Socio-hydrological aspects of event-based flood hazard in Assam, India

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Ⅰ. Abstract

This is an observation-based, primarily quantitative sociohydrological study on flood inundation events Assam floods in Northeastern India. The anthropogenic socio-economic factors regarding coupled human-water system and its evolution in flood disasters were studied. Geospatial techniques were applied to visualize the flood inundation extent and the event-based flood inundation phenomena were reconstructed through a hydrological 2-D shallow water inundation model. From the state government's daily flood hazard dataset, the socio-economic variables were characterized by multi-criteria decision-making, and a ranked vulnerability map for different flood seasons for the state was generated. The study tries to use the remotely sensed results and perturbation theory to model the flood hazard, while associating it with a few important societal factors and feedback mechanisms within the co-evolutionary dynamics of hydrology and human behavior in the context of specific emergent hydrological phenomenon i.e. the events of inland flooding in the state of Assam, India.

Ⅱ. Results & Discussion

The study has used and analyzed the daily flood hazard data of the years 2018, 2019, and 2020 from the Assam State Disaster Management Authority (ASDMA) through a multi-criteria decision-making approach. Comparison of these datasets and their validation with remotely sensed flood inundation extent and field-based surveys indicate that most of the damages were done by the flood waves coming during the mid-week of July and lasting for around two weeks. Most of the districts face another flood wave during the last week of June which precedes the main flood wave and lasts for one week. Some of the northern districts can also be subjected to a third flood wave occurring during the mid-week or last week of September. The short-staying flood-waves simultaneously act as economic and psychological shocks to the affected communities, as well as the catalyst for their socioeconomic resilience by building up knowledge and relatively expensive protection measures e.g. embankment heightening or landfill.

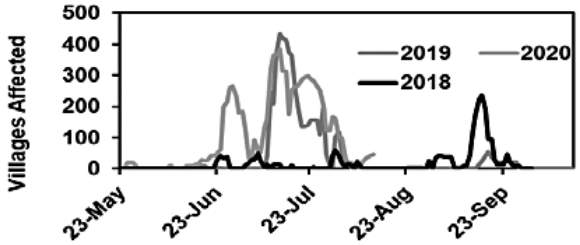

Figure 1. flood hazard characteristics in the district of Dhemaji, Assam, India for years 2018, 2019, 2020

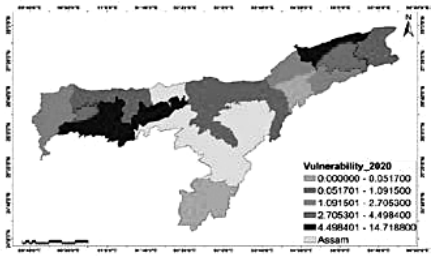

Figure 2. Thematic map of district-wise flood vulnerability for the flood event of the year 2020 in Assam, India

Ⅲ. Conclusion

The duration of inundation and intensity of damages were observed to have very distinct and often counterintuitively inverse correlations among each other. For example, the district of Dhemaji was observed to have a long inundation period yet less intensity of damage whilst the district of Dhubri with a relatively low inundation period has faced severe damages. Also, it was observed that the areas with the most unanticipated and extensive inundations were inside former wetlands that have been encroached and currently utilized for residential, fishery, and agricultural activities where embankments were breached to cultivate pieces of land. From the observations, a simple, conceptual, dynamic model was developed to further explore and predict the process of coupled humanwater interaction in the cases of encroached wetlands vulnerable to flooding. The study further intends to develop a holistic human-water framework for exploring the emergent vulnerability criteria and resilience measures of the local population against flood-induced hazards, which can be useful during relief distribution as well as managing and planning rescue operations.

IV. References

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