SERVICES & EXPERTISE

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

Flood Risk Management - Science and Services

Challenges

Resilient governments, businesses and emergency responders face a dual flood risk management challenge: to mitigate flood risk and assist in effective flood incident response. Achieving this challenge requires accurate understanding of flood risk, provision of early warning and science-led discovery at relevant spatial and temporal scales.

The Centre for Ecology & Hydrology (CEH) flood risk management and forecasting services help steer today's planning and investment decisions while future-proofing against the longer-term term impacts on flooding due to changes in climate, land use and population.

Summary

The past is less reliable as a predictor of the future. CEH's science-led approach provides the insight needed to underpin robust civic and corporate flood resilience now and into the future.

We are a world-leading centre for flood research. We provide coordinated flood assessments and advice to support national policy, environmental and infrastructure planning, ecological management and emergency response to flooding. We offer flood risk insight across spatial scales and tools to forecast impending floods in real-time. But in a changing world, our predictive capability goes beyond the 'business as usual' – we help future-proof decisions against changes in climate and land use. We do this by integrating expertise across hydrology, meteorology and climate, geology, ecology, engineering and information technology.

Capabilities

- Flood Forecasting
- Spatial Rainfall, Weather Radar and Flood Monitoring
- Flood Risk Estimation
- Future Flood Risk Estimation

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CAPABILITIES

Flood Forecasting

CEH flood models improve warning times of national flood forecasting systems and support flood management and incident response. Our state-of-the-art models have been extensively validated against historical flood records across the UK and overseas. We provide tools and solutions that support:

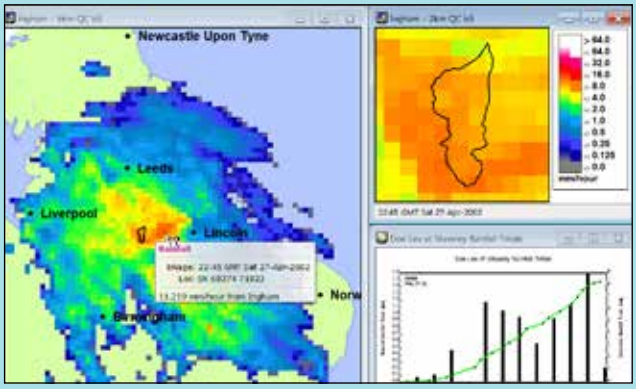
- Real-time and seasonal river flow forecasting
- Probabilistic flood forecasting
- Risk analysis and impact-based flood forecasting
- Surface water flooding hazard assessment
- Catchment to national scale coverage to forecast "everywhere"
- Performance assessment of rainfall and flood forecasts

Improving hazard warning times

Spatial Rainfall, Weather Radar and Flood Monitoring

CEH tools provide access, analysis and display of real-time spatial rainfall observation and forecast products. Raingauge and radar rainfall data are integrated to yield improved gridded rainfall estimates. We advance flood risk management through:

- Monitoring of rainfall at fine space-time resolution
- Historical archives to support post-flood analysis
- Automated quality control of real-time rainfall data
- Assessing rainfall rarity
- Interfacing to flood forecasting systems
- Managing other real-time gridded weather observation and forecast products



Optimising data for flood forecasting

Flood Risk Estimation

CEH data products, tools and models provide valuable insights into flood and rainfall rarity for design planning or asset management professionals. Our methods and procedures form the UK standard for flood risk assessment.

We offer:

- Risk mapping and assessment
- Design flood estimation - local and national
- Regional flood frequency estimation at ungauged sites
- Rainfall depth-duration-frequency estimation
- Reservoir dam and spillway guidance
- Flood estimation in data-scarce situations

Underpinning flood planning and design

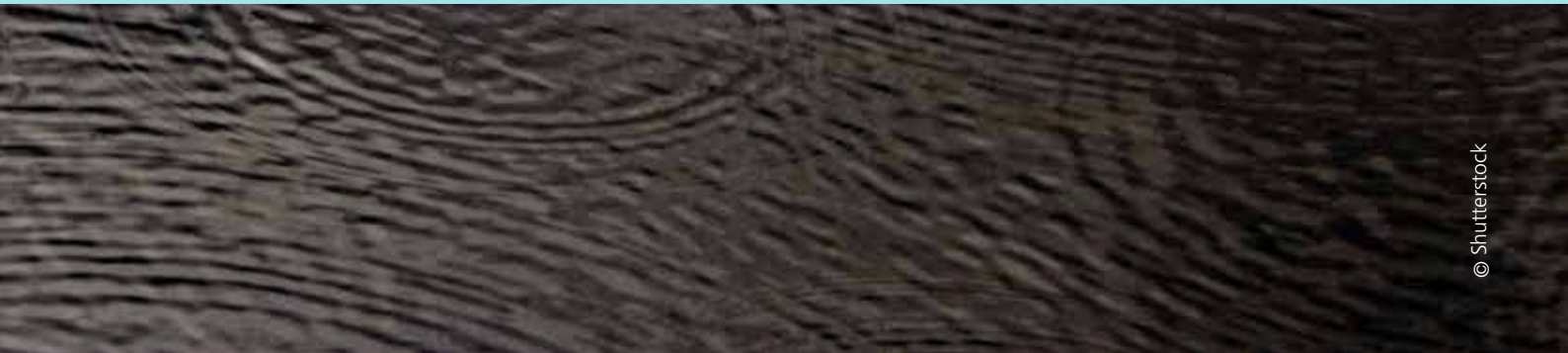
Future Flood Risk Estimation

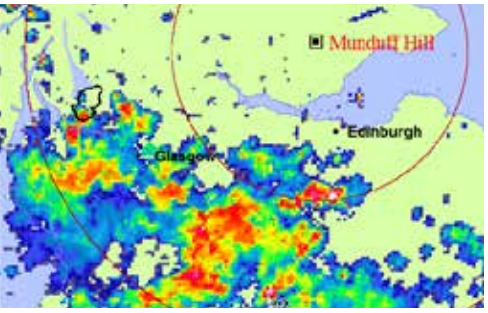
CEH models and tools quantify the implications and uncertainties of long-term climate and land-use change on flood risk. Using continuous river flow simulation techniques for flood frequency estimation we provide future flood insight both nationally and locally.

We offer expertise in:

- Climate change impact on flood flows
- Land-use management change implications
- Options for "natural" flood mitigation
- Future urban runoff evaluation
- Adaptation measures to reduce vulnerability

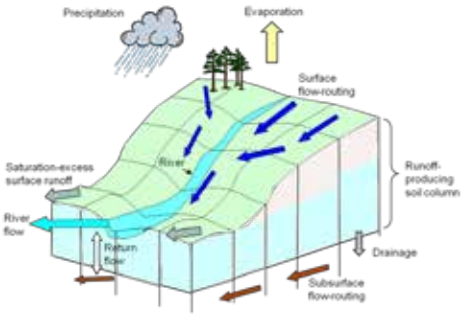
Quantifying future flood risk





Integrated Weather & Flood Monitoring Radar Systems

FEH: flood risk estimation planning tool



National Grid-to-Grid (G2G) Distributed Flood Model

by Duffman69

CEH supported operational surface flood model for the Commonwealth Games 2014

Front cover photos:
Left - Tadcaster: aftermath of 2015/16 Winter floods.© Neil Mitchell, Shutterstock; Right - © CEH

Project Experience

HYRAD – Hydrological Radar System for storm and flood monitoring

HYRAD helps monitor storms and floods in real-time using observed and forecast gridded rainfall products. It can interface these with flood forecasting systems to give timely warnings and merge telemetry raingauge and radar rainfall data to improve accuracy. Users can interactively display and analyse the latest weather information to support real-time flood risk assessment and decision-making during flood incidents.

HYRAD is used by government agencies across the UK and Belgium and by water utilities concerned with urban drainage management.

Flood Estimation Handbook (FEH)

FEH is the UK standard approach for rainfall and river flood magnitude and frequency estimation and is used by engineers, planners, regulators and insurers. It is essential for flood defence planning and design specification for infrastructure including bridges, culverts, and reservoir spillways.

We continue to develop and maintain the FEH methods and procedures.

fehweb.ceh.ac.uk

National Grid-to-Grid (G2G) Distributed Flood Model

G2G translates rainfall to river flow over a countrywide gridded domain to give flood estimates "everywhere". It is used across Britain by the Flood Forecasting Centre and Scottish Flood Forecasting Service to predict fluvial flood risk out to five days at a 1km resolution.

Applications include:

- Real-time forecasting
- Daily flood risk assessment
- Urban surface water flood forecasting
- Seasonal river flow forecasts
- Climate change impacts on river flows

Real-time Surface Water Forecasting - Commonwealth Games 2014

Our tools and methodologies are used to provide real-time surface water flooding impact and risk forecasts. Offering a 24 hour lead-time, these forecasting services support emergency response preparedness and can assist authorities manage major civic and corporate events.

Working with partners, we delivered a surface water flood forecasting service that was used operationally during the Glasgow Commonwealth Games in 2014. This enabled SEPA to advise the Games organisers on the likely timing, location and best- and worst-case scenarios for potential flood disruption.

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