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Capturing Water-Energy-Food (WEF) Nexus as a network phenomenon in social ecological systems

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The Water-Energy-Food (WEF) Nexus has gained growing interest in recent years as a promising approach to overcome governance failures in dealing with complex resource management challenges. Various qualitative and quantitative methods from different disciplines have been used to understand Nexus issues, but just few of these take into account (1) the role of institutions on interactions, and (2) the intertwinedness of social and ecological interactions, which cause social-ecological patterns in Nexus issues.

This paper introduces an approach to address that methodological gap. Specifically, the paper links two nascent approaches –the Networks of Action Situations (NAS) approach and the Social-Ecological Action Situations (SE-AS) framework. The value and the potential of the approach introduced is illustrated for two Nexus cases with a problem constellation, which is quite typical for many regions in the world. The two cases are reservoir-lake-river-cascades with water uses for drinking water, energy- and food-production in the canton of Zurich and in the canton of Bern, Switzerland. The results show governance gaps and coordination problems regarding the WEF Nexus. The governance processes prioritise energy production in both WEF Nexus cases and drinking water in one case. Both cases do not take into account food production in the coordination processes. The study presents the value of the approach by demonstrating the ways in which institutions limit or support synergies, how adjacent actions situations shape decisions with immediate relevance for collective outcomes in WEF Nexus, and how the intertwined interplay of social-ecological interactions jointly and dynamically generate social-ecological patterns in Nexus situations.