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Deriving targeted intervention packages for ecosystem-based adaptation: A geospatial multi-criteria approach for building climate resilience in the Puna region, Peru.

Oscar Higuera Roa¹, Davide Cotti¹, Natalia Aste², Alicia Bustillos-Ardaya¹, Stefan Schneiderbauer^{1,3,4}, Ignacio Tourino-Soto⁵, Francisco Roman-Dañobeytia², and Yvonne Walz¹

¹UNU-EHS, Bonn, Germany

²CONDESAN, Lima, Peru

³Eurac Research, Bolzano, Italy

⁴University of the Free State, Bloemfontein, South Africa

⁵GIZ, Eschborn, Germany

Emergent dynamic climate risks challenge conventional approaches for climate adaptation and disaster risk reduction. This situation demands new ways of addressing climate risks with integrated solutions. However, little attention has been paid to exploring methodological approaches for combining adaptation measures to reduce climate risks. Still, selecting the appropriate and effective combination of adaptation measures is a challenging task. This research results in a geospatial multi-criteria approach for developing ecosystem-based adaptation packages to face climate change effects and applies this innovative methodology to a case study area in the Puna region in Peru. We started with an in-depth literature analysis combined with a participatory process with local experts to identify and select locally valid adaptation measures for the specific context of the case study area. Building upon that, we developed the overall multi-criteria approach consisting of a matrix-based procedure to evaluate the applicability of relevant adaptation measures and their feasibility of being combined in adaptation packages. We then integrated the multi-criteria analysis into a Geographic Information System using a spatial analysis model to map suitable intervention areas. Next to the methodological innovation, we applied this multi-criteria approach in the case study area to generate a place-based adaptation package for addressing the risk of reduced water provision, with its respective potential intervention sites differentiated by adaptation measure. This methodological approach is novel and considered an affordable support tool that helps practitioners design more robust and effective adaptive interventions. Furthermore, this methodological approach involves shifting the perspective from activities focused on "single adaptations" to "multi-solution" strategic interventions that address climate risks more comprehensively, recognizing the dynamics and complexities of the social-ecological systems. We encourage researchers and practitioners to transfer the methodological approach to other contexts and, with that, accelerate the efficient and targeted implementation of nature-based solutions for climate resilience.