Australian Government
National Emergency Management Agency

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Northern Rivers Resilience Initiative – Frequently Asked Questions

1. What is the hydrodynamic model and why is it unique?

- This is the first time a catchment model of this scale and complexity has been built for the region.
- The model is a representation of water flows across the Richmond River catchment (more than 7000 km²) and covers very complex and varied terrain.
- The design is based on detailed spatial representation of the catchment's biophysical characteristics such as soils (infiltration rates, soil storage capacity, etc.) and landscapes (roughness, flow paths, flow direction, structures, vegetation, etc.)

2. In short, what does the technical report on the hydrodynamic model tell us?

- The report describes the setup of the hydrodynamic model for the Richmond River catchment, its implementation, the validation results, and all the inputs and outputs for the five selected historical flood events.
- Importantly, the report tells us that the model is reliable and is able to reproduce the five identified historical flood events to a reasonable standard. This means the model is now ready for the next stage of the project; modelling flood mitigation scenarios for the Richmond River catchment.
- The technical report has also been reviewed by three flood modelling experts, external to CSIRO, who have confirmed the reliability of the results and support the approach taken to develop the model.

3. Why has it taken this long to build the hydrodynamic model?

- Building a model for the Richmond River catchment is a very complex task given the size and complexity of the catchment.
- CSIRO began working on the model in early 2023, however due to poor weather in the Northern Rivers region the required data collection activities took a lot longer than originally anticipated, with the LiDAR and bathymetry data only becoming available in June 2024.
- Following this, hundreds of hours have been spent building the mesh model which is common practice for a model of this scale and complexity.
- This was then followed by validation exercises to ensure the model is accurate, robust and reliable by comparing the modelling results to water level gauges across the region, remotely sensed inundation extents as well as community feedback on the flood levels.

4. Does the model include all waterways and infrastructure in the Richmond River catchment?

- Given the large area covered by the modelling domain and the very complex sections of steep and flat terrain, it was not possible to represent all small streams and channels.

- However, every attempt has been made to make sure that all important streams, levees, flow control structures such as bridges, culverts, and pipes, etc. across the entire catchment are explicitly represented in the model.
- Importantly:
    - All levee details were collected from the local councils and all data from the recent survey of the major levees undertaken after the 2022 floods (courtesy NSW Department of Public Works) are explicitly represented in the model.
    - The Pacific Highway M1 development has been incorporated into the model, with the representation of the M1 infrastructure slightly different for flood events in 2008 and 2009; 2013; 2017 and 2022 to correctly reflect the progress of the M1 infrastructure works at the time of the flood events.
- For a map of what has been included in the model refer to the orange area in Figure 1 on page 5 of the technical report and Figure 13 on page 22.

5. Has the technical report been reviewed by any experts external to CSIRO?

- Yes, the technical report has been peer-reviewed by three flood modelling experts:
    - Dai Yamazaki, Associate Professor, Institute of Industrial Science, the University of Tokyo
    - Charles Perrin, French National Institute for Agriculture, Food, and Environment (INRAE)
    - Barry Croke, Professor, Institute for Water Futures, Mathematical Sciences Institute, Australian National University.

6. Does the model have any limitations?

- While the model is able to reproduce the five historical flood events reasonably accurately, it is worth noting:
    - The water level gauge at Lismore (H058176) had few incomplete observed records over the five historical events with only patchy data from 2017 being suitable to use in the water level analysis.
    - CSIRO was not able to conclusively determine why the water level gauge at Casino (203004) over-estimated the peak for the 2017 flood, however suggested that this may be due to an issue with the water level measurements.
    - The results from the comparison of the model simulated flood extents with the remote sensing images show that the model has captured the complex flood characteristics reasonably well however there were no remote sensing images for 2008 and 2013, with the quality of other images impacted by cloud cover and the misrepresentation of wet vegetation.
    - Water velocity data from the historical events was not available.
    - All efforts were made to collect and use consistent and accurate elevation data but areas of permanent water where bathymetry was not collected may be slightly under or overestimated by the dimensions used in the modelling.

7. Do the modelling results contradict any previous modelling of the 2022 flood event?

- The results from CSIRO's model have not been compared to any other models in the region as each model is developed for a specific purpose and CSIRO's model is the only model that has been developed for the Richmond River catchment. The results from this model are compared against various observation such as water levels and satellite imagery and the model accurately reproduces the observations.

8. Has the recent flood that occurred in NSW in May 2025 affected this project?

- Largely no. There was some flooding in small parts of the Clarence Valley but this significant flood event mostly impacted the Mid North Coast and parts of the Hunter Valley region, including the towns of Taree, Kempsey, Nambucca Heads, Sawtell, Dorrigo, Port Macquarie, and Coffs Harbour.
- The conditions were strikingly similar to the 2022 floods in the Northern Rivers but occurred further down the coast.
- These conditions included high soil moisture, wet air intake from Coral Sea, a static weather system hovering over the region and peak river flows.