



## Stakeholder co-production of models in catchment management for water quality

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“Good” water quality may be delivered by a mix of regulations, incentives and voluntary actions. Hence successful catchment management requires strong partnerships and stakeholder engagement. Due to the complexity of catchments we also need models to help us characterise them, set water quality goals and identify the best mix of actions. Because decisions are then (partly) based on models, all involved must accept the model results if catchment management is to work effectively. One possible way of achieving model acceptance is stakeholder co-production of models which can take various forms. In this paper, we report two case studies of taking stakeholders through the three main stages of model development (perceptual, formal and procedural modelling) at varying levels of depth. Both studies are set in the context of catchment management for water quality in the UK, one in the Thurne in Norfolk and the other in the upper Tamar in Devon/Cornwall.

This type of stakeholder co-production of models yielded substantive benefits in terms of adding to or “ground-truthing” the model database through stakeholder knowledge (especially regarding land use and management), agreeing on the dominant factors to be modelled, and rendering the model interface user-friendly. These led to instrumental benefits for overall catchment management in terms of greater stakeholder trust in and ownership of the model as well as the collectively produced management scenarios. The fact that the model looks at all sources of pollution, not just agriculture, added to its credibility. Stakeholders appreciated that model uncertainty was accounted for (here probabilistically) and explained it to others in non-scientific terms, providing evidence of collective learning.

In conclusion, this type of modelling provided a platform for the stakeholders to collaboratively frame the scale and severity of the water quality problems, and develop a collective understanding of uncertainty. The stakeholders had the opportunity to model potential solutions to the problems in real time, stimulating highly dynamic and engaged discussion. The modelling also allowed an appreciation of trade-offs to be developed. The provision of indicative scenario costs provided all important economic reality to the debate. The model became an explicit vehicle for stakeholders to incorporate their knowledge within the problem solving process, thereby stimulating ownership and trust in the outcomes. There remain, however, issues of confidentiality which point to an “honest broker” to govern the model that is collectively produced. Finally, modelling will only add value to catchment management if it is adapted and refined as additional data become available and scientific theory advances. Ways must be found to make this as inexpensive as possible.