

The overall system design is in the process of being finalised and the code development will take place in 2007/2008. The Beta testing and final software delivery is currently programmed for 2008/2009.

The MDSF2 will provide a consistent decision support tool for application to CFMPs, SMPs, ESs, strategy plan and scheme appraisal, allowing for the exploration of integrated FRM strategies in the context of different future scenarios. It provides a means to apply the latest R&D methods in practice, and is designed with an appropriately flexible architecture to allow for future updates, as the science evolves. A key benefit is the incorporation of the RASP approach, as this enables the defence performance and contribution to risk to be taken into account.



**Dr Caroline McGahey –
Project Manager**
(c.mcgahay@hrwallingford.co.uk)



**Dr Suresh Surendran –
MAR Theme Manager,
Environment Agency**
(suresh.surendran@environment-
agency.gov.uk)

Revitalised flood estimation research

Background

For many years, Defra and the Environment Agency have funded research by the Centre for Ecology & Hydrology (CEH) and others to develop and produce guidance on rainfall and river flood frequency estimation.

The Flood Estimation Handbook (FEH) published in 1999 continues to form the basis of most work on flood frequency estimation in the UK. It consists of five volumes describing two principal methods for conducting flood frequency analysis as well as information on electronic datasets of catchment descriptors such as catchment area and annual average rainfall. The two principal methods described in the FEH are: i) a rainfall-runoff based approach adopted largely unchanged from the original method developed in the early 1970s and published in the Flood Studies Report (FSR) and ii) a statistical method based on analysis of annual maximum series of instantaneous peak flow.

Since publication in 1999, continuous dialogue between users of the FEH and the research team at CEH Wallingford has highlighted various aspects of the methods and their implementation which would benefit from further improvements. As a result, the Joint Defra/Environment Agency Flood and Coastal

Erosion Risk Management R&D programme has funded a number of projects aimed at improving various aspects of the two methods in the FEH.

Firstly, the projects *Revitalisation of the FSR/FEH rainfall-runoff method* (FD1913 January 2005) and the subsequent *Dissemination of the FSR/FEH rainfall-runoff method* (SC040029 April 2007) have recently been completed and focused on improving the rainfall-runoff approach. Secondly, the ongoing project *Improving the FEH statistical index flood method and software* (SC050050) is scheduled for completion in Autumn 2007.

The projects have all benefited from new data, updated analytical techniques and advances in computation made available since the publication of both the FSR and the FEH. In particular, the improved datasets made available through the Hiflows-UK project have provided significant benefits.

Results

The recently completed projects provide a revitalised and improved method for event-based modelling of flood events in the UK based on the Revitalised Flood Hydrograph (ReFH) model. The improvements include improved rainfall-runoff modelling techniques and a method for generating design

flood events with added emphasis on quantifying the underlying physical flood generating mechanisms including seasonality. To improve confidence in the performance of the method, especially at higher return periods, extra hydrological data from recent large flood events were collected from catchments throughout the UK and added to the existing flood event archive held at CEH Wallingford.

A further outcome of the ReFH project were three components supporting effective dissemination of the revitalised rainfall-runoff method to the user community. First, the ReFH design spreadsheet was made available for downloading free of charge on the 19 January 2006 from a dedicated web-page hosted by the CEH (www.ceh.ac.uk/refh). In excess of 1000 individuals from public, private and academic institutions have downloaded a copy of the spreadsheet at the time of writing.

Second, comprehensive ReFH Flood Modelling Software has been developed for the Windows platform. The software package supports all aspects of the revitalised FSR/FEH rainfall-runoff method, including import, storage and retrieval of observed hydrometric data, estimation of parameters for the ReFH model itself through analysis of observed flood events, simulation of both observed and design flood events and, finally, reservoir routing functionalities. A comprehensive user manual accompanies the software.

Finally, an application-oriented description of the revitalised FSR/FEH rainfall-runoff method is provided in a report supplementing the existing five-volume Flood Estimation Handbook. The report consists of six chapters providing a description of the ReFH model.

Further ongoing work is concerned with improving the FEH statistical method, especially i) the predictive ability of the QMED equation ii) procedures for the use of donor catchments and iii) the formulation and use of regional information in pooling groups. These improvements will further enhance the ability of the method to accurately predict the flood risk at both gauged and ungauged sites. In addition to improvements of the methodology, a series of new catchment descriptors have been developed describing the extent of flood plains in any UK catchment larger than 0.5 km².

Outputs

The projects will provide a series of improvements to the original FEH procedures for both the rainfall-runoff and the statistical approach to flood frequency estimation. The methods will be made available through a series of software packages, assisting hydrologists and engineers involved in flood frequency estimation. At the same time, these projects will ensure that the UK remains at the forefront of the development and application of flood risk estimation techniques.



**Dr Thomas Kjeldsen –
Project Manager**
(trkj@ceh.ac.uk)

**Dr Suresh Surendran –
MAR Theme Manager, Environment Agency**
(suresh.surendran@environment-agency.gov.uk)