Workshop on Understanding and Modeling Complex Risks in Coupled Human-Environment Systems

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Flood transport resilience: Exeter case study

Globally, catastrophic events associated with flooding and extreme rainfall represent a major natural hazard facing societies with regards to the number of people they affect (2 billion between 2000 and 2009) and economic losses (US$100 billion per annum). Escalating costs are an increasing concern for governments but the costs of disasters are felt most acutely at a community level and are determined by the community's ability to absorb the impact and recover after the event. As infrastructural systems are the backbone of contemporary societies, increasing the resilience of the systems to natural hazards is essential for reducing the impact of events on communities and enhancing their ability to recover. To achieve infrastructure resilience, local authorities and decision makers need tools which can help them anticipate, prepare, and recover from flood events. A wide bulk of literature is available on the topic, however existing methods often fail to capture the dynamic interactions between floodwater and transport systems.

Using the city of Exeter (UK) as an exemplar case study, this research investigates interventions at urban level which can improve the flood-resilience of transport systems, as well as for evacuation and emergency management approaches. The research builds on recent work by Evans et al. (2020), and couples dynamically hydraulic flood simulations with an open-source micro-scale traffic model (SUMO - Simulated Urban MObility) to understand flooding impact to traffic and flows. Dynamics for traffic speeds and re-routing due to road closures are embedded based upon vehicular (Pregnolato et al., 2017) and pedestrian (Musolino et al., 2020) stability curves. The analysis is used to understand the most impacted areas of the network and the safest routes for evacuation.

Reference

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