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Projecting supply and demand of hydrologic ecosystem services under future climate conditions

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Ecosystems provide essential goods and services, such as food, clean water, water purification, soil conservation and cultural services for human being. In a watershed, these water-related ecosystem goods and services can directly or indirectly benefit both local people and downstream beneficiaries through a reservoir. Water quality and quantity in a reservoir are of importance for agricultural, industrial and domestic uses. Under the impacts of climate and land use changes, both ecosystem service supply and demand will be affected by changes in precipitation patterns, temperature, urbanization and agricultural activities. However, the linkage between ecosystem service provisioning (ESP) and ecosystem service beneficiary (ESB), and scales of supply and demand of ecosystem services are not clear yet. Therefore, to investigate water-related ecosystem service supply under climate and land use change, we took the Xindian river watershed (303 km2) as a case study, where the Feitsui Reservoir provides hydro-power and daily domestic water use of 3,450,000 m3 for 3.46 million people in Taipei, Taiwan. We integrated a hydrological model (Soil and Water Assessment Tool, SWAT) and a land use change model (Conversion of Land Use and its Effects, CLUE-s) with future climate change scenarios derived from General Circulation Models (GCMs), to assess the changes in ecosystem service supply and demand at different hydrologic scales. The results will provide useful information for decision-making on future land use management and climate change adaptation strategies in the watersheds.

Keywords: climate change, land use change, ecosystem service, watershed, scale