NATIONAL FLOOD MAPPING FOR SLOVAKIA

The first nation-wide project of flood hazard and flood risk mapping in line with the European Union Floods Directive

Slovakia, as a European Union member state, is required to establish flood risk management plans for the year 2015. These plans indicate to policy makers, developers and the general public of the measures that Slovakia has put in place to manage flood risks and mitigate the effects should flood events occur. Our client, river operator Slovak Water Management Enterprise, is a state-authorised organisation for the implementation of the Floods Directive (Directive 2007/60/EC of the European Parliament) – a legislation in the European Parliament on the assessment and management of flood risks. In preparing the flood risk management plans, input such as flood hazard maps and flood risk maps are essential. Together with our partner Stengl a.s., we have signed a contract with Slovak Water Management Enterprise to help them deliver flood hazard maps and flood risk maps to the EU in line with the compulsory flood risk management plans.

FLOOD MAPS AS ESSENTIAL DATA

Flood impacts could be mitigated and flood damages can be significantly reduced or even prevented if proper preventive measures are implemented. Planning of preventive flood protection and flood mitigation measures is based on flood risk analysis and is part of Flood Risk Management Plans.

Good flood risk analysis must be based on the extent of flooding. Flood hazard maps show flooding extent by flood lines and additional information like water depth or water velocity, making flood maps essential in providing data for flood risk management.

The Danube River — Flood 2013 in Bratislava © DHI

CLIENT

Slovak Water Mangement Enterprise

CHALLENGE

- Managing significant flood risk in 559 urbanised areas and settlements
- Flood mitigation planning and prevention measures
- Acquiring water level data in order to forecast flood events

SOLUTION

Modelling of water flow using MIKE FLOOD technology which includes MIKE 11 and MIKE 21 FM.

VALUE

- Cost-efficient design of flood protection measures
- Flood damage costs saving
- Reduced flood risk and increased safety

LOCATION / COUNTRY

Slovakia

SOFTWARE USED

MIKE FLOOD

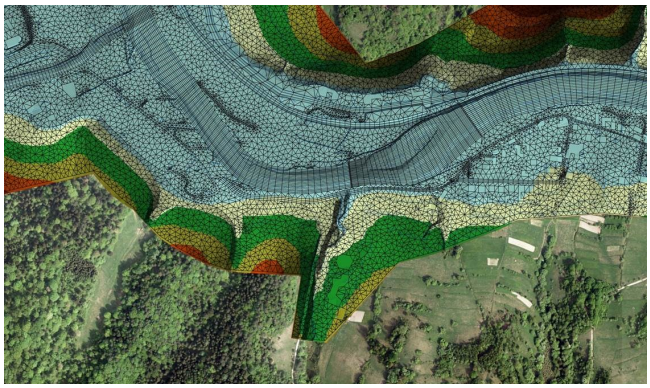
The Danube River — Flood 2013 in Bratislava © DHI

In the frame of the national flood mapping in Slovakia, flooding extents for 5 N-years discharges (5, 10, 50, 100, 1000) were calculated using MIKE Powered by DHI's MIKE FLOOD software. Input are based on hydrodynamic modeling of flooding scenarios with different return periods. The results of numerical simulations of flood flows were vital part of flood maps.

MIKE FLOOD – INTEGRATED 1D AND 2D MODELLING

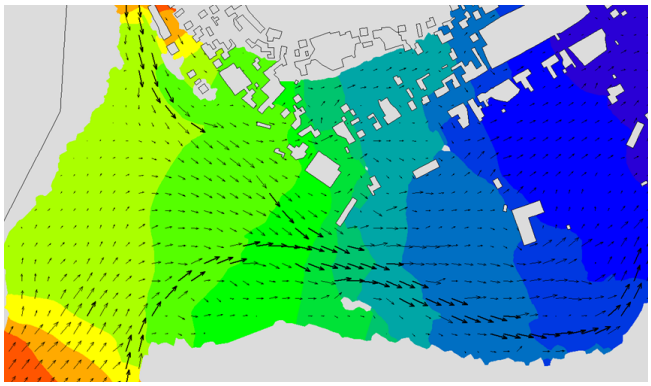
The project was carried out in 559 geographic areas across the whole of Slovakia. To model water flow, we primarily used a 2D mathematical method and hydrodynamic modelling with MIKE 21 Flow Model (FM). Another method we used was the combination of 1D and 2D mathematical and hydrodynamic modelling called MIKE FLOOD (Couple). Both these methods enable a quick and effective modelling of larger parts of rivers and can be easily set up to describe specific hydraulic phenomena.

MIKE FLOOD enables us to describe the actual topography of the terrain in great detail. It also enables simple entry of input data, including parameters of river structures. What the software does is to calculate, precisely and in detail, how and how much water flows in river beds and inundation areas.



Flexible Mesh with Topography of the terrain © DHI

With our MIKE software, we are able to calculate water levels and current velocities on selected river sections. This is primarily useful in providing a more holistic picture of possible flood events, and thus enables mitigation efforts to be put in place.



Calculated water flow along the urbanised area © DHI

INPUT DATA IS KEY

Generally, the quality of data determines the quality of results. With our software, geodetic and hydrological data is easily acquired.

Our partners; EUROSENSE, s.r.o delivered a digital terrain model with integrated river beds, whilst Slovak Hydro Meteorological Institute delivered hydrological data. Both these organisations are long-acting organisations in Slovakia with highly-dependable data which plays an essential role in the accuracy and success of our modelling work.

COMPUTING CAPABILITIES

Within the project, we created 127 setups of mathematical models. We developed the possible length of modelled rivers sections to be within the range of 1 km to 109 km. For this, we coordinated with more than 30 modelers and use fast computing technology.

For fast computing of large models, we use graphics processing unit (GPU) technology which enables us to calculate large models with many computing elements in a far shorter time than standard technologies.

VALUE FOR THE FUTURE

Flood protection of urbanised areas is of high priority now and in the future. The models created in this project will be used to effectively evaluate existing and planned flood protection measures. Results from our models are valuable for urban and crisis planning in which they will be able to contribute to flood forecasting and the subsequent implementation of early warning systems. Our work will enable the client to implement cost-efficient flood protection measures, mitigate possible damages caused by flood, and bring about a reduction of flood risk and increased safety.

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