



# FLOOD MAPPING SYSTEM FOR FLANDERS

SIGGIS DEVELOPED A MAPPING WEB APPLICATION TO PROVIDE A FLOOD MAPPING SYSTEM FOR THE FLEMISH ENVIRONMENTAL SOCIETY (VLAAMSE MILIEU MAATSCHAPPIJ), COMPLETE WITH EDITING FUNCTIONS – WITHIN ONE WEEK – AND COMPLETED IT WITH AN ARCGIS BASED MODEL FOR PERIMETER CORRECTIONS.

When a flood strikes, information is crucial. This goes not just for emergency services and local authorities, but also for the general public. How high and how quickly will the water rise? When will the flooding reach its peak? Who will be most affected?

During the extensive floods of mid-November in Flanders, the general public gained access to this information via the flood forecaster website; a website that shows, amongst much other useful information, the expected flooding based on hydrological modelling.

The Department of Operational Water Management or the Vlaamse Milieu Maatschappij (VMM) plays a crucial role in continually monitoring the flooding effects. They keep official records of the highest flooding levels as well as accompanying inventories. This data helps in the fine-tuning of future policies and management and can make flood forecasting, design studies, water consulting, etc., more accurate.

In a situation where a few centimetres means the difference between a close escape and a ruined house, this essential data needs to be accountable and thus verified and corrected with real life information. Local river basin coordinators are tactically placed to collect and input this data – and the sooner after the disaster that this occurs (or even during it), the better. Ideally therefore, this

information should be collected by a standardized system.

And yet, prior to the November floods, the VMM lacked a central map-based tool to register the flood data. Therefore, with the support of SIGGIS, the decision was made to set up such a tool. Based on ArcGIS Server 10 and the Adobe Flex API, SIGGIS developed an online mapping application. What's more, this quality application was conceived in one week, upholding in a way to the value of time for this particular project.

As reference maps, the tool makes use of geographic data layers, such as:

- Waterway data collected from the Flemish Hydrographic Atlas
- Street map data, including a location finder
- Aerial photographs
- Definition of flood areas based on helicopter observations of the disaster zone

These geographic data layers provide the user with ample reference points that allow for sufficiently accurate digitizing via the Internet of:

- Flood areas, including date and time, by means of a simple drawing
- Flooding levels in relation to individual house doorsteps
- Houses can be classified in terms of flooding effects as well as the exact time of occurring damage.

This application now being online, the Department of Operational Water Management can manage all information centrally while continuing to work in a structured way to correct the details of the flood perimeter. VMM and SIGGIS managed to set this system up in a very short timeframe, thereby proving that Flanders can act quickly, also in the field of Geographical Information Systems.

### Collecting and correcting

During a flood, river basin coordinators collect field data simultaneously with the intake of helicopter-level observations. The videos recorded during these flights are digitized. The resulting combined dataset is referred to as the "Recent Flood Perimeter". Of course, inaccuracies will occur in the collected areas. With only a limited number of people available in the field at any one time, it is impossible to ensure that the flood is measured at its highest level. The same drawback applies to the helicopter observations in addition to the usual problems one encounters with such methods of data collection. Once this data has been assembled, it is compared, via the ArcGIS model made by SIGGIS, to the existing Digital Elevation Model of Flanders (DEM) and consequently corrected where needed; bearing in mind that the currently available DEM has a resolution of five metres.

To further increase the accuracy of the Recent Flood Perimeter, it is compared to a dataset containing the actually flooded houses, and another dataset containing the flood level relative to doorsteps. However, the distribution of these observations pertains mostly to urban areas, leading to clustering of the points. Therefore these datasets are only useful for a limited part of the basins. To overcome this issue SIGGIS used "flood compartment areas" as a restriction for the usage of these point observations. The compartments serve as zones for hydrological modelling calculations and are available for many but not all basins in Flanders. Nevertheless, these observations allow for finer corrections of the flood perimeter especially in urban areas.

Once all available data has been considered, the resulting



Typical information and views presented on the flood mapping site prepared for VMM

"Corrected Recent Flood Perimeter" is compared to the existing "Modelled Flood Perimeter". A hydrologist must conduct this comparison.

At this point, the resulting data is not automatically uploaded to the flood forecaster website, although ultimately this would be ideal. Emergency services could identify threatened areas more accurately and focus their efforts accordingly. The general public would benefit as well, as they would be able to check whether their homes are at risk and take action if possible.

Finally, since the resulting "Corrected Recent Flood Perimeter" is basically a snapshot of the maximum flood level at a certain time, the possibility exists to add this data collected from subsequent floods to the time-aware layers that ArcGIS 10 supports. This would allow local (and regional) authorities to evaluate the impact of the flood countermeasures they have taken.

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