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Mobilizing citizen science to build human and environmental resilience: a synthesis study of four remote mountain communities

Zed Zulkafli (1,2), Wouter Buytaert (1,3), Timothy Karpouzoglou (4), Art Dewulf (4), Praju Gurung (5), Santosh Regmi (5), Bhopal Pandeya (1,3), Aiganysh Isaeva (6), Zuura Mamadalieva (6), Katya Perez (7), Tilashwork C. Alemie (1,8), Sam Grainger (1,3), Julian Clark (9), David M. Hannah (9), and the Mountain-EVO Team

(1) Civil and Environmental Engineering, Imperial College London, London, United Kingdom (z.zulkafli10@imperial.ac.uk), (2) Civil Engineering, Universiti Putra Malaysia, Serdang, Malaysia, (3) Grantham Institute for Climate Change and the Environment, Imperial College London, London, United Kingdom, (4) Public Administration and Policy Group, Wageningen University, Wageningen, Netherlands, (5) Society of Hydrologists and Meteorologists (SOHAM Nepal), Kathmandu, Nepal, (6) Mountain Societies Research Institute, University of Central Asia, Bishkek, Kyrgyzstan, (7) Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN), Lima, Peru, (8) School of Civil and Water Resources Engineering, Institute of Technology, Bahir Dar University, Bahir Dar, Ethiopia, (9) School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, United Kingdom

Communities that are the most vulnerable to environmental change and hazards, also tend to be those with the least institutional and financial resilience and capacity to cope with consequent impacts. Relevant knowledge generation is a key requisite for empowering these communities and developing adaptation strategies.

Technological innovations in data collection, availability, processing, and exchange, are creating new opportunities for knowledge co-generation that may benefit vulnerable communities and bridge traditional knowledge divides. The use of open, web-based technologies and ICT solutions such as mobile phone apps is particularly promising in this regard, because they allow for participation of communities bypassed by traditional mechanisms.

Here, we report on efforts to implement such technologies in a citizen science context. We focus on the active engagement of multiple actors (international and local scientists, government officials, NGOs, community associations, and individuals) in the entire process of the research. This ranges from problem framing, to identifying local monitoring needs, to determining the mode of exchange and forms of knowledge relevant for improving resilience related to water dependency.

We present 4 case studies in arid, remote mountain regions of Nepal, the Kyrgyz Republic, Peru, and Ethiopia. In these regions, livelihoods depend on the water and soil systems undergoing accelerated degradation from extreme climates, poor agricultural management practices, and changing environmental conditions. However, information on the interlinkages of these processes with people's livelihoods is typically poor and there lies the opportunity for identifying novel forms of joint-creation and sharing of knowledge.

Using a centrally-coordinated but locally-adaptable methodological framework comprising of field visits, systematic reviews of white and grey literature, focus group discussions, household questionnaires, semi-structured interviews, and transect-walks, we identify local knowledge needs related to environmental resources management. The full decision pathways from identifying local knowledge gaps to knowledge co-generation and exchange are presented for all four cases and the similarities and differences between them are highlighted. Our results indicate the existence of several cross-cutting issues, including water availability for crops and livestock as a main driver of environmental poverty and the need for hydro-meteorological information to support local decision-making, as well as the prominent role of traditional systems that are either adaptive or resistive mechanisms to environmental change and resource governance.