Abu Dhabi Dialogue Knowledge Forum  
Small Grants Programme (ADDKF-SGP) Project

Project Title  
Case studies of impacts of climate change on hydrological regime in Nepal, India and Afghanistan

Lead Institution  
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Background  
The Himalayas display great climatic variability. The mountains act as a barrier to atmospheric circulation for both the summer monsoon and winter westerlies. A substantial amount of the annual precipitation falls as snow, particularly at high altitudes (above 3000 m asl) feeding the Himalayan glaciers. The Himalaya, Hindu Kush, Karakorum, Tibetan Plateau and inner Asian ranges have the most glaciated areas outside the polar regions. The contribution of snow and glacier melt to the major rivers in the region ranges from 2% to 50%. Climate change is currently taking place and is projected to compound the pressure on natural resources and the environment associated with rapid urbanization, industrialization, population growth and economic development. It will potentially have profound and widespread effects on the availability of and access to, water resources. By the 2050, access to freshwater in Asia, particularly in large basins, is projected to decrease.

The water resources from the main Himalayan region drain through Ganges, Brahmaputra and Indus rivers. These three glacier-fed river systems supplies vital water resources to about 0.7 billion population in the South Asia. The most widely reported impact of climate change in this region is the retreat of glaciers which has profound future implications for downstream water resources. However, there is severe knowledge gap in the Himalayan region in understanding the impacts of climate change on the hydrological
regime. Appreciable changes in the volume and/or timing of river flows are likely, but there is great uncertainty about the rate, and even the direction, of these changes. There is an urgent need to close this knowledge gap in order to provide policy and decision makers with knowledge upon which well-informed decisions can be made for water resource management. In such a situation, case studies of three glacierized river basins of Nepal, India, and Afghanistan will be very important to understand the impact of climate change on hydrological regime of glacier-fed rivers in the region. To address this problem, three case studies each one in Nepal, India, and Afghanistan namely; Langtang basin in Nepal, Kafani river basin in India; and Bamyan River basin in Afghanistan are planned. Two study basins in Nepal and India are sub basins of Ganges and another one Bamyan is a tributary of Kunduz River which is a tributary of Amu Darya River in Northern Afghanistan. Glacio-hydrological studies of the Langtang River basin in Nepal; Kafani River basin in India and Bamyan River basin in Afghanistan will be carried out through the past literature review, data analysis and field measurement of discharge, glacio-hydrological modeling and estimation of future water availability in those basins.

Climate warming is often accompanied by changes in the hydrological cycle e.g. changes in rainfall patterns, snow and glacier melting and river discharges. These changes impact the water sector and other sectors such as agriculture, energy, human health, water-induced disasters and urban settlements. Therefore, all governments have already included proper water resource planning by formulating different plans and strategies. In Nepal, Water Resources Strategy 2002, National Water Plan 2005 and National Adaptation Program of Action 2010 all have incorporated proper water resources planning and use through various methods. NAPA 2010 is the latest document in which prediction of future water availability is also envisaged. In India, first National Action Plan on Climate Change 2008 outlined existing and future policies, and programs to address climate mitigation and adaptation. It also emphasizes on the sustainable use of Himalayan water resource. Similarly in Afghanistan, the Environment Law 2007, Chapter 5 speaks about the management of water resources and emphasizes the importance of integrated watershed management and sustainable use and management of water resources. Therefore, the present study will help to fulfill all government’s commitments on its water resource policy by providing the future availability of the studied river basins.

**Project Goal and Objectives**
The main goal of these case studies is to put forward some knowledge on hydrological regime of the glacierized river basins of the Himalaya and Hindu Kush regions. The specific objectives are:

1) to find out current status of the hydrological regime of the proposed river basins
2) to select suitable glacio-hydrological models and improve its accuracy/performance for our study region
3) to use the glacio-hydrological model for predicting future water availability in 2020 and 2030

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