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Mapping, Monitoring, Forecasting and Assessing the Impact of Climate Change in Groundwater Systems in Ireland

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In recent years Ireland has experienced significant and unprecedented flooding events, such as groundwater floods, that extended up to hundreds of hectares during the winter flood season, lasting for weeks to months, and affecting many rural communities in Ireland. In response to the serious flooding of winter 2015-2016, specifically related to groundwater, Geological Survey Ireland (GSI) initiated a project (GWFlood, 2016-2019), in collaboration with Trinity College Dublin (TCD) and Institute of Technology Carlow (ITC), to investigate the drivers, map and numerically model the extent of groundwater flooding in Ireland. Through this project, the use of remote sensing data, Sentinel-1 satellite imagery from the European Space Agency Copernicus program, was key to overcome the practical limitations of establishing and maintaining a national field-based monitoring network. The main outputs for this project included: 1) a national historic groundwater flood map, 2) a methodology for hydrograph generation using satellite images, and 3) predictive groundwater flood maps for Ireland.

Subsequently GSI started a new project (GWClimate, 2020-2022), in collaboration with ITC, to monitor floods in Ireland using remote sensing data, to enable short-term forecasting groundwater floods at a national scale, and to evaluate the potential that climate change may have on Irish groundwater resources, both in terms of flooding and drought issues. The GWClimate project is enhancing the tools developed by GWFlood in order to deliver: 1) seasonal flood maps for Ireland, 2) near-real time satellite-based hydrographs, 3) groundwater flood forecasting tools, and 4) maps evaluating the impact of climate change in groundwater systems in Ireland. The outputs of this project will contribute to monitor and quantify the impacts of flooding in Ireland at a national scale, improve the national capacity to understand how groundwater resources respond to climatic stresses, and improve the reliability of adaptation planning and predictions in the groundwater sector.

Data and maps from GWClimate and GWFlood projects are available at: 1) https://gwlevel.ie, and 2) https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/groundwater-flooding/gwflood-project-2016-2019/Pages/default.aspx