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The use of interdisciplinary storylines to ensure the inclusiveness of marginalized stakeholders in participatory sociohydrological modelling: A case study in Tz'olöj Ya', Mayan Guatemala

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New and unconventional sources of data that enhance our understanding of internal interactions between socio-economic and hydrological processes is central to sociohydrological modelling. Participatory modelling (PM) departs from conventional modelling tools by informing and conceptualizing sociohydrological models through stakeholder engagement. However, the implementation of most PM processes remains biased, particularly in regions where marginalized communities are present. Most PM processes are not cognizant of differentiation and diversity within a society and tend to treat communities as homogeneous units with similar capabilities, needs, and interests. This undifferentiation leads to the exclusion of key actors, many of whom are associated with marginalized communities. In this study, a participatory model-building framework (PMBF), aiming to ensure the inclusiveness of marginalized stakeholders - who (1) have low literacy, (2) are comparatively powerless, and/or (3) are associated with a minoritized language - in participatory sociohydrological modelling is proposed. The adopted approach employs interdisciplinary storylines to inform and conceptualize system dynamics-based sociohydrological models.The suggested method is underpinned by the Multi-level Perspective (MLP) framework, which was developed by Geels et al. (2002) to conceptualize socio-technical transitions and modified in this study to accommodate the development of interdisciplinary storylines. A case study was conducted in Atitlán Basin, Guatemala, to understand the relationships that govern the lake's cultural eutrophication problem. This research integrated key stakeholders from the indigenous Mayan community, associated with diverse literacy ranges, and emerging from three different minoritized linguistic backgrounds (Kaqchikel, Tz'utujil, and K'iche'), in the PM activity. The generated model serves as a decision support system for managing nutrient discharge into Lake Atitlán, allowing stakeholders to investigate trends of different policy and management scenarios. The participatory model-building activity helped eliminate the impact of power imbalances in water resources management and empower community-based decision-making.