3Di Water Management is a four-year innovation programme developing various IT products for water managers, spatial developers and emergency organisations. These products allow for faster and more accurate flood forecasts.

3Di Water Management supplies detailed information about problems with excess water from heavy rainfall and floods, and generates an immediate picture of the effects of measures. Real-time information is accessed through an interactive web portal and realistic 3D-animations establish a clear picture of the flooding.

Models for flood prediction benefit from ever-higher resolutions of digital elevation maps; the most recent map of the Netherlands (AHN-2) has a resolution of 0.5x0.5 metres. Conventional simulation software, such as SOBEK’s Overland Flow, cannot cope satisfactorily with the explosive increase in the number of these “pixel” grid cells. We would like to have the necessary detail at far lower computational costs. The Casulli and Stelling “subgrid” technique computes water levels for conventional grid cells (10x10 metres, for example), but computes conveyance values for the fine pixels. In this way, the flow solver remains fast while all detailed elevation changes are “felt” by the flow.

These innovations were further developed and aligned with existing software such as SOBEK and D-Flow Flexible Mesh. The latest addition is a prototype for distributed rainfall-runoff modelling, which could be particularly interesting for urban flooding problems. At the high resolution available, it is much easier to represent buildings, pavements, parks, and retention areas in a single two-dimensional model. 3Di could therefore help to plan the mitigation of severe rainfall effects.

3Di is designed to support the decision-making process. The results from the flow solver are therefore presented on the online web portals Lizard.net and Delft-FEWS. Scenarios can be compared and analysed so that questions can be answered quickly on the basis of model results, which is particularly important during disasters (and disaster training). Existing models can be modified on the fly, for example by raising dikes locally, or by breaching certain segments to create emergency storage.

3Di results can be presented in a virtual 3D realistic environment. The AHN-2 datasets have a coloured dot associated with every LIDAR point. These dots form a dense “point cloud” representing the real world, where the roofs are orange, playing fields are green and market places are as colourful as in real life. The challenge for the TU Delft researchers is to cope with these billions of points. In this virtual world, the subgrid flooding results are visualised using a photo-realistic wave model. During an emergency drill in Delfland, this environment was found to help in terms of getting all the experts “aligned” on the actual problem at the start of the day. Spatial planners can also benefit greatly from realistic visualisation, using it to explain their plans (dike upgrades, for example) in communications with the general public.