



## Collaborative Modelling

### Strengthening stakeholder participation and ownership in decision making

Water resources systems are complex and encompass a variety of competing technical, ecological, economic, and social dimensions. Often experts and stakeholders do not fully understand or cannot agree upon the reasons why water-related challenges occur, let alone upon the actions that should be taken to adapt to or mitigate their impacts. Deltares' collaborative modelling approaches offer an effective means by which to address and resolve these knowledge- and values-based conflicts between experts, water users, stakeholders and decision makers. They consist of interactive and iterative processes for decision support that combine stakeholder engagement with analytical modelling, visualisation and communication tools.

The acceptance of water-related strategic plans and policies by national and local authorities are critical enabling preconditions for sustainable development. Conflict between stakeholders can generate opposition to these plans and lead to their rejection. Deltares seeks to resolve these conflicts by engaging stakeholders

in joint analytical modelling activities to test and assess the performance of water resources systems under a variety of policy options. The benefits of our collaborative modelling approaches include the benefits and mechanisms.

#### WHY

##### Acceptance and Ownership

Increased acceptance and ownership over developed plans and strategies

##### System understanding

Improved system understanding and model performance through the incorporation of shared multi-sector and local knowledge

##### Transparency

Increased transparency of both modelling and decision-making processes

##### Consensus

Improved consensus relating to system function and preferred strategies

##### Stakeholder relations

Improved stakeholder relations, by opening channels of communication, generating mutual understanding and negotiating compromise solutions

#### HOW

##### Stakeholder participation in model development

Data collection → model definition → model construction → model validation → verification

##### Stakeholder involvement in model application

Model use → Design, formulation and evaluation of measures and strategies

Create the necessary cooperative environments to facilitate the joint formation of negotiated solutions

**Collaborative modelling for decision support**

# Four Key Pillars

Deltares' collaborative modelling approaches for water-related policy analysis and decision support rest upon the integration of four key pillars

## Water resources planning

structured, iterative decision or policy making processes that commence with problem definition and determine the subsequent activities necessary to analyse and achieve desired objectives in a timely manner.

Within the World Bank's Integrated River Basin Master Plan (IRBMP) project in Pemali Comal, Indonesia, Deltares experts collaborated with regional and local government counterparts as well as other stakeholders to prepare an integrated master plan for managing operational water management issues in the river basin. River basin issues were discussed and a conceptual model of the integrated water resources system was developed. Data and modelling requirements were collectively identified prior to the co-construction of an integrated water allocation model for the basin in RIBASIM. Potential measures were co-designed, modelled, analysed and evaluated with local stakeholders in joint workshops. The structured planning process meant that the IRBMP could be finalised, approved and adopted by local and regional decision makers according to the project schedule.

## Stakeholder participation

engagement with representatives of sector interests affected by the decision making process to capture their variety of values, perceptions, concerns and needs.

To assist with disaster risk reduction in Cork, Ireland, Deltares worked with local stakeholders from various critical infrastructure sectors (energy, health, education, water, etc.) to collaboratively map interdependencies between their various facilities using our Circle tool. Connections between these networks are rarely identified. As each of the various sectors are typically reluctant to share network data due to the risks of misuse by third parties. As such, the impacts of flooding or other disasters due to cascading effects remained largely unknown. Having representatives from the relevant stakeholders come together in the same room to discuss these issues, Deltares' approach made it possible for stakeholders to share only the necessary information about their respective networks. The causal effects and dependencies between the networks could then be collected in a database and coupled with an interactive modelling engine to simulate the impacts of a series of extreme flooding events. In doing so, the benefits of providing targeted protection to vulnerable pieces of critical infrastructure could be visualised and easily understood by all stakeholders.

## Negotiation:

water resources management invariably involves conflicting stakeholder interests. Our collaborative modelling approaches aim to incorporate accepted, factual information generated by the developed models to support interest-based negotiations between stakeholders.

During the Dutch Delta Programme Rivers, central government, provincial, municipal and water board representatives cooperated together in formulating an adaptive, long-term flood risk management strategy for riverine areas. Social organisations and the business community also had opportunities to provide input. Stakeholders were brought together to design and assess a large variety of dike reinforcement and spatial measures, the latter which prioritised giving back 'room to the river'. Many of these spatial measures involved land use changes, decisions about which were inherently political. A collaborative modelling approach was proposed that combined structured stakeholder participation in various discussion and negotiation forums, supported by a simple, fast modelling tool: the Planning Kit (in Dutch: Blokkendoos). The Planning Kit provided stakeholders with a quick and effective means to visually analyse and assess flood protection and other impacts for the many spatial measures to be considered during negotiations over the preferred strategy.

## Informed decision making by means of models and analytical tools

Computer-based models to inform relationships between the competing interests and impacts of a particular decision or policy. The models are used to support the analysis of data, the generation of possible scenarios and options, and to support decision makers and stakeholders in evidence-based strategy making.

During the Büyük Menderes River Basin planning project in Turkey, Deltares collaborated with local experts to develop a tool for supporting the rapid assessment of measures and strategies to help achieve compliance with the EU's Water Framework Directive. Separate hydrology and ecology working groups were set up that included representatives from Turkish universities, ministries, monitoring departments and water institutes. The developed tool consisted of two modelling suites, RIBASIM and WFExplorer, and modelled basin hydrology, water distribution, water quality and ecology processes. It was used together with a wider group of regional stakeholders to assess the efficacy of various restoration and mitigation measures. Stakeholders could assess potential measures against a set of the agreed key performance indicators, and were familiarised with the use of the tool via a gaming approach. Having been built with the knowledge of local experts, stakeholder trust in the developed tool was high and stakeholders viewed it as a useful support for informed decision making.





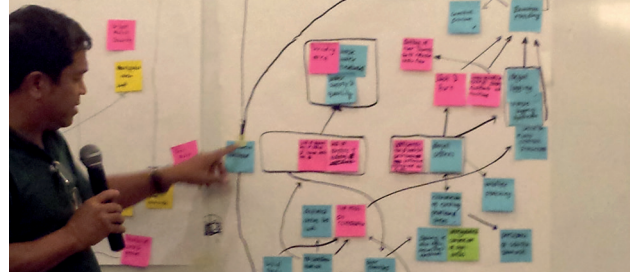
## Collaborative approaches being applied by Deltares

Deltares' portfolio of collaborative modelling approaches, tools and applications is constantly developing. We apply these to a range of software simulation products (e.g. complex physical simulation models, Bayesian network models, etc.) and topic areas (e.g. flood risk, adaptive delta planning, IWRM, water quality, environment). A non-exhaustive list of the methods we employ includes:

### Fast Integrated Systems Modelling (meta-modelling)



### Group model building and mediated modelling using system dynamics



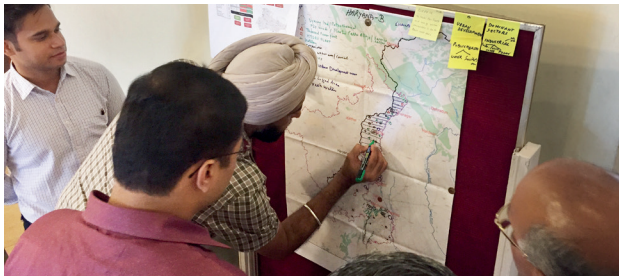
### Interactive modelling



### Serious gaming



### Participatory mapping



### Social network analysis of critical infrastructure



By applying these approaches to water-related problems, Deltares aims to enhance planning and decision making capacity for both our clients and other stakeholders. These include national and international government agencies, policy makers, private enterprises, non-governmental organisations and various water user groups and associations. The combination and interaction of expert and local forms of knowledge forms the basis to all of our collaborative modelling approaches. Through frequent, interactive and facilitated workshops, we create transparent

platforms for knowledge sharing that credibly balance competing stakeholder interests. Directly involving stakeholders in the design, construction and use of modelling tools builds stakeholder trust, understanding and sense of ownership for the developed tools. This helps to ensure their continued use by stakeholders after the conclusion to the planning project.

### For more information visit:

<https://www.deltares.nl/en/issues/information-systems-for-freshwater-security>