



DHI CASE STORY

PROTECTING THAILAND FROM FLOODS

Using DSS to forecast floods in the Chao Phraya River basin

During the 2011 monsoon season, severe floods devastated Thailand. With hundreds dead and billions of dollars in economic losses, it was one of the worst floods to hit the country in decades. To help Thailand improve flood management in the future, the Hydro and Agro Informatics Institute asked us to develop a flood forecasting and flood management Decision Support System (DSS). Based on real-time information, this system will enable Thai authorities to make sound decisions before and during the flood season. In addition, it will help the country undertake preventive measures to alleviate the detrimental impacts of severe flooding. Furthermore, it will aid Thai authorities in warning the public about imminent flooding, giving residents and businesses time to prepare.

DEVASTATING FLOODS

In 2011, Thailand experienced some of its worst flooding in decades. Heavy rains during the 2011 monsoon season triggered floods throughout the country. The flooding affected large parts of Bangkok and most of the industrial area upstream of the Thai capital. With more than 900 factories in 28 provinces affected, the flooding took a heavy toll on Thailand's manufacturing industry. In addition, more than 20,000km² of farmland was damaged.



Regulated inflow to Chao Phraya Right Bank Irrigation System

SUMMARY

CLIENT

Hydro and Agro Informatics Institute (under the Thai Ministry of Science and Technology)

CHALLENGE

- Lack of reliable, current flood data before and during the monsoon season
- Inability of authorities to properly plan for and warn the public of possible flooding

SOLUTION

Real-time flood forecasting and management Decision Support System (DSS) driven by MIKE CUSTOMISED by DHI

VALUE

- Enables authorities to make sound flood planning decisions
- Allows authorities to warn the public in due time of possible flooding

LOCATION / COUNTRY

Thailand

After the waters receded, more than 800 people were dead and the country's economic damage and losses stood at more than USD 45 billion. In response to the devastating floods, Hydro and Agro Informatics Institute (HAI) asked us to establish an operational water management DSS.



HAI water level measuring equipment applying radar wave technology

REAL-TIME DATA TO FORECAST FLOODS

The DSS uses models and real-time data to help Thailand improve its flood planning and management. Each day, the system's job scheduler implements the flood forecasting models. First, it runs the NAM model and then stores the output from the simulation in the DSS database. Next, it initiates the MIKE 11 HD model, applying the NAM output and relevant real-time observations. The MIKE 11 HD output is then stored in a DSS folder. A number of pre-selected time series, as well as observed data, are copied to a separate folder, accessible to the Dashboard Manager.

Once a day, four MIKE FLOOD models in the system (each covering separate flood plain areas) run in hindcast mode. This brings all model parameters up-to-date, reflecting the current hydrological conditions. Next, the system performs forecast simulations if needed.

To process the information, the DSS imports real-time data and organises it in groups based on the data source and type. The data is imported with varying frequency based on its availability. For example, it imports rainfall and water levels hourly, while meteorological forecasts are imported twice a day. Once imported, the DSS processes the data according to its application. This processing includes:

- extracting data according to the simulation period
- checking the range, rate of change and missing data
- submitting a daily data quality assurance report

CLIENT TESTIMONIAL

“HAI highly appreciates DHI for their excellent job on the Chao Phraya project, especially on the close collaboration and hands on experience that made us become a good partner.”
Piyamarn Sisomphon—Project Leader—Hydro and Agro Informatics Institute

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BETTER FLOOD PREPARATION

The Flood Forecasting model covers the entire Chao Phraya River Basin (approximately 160,000 km²) including Bangkok, the capital of Thailand. From the DSS webpages, users can access:

- information about the project
- real-time data
- forecast data
- water balance analysis
- flood management tools

The system provides users with forecasted levels and discharges at 28 locations up to seven days in advance, allowing for short- and medium-term flood forecasting. The fast, accurate and reliable information provided by the DSS will enable Thailand to:

- issue early warnings in flood prone areas
- plan for and initiate emergency actions
- conduct analyses to contain floods in reservoirs and retention basins
- mitigate flood impacts on the public and major industries

This will allow Thai authorities to improve water management in the Chao Phraya River basin, especially for flood management. Thai authorities can now prepare better for future floods, while also managing their water resources.

TRANSFERRING OUR KNOWLEDGE

To ensure a strong transfer of knowledge and maximum use of the solution, we worked closely with HAI and Thai partners to develop the real-time DSS. The project also included assistance to and guidance of local modellers in:

- model schematisation and application
- design and development of knowledge database management systems
- development of real-time reservoir and flood forecasting systems

By providing this support, we helped ensure that the knowledge of building and using a real-time DSS remains in Thailand long after the project finished.