

SOCIAL VALUATION OF HIGH-ALTITUDE LAKE ECOSYSTEM SERVICES UNDER CLIMATE CHANGE IN THE SIKKIM HIMALAYAS

ABSTRACT

High-altitude lakes (HALs) in the Himalayas are pristine water bodies that provide essential ecosystem services (ES) to their dependent communities. These lakes are highly vulnerable due to their higher exposure to natural and human-induced drivers. This research aims to identify, characterize, and prioritize social valuation frameworks for HAL-ES planning and management, examining the complex interplay between HAL-ES, human wellbeing, and climate change.

This study examines stakeholders' wellbeing and drivers-of-change linking with their clarity of climate change using a comparative assessment of two popular HALs (Tsomgo and Gurudongmar lake) in the Sikkim Himalayas. The study identifies stakeholder typology showing their level of dependence, influence, involvement, interest, and power for HAL-ES management. By including 384 different groups of stakeholders with a multistep social valuation framework, the study obtained their perceptions on climate change, prioritization of HAL-ESs importance and vulnerability, HAL-tourism-human wellbeing, direct-indirect drivers-of-change, and other socioeconomic aspects.

Results show that majority of stakeholders lack clear perception of climate change in the context of HAL-region, possibly influenced by their prior common belief about climate change, value attached to the place, and limited exposure to unique and changing climate trends in/surrounding HALs. Climate variability is common, sometimes contrasting among stations but temperature increase, and precipitation decrease grossly noticed that can affect ES for community wellbeing. Stakeholders with direct dependency on HAL-ESs prioritized cultural and provisioning services, while those with indirect dependency focused on regulating services. Climate change emerged as a significant driver of change, with impacts varying across wellbeing dimensions. Stakeholders with a deeper understanding of climate change assigned higher importance to lake health and tourism-related wellbeing components. However, perceptions of climate change often misaligned with actual climate trends, highlighting the need for improved climate communication. The multidimensional matrix analysis found that stakeholders could connect the dimension of HAL physical wellbeing and tourism wellbeing based on their current understanding of climate change. By aligning perceptions with scientific evidence, communities can better understand climate risks and develop informed responses to protect livelihoods and ecosystems under the changing climate. Therefore, the study indicates that effective planning and management of HAL-ES require more attention to socio-cultural aspects, focusing on their direct and indirect linkages with climate change.

Keywords

Climate Change; Social Valuation; High-Altitude Lakes; Ecosystem Services; Wellbeing; Drivers of Change; Stakeholders; Perception; Sikkim Himalayas.