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IMPACT OF GROUNDWATER IN COMPOUND FLOODING: A CASE STUDY OF THE CONWY ESTUARY IN WALES.

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Compound flooding occurs when multiple flood drivers act simultaneously, leading to more severe and complex flood events. Low-lying deltas and estuaries are particularly vulnerable as they face storm surges, high river discharge, intense rainfall, tides, and sea-level rise. Globally, 2.15 billion people reside in near-coastal areas, including 898 million in low-elevation coastal zones. The UK has a long history of estuarine flooding driven by compound events. Despite its importance, the role of groundwater and soil moisture in compound flooding remains under-researched due to its lesser frequency and perceived lower severity. Recent studies highlight coastal aquifers' increasing exposure to flooding, yet few have examined the compound effects of groundwater rise and other flood drivers. This study integrates a coupled catchment and groundwater model using Caesar Lisflood to assess groundwater's influence in compound flooding within the Conwy estuary in North Wales, a flashy catchment with a history of flood events. A notable example is during Storm Ciara in February 2020, where record river levels, intense rainfall, and high storm tides combined to inundate 172 properties. Conwy River drains a 600 km² catchment, receiving 1,700 mm of annual precipitation, with baseflow contributing 27% of total streamflow. The model is calibrated using historical fluvial and tidal data to assess how different drivers influence flood magnitude, timing, and behaviour. The study also examines the sensitivity of Conwy estuary to hydrogeological variations by analysing changes in modelled groundwater heads and discharge in response to changes in aquifer properties such as hydraulic conductivity and specific yield.