Sustainable Flood Retention Basins to Control Flooding and Diffuse Pollution

Strategic Alliance for integrated Water Management Actions

OVERALL AIM

The overall project aim is to establish an objective, mathematical and quantitative *Sustainable Flood Retention Basin (SFRB) Decision Support Model*. A user manual and guidance documents will be produced for engineers and planners to design, operate and manage different types of SFRB. The model will be based on engineering (hydraulics and sustainable drainage), environmental, landscape and socio-economic variables, and should assist in controlling *flooding* and *diffuse pollution*.

TRANSNATIONAL OUTPUT

The SFRB concept, associated model and representative Scottish and German case studies will be disseminated via journal paper publications. Project partners will have access to an inter-active database providing solutions to the design, operation and management of SFRB. The SFRB model will support *flood risk management plans* in most European countries and other regions with temperate climate. Guidance documents will supply generic recommendations of how to identify a SFRB, classify different SFRB types and develop *management strategies* for individual SFRB types.

PROJECT TEAM

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Chris Sagar, **Michelle Robinson**, **Louise Blackhall**, **Mark Keane** and **Rodney Moody**, final year project students

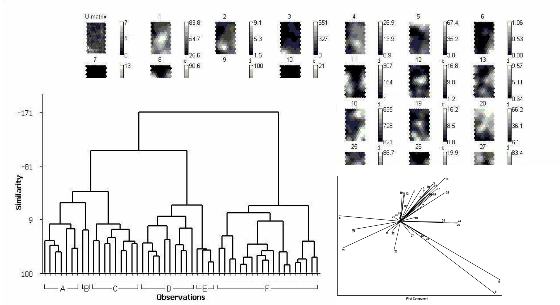

Fig. 3. Collage of example outputs from *statistical and modelling tools* to analyse SFRB variables and different SFRB types.

Fig. 1. Baddingsgill Reservoir (extreme example): highly engineered *Hydraulic Flood Retention Basin* (type 1 SFRB); predominantly used for drinking water supply and flood control purposes.

Fig. 2. Milkhall Pond (extreme example): passively managed *Natural Flood Retention Wetland* (type 6 SFRB); predominantly used for environmental protection, recreational and diffuse pollution control purposes.

PROJECT DESCRIPTION

The international research team will identify representative SFRB types (e.g. Figs. 1 and 2) for subsequent analysis and model development. The performances of SFRB are heavily influenced by engineering design, environmental and process factors. Practitioners will therefore benefit from having a decision support tool optimising SFRB use depending on target values to be defined by the corresponding SFRB type. Such a tool can assist in identifying the most important variables that influence the performance of a SFRB. This will be useful not just for the management of new SFRB systems, but also for the operation and *compliance monitoring* of existing systems. The compliance of a SFRB with consent conditions can be tested readily without the need for frequent monitoring.

The *classification* of SFRB to optimize flood control is novel. The research methodology proposes a step change from traditional engineering solutions, which rely predominantly on standard engineering control variables towards *holistic and soft variables*. This approach will more adequately address *multi-disciplinary* problems. Traditional engineering methods will be combined with timely and novel statistical and *machine learning techniques* (Fig. 3). This combination of tools has not been tried previously, and if successful, will lead to a significant step change in how SFRB are planned, designed, operated and managed.

The proposed research is timely, because member states of the European Union have to improve the *water quality* status of their major river basin catchments. Point source pollution is under regulatory control. However, diffuse pollution problems caused by uncontrolled *urban* and *agricultural* sources have not been solved by environmental regulators.

A user-friendly version of the model and associated manual will provide regulators and designers with a practical but scientific management tool. This will end the reliance of planners, designers and operators on past empirical observations based on traditional civil engineering philosophy.

The Interreg IVB North Sea Region Programme

European Regional Development Fund
Interreg IVB 2007 - 2013