



The perfect storm surge;

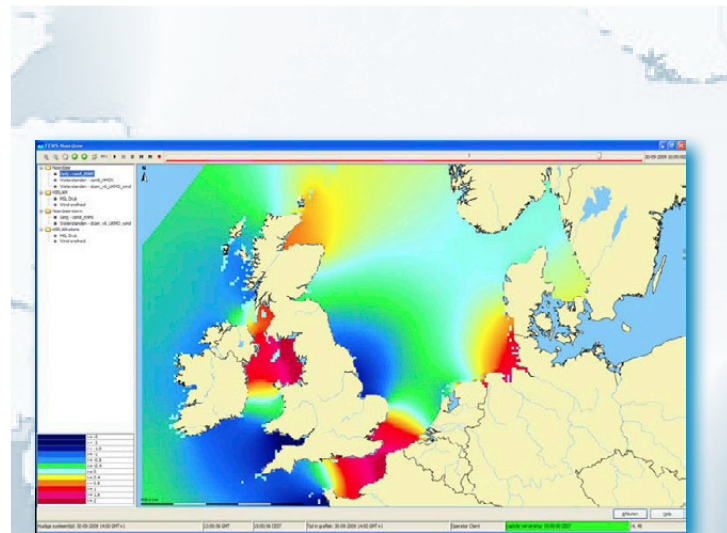
Water Coach: serious gaming during flooding

Flooding occurs infrequently in the Netherlands, however, when flooding is imminent it is essential that forecasters involved in providing information on water levels are well-trained and able to work in stressful situations.

In complex situations such as these, the pressure is high. Therefore complete, correct, and timely information is essential. In order to prepare for such a situation, the institutions involved, such as the Storm Surge Warning Department (SVSD) and the Water Management Centre (WMCN) should train not only their specific tasks, but also the communication among the different organisations involved. Since floods do not occur often enough for professionals to train their skills in real life, Deltares devised a simulation tool, Water Coach, which provides an alternative method of training for these organisations. The main purpose of Water Coach is to help flood professionals reach their learning objectives efficiently and to optimise learning conditions.

Forecasting

The prediction of storm surge levels in Water Coach is supported by a state-of-the-art operational forecasting system, based on Deltares' Flood Early Warning System (Delft-FEWS), and provides accurate flood forecasting and warnings. The system is a sophisticated collection of modules designed for building a flood forecasting system customised to the specific requirements of an individual flood-forecasting agency. The philosophy of the system is to provide an open shell for managing the forecasting process. This shell incorporates a wide range of general data handling utilities, while providing an open interface to a wide range of forecasting models.



Delft-FEWS system for the North Sea, showing the tides in the North Sea

Water Coach

In real life, the crisis response professionals work with different Delft-FEWS applications in order to set up their operational forecasts. Water Coach replicates the actual Delft-FEWS operational environment used during crisis almost completely. This means that the trainee can access meteorological and hydrodynamic model results and measurements relevant for the exercise scenario within the familiar operational environment. The only difference is that Water Coach generally works with pre-simulated model runs in order to avoid long simulation times during exercises.

The crisis scenario in Water Coach consists of all data related to the weather and water situation. Each scenario contains several scripts (i.e. storylines) to enable training of different learning objectives. A script describes everything that is not data from the model, such as a weather forecast update or a news bulletin concerning a sunken ship.

Water Coach assists the trainee to reach the following learning objectives, i.e. to demonstrate the ability to:

- Collect, analyze, and interpret data, and to formulate and support conclusions. This concerns the results of both hydrodynamic and meteorological models and measurements (see figure 1);
- Identify the strengths and limitations of models as predictors of behaviour in the real world. This concerns both the meteorological and hydrodynamic models. The model results are evaluated based on measurements and expert judgment;
- Apply appropriate software tools to analyze the relevant data;
- Communicate effectively about forecasts with a specific audience, both orally and in writing; and
- Work effectively under time pressure and/or during unexpected events occur (e.g. technical problems).

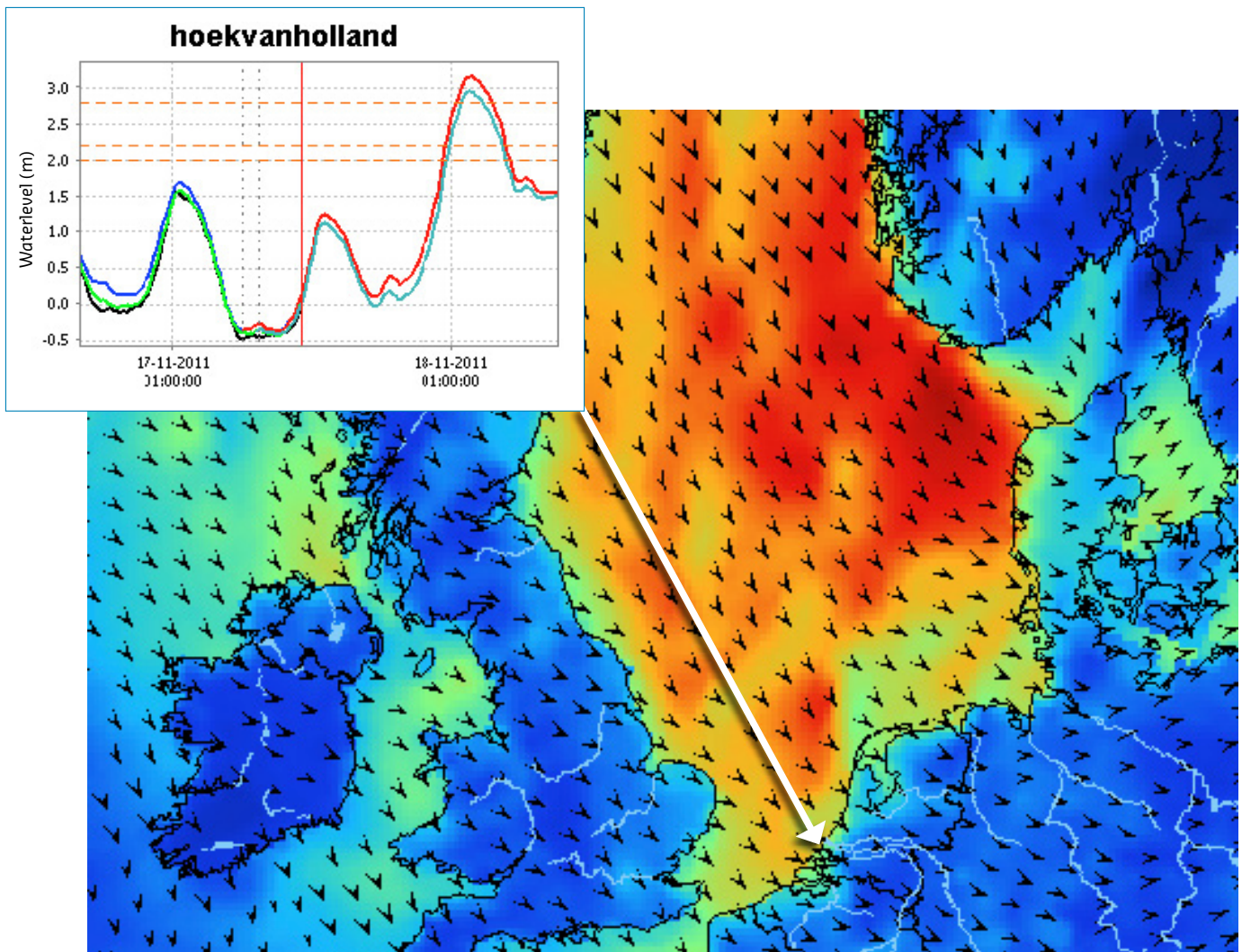


Figure 1: Water Coach uses input from FEWS-North Sea in order to provide water professionals with realistic conditions during training with a crisis scenario. Overlay (top): Time series of the forecast water levels [m] by 2 models (colored) with measured levels (black) for Hoek van Holland (location along the Dutch coast). Red vertical line is "now", orange horizontal lines are warning levels. Background: 2D display of the forecast wind speed [m/s] on the North Sea.

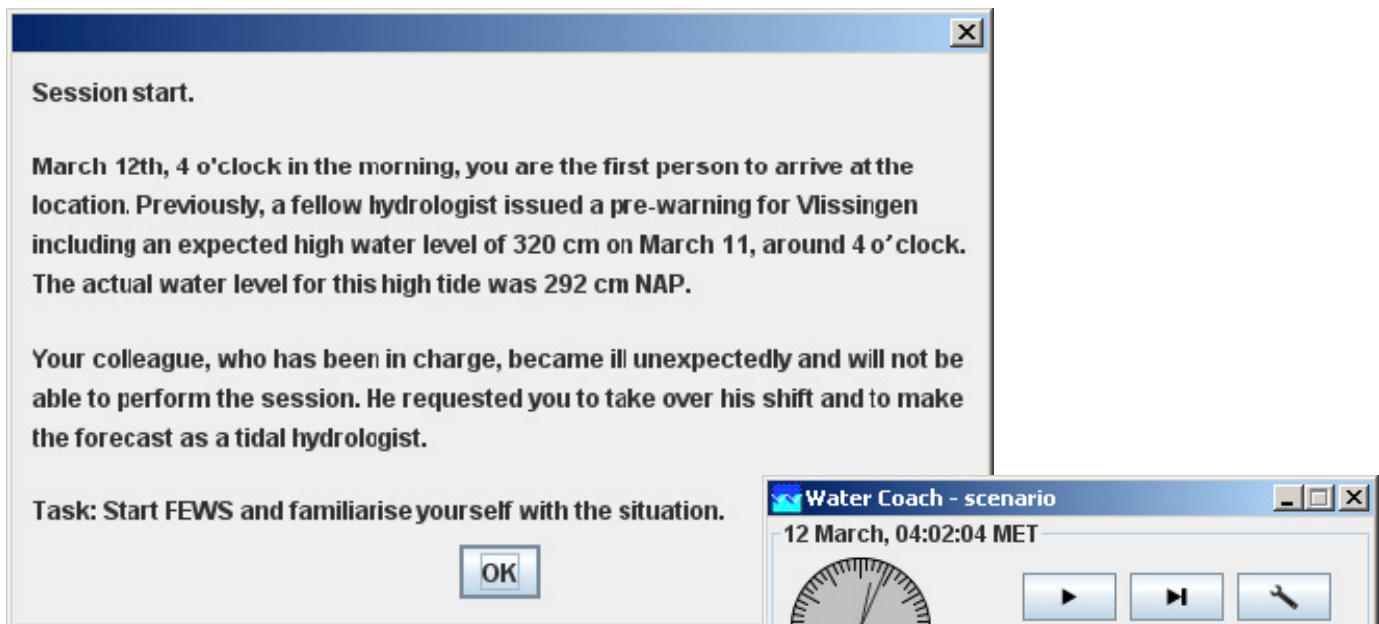


Figure 2: Water Coach guides trainees through the timeframe of the flood crisis, not only by modelling data, but also by running different storylines involving communication between organisations and unexpected events such as a news bulletin involving a sinking ship.

Training with Water Coach (SVSD and WMCN)

The crisis response group SVSD (Storm Surge Warning Department of the Netherlands) is part of the early warning system of the Netherlands, and only becomes active when there is a threat of a storm surge on the North Sea. This group generates predictions of water levels based on weather forecasts and water level measurements using water level prediction models and expert judgement. Based on the predicted storm surge levels, they have to inform and warn the appropriate parties involved in keeping the Netherlands safe from flooding.

The learning objective of the SVSD is to operate effectively and efficiently during a risk of flooding, using the available forecasting system. To cater to these needs, it is necessary to reach a high level of reality in the training. Water Coach provides the SVSD with a realistic serious game, both in accuracy of the water data and in communication, and enables professionals to train in an effective manner.

The WMCN (Water Management Centre for the Netherlands) provides the daily communication regarding the status of the Dutch water systems, also during normal water level conditions. This includes information on expected water levels (ship maneuvering) and (bathing) water quality. The WMCN is also responsible for the early warning system in case of extreme events such as floods, droughts and water contamination. In such cases the WMCN informs and

advises the national and regional water managers on the expected state of the water system. In this way, the WMCN helps them to cope with any water situation.

At the WMCN all professionals involved in forecasting and provision of warnings concerning the water systems, who normally operate as different teams, work together as a team of teams during a crisis. The preparation of the water reports requires intensive communication and collaboration between the teams involved. In times of crises, all of this generally takes place under a high time pressure.

In November of 2011 the WMCN performed a large scale exercise to train the communication between all teams involved. The objective was to reach a consistent communication from the 'superteam' to the national and regional water managers concerning a scenario with both high water levels on the main rivers and a storm at sea. This realistic scenario requires optimal interaction between teams, because this scenario not only creates a flood risk along the inland rivers and the coast, it also creates unexpected situations because these water bodies interact and are able to enforce each other. The national response to such

a complex crisis requires intensive communication between many teams. WMCN training focused on the process of cooperation between teams in a crisis situation, i.e. working together to be able to act quickly and appropriately in a complex situation under (time) pressure. Complete, correct, and timely information is essential and in order to communicate optimally, it should be in line with pre-defined procedures. During this exercise in November such newly defined procedures were tested.

Learning process

Feedback is an important part of the learning process. Water Coach does not give a score, but relies on feedback given by a senior hydrologist in an evaluation after the training. In order to assist this evaluation, Water Coach has a functionality to compare the in-game forecast with the real forecast made during the actual event in the real world used in the scenario, or by previous players of the same scenario during earlier trainings. Next to that, it is possible to log more in-game actions of the individual trainee, for instance to monitor communication activities.



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