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Integrating observations and models to help understanding how flooding impacts upon catchments as a basis for decision making.

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This paper explains how flood management projects might be better informed in the future by using more observations and a novel impact modelling tool in a simple transparent framework. The understanding of how local scale impacts propagate downstream to impact on the downstream hydrograph is difficult to determine using traditional rainfall runoff and hydraulic routing methods. The traditional approach to modelling essentially comprises selecting a fixed model structure and then calibrating to an observational hydrograph, which make those model predictions highly uncertain. Here, a novel approach is used in which the structure of the runoff generation is not specified a priori and incorporates expert knowledge. Rather than using externally for calibration, the observed outlet hydrographs are used directly within the model. Essentially the approach involves the disaggregation of the outlet hydrograph by making assumptions about the spatial distribution of runoff generated. The channel network is parameterised through a comparison of the timing of observed hydrographs at a number of nested locations within the catchment. The user is then encouraged to use their expert knowledge to define how runoff is generated locally and what the likely impact of any local mitigation is. Therefore the user can specify any hydrological model or flow estimation method that captures their expertise. Equally, the user is encouraged to install as many instruments as they can afford to cover the catchment network.

A Decision Support Matrix (DSM) is used to encapsulate knowledge of the runoff dynamics gained from simulation in a simple visual way and hence to convey the likely impacts that arise from a given flood management scenario. This tool has been designed primarily to inform and educate landowners, catchment managers and decision makers. The DSM outlines scenarios that are likely to increase or decrease runoff rates and allows the user to contemplate the implications and uncertainty of their decisions. The tool can also be used to map the likely changes in flood peak due to land use management options. An example case study will be shown for a 35km2 catchment in Northern England which is prone to flooding. The method encourages end users to instrument and quantify their own catchment network and to make informed, evidence based decisions appropriate to their own flooding problems.