A SYNTHESISED APPROACH TO IMPLEMENTING INTEGRATED RIVER BASIN MANAGEMENT USING DISTRIBUTED MODELLING FOR A TYPICAL FLOODPLAIN CATCHMENT IN THE UK

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In order to enhance the sustainable management of water resources and to provide a better understanding of surface heterogeneity in a catchment, a more integrated approach on physical, hydrological and ecological features of the catchment associated with human activities is needed. This study is an attempt to treat those aspects using large quantities of spatial and temporal data of land cover, rainfall, soil hydraulics and hydrogeology for a typically floodplain based wetland river basin in the South West of the UK in the line with the EU WFD (Water Framework Directive). However, the aims of the EU WFD, which focuses on the integrated management and on ecological quality across the European Union, raise major scientific and technical questions, and these need improved understanding of catchment systems and hydro-ecological interactions that can be only achieved from integrated and multidisciplinary experimental research and the associated development of truly interdisciplinary scientific collaboration.

Basically, this study attempts to understand and to simulate catchment behaviour in terms of hydrology and land use as well as to suggest ways of improving the understanding between local farmers (main land users), policy makers and environmentalists. Decision-support and the integrated assessment of river basins requires information - and criteria against which that information can be evaluated. Management of the hydrological impacts of land-use change in respect of flood risk and linking surface water/groundwater interactions is required to improve scientific understanding because of the complexity of water/land use management issues and complex hydrological exchanges. This is particularly so in the case of wetlands.

The study area – the River Parrett - has extensively developed wetlands in low lying areas, the major part of which has been designated as a nature conservation area for the wild life habitats at local, national and international level, and major towns have been developed in the lower riparian areas since Roman times. Despite historical drainage and flood protection development and the fact that flooding defences have been installed, the Parrett catchment is significantly at risk of flooding as well as being important from the point of view of habitat, agriculture and biodiversity (Mills, et al; 2000, Park and Cluckie, 2004).

Modelling is composed of three parts: GIS techniques are for interpreting spatial patterns of the topography, slope distribution, geologic/hydrogeologic distribution and land cover/use and distributed hydrodynamic models such as MIKE 11 and MIKE SHE (DHI-Water and Environment software) for hydraulic and hydrological modelling, in particular integrating surface water and ground water. Used parameters for the Parrett

model are meteorological data, soil hydraulics, hydrogeology, land use, potential evapotranspiration and elevation. In physical distributed modelling, spatial data - soil, hydrogeology, land use, and geographic boundaries - is divided into a number of computational cells for the numerical solution of the governing equation. The Simulation period is decided based up on agricultural practice, such as the crop growing season, August, and the dormant season, December, in 1999 and 2000, in order to see the hydraulic/hydrological differences in extreme flooding year and normal year.

Flooding in the Parrett is an annual occurrence and plays a significant role in maintaining biodiversity but, increasingly, more extreme events cause damage to property and adversely affects livelihoods, creating local tensions and demands for more immediate and effective action in flood management. As part of the Flood Risk Management Research Consortium (http://www.floodrisk.org.uk), interaction of this study with existing projects is required, if we are to deliver an integrated river basin management programme taking into account social, economic and environmental factors.

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