



MIKE CUSTOMISED CASE STORY

# HYDROLOGICAL FORECASTING IN PIEDMONT

A regional system for real-time forecasting

The entire course of the river Po in Piedmont has heterogeneous characteristics. The presence of both rivers (Po and Ticino) at their confluence are characterised by short concentration times and fluvial dynamics. The hydrological response is influenced by rain events, snow melt processes, reservoir and lake operational rules, exchanges with groundwater and the presence of other water intakes. The result: extreme hydrological events in the river basin. We developed a hydrological forecasting system in order to facilitate better management of the water of the river at the confluence.

## A HYDROLOGICAL SYSTEM FOR REAL-TIME FORECASTING

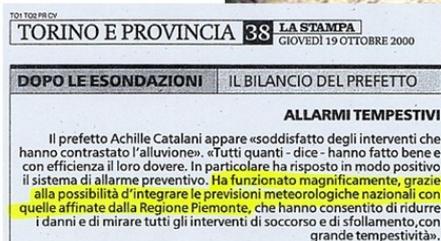
The management of the extreme hydrological events in the Po River basin is based on an advanced real-time hydrological forecasting modelling system. It has been operational since 2000. This system can be considered the real precursor to all the Decision Support Systems (DSS) now operating in Italy.

The system has been implemented in the entire basin until its confluence with the Ticino River. This region includes the entire territory of the Piedmont and Aosta Valley Region as well as part of Liguria, Lombardia and the Switzerland portion. The system operates every day to support the technicians of the Regional Civil

Protection Center in forecasting water levels and discharges in all the networks.

It is also able to support the management of predicted water scarcity conditions.

Dora Baltea a Ivrea



Images and extract from 'La Stampa' referred to the event occurred on 13-16 October 2000 in Piedmont

## SUMMARY

### CLIENT

ARPA Piedmont

### APPROACH

Po River basin at the confluence with the Ticino river

### ADVANTAGES

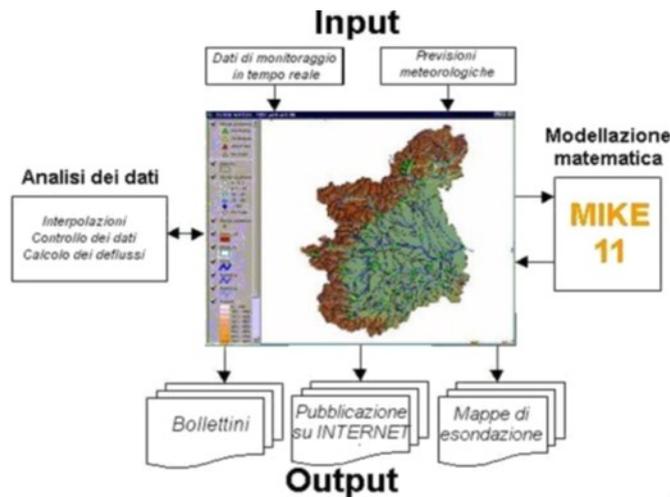
- Real-time forecasting of hydrological flood events
- Support to civil protection
- Comparison between operational scenarios
- Standardised approach used in many other Italian regions
- Complete integration with the regional monitoring network
- Unique system that can also be applied to the management of drought conditions

**THE MODELLING SYSTEM**

The real time forecasting system adopted the continuous hydrological simulation approach. It uses several modules of the one-dimensional computational software MIKE 11 by DHI:

- Hydrodynamic module (HD)
- Hydrological module (RR NAM)
- Module for the complex structures (SO)
- Assimilation module of the hydrometric observations data (FF/DA)

The same structure is adopted in many other real-time forecasting systems that are operative in Italy these days.



Schematic to depict the production chain of the flood forecasting for Po River ©DHI

**THE MANAGEMENT PLATFORM**

The modelling system operates upon the MIKE CUSTOMISED platform developed by DHI.

MIKE CUSTOMISED by DHI is a robust forecast management system, that automatically collects all required data and information, performs data checking, runs forecast models and issues forecasts and early warnings.

**CONDITIONS OF USE OF THE SYSTEM**

The system is installed at the Civil Protection Center of the Piedmont Region (ARPA Piedmont) and is automatically operated to provide accurate forecasts of water levels and discharge in all river sections.

The meteorological input given to the system is supplied daily by the ARPA Piedmont meteo forecasting technicians. Meanwhile, the observation data comes from the regional meteo-hydrological monitoring network.

The system is configured to operate automatically. At the same time, the ARPA technicians can manage the system on the basis of specific needs, also simulating alternative scenarios.

**ADVANTAGES OF THE APPROACH**

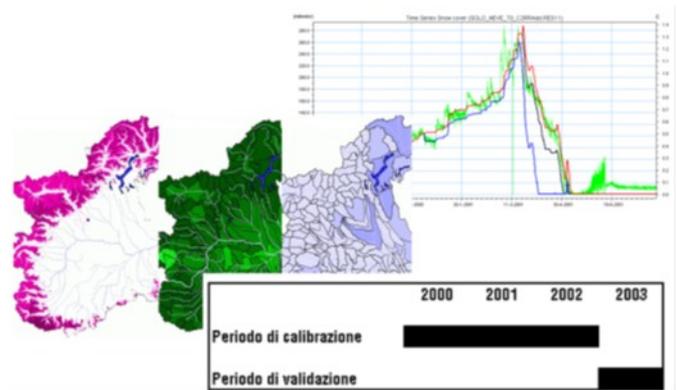
The Civil Protection Center is supported by the system for all the activities concerning the hydrological forecasting and management.

The hydrological and hydraulic modelling allows personnel to set up alert procedures based not only on the comparison between rainfall and threshold values, but also on the predicted effects on the basin.

The deterministic and quantitative approach assures accurate forecasts coherently with the real-time needs.

The same platform can also be used for the forecasting and management of drought conditions.

The platform represents a complete support system for the overall management of the water resources in the entire basin.



Calibration and validation of the modeling system ©DHI

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