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ATLAS INFORMATICS

NARIF

NATIONAL RESERVOIR INFLOW FORECASTING

SYSTEM FUNCTIONAL OVERVIEW

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Introduction

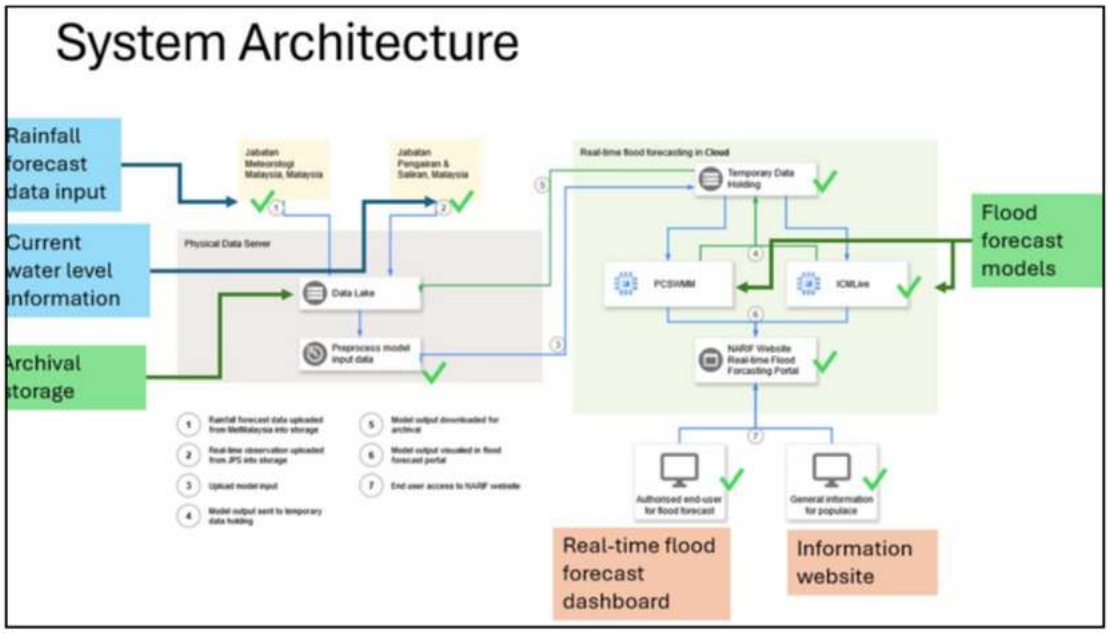
This system overview provides a comprehensive guide to the National Reservoir Inflow Forecasting System (NaRIF). NaRIF is a forecasting tool specifically developed to address dam-related flood risks, with its initial implementation as a pilot project at Batu Dam. The system provides reservoir water level forecasts, enabling dam operators to make informed decisions for safe reservoir operation and downstream flood risk mitigation. This system represents a critical advancement in national disaster preparedness and dam management.

Why NaRIF is Essential:

The development of NaRIF was prompted by significant flood events stemming from dam operations, such as the water release from Batu Dam in December 2021. These incidents resulted in widespread flooding, causing considerable damage to communities, property, and the environment. The rapid surge in lake water levels often overwhelmed dam capacities, leading to quick overflows into rivers and leaving downstream residents with insufficient time for evacuation or property protection. NARIF was designed to overcome these challenges, ensuring the structural integrity of dams while providing effective early warnings to mitigate flood impacts. Its core objective is to enhance dam safety and integrity by accurately predicting water levels in dams 3 days in advance and providing early warnings to am owner and operators. The long-term vision for NARIF includes expanding its implementation to other JPS-owned dams and eventually to dams owned by various agencies across Malaysia.

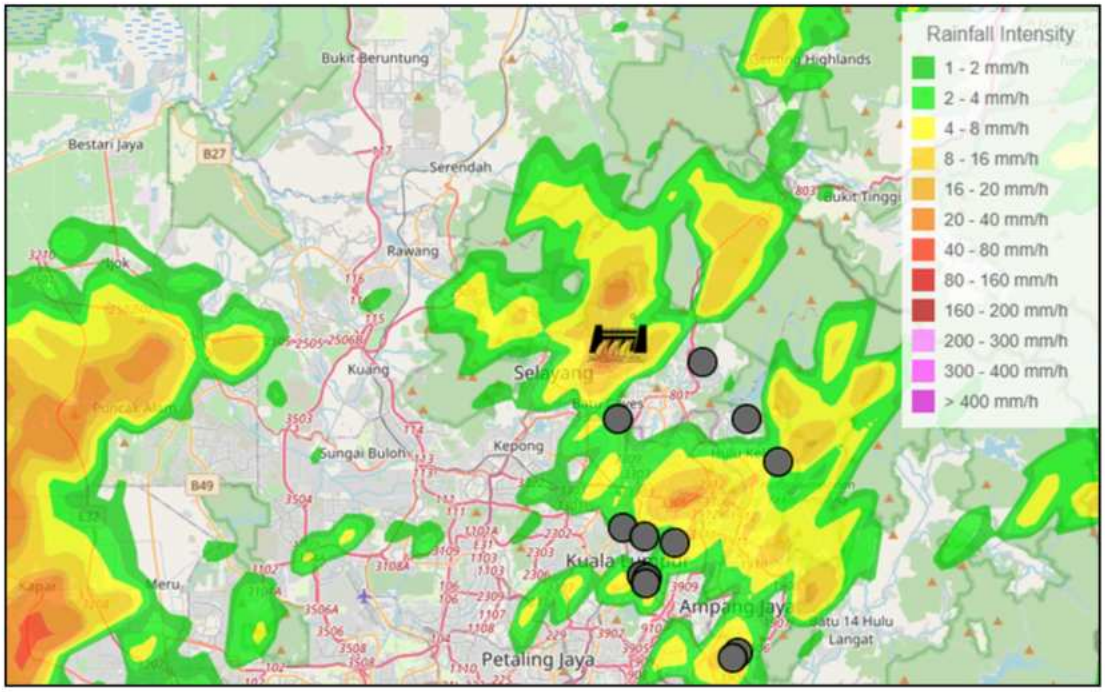
NARIF is a result of collaborative efforts between Universiti Tenaga Nasional (UNITEN), Department of Irrigation and Drainage (DID) and Malaysian National Committee On Large Dams (MYCOLD). These partnerships are supported by funding from the Collaborative Asia Pacific Network (APN) Regional Research Programme (CRRP) and the Transdisciplinary Research Grant Scheme (TRGS).

System Architecture



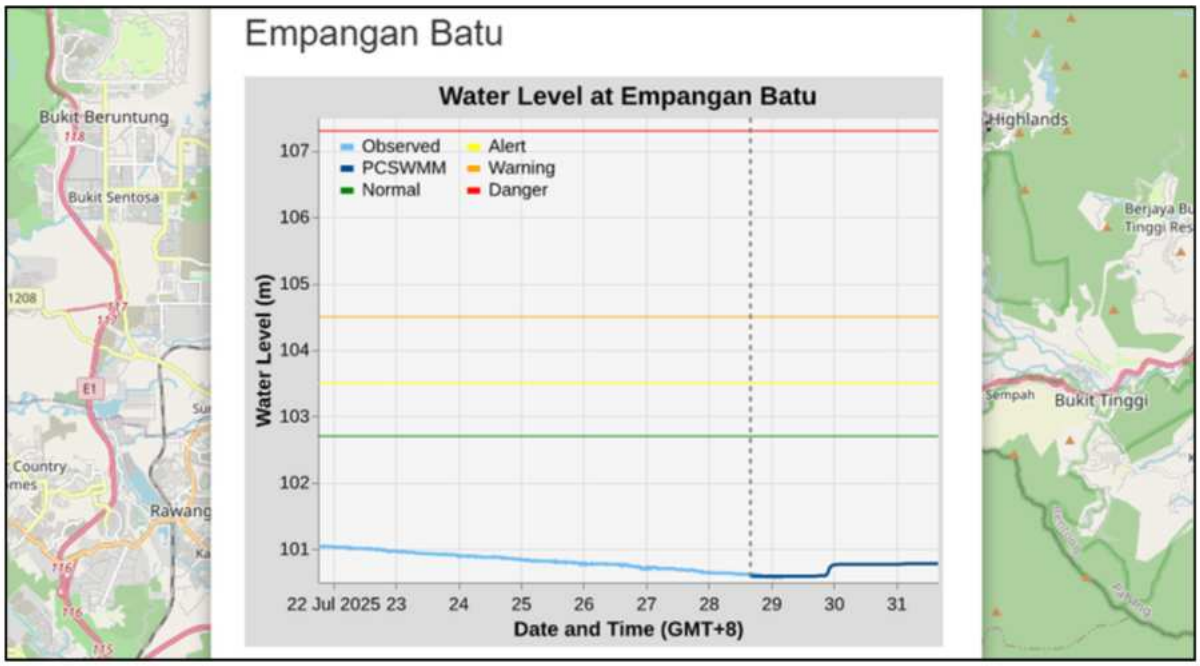
The NaRIF system architecture includes modules for data collection, forecasting and early warning communication. It processes rainfall forecasts, water level data, and historical records to generate real-time reservoir water level forecasts. These outputs support early warning and are displayed via a user-friendly web platform.

Rainfall Forecast



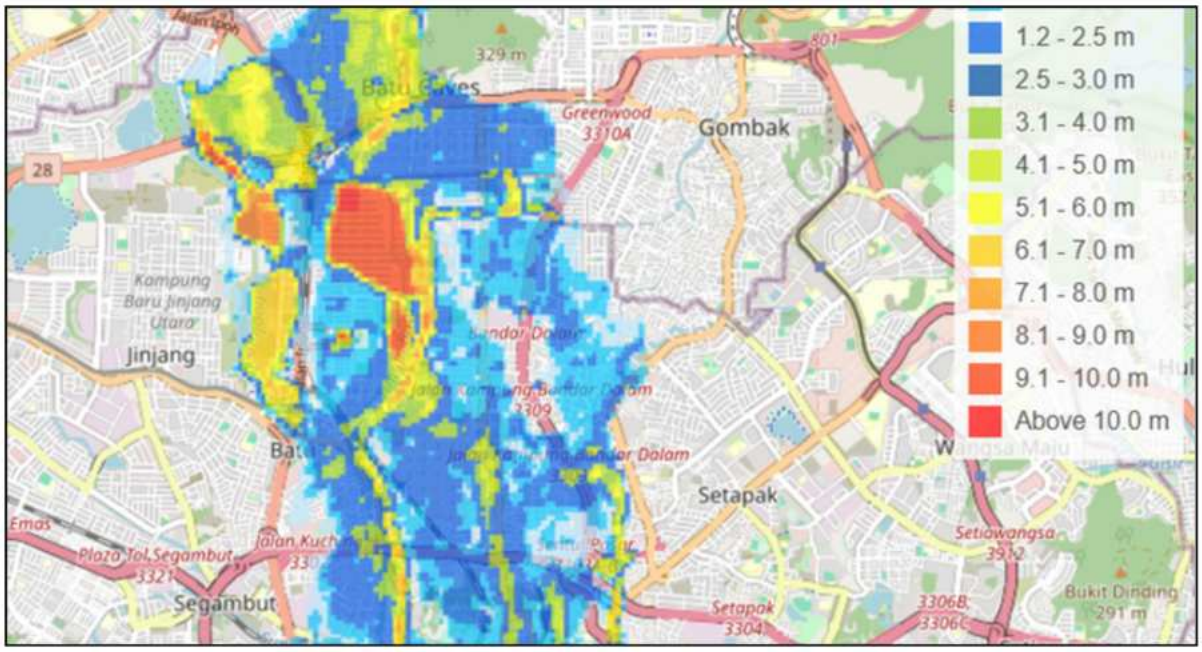
The system is able to display real-time rainfall intensity map generated using Numerical Weather Prediction data from MET Malaysia. Different color gradients indicate varying levels of rainfall intensity. The legend on the right provides a reference scale for interpreting rainfall intensity values.

Reservoir Water Level Forecast



Forecasting element provides information on reservoir water level forecast up to 3 days in advance, allowing dam operators to monitor trends and anticipate risks. If water levels approach critical thresholds, pre-emptive actions—such as controlled releases, activation of emergency action plan or public alerts—can be initiated. This enhances real-time decision-making for dam safety, flood mitigation, and community preparedness.

Flood Hazard Map



The flood hazard map section incorporates multiple flood scenarios, including potential dam break events and projected flood impacts due to future climate change. It uses color-coded flood depths, ranging from less than 0.5 meters to over 10 meters, to enable clear visualization of inundation severity across affected areas. This map serves as a vital tool in supporting risk-informed decision-making for emergency response planning, land use management, and long-term climate adaptation strategies.

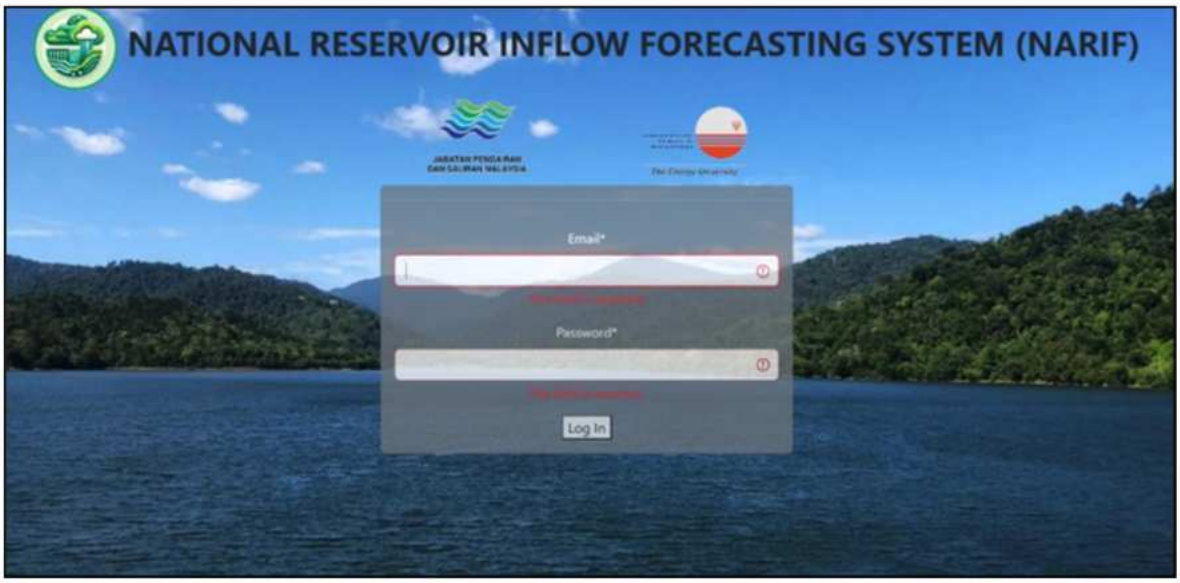
1. Accessing the Website

Open browser and go to: https://narif.dam-safety.uniten.edu.my

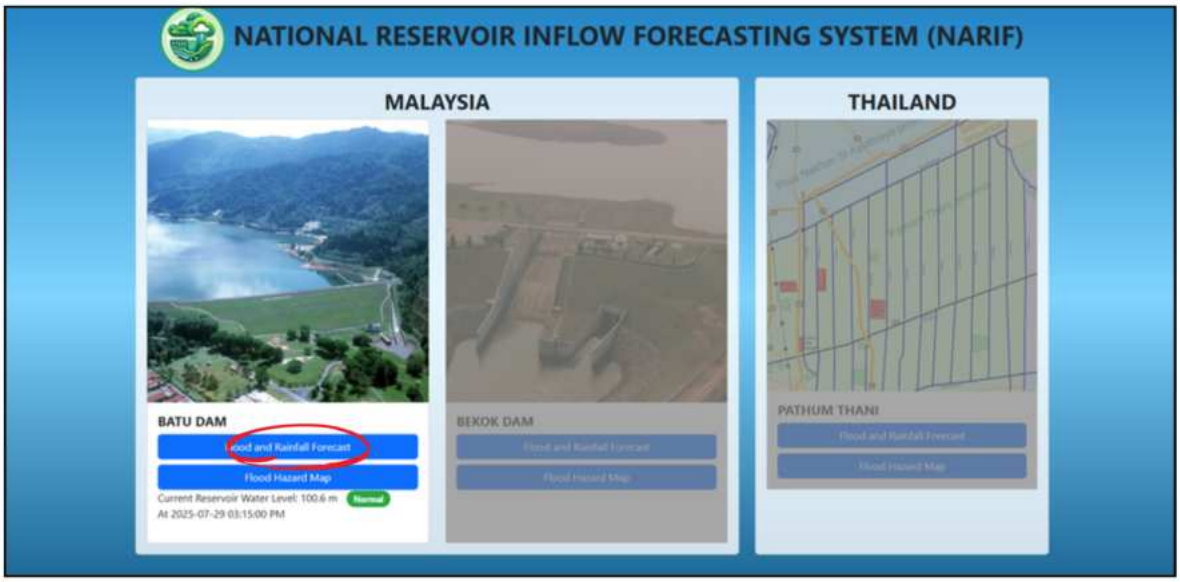
2. Click on the **"Real Time Flood Forecast"** Button on the NARIF Dashboard

2. Logging In to the Website

Enter the username and password



Once logged in, the page will be directed to the Real-Time Flood Forecast page.
On the main page, click the “Flood and Rainfall Forecast” at Batu Dam

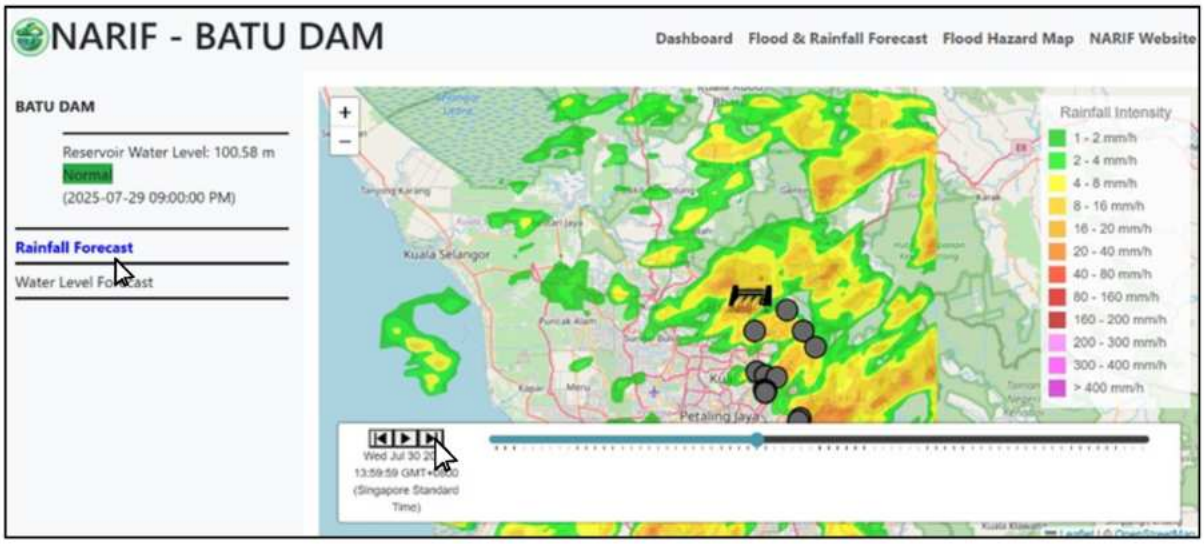


3. Viewing Rainfall Forecast at Batu Dam

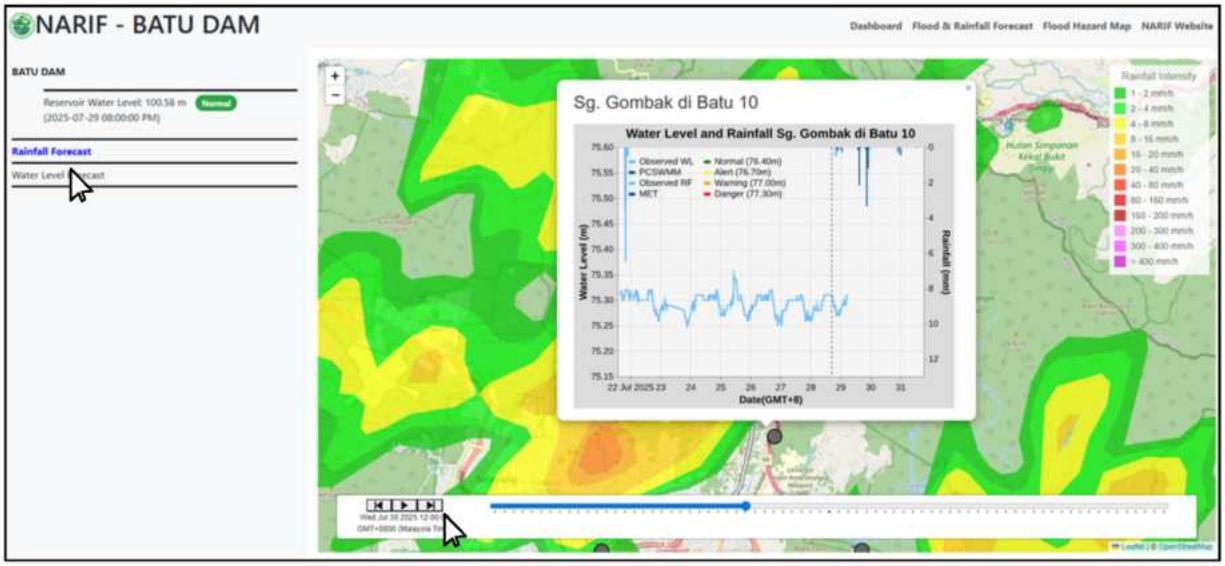
On the left-hand menu, click on Rainfall Forecast.
User can click on the dam icon to view the Rainfall forecast at the Batu Dam

At the bottom of the interface, you will find a timeline slider with playback controls. This tool allows user to play through rainfall forecast animations over time.

- Click the play button ▶ to auto-play the rainfall forecast by time steps.
- Use the arrow buttons ◀▶ to move backward or forward manually.



To view the rainfall data at nearest rainfall station, click the grey circle icon on the map to open the rainfall forecast for the closest monitoring station (e.g, Sg Gombak)

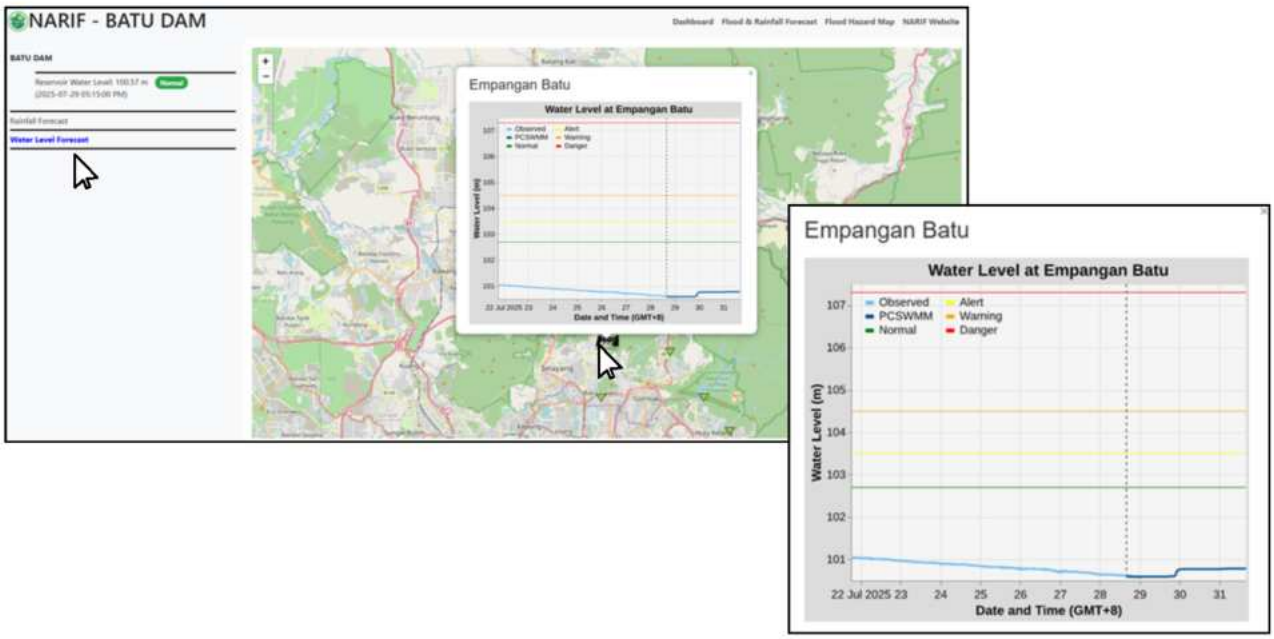


4. Viewing Water Level Forecast at Batu Dam

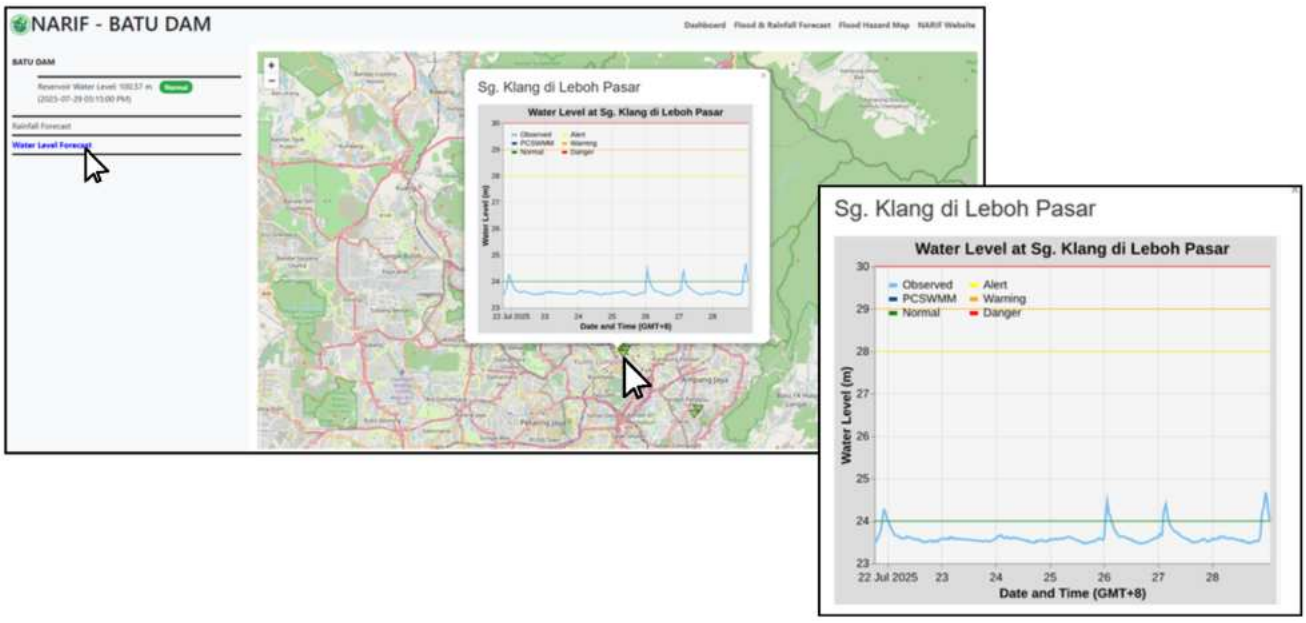
On the left-hand menu, click on Water Level Forecast.

User can click on the dam icon to view the reservoir water level forecast at the Batu Dam

The graph displays observed and forecasted water level.

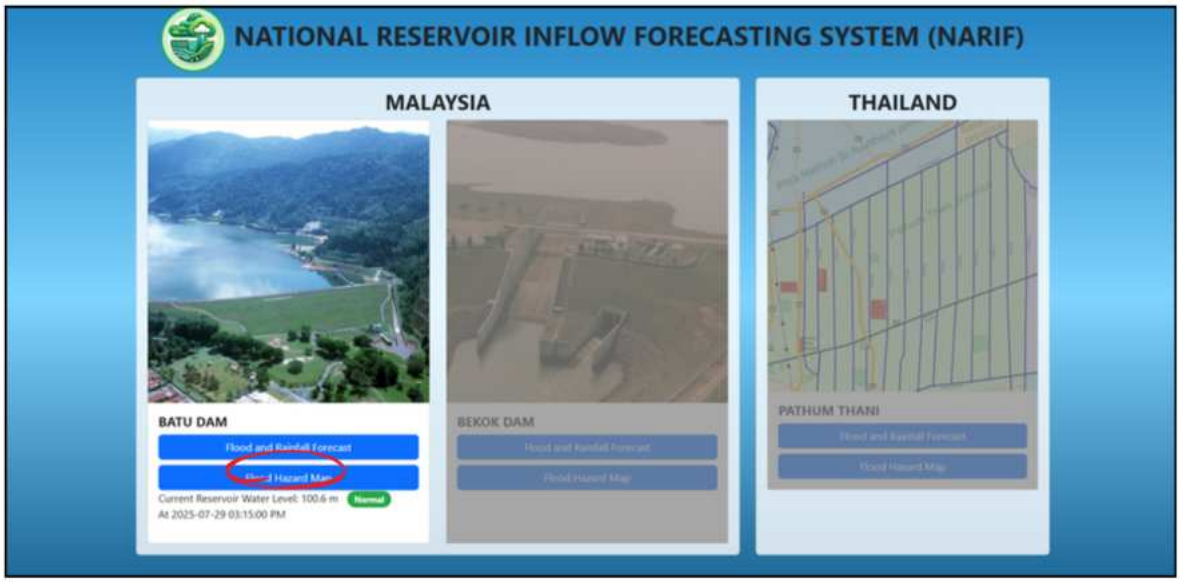


To view the water level data at water level station, click the green triangle icon on the map (e.g, Sg Klang di Leboh Pasar)



5. Flood Hazard Map

On the Dashboard, choose the “Flood Hazard Map” at Batu Dam



From the “Scenarios”at the left hand menu, click on “Probable Maximum Flood” or other scenarios.

A color-coded flood depth map will be displayed, showing the spatial extent and severity of flooding. The flood depth legend (right side of the map) categorizes water depth from less than 0.5 meters (light blue) to more than 10 meters (dark red).

User can click on any point on the map to retrieve the maximum flood depth value at that specific location (e.g., Max Flood Depth: 1.98 m).