

## **Heavy Precipitation impacts and emergency planning – developing applicable strategies for a metropolitan area**

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Heavy rainfall in central Europe is one of the assumed effects of climate change, which occurs with large seasonal and regional differences in its magnitude. The extent of loss depends on natural parameters (e.g. topography and vegetation) as well as on socio-economic factors like urbanized and industrialized areas and population density. Dangerous cascade effects appear, if critical infrastructure like the electrical power supply is affected. In some cases mudflows and flash floods cause inundated or undercut roads and cause a high demand for fast and effective assistance of the authorities. The civil protection in Germany is based on a federal system with a bottom-up command-structure and responsibility to the local community. Commonly this responsibility is taken by the fire brigades and civil protection units of the community or district. After heavy rainfall in an urban area, numerous incidents and emergency calls appearing at a time are overstressing the human and technical resources of the fire brigades within the local authority frequently.

In this study, a method of comprehensive evaluation of meteorological data and the operation data from local fire brigades shall be developed for the Rhine-Main-Area in order to identify particular affected spots of heavy rain and bundle resources of the fire brigades. It is to be found out if the study area contains regions with a particularly high exposure to heavy rain and high application numbers of the fire department and whether there is a relationship of rainfall and frequency of use. To evaluate particular local effects on the fire brigades capability, a brief analysis of the meteorological data provided by the German Meteorological Service (DWD) as well as the evaluation of the incident data of the affected fire brigades, is used to frame a realistic approach. In particular fire brigade operation data can be used accordingly to describe the intensity of the aftermath when heavy precipitation strikes a certain area.

It shows that most of the damage is caused by spilled sewage drains flooding basements and streets. Besides less fire brigade operations are observed in rural areas with constant amount of rainfall. The occurrence of heavy rain events is spatially limited, hot-spot areas with higher probability can be detected. Based on this finding, a resource management strategy for the fire brigade can be developed.

Keywords: emergency planning strategy, critical infrastructure, heavy rainfall, fire-brigade resource management