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Risk based adaptation of infrastructures to floods and storm surges induced by climate change.

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Coastal natural hazards are changing in frequency and intensity associated to climate change. These extreme events combined with an increase in the extent of vulnerable societies will lead to an increase of substantial monetary losses. For this reason, adaptive measures are required to identify the effective and adequate measures to withstand the impacts of climate change. Decision strategies are needed for the timing of investments and for the allocation of resources to safeguard the future in a sustainable manner.
Adapting structures to climate change requires decision making under uncertainties. Therefore, it is vital that risk assessments are generated on a reliable and appropriate evaluation of the involved uncertainties. Linking a Bayesian network (BN) to a Geographic Information System (GIS) for a risk assessment enables to model all the relevant parameters, their causal relations and the involved uncertainties. The integration of the probabilistic approach into a GIS allows quantifying and visualizing uncertainties in a spatial manner. By addressing these uncertainties, the Bayesian Network approach allows quantifying their effects; and facilitates the identification of future model improvements and where other efforts should be concentrated. The final results can be applied as a supportive tool for presenting reliable risk assessments to decision-makers.
Based on this premises, a case study was performed to assess how the storm surge magnitude and flooding extent of an event with similar characteristics to the Sandy Super storm will occur in 2050 and 2090.