



## **Cross-institutional Flood Forecasting in Regional Water Systems; Innovative application of Delft-FEWS in The Netherlands**

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The regional water system in the North-Brabant province in The Netherlands is (operationally) managed by four different Water Authorities: Rijkswaterstaat Southern-Netherlands, and the three Regional Water Authorities (RWA's) Aa & Maas, De Dommel and Brabantse Delta.

The water systems basically consist of mid-sized (navigable) canals, semi-natural brook valleys in mildly sloping sandy soils, and man-made watercourses in clayey polder areas. The management areas of the De Dommel and Brabantse Delta RWA's are bordering Belgium over a total length of approx. 185 km, and are prone to transboundary flood flows.

The current project 'Dynamic Water Management' intends to improve the mutual cooperation and communication between the RWA's and Rijkswaterstaat during periods of both high and low water stages. The project deals with governance issues such as water agreements and water systems analyses.

A powerful product of the project is a DSS for flood forecasting ('DSS Brabant'). One of the main benefits of cooperation between the RWA's and Rijkswaterstaat is to enable assistance during peak flows and flood events and to try to optimise operational water systems management by deploying drainage and storage facilities by using the connecting (navigable) canals. A set of hydraulic structures like pumps, weirs and sluices facilitate the control and routing of the water flows. Especially during peak flow and flood events, these canals allow to deviate excess flow to neighbours who suffer less from flooding. During regular conditions the water systems are fully independent, but during floods connections are made by using the canal system.

The heart of DSS Brabant consists of a Delft-FEWS application, containing several RTC (1st) and hydrodynamic Sobek (2nd order) models FEWS is receiving a variety of data on hourly or six-hourly basis, consisting of measured and forecasted meteorological input (radar-precipitation/HIRLAM, evaporation and wind), water levels and discharges at (transboundary) model boundary locations.

Three RTC models, which are running continuously, are fed with the output of conceptual rainfall-runoff models to simulate water level, discharge and weir height forecasts. These RTC models simulate a five days period within a few minutes. In addition, an ECWMF ensemble of 50 members runs each 12 hours to estimate the reliability and uncertainties of forecasted water levels and discharges. The FEWS application in DSS Brabant also contains three additional RTC (beta) models that optimise the (penalty based) settings of weirs and gates, and the deployment of water retention areas.

Four different hydrodynamic Sobek models are used for routing purposes and more detailed overland flow forecasts on various 'key' locations. These models run standard on a six hourly basis, but can also be used manually to simulate the impacts of the various operational measures. These 2nd order model runs are intended to run within one hour.