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Ecological effects of ice and snow change in High Mountain Asia

High Mountain Asia (HMA) region also called the third pole region, which are the source of the main rivers of Asia and have impacts on more than a billion people living downstream. The glacial retreat and variation of the snow cover, changes to river discharge and groundwater recharge and knock-on effects on water supply to ecosystems, especially for the soil and vegetation in the downstream. The study will conduct and analysis the effects of ice and snow on the eco-environment aspects in the downstream of the basin in the typical watershed of HMA. The research going to cover the HMA regions major river basins and watersheds as the study area, with based on satellite-based imagery, station monitoring climatic and hydrological datasets, and field investigation datasets. The specific objects of the study are as follows:

To assess status and changes of landscape in the major basins and identify the sensitive areas. This study will be carried out the status and changes of land cover from 2000 to 2015 in HMA, using satellite-based imagery with together field investigations. Based on these, further analysis will conduct to find how does the landscape changes impacted by the ice and snow change in the downstream region of the high mountain glaciers and snow cover regions, especially the spatial pattern changes of the wetland, waterbody and grassland changes in the downstream regions. The sensitive areas would be identified in different basins in HMA.

Ice and snow change effects on the key ecosystems elements and ecosystem process in the upper, middle and lower basins in the HMA. The main ecosystem type such as grassland, wetland, and dessert, which are most sensitive to the changes of water, would be chosen to analyze the effects of the snow and ice change. The snow has heat preservation effect on soil, snow thickness on the surface soil have
influence on the soil temperature, if the snow is thicker, and the soil surface temperature affected by the outside world is smaller. The soil surface water content increased with the rapid increase of snow melting and then keep decreasing unless there is precipitation to supplement. The combination of the soil moisture content and soil temperature would influence the time of the start of grown of the vegetation. Soil moisture content and temperature would be monitoring in the field sites in HMA. Remote sensing datasets would be used to retrieve the vegetation phenology (starting, growth and ending period). The temporal and spatial distribution and variation of the major ecological indicators such as vegetation coverage, phenology (starting, growth and ending period) would be analyzed. The relevant model and advance GIS tools would be used to further examine the relation of the ice and snow change effects on them.

To assess the impact of ice and snow change on the ecosystem services in the lower zones of the basins. This study aimed to carry out the relationship between ice and snow with ecosystem elements and ecosystem services. The study will measure and discussing the degree of influence and impact of ice and snow change

on ecosystem services. This will conduct in the different watersheds and basin in HMA and will carry out a specific amount of impacts of ice and snow on ecosystem services. In addition, the effects of ice and snow on ecosystem services and their functions, such as support function (habitat, nature conservation, etc.), regulating function (water conservation, etc.), and product supply function in the selected river basins and their upper, middle and lower zones.