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Land use transformation and changing flooding regimes – An attempt of integrating social and natural science methods

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The rapid expansion of oil palm plantations in Sumatra, Indonesia is associated with a loss of several ecosystem services. According to villagers' observations, this land use transformation has led to an increase in the magnitude and frequency of flood events which present a serious challenge for village and plantation development. Taking this empirical societal problem as a starting point we investigate whether we can find measurable indications for such presumed linkages between land use transformation and changing flood patterns in Jambi province (Sumatra, Indonesia). To this aim, we follow on an explorative, bottom-up research approach that builds on a review of interdisciplinary datasets from social science, soil science, climatology, hydrology and remote sensing. We start our analysis by presenting insights from a qualitative case study, exploring villagers' perceptions of changing flood patterns and assumed causal linkages. Based on this local knowledge, we test different hypotheses on the causes of increasing flood occurrence. We find that water levels of Jambi's largest rivers, the Batanghari and Tembesi river, have increased significantly during the last two decades. Preliminary results show that alterations in rainfall patterns cannot explain for these changes. However, forest conversion towards monocultures plantation systems changes bio-geophysical soil properties thereby possibly contributing to higher surface-run-off. Further, we find that an increasing encroachment of Jambi's wetlands likely reduces the water storage capacities of these ecosystems. According to the villagers, the construction of drainage and flood control infrastructure in these wetlands leads to a highly contested redistribution of water at the local level. We conclude that changing flooding regimes are thus the result of multiple interacting socio-ecological processes associated with the expansion of the plantation business in Jambi province. While eco-hydrological changes likely contribute to an increase of flood events, their social impacts are increasingly mediated through the installment of water infrastructure under often very uneven social power relations.