

Major Evaluation

OF THE HAWKESBURY-NEPEAN VALLEY FLOOD RISK MANAGEMENT STRATEGY









Source: INSW (photos Adam Hollingworth)

End of program report - Final v1.02 August 2022

1. Executive Summary

1.1 Context and background

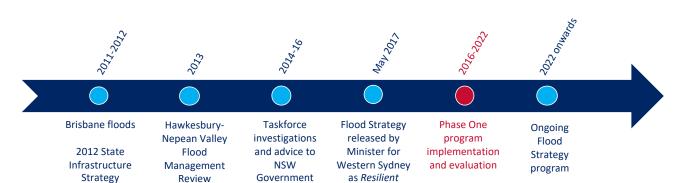
The Climate Change Fund (CCF) provided funding for Phase One of the Hawkesbury-Nepean Valley Flood Risk Management Strategy (the Flood Strategy) to improve the resilience of the Hawkesbury-Nepean community and prepare for the impacts of climate change on flood risk. Infrastructure NSW (INSW) was the lead agency responsible for implementing the program in partnership with other government agencies and Water NSW.

The **objective** of the Hawkesbury-Nepean Valley Flood Risk Management Strategy is to reduce flood risk to life, property and social amenity from regional floods in the Hawkesbury-Nepean Valley, now and in the future.

Due to its large existing population and unique geography, the Hawkesbury-Nepean floodplain has the most significant and unmitigated community flood exposure in Australia. While this is a legacy of past decisions, there is increasing urgency to mitigate the mounting risk driven by the combined effects of climate change and population growth.

The Flood Strategy is an integrated program of initiatives across the disaster risk management spectrum of prevention/mitigation, preparedness, response, and recovery (PPRR), recognising that there is no single or simple means of reducing existing and future flood risk in the valley.

The Flood Strategy comprises a suite of integrated measures to mitigate flood risk. The Climate Change Fund provided \$58.46 million for Phase One of the Flood Strategy, which started in late 2016 and concluded in early 2022. Key milestones in the Flood Strategy's timeline, from investigations through to staged implementation, are illustrated in Figure 1.



Valley, Resilient Communities

Figure 1 Key milestones in the Flood Strategy's development and implementation

Phase One of the Flood Strategy included around \$30 million to undertake detailed planning, environmental assessments and community consultation for the proposal to raise Warragamba Dam wall by around 14m to create a flood mitigation zone, plus around \$28 million for a suite of complementary actions to reduce flood risk in the Valley. Further background information is available at www.infrastructure.nsw.gov.au.

The **purpose** of the evaluation was to assess performance to the end of Phase One of the Flood Strategy, and to guide adaptive management for the ongoing program. The evaluation **methodology** used comparative analysis, qualitative assessment and contribution analysis to respond to the key evaluation questions with a focus on efficiency, effectiveness, appropriateness, and learnings from new flood events.

Figure 2 summarises key achievements to April 2022 under the Flood Strategy's nine outcomes. The evaluation findings contributed to the preferred package of measures for ongoing implementation of the Flood Strategy to improve the flood resilience of the Hawkesbury-Nepean community and prepare for the impacts of climate change on flood risk.

Figure 2 Key achievements under the Flood Strategy's nine outcomes

Coordinated flood risk management across the Hawkesbury-Nepean Valley

- The Flood Strategy Directorate was established in Infrastructure NSW to coordinate regional flood risk management in partnership with state agencies, local government, businesses and the community
- INSW prepared a final business case and reviewed governance for the ongoing Flood Strategy program

2. Reduce flood risk by raising Warragamba Dam wall

- A comprehensive EIS and detailed concept design were prepared for the proposal to raise Warragamba Dam wall to create a flood mitigation zone to reduce flood risk to the lives and homes of thousands of people downstream
- Public exhibition of EIS in Sept-Dec 2021
- Extensive community and stakeholder consultation for EIS process

3. Strategic and integrated land use and road planning

- A leading-edge flood evacuation model was developed to support integrated land use, road and evacuation planning
- DPE is working with other state agencies and floodplain councils to develop a new Regional Land Use Planning Framework
- TfNSW is continuing to develop flood resilience design guidelines to support road transport planning in the floodplain

6. Improved weather and flood predictions

- A pilot tool for the Hawkesbury-Nepean Valley was developed by the Bureau of Meteorology to enable extended lead time forecasts to provide more certainty of warning for emergency response and managing evacuation
- Work is continuing to operationalise the tool

5. Aware, prepared and responsive community

- The Community Resilience Program has contributed to raising awareness of flood risk and preparedness to respond to a flood, through programs targeting broad public awareness, communities of concern, and education programs for young people
- A new evacuation road signage system was designed, tested, and 150 new signs installed

4. Accessible contemporary flood risk information

- A new region-wide flood study using upto-date science and data provided latest mapping for decision-makers and accessible, interactive flood maps for the community on the NSW ES website:
- Detailed database compiled of floodplain population, property, and assets to support land use, road and evacuation planning

7. Best practice emergency response and recovery

- NSW SES revised and updated the HNV Flood Emergency Plan 2020 (a sub-plan of the State Emergency Management Plan)
- Resilience NSW revised and updated the HNV Flood Recovery Strategy
- Agencies conducted a range of emergency response and recovery exercises, including Exercise Deerubbin for a catastrophic flood in the valley

8. Adequate local roads for evacuation

- TfNSW completed detailed investigations to improve access to the existing evacuation road network by addressing legacy issues of local flooding at low points and other constraints.
- TfNSW developed a strategic business case for around 100 priority road improvements identified through the detailed investigation process

9. Ongoing monitoring, evaluation, reporting and improvement

- Best practice monitoring and evaluation were integrated into delivery of Phase One of the Flood Strategy
- Evaluation findings contributed to adaptive management and informed decisions for the ongoing Flood Strategy

1.2 Key findings

The Flood Strategy implemented a best practice evaluation framework – including process, outcome and economic evaluation – based on the CCF evaluation framework (OEH, 2017). A mid-term evaluation was conducted in 2018. Prior to completing this final evaluation report for the end of Phase One funding from the CCF, INSW published the Phase One interim evaluation report in 2021 for a wide community audience.

This final report presents the key outcomes from the major evaluation of the Flood Strategy implementation to the end of the Phase One program in April 2022. Key findings from the program evaluation are summarised in Figure 3. In addition, a comprehensive evaluation of the March 2021 flood was published on the INSW website: Hawkesbury-Nepean River March 2021 Flood Review. Analysis of data from the 2022 floods was still in progress when this evaluation report was prepared.

Figure 3 Summary of evaluation findings

KEQ Efficiency

- Implementation of Phase One of the Flood Strategy took longer than originally planned. The
 majority of actions under the nine key outcomes for the Phase One program were completed
 by the end date of April 2022. Some actions such as the regional land use planning
 framework, road planning flood-resilience guidelines and proposed road improvements are
 still in progress.
- 2. Expenditure was within the approved program funding from the CCF and supplement approved by the NSW Government, including \$58.46 million from the CCF.
- 3. A review of all feasible options using the latest information, costings and decision support tools confirmed that raising Warragamba Dam wall is still the most cost-effective option to achieve the targets for reducing risk to life and property damages.

KEQ 2
Effectiveness

- 4. The Flood Strategy has been effective in improving regional flood risk management by applying a holistic approach with effective coordination and governance. It demonstrated significant innovation and adaptive management.
- 5. Flood risk information has been significantly enhanced so that new models and decision support tools are available to guide decision-making, and a web-based flood mapping tool has made information more accessible.
- 6. The Community Resilience Program delivered a wide range of projects designed to raise public awareness about flooding and improve resilience in communities of concern. While there were many indicators relating to *inputs*, the evaluation of *outcomes* had some limitations.
- 7. While it is premature to evaluate the outcomes of the longer term Flood Strategy, there is sufficient evidence from evaluating causality to conclude that implementing Phase One has made a difference by laying the necessary foundations for improving flood resilience. However, achieving the Flood Strategy's vision in the longer term relies on investment in infrastructure to significantly reduce risk exposure.

KEQ 3
Appropriateness

- 8. The process of implementing Phase One of the Flood Strategy was considered appropriate, because it:
 - successfully applied an adaptive management approach across the prevention, preparedness, response and recovery (PPRR) spectrum
 - used a strategic, place-based, systems approach based on best practice
 - applied significant innovation to research, investigate and model complex issues, adapt to new information, and develop new solutions
 - identified emerging priorities and applied lessons learnt from implementing the Flood Strategy and from new flood events, to adapt the program where relevant.
- 9. The review of all feasible options for the ongoing Flood Strategy identified the most appropriate suite of measures to continue. Environmental and planning approvals for the proposal to raise Warragamba Dam to create a flood mitigation zone remain critical to realising the full benefit of reductions in risk to life and property. If this proposal cannot proceed, then a major revision of the Flood Strategy will be triggered.

KEQ 4 Actual flood events

10. The *Hawkesbury-Nepean River March 2021 Flood Review* indicated that work under the Flood Strategy has started to realise benefits. It also identified some opportunities to increase resilience ahead of future floods.

Recent flood events, in February 2020, March 2021, March-April 2022 and July 2022, reinforce the reality of flood risk in the Hawkesbury-Nepean Valley. The important **legacy** of Climate Change Fund investment in Phase One of the Flood Strategy is an ongoing program of infrastructure works and complementary

measures to improve flood resilience, embedded into core business of government, that will generate lasting benefits for the community of the Hawkesbury-Nepean Valley and the wider community of NSW.

1.3 Recommendations

The recommendations from the major evaluation are summarised in Table 1.

Table 1 Summary of recommendations

	Recommendation	Responsibility	Relates to finding number
1	Ensure program milestones are realistic and take account of funding and resource availability, project interdependencies and critical path planning.	INSW All delivery agencies	1
2	Reset the strategic coordination and governance arrangements between Infrastructure NSW and other delivery agencies as the Flood Strategy transitions from the defined Phase One program to an ongoing function of government. Key focus areas include: — systems to maintain the integrity of essential flood risk information, models and decision support tools — embedding key responsibilities into business-as-usual for partner agencies — legislative, regulatory and operational changes for WaterNSW to operate Warragamba Dam for flood mitigation (if approved).	INSW (lead) All delivery agencies	4, 5
3	Review the performance measures for <i>effectiveness</i> of the Community Resilience Program in (1) raising public awareness, and (2) achieving sustained behaviour change in the targeted communities of concern. Also consider the potential for related programs to contribute to multiple lines and levels of evidence for future evaluations (such as the state-wide all-hazards <i>Get Ready</i> program led by Resilience NSW).	INSW NSW SES Resilience NSW	6
4	Evaluate the achievement of longer term outcomes from the Flood Strategy using a benefits realisation framework, adapted as needed in line with government policy and decision-making.	INSW (lead) All delivery agencies	7
5	Continue to provide objective information about the social, economic and environmental issues for alternative options to reduce flood risk, to assist government and the community to understand and balance these complex issues.	INSW	9
6	Monitor, evaluate and report on actions to respond to the findings from the Hawkesbury-Nepean River March 2021 Flood Review.	INSW NSW SES Resilience NSW	10