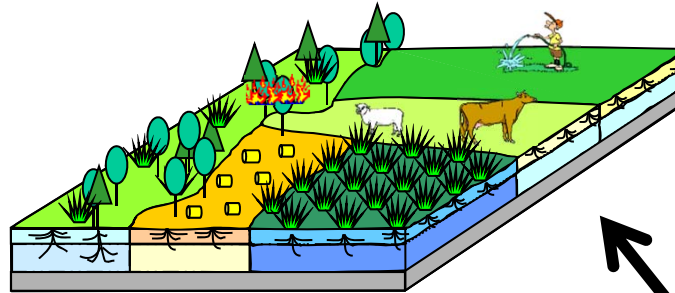
Downscaling
of socio
economic
scenarios



Informing



Informing



Evaluation of
impacts



Set of
adaptation
options

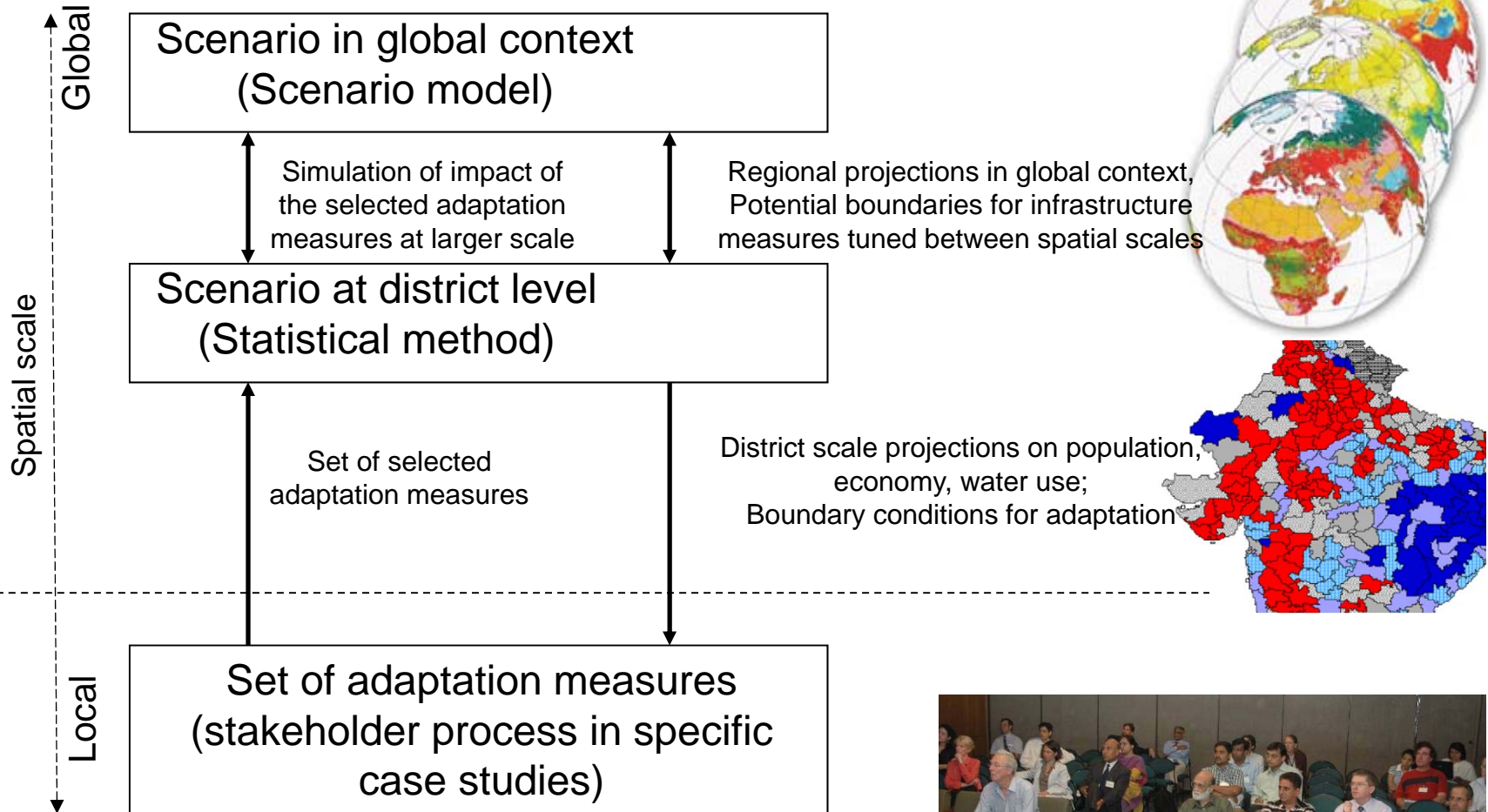


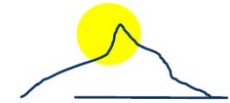


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Use of a nested approach to assure consistency amongst scales.





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- Temporal changes in timing of snow/ice melt, precipitation have been observed in most regions.
- Increased local precipitation in the RCM's if compared with the AR4 GCM's
- There is confidence in increasing temperature under the SRES A1B scenario.
- For precipitation the differences between the models is such that more analysis is needed before conclusions can be drawn.
- Present adaptation (development) measures do not suffice to overcome changes (soc. econ. and CC). Some measures may increase vulnerability (e.g. 5 rice species to 1)

(Moors et al., 2011. Adaptation to changing water resources of the Ganges basin in northern India. *Ecology and policy*, 14: 758-769)





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Outputs (1)

HIGHNOON:

Adaptation to changing water resources availability in Northern India with Himalayan glacier retreat and changing monsoon

➤ New runs regional climate models (RCM's, i.e. PRECIS & REMO 25 x 25 km) available:

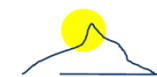
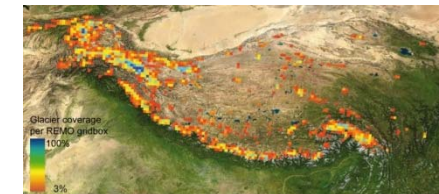
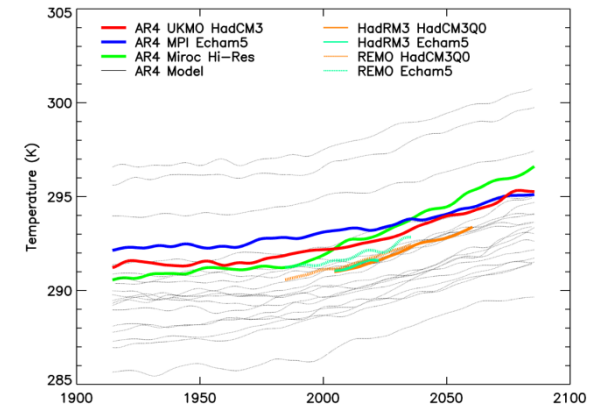
- Temp.: Consistent T increase: + 1-2 °C in 2050
- Precip.: Large variability in time and space.

➤ The large variations in precipitation increase uncertainty in the outcomes and makes it complicated to analyze extreme events such as floods and droughts.

➤ There is still a need to better describe the tail ends of frequency distributions, of extremes.

➤ Comprehensive inventory of the best available glacier data for the entire HighNoon modelling domain.

➤ Availability of high quality data on glacier and snow melt are sparse in the region. This may lead to contradictory conclusions.





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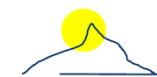
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Outputs (2)

HIGHNOON:

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- First phases of the stakeholder participation framework have been carried out in the case studies. Prioritization of the adaptation options is taking place. The HighNoon framework has been copied and is used by other agencies working on climate adaptation.
- Communication of uncertainty is still an issue in stakeholder discussions.
- Adaptation options at the local and state level do not always match.
- It is expected that the partitioning of water over the different sectors and regions will be the biggest constraint, a consistent water use plan at catchment and river basin scale may be the best solution.





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Data Needs

- Process understanding, i.e. to explain changes
 - Changes in snow/ice mass and volume
 - Discharge data
 - Extend of glacier lakes and landslide dams
 - Groundwater data (including quality)
- Mapping
 - Water use, e.g. groundwater extraction, irrigation
- Model validation
 - precipitation at high latitudes,
 - discharge
- Effect of (adaptation) measures
 - Discharge data
 - Soc. Economic data of different sectors (e.g. agriculture, health, income, ...)





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Research Needs

- To develop effective implementation of adaptation options spatial allocation algorithms are needed
- Analyse AR5 runs especially for tail ends of the frequency distributions
- Model development
 - Snow atmosphere feedback in RCM's and hydrological impact models,
 - To improve soil moisture atmosphere feedback, include water demand in RCM's,
 - Combine water demand models and water availability models
- Quantification of grey, green and soft adaptation measures especially under extreme conditions
 - Efficiency
 - (Costs &) social econ. benefits
- Inter policy consistency (e.g. energy, labour costs, water boards, adaptation policies, ...)





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Opportunities

- Regional Climate Service Centre, including impacts for different sector
- Develop expertise/consultancies to design and implement adaptation options at the local scale
- Exchange of results of pilot and demo projects of adaptation measures



SEVENTH FRAMEWORK
PROGRAMME



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Upcoming HighNoon events

- *"Adapting to the Changing Climate and water resource availability in Ganges Basin"*, side event at the 12th Delhi Sustainability Development Summit, 2-4 Feb. 2012, New Delhi, see dsds.teriin.org/2012 special events.
- *"Glacier, Snow Melt and Runoff in the Himalayas"*, conference, 6-7 Feb. 2011, Kathmandu
- HighNoon Spring school, 2-5 April 2011, New Delhi
- HighNoon Science – Policy workshop, 6 April 2011, New Delhi

➤ See: www.eu-highnoon.org