Sub-Watershed Approach for Climate Change Adaptation

Introduction

The Himalayan catchments of Nepal including watersheds are revealed to be very sensitive to climate change due to the high variation in altitudes. Changes in rainfall pattern, melting of ice caps and glaciers and reduced snow cover are some of the evident risks due to rise in temperature. The significant effect of climatic variability in major rivers and their tributaries has already been observed. As a result, rivers and tributaries, catchments and watersheds are at risk from increased soil erosion, landslides, flooding and others, more intense rain during the monsoon. Besides, water scarcity and droughts pose a similar threat to social and natural system. The expected increase in temperature and extreme weather events will amplify hazards in watersheds and change the hydrological cycle, more on upstream areas having change on bio-physical environment (land use, soil erosion, landslide etc.) and their downstream areas.

Ecosystems offer provisioning, regulating, cultural and supporting services. Without healthy ecosystems in well-functioning watersheds, the infrastructure built for landslide, flood, irrigation, hydropower or water supply may not function sustainably, and is unlikely to achieve the economic returns necessary to justify investments. Considering sub-watersheds as organizing units for planning and implementation for adaptation to climate change is a new approach in climate change adaptation arena, where large regions can be divided along topographic lines that go beyond administrative boundaries and the status and trends analysis can be done on the basis of entire natural systems in concert with social conditions. The assessment of entire natural systems are imperative for ensuring upstream and downstream linkages. The assessment of sub-watershed through remote sensing and geographical information system technology for accurate information on bio-physical and socio-economic condition is especially important to prepare local adaptation plan for action to manage the adverse differentiated sectoral impacts of climate change in a more comprehensive manner.

Adaptation for Smallholders in Hilly Areas (ASHA) Project, together with local authorities and smallholders farmers in the Karnali Province of Nepal, is working to materialize sub-watershed approach for climate change adaptation planning, promote awareness of the significance of sub-watershed approach for climate change adaptation and build capacities to adaptation planning adopting sub-watershed approach across the project districts. In two ASHA's Project working district (Dailekh and Salyan), a sub-watershed approach for climate change adaptation planning is being piloted.

Six-step approach for sub-water-shed based climate change adaptation planning

Step 1 Preliminary Preparation and Coordination

Step 2 Sub-watershed Delineation and Identification

Step 3 Sub-watershed Prioritization

Step 4 Sub-watershed Assessment

Step 5 Assessment Findings Integration

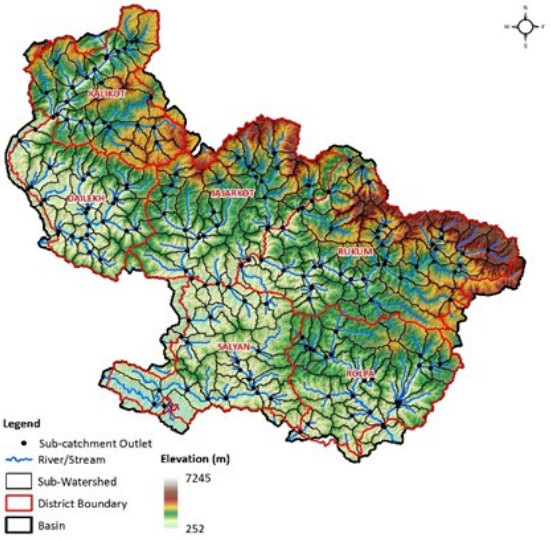
Step 6 Local Adaptation Plan for Action Preparation

Methods

Sub-watersheds in districts delineated using ASTER DEM digital elevation model (DEM) by means of soil and water assessment tool in Arc GIS, followed by sub-watersheds identification and prioritization. The sub-watershed assessment used both primary and secondary data and information. Bio-physical condition of sub-watershed; trends of land use land cover changes and estimation of soil erosion dynamics over decades were primarily obtained from analysis of Landsat satellite images. Likewise, forest fire spatial and temporal distribution primarily obtained from the analysis of Moderate Resolution Imaging Spectroradiometer (MODIS) active fire data sets. Similarly, landslide distribution was obtained from analysis of secondary data and Google Earth Image. Moreover, land use adjustment primarily obtained from Landsat TM imageries and land capability data analysis. Furthermore, socio-economic condition of sub-watersheds assessed through review of relevant literatures and analysis of secondary data available from the Central Bureau of Statistics reports; National Population and Housing Census 2011, district profile data, stakeholder consultations, focus group discussion and key informant interview.

Result

The assessments generated information and mapped bio-physical and socio-economic condition of the sub-watersheds in districts include; trends of land use land cover changes over decades, soil erosion dynamics over decades, spatial and temporal distribution of forest fires over decades, landslide distribution and land use adjustment, locations for upstream and downstream linkages. In addition to this, assessed and identified adaptation measures to areas where the risks of catastrophic climate-induced impacts are greater. Sub-watershed assessment generated information and maps of the sub-watersheds and adaptation measures integrated in local adaptation planning process and prepared enhanced local adaptation plan for action in project districts.



Conclusion

Scientific based information on sub-watershed condition is needed for comprehensive adaptation planning and its implementation. The assessment of entire natural systems is imperative to design adaptation measures ensuring upstream and downstream linkages. Integration of sub-watershed assessment findings could contribute for the local adaptation planning to design appropriate adaptation measures to areas where the risks of catastrophic climate-induced impacts are greater thereby contributing to address adverse impact of climate change in a more comprehensive manner and is likely to achieve the economic returns necessary to justify investments for climate change adaptation.

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