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Dynamic adaptive planning for urban coastal flooding in the city of Miami, Florida

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Coastal and low-land flooding in urban areas is causing increasing nuisance and damages in many communities across South Florida. Sea-level rise, storm surge and extreme rainfall events are projected to increase the likelihood of such flood events in the future. Here we present the results from a study by a consortium of researchers and local policymakers and planners, aimed at understanding which adaptation actions in the water system and local communities can deliver more resilience to flooding.
We focus on the performance of the current water system in the city of Miami in South Florida, USA, by analysing current and future flood risk due to storm surge and rainfall, and potential adaptation measures to reduce flood occurrence as well as flood impacts. Such impacts are quantified by estimating damages to buildings and roads for different flood return periods. Performance of the adaptation measures is expressed as the level of current and future expected direct flood damages. Hydraulic simulation of the water management system is done with the xpSWMM model, and flood damage estimation is done using the HAZUS-MH approach within the Delft-FIAT flood damage model. Measures to mitigate the flood hazard include upgrading of the local drainage system and the installation of local municipal pumps, and installation of booster pumps at the coast. Measure to mitigate flood damages include the increased elevation of roads and buildings. We show in a dynamic adaptive planning approach, how the costs, sequencing and timing of the strategies with different sets of measures can best be approached, when taking into account the uncertainties about future sea-level rise. Results are presented for several pathways, that have been illustrated to local policymakers using the Pathway Generator software.