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TRUST - Sustainable water supply and management in water-scarce regions - the case study of the Lurín River in Lima, Perú

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Water stress due to natural water scarcity and insufficient water management are often encountered in regions experiencing rapid demographic developments. TRUST, a project funded by the German Ministry of Education and Research (BMBF), aims at developing innovative concepts in order to face the complex challenges arising from extreme climate conditions and shortcomings in water resources infrastructure and management. Bringing together researchers and engineers from both natural and social sciences, TRUST will develop systematic management strategies as well as technical planning tools to provide a basis for future decision-making. The project uses the Andean catchment of the Lurín (A=1650 km2) as a case study, one of currently four river basins providing drinking water for the megacity of Lima, Perú. Scarce annual rainfall, a pronounced seasonality and a strong spatial concentration of rainfall at higher altitudes, imposed by the semi-arid tropical climate in the western Andes, pose enormous challenges regarding water availability throughout the year. Insufficient communication of urban and rural needs and potentials lead to a rather isolated and inefficient infrastructure planning that is incapable of tackling the challenges.

As knowledge and understanding of a hydrosystem's water budget and dynamics lie at the heart of a successful water management and economically weak regions often suffer severe data scarcity, an adequate hydro-meteorological monitoring network will be designed and installed throughout the Lurín river basin. Innovative remote sensing techniques, such as satellite-based as well as drone-based hyperspectral imaging, will complement ground-based point measurements and provide insights into spatial distributions of hydrologically relevant parameters like soil moisture, land use and irrigation systems. First results of the evaluation of remotely sensed rainfall data from GPM, successor of NASA's TRMM mission, indicate significant differences in annual precipitation between terrestrial and the satellite-based microwave measurements. Highly dynamic and spatially concentrated occurring flash floods in the basin yet call for wider distributed rainfall monitoring, a reason for which the Israeli-developed method using rainfall-caused perturbations of cellular networks as proxy for rainfall intensity might serve as a useful alternative. On the basis of the observation data gained, two conceptual, spatially explicit hydrological models (mHM, WASA-SED) will be used and compared at the catchment scale. At the hillslope scale, the process-based model CATFLOW will serve to investigate soil water dynamics, especially in light of ongoing changes in land use such as afforestation.