An Adaptive Toolkit for Projecting the Impact of Green Infrastructure Provisions on Flooding and Pollutant Load in Galena Park, TX

Extreme weather events, such as hurricanes, have become more frequent and severe in recent years. The effects of climate change make it more likely that metropolitan areas with long histories of being polluted by land-based industries will be subject to more devastating and more frequent flooding. As home to one of the world's largest petrochemical complexes, Harris County, TX, faces public health concerns from the transfer of hazardous substances in increasingly severe flooding. Toxic heavy metals discharged from industrial land are also transported through flood water to nearby residential areas and deposited in soil. To overcome this challenge, we developed an adaptive GI toolkit that can be tailored by both on-ground spatial size and underground depth of obstruction. This study applies and assesses the effectiveness of this toolkit in mitigating flooding and non-point source pollutants through a case study of Galena Park, Texas, USA. We first applied the toolkit to create a master plan for Galena Park and evaluated the effect of the master plan by using the Delft3D-FM (Flexible Mesh) flood model alongside the Long-Term Hydrologic Impact Assessment (L-THIA) model. The L-THIA findings reveal gradual reductions up to 13% in stormwater runoff and non-point source pollutants during rainfall-induced inland flooding. Additionally, according to the Delft3D-FM results, the implementation of the suggested interventions from the master plan led to a reduction of about 30% in both the extent of flooded areas and the peak volume of floodwater during hurricane-induced flooding.