



Decision-Support Tool for Reservoir Operation in Huế City, Vietnam

Overview

ISET-International (ISET) collaborated with the Huế City Division of Water Resources and Climate change (DRM office) to develop a real-time Reservoir Operation Support Tool for the Huong River basin's inter-reservoir system. This tool was built on practical operational experience in recent years and allows operators to simulate multi-reservoir operation scenarios under different rainfall and inflow conditions using continuously updated hydrometeorological data, reservoir parameters, and river information. It translates complex data into clear, actionable insights, supporting timely, coordinated and risk-informed inter-reservoir operation decisions. Ultimately, the tool strengthens strategic reservoir operation, improves timeliness of community early warning, and enhances overall flood risk management and response for Huế City.

The gap

Huế is among the rainiest in Vietnam and face frequent, severe flooding due to its extreme seasonal rainfall and complex topography. The steep upstream catchments and the low-lying downstream coastal plains make coordinated reservoir regulations critical. The inter-reservoir system, including Tả Trạch, Bình Điền (on the Hương River basin) and Hương Điền (on the Bồ River basin), forms the backbone of this regulation, helping to manage flows and limit downstream flood peaks.

However, reservoir operation had long relied on manual calculations, primarily using Excel sheets, and depended heavily on a single experienced officer. These manual processes made it difficult to update data quickly, compare multiple rainfall-inflow and discharge scenarios, or anticipate downstream impacts during rapidly evolving flood conditions. When this key officer was reassigned, the DRM Office faced significant challenges in maintaining the same level of



Facts and figures



Cost of a developing the tool:
US\$14,000



Annual update/maintenance costs (covered by the city):
15 staff days/year



Time to implement
Five months for developing the tool.



Easy to replicate?
IT expertise needed for programming, city-authorized server for hosting and system integration.

Photo: Training for community members and officials in Quang Dien district on hydropower reservoir operation and its role in flood regulation, September 2023 © Huế Division of Water Resources and Climate Change



Real time water level of Ta Trach and Binh Dien reservoirs

accuracy and speed. Without a unified, automated system, manual calculations became slower and more error-prone, underscoring the need for an integrated, scenario-based tool to support faster and more coordinated inter-reservoir operation during extreme floods.

Our solution

ISET collaborated with the Huế City DRM office (responsible for DRM and advising city authorities on reservoir operation) and Huế Intelligent Operation Center (IOC) to develop the Reservoir Operation Support Tool for the inter-reservoir system in the Hương River and Bồ River basins. The tool integrates multiple datasets, including topography, river network maps, reservoir parameters, reservoir operation data, and hydrometeorological information, into a single platform. Both automatic and manual monitoring data are continuously updated, allowing real-time filtering, analysis, and accurate calculations to support inter-reservoir operation.

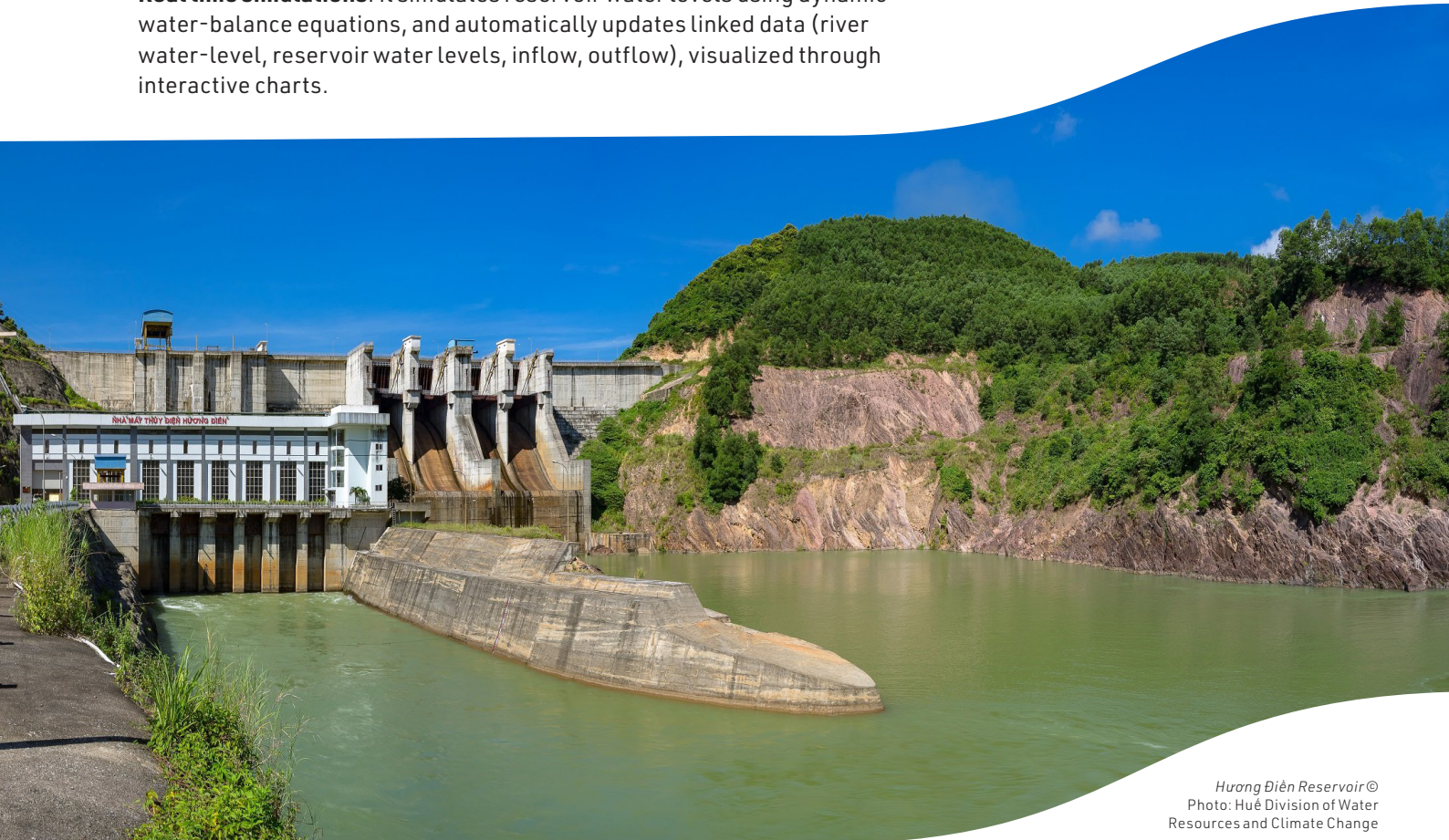
The tool provides a comprehensive set of functions:

- **Real time simulations:** It simulates reservoir water levels using dynamic water-balance equations, and automatically updates linked data (river water-level, reservoir water levels, inflow, outflow), visualized through interactive charts.

Climate Resilience Measurement for Communities (CRMC)

The Climate Resilience Measurement for Communities (CRMC) is a data-driven process, complemented by a web-based tool and mobile app, which helps communities to evaluate and measure how resilient they are to climate hazards. Using the results, they can identify and implement resilience-building interventions and run additional measurements to track improvements.

Find out more: ZCRAlliance.org/crmc



Huong Dien Reservoir ©
Photo: Huế Division of Water Resources and Climate Change

- **Operational analysis:** Users can retrieve reservoir parameters and assess how changes in storage, water level, inflow, or rainfall affect operational needs, including estimating the time required to reach a target water level.
- **Downstream impact estimation:** It estimates downstream water levels by simulating interactions between reservoir releases, upstream flows, and rainfall.
- **Scenario testing:** DRM agency can test and compare multiple reservoir operation scenarios under different rainfall conditions, assess when water levels may exceed Alert Level II, III, or above, and identify optimal discharge strategies. These scenario results help them issue timely and appropriate warnings to communities when necessary.
- **Automated outputs:** Results are displayed via clear charts and maps, and the system can automatically generate operation recommendations and reports.

The tool is hosted at the Huế IOC, the authorized city agency that operates and manages the city's entire digital systems. The city covers the annual operation and maintenance costs, while IOC provides ongoing IT support to ensure stable system performance. The tool was piloted during the historic October 2025 flood event, where it delivered positive and reliable results, and it will continue to be refined and upgraded based on operational experience.

How it increases resilience

The tool provides a single, reliable information system for reservoir operation and flood response. Continuous data synchronization improves situational awareness and ensures that critical hydrological changes are detected earlier and more rapidly, enabling timely adjustments during fast-evolving flood events.

By converting complex hydrological data into clear, scenario-based insights, the tool enhances decision-making efficiency and supports more adaptive, risk-informed reservoir operation. Rapid scenario analysis allows operators to compare release options within seconds, improving both the speed and accuracy of operational decisions. The tool also helps determine not only how much water

Conditions for success

Q: Is this intervention appropriate for other communities?

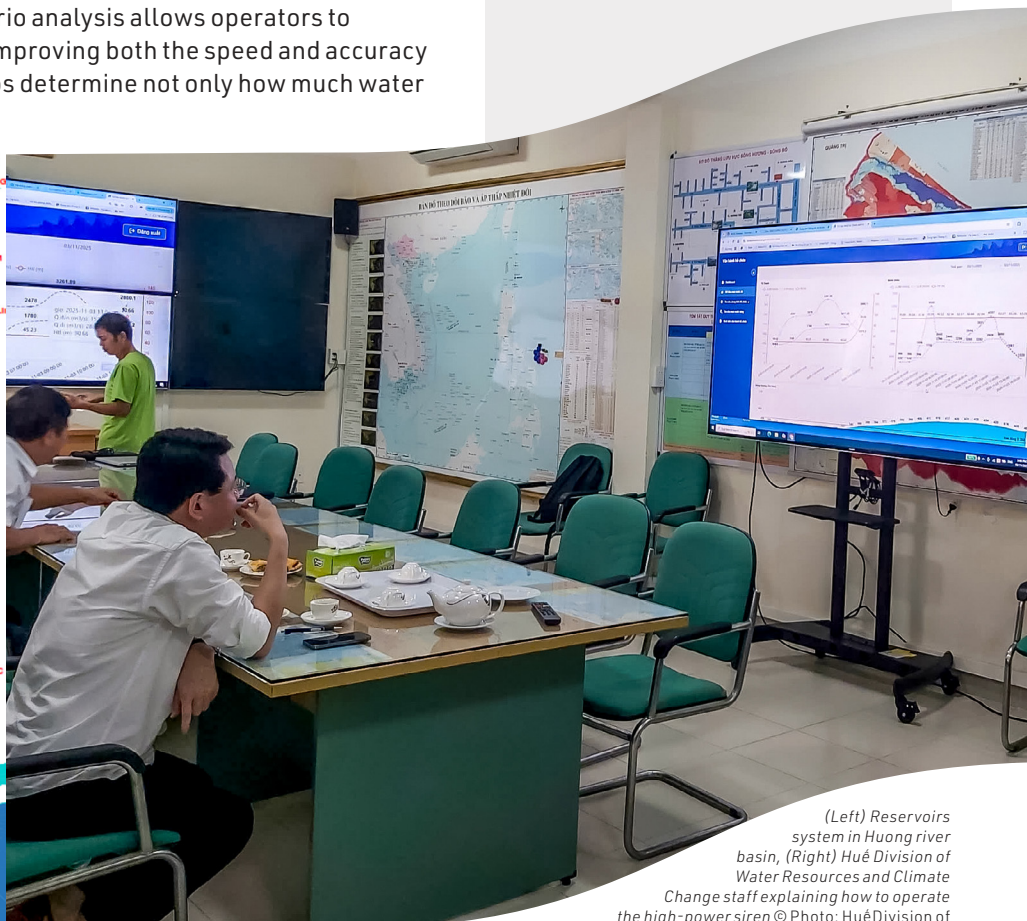
A: Yes, it is applicable to other provinces that wish to strengthen reservoir operation and flood risk management.

Q: What conditions are needed for the interventions?

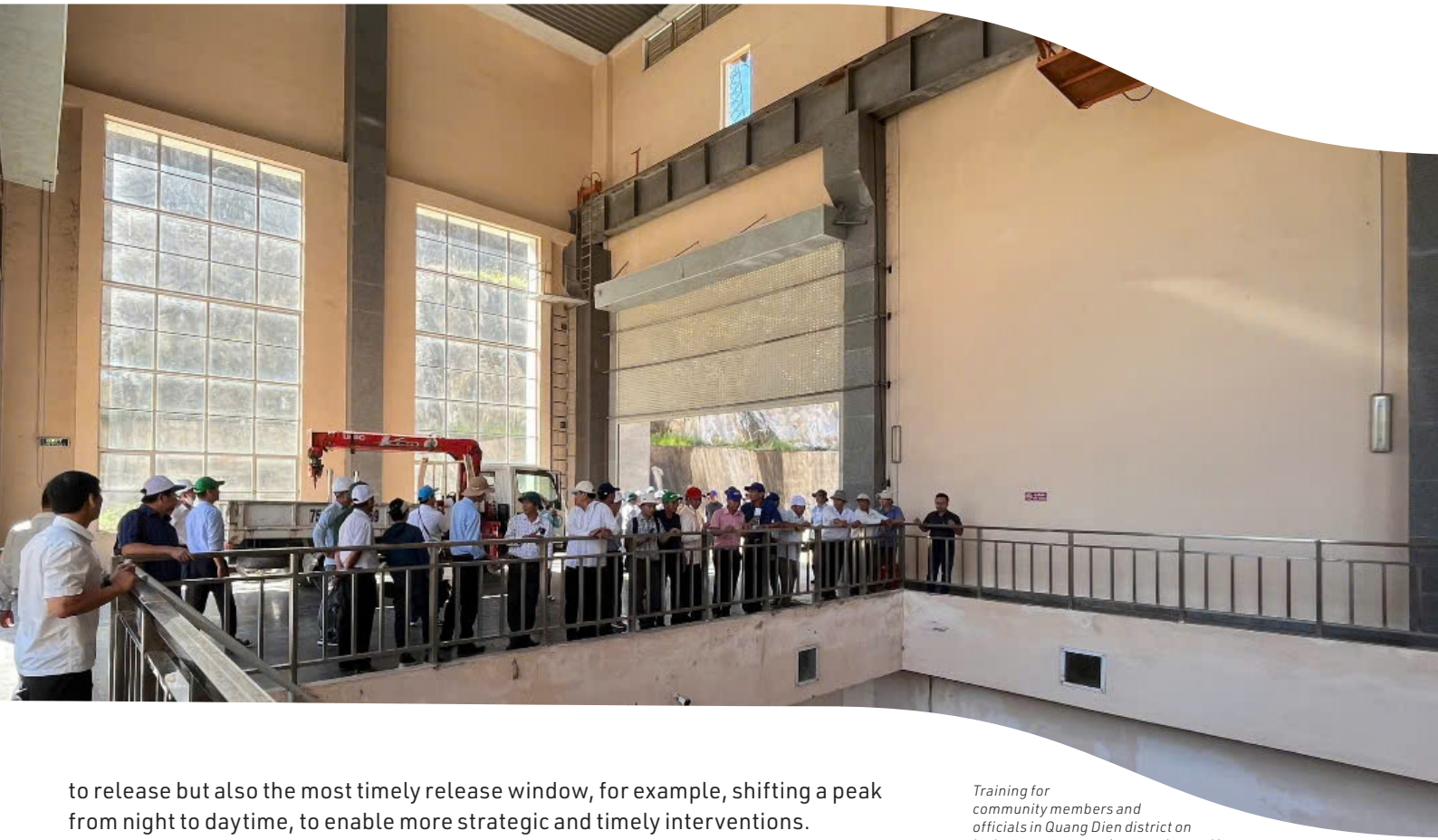
A: Reliable integration with existing hydrometeorological and reservoir data systems, adequate IT and human capacity, city-authorized server for hosting and system integration, and a sustained operation and maintenance budget.

Q: Was there anything special about the communities where interventions were effective?

A: Dedicated team familiar with manual calculations, close coordination among local agencies, and commitment from local authorities.



(Left) Reservoirs system in Huong river basin, (Right) Hué Division of Water Resources and Climate Change staff explaining how to operate the high-power siren © Photo: Hué Division of Water Resources and Climate Change



to release but also the most timely release window, for example, shifting a peak from night to daytime, to enable more strategic and timely interventions.

Scenario outputs also support timely and targeted warning decisions for downstream communities. The tool strengthens longer-term resilience by generating continuous, high-quality hydrological archives that inform updates refinements to reservoir operation rules, forecasting, and strategic planning.

At the institutional level, the tool provides a shared operational platform and standardized data protocols that improve the timeliness, transparency, and consistency of coordination among reservoir operators, hydrometeorological agencies, and DRM authorities. It also reduces reliance on a single officer by embedding operational knowledge into a shared digital system, strengthening institutional memory, and enabling new staff to learn and apply procedures more quickly.

Co-benefits

- The tool reduces manual workload and standardizes calculation processes, improving operational efficiency and transparency.
- Its modular design allows future expansion to other river basins and integration with additional automatic monitoring stations, supporting scalable, long-term flood management improvements.
- The system also strengthens post-event analysis and accountability by providing a continuous, traceable record of data and operational decisions.

Training for community members and officials in Quang Dien district on hydropower reservoir operation and its role in flood regulation, September 2023 © Huế Division of Water Resources and Climate Change

Get in touch

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The Institute for Social and Environmental Transition - International (ISET) is a non-governmental organization committed to building inclusive and transformative resilience in the face of natural resource, environmental, and social challenges, especially related to climate change, natural hazards, and urbanization. Officially operating in Vietnam since 2010, ISET has an intimate understanding of Vietnam's institutional landscape and its strengths and challenges, and has proven expertise in working effectively across levels to bridge the still significant divide between science, policy, and implementation. ISET is working in Huế City and Gia Lai Province, both coastal areas in central Vietnam and Cần Thơ city in the Mekong Delta.