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Probabilistic Flood Risk Assessment in Sub-Saharan African Countries

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In recent years, the UN Agency and EU is putting an increasing effort in improving the understanding of risks related to natural hazards in Africa. This continent is facing an increasing number of natural hazards, which strongly affect its development, impairing the GDP and their investments. Furthermore, the number of people affected by natural hazards is particularly growing in this region due to increased population and the movement from rural to urban areas.

The aim of this work is to generate national risk profiles for Sub-Saharan African Countries, which can significantly support African Governments to inform national DRR policy and strategy formulation and priority setting. The development of national disaster risk profiles consists of the following steps:(i) Flood scenario generation ; (ii) Quantification and characterization of the exposure and vulnerability of a series of elements at risk; (iii) Impact scenario generation; (iv) Generation of Loss Exceedance Curves and other metrics (Annual Average Losses (AAL) and Probable Maximum Losses (PML). The procedure is applied to present and future conditions, such as evolving climate and exposure. Different categories of elements at risk are considered: (i) Human exposure in terms of population density; (ii) GDP; (iii) Built up environment, characterized by different construction typologies and where possible for different occupancy types; (iv) Agricultural production.

Exposure data collection and homogenization at a sufficient level of detail represents a key aspect of the assessment. Damage computation is subjected to the availability of exposure and vulnerability data at relative high resolution. Access to high resolution base layer datasets such as high-resolution Data Elevation Models allows a fairly detailed implementation of hazard models, aimed to predict the effects of floods. However, in data-poor contexts, such as many of the Sub-Saharan African Countries, exposure data usually rely on global datasets, which contain information aggregated at national/regional scale and cannot be directly used for damage computation. In this work, a special attention is spent to obtain detailed population and built-up area information, merging data from different sources: local, such as census data, but also global, such as the Global Human Settlement Layer (GHSL) from the European Joint Research Centre (JRC), WorldPop as well as the Global Urban Footprint.