# Adaptation to Changing Water Resources Availability in Northern India with respect to Himalayan Glacier Retreat and Changing Monsoon Pattern

HighNoon

**Situation**

The hydrological system of Northern India is based on two phenomena: the monsoon precipitation in summer and the growth and melt of the snow and ice cover in the Himalaya. Climate change is expected to change these phenomena and it will have a profound impact on snow cover, glaciers and its related hydrology and water resources availability, especially in the perennial river basins Ganga, Indus and Brahmaputra, where snow and glacier melt form a great part of the rivers' flow.

India is a country in rapid socio-economic development. These developments will have a profound influence on the use of water resources. With a growing population and economy, water demand for food production, electricity and other sectors will increase.

In order to anticipate on the potential negative effects of changes in water resources availability and demand, implementation of adaptation measures is necessary. Small-scale, community level strategies, that increase the resilience and adaptive capacity of the most vulnerable groups, must be considered alongside the large scale, technical and structural approaches that could potentially dominate adaptation planning. It is obvious that traditional, single sector adaptation measures will fall short. Therefore, integrated measures that enhance adaptive capacities of systems need to be identified and strengthened.

**Aim**

The HighNoon project aims to assess the impact of Himalayan glaciers retreat and possible changes of the Indian summer monsoon on the spatial and temporal distribution of water resources in Northern India. The project further aims to provide recommendations for appropriate and efficient adaptation strategies to hydrological extreme events through a participatory process.

**Approach**

HighNoon is an EU funded research project focusing on the development of adaptation measures in Northern India. The project is carried out as collaboration between European and Indian partner institutes. The basic approach of the HighNoon project is to link the results of improved climate modelling to the estimation of practical and applicable adaptation measures.

The main aspects of the research programme are:

- developing scenarios for snowmelt and monsoon patterns, based on improved regional climate simulations.
- developing realistic regional socio-economic scenarios, and assess the changing water resources, using regional models.
- providing new methods for the prioritisation of adaptation measures to be used as a design tool in the selection of adaptation options.
- participative development of specific multi-sector adaptation measures, in consultation with stakeholders.

**Results**

The HighNoon project focuses on the relationship between climate change and water use in a highly vulnerable region.

**HighNoon will deliver the following products**

- regional climate change scenarios with improved representation of the snowmelt and monsoon patterns, which are the most important phenomena in the region.
- socio-economic scenarios for population, economy and water use, that are consistent at all relevant scales.
- participatory developed methodology for the prioritisation of cross-sectoral adaptation measures.
- participatory developed relevant sets of adaptation measures, that are tested within a regional modelling framework.

**Follow up**

HighNoon is working on an in depth study on the changing water resources in Northern India. In the project scientists, policy makers and stakeholders work together to assess the possible negative effects of changing water resources, and to formulate and test possible adaptation options. For the three case studies, sets of adaptation strategies will be developed in a participative process. The methods and concepts developed in this project, combining different scales, groups of stakeholders and sectors, will provide useful information for both policy makers at the national and international level, as well as for researchers and practitioners on adaptation.

**Contact**
HighNoon Programme
Mr Eddy Moors
Alterra, Wageningen UR
P.O. Box 47
6700 AA Wageningen
The Netherlands
phone: +31 317 488745

**For more information**
web: www.eu-highnoon.org
e-mail: info@eu-highnoon.org

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