Assessment Of Urban Flood Risk Under Climate Change Scenarios Using 1D–2D Hydrodynamic Modelling: Case Study Of Korba City, Tunisia (Oral)

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ABSTRACT

Urban flooding has become one of the most critical natural hazards affecting coastal cities in the Mediterranean region, particularly in Tunisia, where climate change and rapid urban expansion increasingly exacerbate flood risk. Coastal cities are especially vulnerable due to low topography, dense urbanization, and limited drainage capacity. Recent extreme rainfall events have demonstrated that existing hydraulic infrastructure is often insufficient to safely convey flood flows, leading to severe socio-economic and environmental impacts.

This study aims to assess urban flood risk in the coastal city of Korba under present and future climate change conditions using a coupled one-dimensional and two-dimensional hydrailiic modeling approach. The hydraulic behavior of the urban drainage system and adjacent natural channels was simulated using the HEC-RAS model, while spatial data preparation and floodplain mapping were performed using HEC-GeoRAS within a GIS environment. A high-resolution digital elevation model was used to accurately represent urban topography, flow paths, and built-up areas.

The methodology includes the reconstruction of design rainfall events for current conditions and future climate scenarios based on projected increases in rainfall intensity. These scenarios were introduced into the model to generate inflow hydrographs and simulate unsteady flow conditions. Hydraulic structures such as culverts, bridges, and road crossings were explicitly represented to evaluate their influence on flood propagation and water level rise. Model calibration and validation were carried out using available flood observations and historical inundation records.

Simulation results indicate a significant increase in flood extent, water depth, and flow velocity under climate change scenarios, particularly in low-lying and densely urbanized districts. Maximum water depths locally exceed 1.2 m, posing serious risks to residential areas and critical infrastructure. The results also highlight the key role of natural floodplain areas and open spaces in attenuating flood peaks and reducing flood impacts.

The findings demonstrate the effectiveness of 1D–2D hydrauliic modeling for urban flood risk assessment and provide valuable insights for urban planners and decision-makers. The study supports the implementation of adaptation strategies such as improved drainage capacity, preservation of flood retention areas, and integration of climate change considerations into urban development planning.

Keywords: Urban flooding; Climate change; Flood risk assessment; 1D–2D modelling; HEC-RAS; Coastal cities; Tunisia.