DHI CASE STORY

IMPLEMENTATION OF RIVER INFORMATION SERVICES IN EUROPE

Increasing the safety and efficiency of inland navigation

Vessel skippers need up-to-date navigational maps that accurately depict current hydrodynamic conditions in order to safely pilot rivers – especially along complex stretches. As part of the European Commission-supported Implementation of River Information Services in Europe 3 (IRIS Europe 3) project, we developed an automated forecasting system that provides this information in real-time. Skippers can use this information and the automatically updated navigational maps to safely and more efficiently steer their vessels.

ENHANCING THE SAFETY OF SAILING VESSELS

Good navigational maps are invaluable tools for vessel skippers, especially on complicated stretches of rivers. The depth of the water in rivers changes according to current hydrological conditions. As such, electronic navigational charts that display both fairway directions and water depth enhance the comfort and security of sailing vessels.

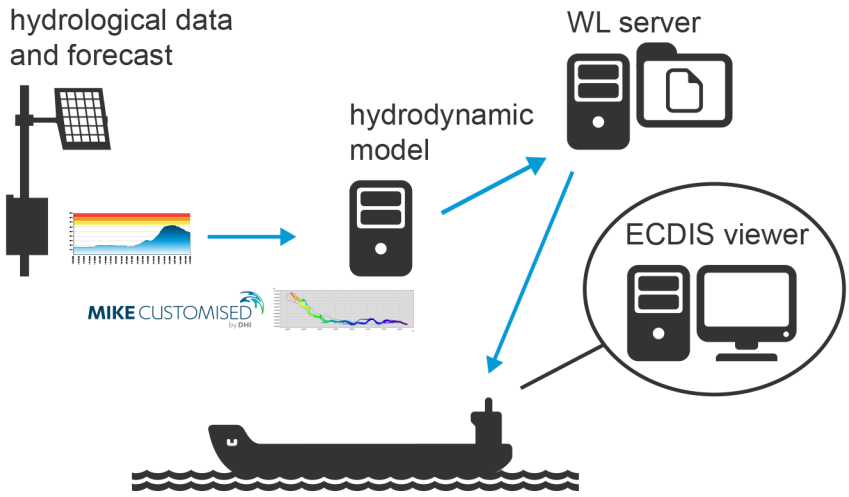


Diagram of real-time hydrodynamic modelling of water level corrections for inland navigation.

SUMMARY

CLIENT

Transport Research Institute, Zilina, Slovakia

CHALLENGE

Need for:

- information on real-time water levels in the Danube River
- automated updates of Electronic Navigational Charts (ENC) to safely navigate vessels

SOLUTION

MIKE CUSTOMISED-driven forecasting system using a two-dimensional (2D) real-time unsteady flow model

VALUE

Enables vessel skippers to:

- better navigate and plan their route along the Danube River
- increase transportation efficiency
- reduce fuel consumption

LOCATION / COUNTRY

The Danube River between Sap and Komarno along the Slovakian/Hungarian border

CONTRIBUTING TO IRIS EUROPE 3

The Implementation of River Information Services in Europe (IRIS Europe) is an international initiative (supported by the European Commission) that aims to foster harmonised development and implementation of River Information Services (RIS). By enhancing the RIS service portfolio, its goal is to increase the safety, efficiency and environmental friendliness of inland navigation.

This project is part of IRIS Europe 3 (the third phase of the initiative) and was conducted in collaboration with national project partners KIOS (a software, web and mobile application company) and the Transport Research Institute.

Technology now exists that automatically updates navigational charts with water depth information depending on how much water is currently flowing in the river. Previously, this technology was successfully applied in a pilot programme on stretches of the Danube River in Austria, Slovakia, Hungary and Romania.

The Transport Research Institute in Zilina, Slovakia selected us to set up and operate the pilot system for a 41 km long stretch of the Danube River between the cities of Sap and Komarno. This particular area – which is on the border of Slovakia and Hungary – has complicated navigational conditions, including shallow sections, side arms and groin systems.

As such, we conducted real-time unsteady flow modelling using parallel computing technology in order to develop and apply this new technology. This involved utilising a state-of-the-art numerical calculation parallelisation using a Graphics Processing Unit (GPU).

Danube River water levels predicted by real-time two-dimensional (2D) hydrodynamic model. Pilot section Sap – Komarno, boundary river reach Slovakia/Hungary.

CURRENT HYDROLOGICAL CONDITIONS IN REAL-TIME

We used our MIKE 21 FM modelling software to set up the detailed two-dimensional (2D) hydrodynamic model. Our MIKE CUSTOMISED REAL-TIME provides the tools need to automate the online model and run the entire system.

Each hour, the system automatically downloads current hydrological data for the specified stretch of the Danube River from the Slovak Hydrometeorological Institute web service dedicated to IRIS Europe 3 project.

The 2D hydrodynamic model then uses information about the current water levels from gauging stations between the cities of Medvedov (upstream limit) and Komarno (downstream limit).

It utilises this information to calculate current water level, speed and flow direction based on information about the river's topography and the hydraulic resistance of the surface. Our model provides a detailed description of the river channel, side arms and adjacent floodplains along the Danube River. The MIKE CUSTOMISED-based system then:

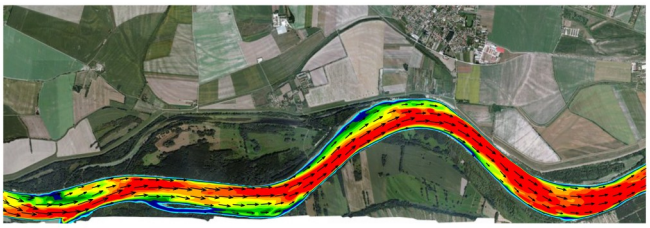
- prepares the boundary conditions for the hydrodynamic model
- performs a 2D model simulation
- generates a water level correction file from the model results
- automatically uploads the file to the water level server of Via Donau (which maintains and develops the Danube waterway) in Vienna, Austria

INCREASING SAFETY, IMPROVING EFFICIENCY

Upon request from skippers, the information on the corrected water level is then sent to vessels. Special devices called Inland ECDIS Viewers then display electronic navigational charts (ENC) with information on water depth, updated for current hydrological conditions on the river. The model simulates actual hydrological situation every hour. Once a day (in the morning) it also simulates the hydrological situation forecasted for the next morning.

The enhanced River Information Service, which now includes current information on water depth, will help skippers navigate and plan their route along the Danube River. Knowledge of reliable and current information on available navigational depth enables vessels to sail more safely and manage cargo loads accordingly. This leads to more efficient transportation and fuel consumption.

The Inland Navigation Division of Slovakia's transport authority will benefit greatly from this project. In the future, advanced technologies – developed and tested in the frame of research projects – will become part of the standard River Information Services (RIS) provided along waterways.



Water depth and flow directions in Danube River meanders simulated by two-dimensional (2D) real-time model.

Contact: info@dhigroup.com
For more information visit: www.dhigroup.com