Flood Foresight: Global Flood Impact Forecasting

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Improving resilience through triggering early action has been a key driver in the development of Flood Foresight, a globally scalable framework for flood and impact forecasting which harnesses a scenario-library of global flood mapping data. Flood Foresight is being used and tested by a number of infrastructure providers and insurance companies and has been demonstrated for the Brahmaputra river basin through using GloFAS ensemble forecasts. It has been set up to produce real-time and forecast event footprints (flood extents and depth data) and early warning of impacts, whilst also accounting for forecast uncertainty. Flood Foresight has a range of early-action applications, including underpinning parametric insurance products, forecast-based financing and flood early warning.

The on-line Flood Foresight system comprises three modules (Rainfall Screening, Flood Forecasting and Flood Monitoring) to target early action for improved resilience. We are able to scan-ahead using the Rainfall Screening module, switch to forecast flood footprints using the Flood Forecast module if things are deteriorating, and evaluate flood footprints and impacts more accurately in real-time for operational decisions with the Flood Monitoring module. The technology has been made more useful and usable recently through providing automated emailed impact summaries for individual users - for example infrastructure predicted to be inundated during an on-going event, to help trigger early action.

Flood Foresight is being adopted by insurers and infrastructure operators to provide forecasts and early-warnings of impacts to assets, and it has been built into policy for infrastructure providers as an alternative to structural risk management measures. The Rainfall Screening module consumes NCEP 0.5° rainfall totals and integrates these at catchment scales, and through fitting extreme value analysis to re-analysis datasets we transform the totals to rarity. As an example, the rarity of Storm Desmond was forecast 2 days ahead as likely to have a return period of 1500 years with this approach. The Flood Forecasting module replaces telemetered gauges with virtual gauges generated by a rainfall runoff model, E-HYPE (in Europe or GloFAS elsewhere), which is driven by ECMWF 0.1° high resolution deterministic atmospheric model (HRES) forecasts. SMHI, Sweden have setup E-HYPE to generate daily flows across Europe, and this provides the distributed signal of rarity for our unique 5-dimensional interpolation approach that interpolates through time, space and rarity. Currently the Flood Monitoring module is set up for England, Scotland and Wales. Data is produced on a three-hour frequency - the system consumes real-time river levels via the internet from telemetered gauges, transforms these to flows, and looks up the most appropriate flood data from the large scenario library using our unique interpolation technique. Here, we report on lessons learnt from the first year of Flood Foresight for development partners and how it is being used to improve their resilience and forward planning.