

Topic 3: Impacts and Adaptation

Break-out session discussions

Discussion participants

- P.G. Dhar Chakrabarti (Convenor)
- Amir Muhammed (Rapporteur)
- Stella M. Navone
- Mats Eriksson
- Nitesh Shrestha
- Haakon Lein
- Christian Nellemann
- Kh. Gajananda
- Ysmaiyl Dairov
- Kathrine I. Johnsen

Are HMGs decreasing because of global warming?

- Overall the HMGs are decreasing/receding, but there are some regional differences e.g., HMGs in the Karakoram region are expanding as compared to the rest of the Himalayas where the HMGs are receding. This might be due to the methods used for measuring glaciers size. It may require more elaborate measurement of the glacier volume/ mass.

- The glaciers in the Western Himalayas are comparatively larger in size compared to the glaciers in the Eastern Himalayas

Has the frequency of GLOFs changed?

- The number and size of the lakes has increased while the GLOF events seem to remain constant.
- The frequency of flash floods and drought instances have been on the whole increasing over time.

How important are glaciers for freshwater supply to downstream populations?

- Glaciers are very important as a source of freshwater supply to the downstream population. Further research is needed to quantify the contribution of ice, snow and glaciers towards freshwater supply.
- Perception of upstream and downstream communities for hydropower production and availability of drinking water are different.

- Glaciers melting does contribute to sea level rise.
- Legal aspects of water apportionment between upstream and downstream countries need to be further studied and streamlined.
- Relevant scientific data of rainfall, glacier melting and snow should be included when discussing apportionment of river waters between upstream and downstream countries.

Data availability vs. data accessibility

- More data needs to be generated about meteorological parameters at various locations. The number of meteorological parameters needs to be reviewed and data collected on 24 hour basis.
- Location of meteorological stations needs to be reviewed to make the meteorological data for different locations relevant.
- Atmospheric aerosols and black carbon measurements may be made near the HMG surface and their impact incorporated in the glacier melting behavior

- Accessibility of available data to research scientists and planners needs to be improved.
- Data from earth observing satellites and institutions generating meteorological data may be freely shared with scientists.
- Basin wide water availability scenarios need to be developed with a prediction for the future.
- Basin demand scenarios using the basin as a hydrological unit need to be developed. These should also incorporate the population changes.
- River flow data at designated location should be collected and shared with colleagues.

What are the knowledge gaps – research and geographical gaps

- **Water use efficiency in agriculture**
- Irrigation application in response to physiological needs of crops
- Precision land leveling to achieve water use efficiency
- Using drip, trickle, sprinkler or sub-surface irrigation instead of flood irrigation to achieve uniform water application and achieve substantial water use efficiency.
- Building sub-storages to supply water on demand instead of the prevalent rigid weekly irrigation irrespective of the prevalent weather or crop needs.
- Identification of suitable water efficient crops to replace the prevalent water-intensive crops like rice and sugarcane.
- Improved, location specific agronomic practices to suit specific crop varieties, soil types and location in order to optimize input use efficiency and crop yields.
- Develop agriculture production technologies specially suited to the needs of small farmers

- Delineation of iso-zones with similar patterns of climate change to determine optimum cropping patterns suited to the anticipated climate changes.
- Develop crop varieties with required growing period length and adaptation to the anticipated temperatures
- Undertake research on impacts of climate change on poverty and food security
- Promote knowledge and data sharing among scientists and policy maker.
- Identify and remove knowledge gaps about location specific health impacts of climate change
- There are major gaps in knowledge about the impacts of climate change in the Himalayas as compared to the Alps. Transfer the relevant knowledge and technologies from Alpine to Himalayan environment to promote sustainable development under different climate change scenarios.

Local and country priorities, and capacity building

- Develop national action plans for adaptation to climate change (NAPA) for individual countries.
- The NAPA plans should be multi-sectoral and region based for each country.
- Develop human resources in impacts and adaptation to climate change in agriculture, water resources and health sectors etc especially for developing countries in various regions.

- Incorporate local knowledge in the packages of practices.
- Climate change adaptation (CRA) may be integrated with disaster reduction adaptation (DRA) under local conditions and in the context of cultural resilience
- Religious institutions could be used for promoting adaptation to climate change.