

## Flood and Coastal Erosion Risk Management Research Programme

# Developing and trialling improved capabilities for forecasting surface water flooding via Natural Hazards Partnership

## Project Summary SC120006

This project has developed an impact-based surface water flood forecasting model. The new model will help the joint Met Office and Environment Agency Flood Forecasting Centre to improve guidance for emergency responders on the potential impacts of surface water flooding.

Around 3 million properties in England and Wales are at risk of flooding from surface water, as well as rail and road infrastructure.

Lead Local Flood Authorities and Local Resilience Forums play an important role in warning and responding to surface water events. It is important that they and local partners have the best available information about whether a storm is likely to hit their area and the potential impacts.

This summary describes the work completed with support and funding from the joint Environment Agency/Defra research programme.

### Background

A Surface Water Flooding Hazard Impact Model (SWFHIM) has been developed to improve incident management for surface water flooding.

The Centre of Ecology and Hydrology led this project in collaboration with the Environment Agency, Health and Safety Laboratory, Met Office and the Flood Forecasting Centre. These all have experience in forecasting flooding and modelling the impacts of hazards.

### What the project involved

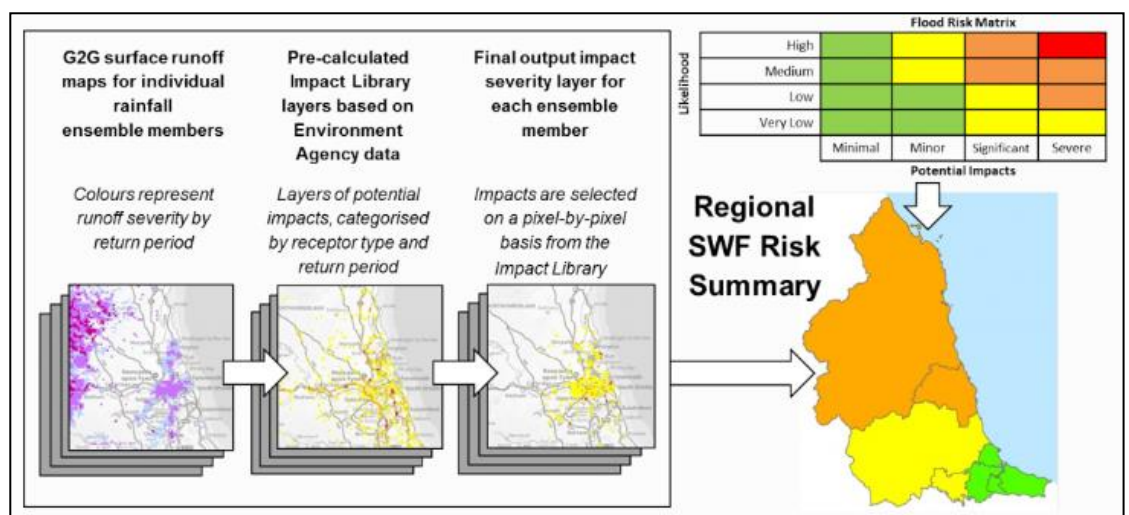
The project developed, tested and trialled an improved real-time forecasting model to show the likely extent of surface water flooding and the impacts to people, buildings, transport and infrastructure.

It used Environment Agency modelling showing areas at risk of surface water flooding under different rainfall scenarios. Property and infrastructure information was used alongside this to determine the possible impacts of flooding.

A pre-calculated library of potential flood impact information was created.

The hazard and impact information can be matched to Met Office predictions of likely rainfall. These predictions use the probabilistic Grid to Grid (G2G) forecast model.

Figure 1: An illustration of the components of the Surface Water Flooding Hazard Impact Model.



Mapped scenarios show different severities of impact. These are used by the Flood Forecasting Centre to produce a county-wide assessment of surface water risk using a Flood Risk Matrix. The matrix is based on the likelihood of a flood occurring and the severity of potential impacts.

The results are presented in the Regional Surface Water Forecast Risk Summary. (See Figure 1 for an illustration of the above steps).

### **Trial Case Study: Glasgow Commonwealth Games**

During development, an early version of SWFHIM model was used and trialled for the 2014 Commonwealth Games in Glasgow. Scottish Environment Protection Agency (SEPA) Regional Pluvial (rainfall-related) Flood Hazard maps were used to build the impact library.

A research team from Scotland's Centre of Expertise for Water (CREW)<sup>1</sup> developed tools to run the model in real-time and report on the likely impacts of surface water flooding. Two surface water incidents happened during the Games and the model performed within expectations.

The trials informed updates to the SWFHIM. It was then tested across England and Wales and trialled by the Flood Forecasting Centre in 2017.

### **How the SWFHIM will be used**

The impact severity maps produced by the SWFHIM will be used to improve the information presented in the Flood Guidance Statements.

Daily Flood Guidance Statements include a 5-day assessment of surface water flood risk at the county level for England and Wales. They forecast situations that could cause flooding, threaten communities and pose a risk to lives and livelihoods.

Both Lead Local Flood Authorities and Local Resilience Forums receive these guidance statements. The resilience fora use the information to support emergency planning and resourcing decisions.

Using the SWFHIM will give greater confidence to the risk forecast and decisions made based on this.

The Flood Forecasting Centre expects to use the SWFHIM in surface water flood forecasts from 2019.

### **What this means for the Environment Agency**

The SWFHIM will help the Environment Agency deliver its Strategic Overview Role for the management of all sources of flooding, including surface water. The Environment Agency and Met Office are reviewing improvements to surface water forecasting and

communication. They aim to make the best use of the information produced across the Met Office, Flood Forecasting Centre and Environment Agency, such as the SWFHIM. This review was reported in the Defra Surface Water Management Action Plan (2018).

The review will also support the government response to an independent review of Local Resilience Forum Multi-Agency Flood Plans (MAFPs) published on 12 June 2018. Defra guidance will be reviewed and updated in light of the outcome of the MAFP Review.

The impact library approach has also informed other Environment Agency projects including the new National Flood Risk Assessment, currently in development.

This project is reported in detail in the following report: 'Natural Hazards Partnership Surface Water Flooding Hazard Impact Model: final report, 2016':

<http://www.naturalhazardspartnership.org.uk/wp-content/uploads/2016/10/NHP-HIM-Surface-Water-Flooding-Phase-2-Final-Report.pdf>

**Project manager of SC120006:** Adam Baylis / Hayley Bowman

**Theme manager:** Sue Manson, Incident Management and Modelling

**Research Collaborators:** Met Office (Exeter, EX1 3PB); Flood Forecasting Centre (Exeter, EX1 3PB); Kings College London (London, WC2R 2LS)

**Research Contractors:** Centre for Ecology and Hydrology (Wallingford, OX10 8BB); Health and Safety Laboratory (Buxton, Derbyshire, SK17 9JN); JBA Consulting (Skipton, North Yorkshire, BD23 3AE).

### **February 2019**

This project was commissioned by the Environment Agency's FCRM Directorate, as part of the joint Flood and Coastal Erosion Risk Management Research and Development Programme.

This contributed to Phase 1, 2 and 3 of the project 'Natural Hazards Partnership Surface Water Flooding Hazard Impact Model' coordinated by the Natural Hazards Partnership and delivered through a consortium of partners.

Website: <http://evidence.environment-agency.gov.uk/FCERM/en/Default/FCRM.aspx>

Email: [fcerm.evidence@environment-agency.gov.uk](mailto:fcerm.evidence@environment-agency.gov.uk).

Enquiries: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk).

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<sup>1</sup> <https://www.crew.ac.uk/publications>

**Research Collaborators:**



**Met Office**

Met Office,  
Exeter, Devon, EX1 3PB

**FLOODFORECASTINGCENTRE**

a working partnership between  Environment Agency |  Met Office

Flood Forecasting Centre,  
Exeter, Devon, EX1 3PB



King's College London,  
London, WC2R 2LS

**Research Contractors:**



**Centre for  
Ecology & Hydrology**

NATURAL ENVIRONMENT RESEARCH COUNCIL

Centre for Ecology & Hydrology (CEH),  
Wallingford, Oxon, OX10 8BB



Health & Safety Laboratory (HSL),  
Buxton, Derbyshire, SK17 9JN



JBA Consulting,  
Skipton, North Yorkshire, BD23 3AE