Social-ecological systems in Mayan communities. A scientific and traditional knowledge perspective of groundwater management

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Abstract

Social-ecological systems interact in unexpected ways and face perturbations. The ability of one system to deal with these perturbations and maintain its functions is known as resilience. One of the social-ecological systems that face potential threats in the future is the groundwater system. Management of groundwater resources in Yucatan, for example, have played an important role in the economy of Mayan society both, at past and present, helping communities to survive dry seasons. However, impact of human activities is widely recognized as one of the most influencing factors that cause environmental degradation of these ecosystems in the area. The calcareous nature of the soil confers it characteristics of high porosity and permeability causing rapid rainwater evaporation. Thus, water situation there can quickly reach critical and vulnerable conditions and even small disturbances may cause dramatic consequences. Moreover, the aquifer is susceptible to several problems like salt intrusion from the sea towards the interior of the basin; overexploitation and pollution of other water sources; contamination derived from an inadequate waste disposal, climate change and natural hazards. To understand the factors that contribute to both, ecosystem resilience and sustainability or weakening and collapse, this research focuses in the analyses of the social ecological systems on Mayan contemporary people as an explanation for the problems with the management of groundwater resources. By considering the role of traditional Mayan knowledge, management practices, institutions, organizations and drivers of change, we use this approach to (1) address the significance of groundwater management for the community within a focus on environmental data and to (2) provide some insights into the resilience research and sustainability of the system. Being myself a member of a Mayan community and scholar, a dual perspective of the groundwater resource problem is provided in order to show how Mayan social-ecological system represents an excellent example of the consequences to society of human impact on an environmentally sensitive area. Based on this, we argue that human drivers impact sustainability of groundwater. However, not only these drivers impact social-ecological system but also the resulting combination of unsuitable groundwater governance, groundwater management and the exclusion of traditional ecological knowledge and local practices. The evidence was collected through combining qualitative and quantitative research methods. We found that, due to the lack of collaboration-interaction between agents, this ecosystem is declining and management at inappropriate scales has created both, biological and social problems. We conclude that the analysis of social-ecological problems, by combining traditional with scientific knowledge, is a useful tool for ensuring a successful understanding of processes towards sustainability of the system.

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