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# A Method for quantitative flood risk assessment in urban areas of developing countries

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Risk in regard to natural hazards is commonly defined as "expected losses (...) due to a particular hazard for a given area and reference period. Based on mathematical calculations, risk is the product of hazard and vulnerability" (UN DHA, 1992). In developed countries flood risk is mostly understood as the economic damage due the inundation caused by a flood of defined probability of occurrence. A common way to quantify economic damage for flood scenarios is to combine modeled inundation and land use data using water depth damage curves. In developing countries this data is not widely available and economic damage is not the major impact of a flood. The more severe consequences of floods in urban areas of developing countries are the pollution of drinking water sources and consequent outbreaks of water borne diseases, especially in slums.

To provide emergency managers and planers with a tool to mitigate these risks, the described flood risk modeling approach has been adapted to the specific needs and data restrictions of urban areas in developing countries. Modeling the population at risk can potentially take into account climatic and demographic change. To thus quantify how many people could be affected by contaminated drinking water enables emergency managers to plan sufficient counter measures (number of mobile filtration units, amount of medication) and assists in making slum communities more resilient to flooding.

Whereas detailed land use data needed for economic damage calculation is mostly not available, data on population density and water supply infrastructure can be obtained from local government agencies. Using these data and a hydraulic model based on satellite derived digital elevation data the population at risk of cholera infection and other water borne diseases can be derived for a given flood event.

In the current paper the method is applied to the case study of Greater Kampala (Uganda). The application shows the potential of quantitative flood risk assessment using sparse data, harvesting the benefits of current risk assessment tools to make urban communities in developing countries more flood resilient.