



Of floods, sandbags and simulations: Urban resilience to natural disasters and the performance of disaster management organisations under change.

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Natural disasters and in particular floods have become a strong threat to urban communities in the last decades. In just eleven years (2002, 2013) two centenary river floods have hit Eastern Germany, causing damages of 9.1 billion € (2002) and 6.7 billion € (2013, first estimate), making them the most costly flood events in German history. Many cities in the Free State of Saxony that were strongly hit by both floods are additionally challenged by demographic change with an ageing society and outmigration leading to population shrinkage. This also constrains the coping capacity of disaster management services, especially those of volunteer-based disaster management organisations such as fire brigades, leading to an increased vulnerability of the community at risk. On the other hand, new technologies such as social media have led to rapid information spread and self-organisation of tremendous numbers of civil volunteers willing to help.

How do responsible organisations deal with the challenges associated with demographic change, as well as with expected increases in flood frequency and intensity, and what strategies could enhance their performance in the future?

To explore these questions, we developed an agent-based simulation model. It is based on socio-demographic settings of the community, communication and coordination structures of disaster management as well as transportation infrastructure for resources and emergency forces. The model is developed in exchange with relevant stakeholders including experts of local disaster management organisations and authority representatives.

The goal of the model is to a) assess the performance of disaster management organisations and determine performance limits with respect to forecast lead times and respective coping times of disaster management organisations and b) use it as a discussion tool with these organisations and authorities to identify weak points as well as new options and strategies to ensure protection and contribute to the communities' resilience.

To achieve this goal we use different scenarios to explore the effects of change processes on the performance of disaster management organisations, e.g. rising demands posed onto disaster management organisations due to stronger floods and lower capacities caused by resource constraints. We especially focus on formal coordination structures within and between organisations, as well as informal structures such as emerging networks of volunteers or informal communication between organisations.