



NSW Government submission

The House of Representatives Standing
Committee on Regional Development,
Infrastructure and Transport

*Inquiry into the implications of severe weather
events on the national, regional, rural, and remote
road networks*

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Executive summary

The NSW Government welcomes the opportunity to make a submission to the Standing Committee on Regional Development, Infrastructure and Transport's inquiry into the implications of the severe weather events on the national regional, rural, and remote road networks.

In 2022, NSW was impacted by widespread, heavy, and intense rainfall, resulting in multiple flood events and unprecedented natural disaster events across NSW with major flooding, flash flooding and storm damage experienced.

This occurred following the February and March 2021 storm and floods, the 2019-20 NSW Bushfires and extreme drought through 2017-19. The severity of these weather events in NSW has had devastating impacts on communities and the economy.

The complexity, intensity, and economic impact of natural disasters in NSW is increasing. In 2020-21, disasters cost the NSW economy \$5.1 billion. This cost is expected to rise to at least \$15.8 billion by 2061.¹ Current disaster spending patterns is focused on recovery, with 97 per cent of Australian disaster funding spent on recovery compared to 3 per cent invested in risk mitigation and resilience building.²

The cost of damage to public assets from the 2022 flooding alone, including those owned by State and Local governments, is in the billions of dollars, with repairs to road networks including:

- 2905 kilometres of State Road
- 119 State owned slopes
- 70 State owned bridges
- more than 128,000 potholes on State roads in FY 22-23 (to 31 Dec 2022)

Damage from the recent natural disaster events has resulted in 13,000 kms of road infrastructure damage with an estimated \$2.5 – 3 billion cost.

As part of the NSW Government's response to these events, several priority programs have been implemented targeting assistance for extreme weather, including the:

- \$312.5 million Regional Roads and Transport Recovery Package (jointly funded)
- \$500 million Regional and Local Roads Repair Program
- \$200 million Infrastructure Betterment Fund, led by the Department of Regional NSW, to help communities across NSW build back better
- Fast-tracked emergency advance payments of more than \$92.3 million for councils to urgently carry out work to restore access to flood-impacted areas under the Australian Government's Disaster Recovery Funding Arrangements

While it is noted that this inquiry is focused on road resilience, it is important to consider the resilience of the whole transport network, including road and rail, as disruptions to one will have a significant impact on the resiliency of the other, and other parts of the network.

¹ NSW Treasury. 2021. Intergenerational Report Treasury Technical Research Paper Series: An indicative assessment of four key areas of climate risk for the 2021 NSW Intergenerational Report

² Productivity Commission, 2014. Natural Disaster Funding Arrangements. Inquiry Report 74, Canberra.

The NSW Government considers there are several key levers and opportunities to partner with the Australian Government to provide strong leadership through embedding resilience outcomes into the way we plan, fund, prioritise and deliver infrastructure to ensure transport systems and networks are capable of withstanding future severe weather events. This includes:

- Recommendation 1: Improving Disaster Recovery Funding Arrangements (DRFA)
- Recommendation 2: Improving support and more effectively partnering with Local Government
- Recommendation 3: Making resilience of transport networks a standing item for ITSOC and ITMM
- Recommendation 4: Developing national road infrastructure resilience guidelines
- Recommendation 5: Creating a common data environment

These points are explored further under the terms of reference 'Commonwealth's role in road resilience planning' section of this submission.

In addition, the Australian Government should consider working with state governments in:

- Improving strategic oversight and coordination of network resilience outcomes across jurisdictions
- Mapping transport networks for vulnerability to climate risk and targeting investment towards projects with enhanced resilience outcomes
- Updating business case and economic evaluation guidelines to embed consideration of climate risk and options, including mitigation measures and betterment opportunities
- Developing a long-term transport network resilience uplift and betterment plan to protect critical connections and target investment towards resilience uplift

One of the recommendations made by the 2022 NSW Independent Flood Inquiry related to the planning and protection of road infrastructure and evacuation routes for access and egress, noting the importance of working with the Australian Government to ensure funding is coordinated and prioritised to target upgrades where it is most needed. The NSW Government supports this recommendation and is eager to work with the Australian Government to build out the approach to target funding towards resilience outcomes.

NSW Government programs to enhance transport network resilience

Since the devastating 2019-20 bushfire season and multiple flooding events in 2021-22, the NSW Government has implemented several priority programs targeting assistance for extreme weather events.

Network Resilience Program

Transport for NSW has commenced the Network Resilience Program after the 2019-2020 bushfire season.

The program identifies how to build resilience in the transport network, acknowledging that future predictions are for more extreme weather events and natural disasters, which will continue to disrupt customers and their journeys.

There are currently three projects under the program:

- Development of a risk management tool to assess the risk to bushfire on State roads. The Bushfire Corridor Resilience Project also includes investment in resilience works on the State network.
- Developing Customer Journey Resilience Plans to create an agile and resilient transport network to natural disasters in the future by identifying vulnerability and the potential for impact to customer journeys. These Plans are being developed with local and regional stakeholders and will inform how Transport for NSW invests in the regional network. Further updates will be provided to the Australian Government.
- Acknowledging the ways in which our First Nations people have historically managed the landscape can be applied to building resilience across transport networks, Transport for NSW has established the Aboriginal Cultural Landscape Management project to develop this framework with Aboriginal people and communities.

Rail corridor bushfire risk mitigation

Sydney Trains has identified and rectified 1800 potential hazards to ensure its electricity network is safe and ready for the hot summer period. This work involved more than 5000 aerial and ground level inspections, with most hazards relating to vegetation encroaching on powerlines.

Regional Roads and Transport Recovery Package

The Australian and NSW governments are jointly funding the \$312.5 million Regional Roads and Transport Recovery Package (RRTRP) under the Disaster Recovery Funding Arrangements to reinforce and upgrade transport networks in northern NSW devastated in the February 2022 floods onwards.

This is the first betterment program, alongside the Infrastructure Betterment Fund, to be launched in NSW. Funding is for the planning, development and delivery of priority Local and State transport infrastructure resiliency works on eligible transport infrastructure directly damaged or impacted by the February 2022 severe weather and flooding across 26 eligible LGAs in northern NSW.

Examples of eligible projects include:

- Mitigation works to address vulnerable high-risk slopes

- Strengthening road pavements, including hardening, to improve resilience of road assets during floods as a general measure to ensure timely recovery
- Installing flood mitigation and other resilience infrastructure to mitigate flooding risks impacting transport infrastructure such as improved drainage
- Upgrades to road corridors to provide improved resilience through enhanced culvert and drainage performance
- Low level bridge replacements and upgrades on key corridors

The RRTRP delivers on the direction set in the *Future Transport Strategy* through well-targeted and sustained investment in resilience, strengthening the regional transport network's capacity to withstand natural disasters, improving the reliability of the regional transport network for regional communities during and after natural disaster events, and improving the regional transport network's ability to respond and recover when natural disasters occur.

Regional and Local Roads Repair Program

The NSW Government's \$500 million Regional and Local Roads Repair Program support all councils to undertake urgent repairs to their road network, which have been significantly impacted by severe flooding, storm damage and persistent wet weather events during 2022.

Every council in NSW successfully applied for funding under this program. In early February 2023, the relevant councils were notified of their funding allocation.

Infrastructure Betterment Fund

The Australian and NSW Governments are jointly funding the \$200 million Infrastructure Betterment Fund, administered by the Department of Regional NSW, to support the repair and rebuilding of public assets directly damaged by the 2019-20 NSW bushfires, February and March 2021 storm and floods and the February and March 2022 NSW severe weather and flooding. The program aims to repair and rebuild public infrastructure including roads and bridges to a more resilient standard.

Hawkesbury Nepean Valley Flood Evacuation Program

The NSW Government released the Resilient Valley, Resilient Communities: the *Hawkesbury-Nepean Valley (HNV) Flood Risk Management Strategy*³ (the Flood Strategy) in May 2017.

The Flood Strategy seeks to manage and reduce flood risk in the Hawkesbury-Nepean Valley. It is a long-term, whole-of-government plan that involves the Australian and NSW Governments, local councils, businesses, and the community collaborating to protect people, buildings, public assets and the NSW economy in the Hawkesbury-Nepean Valley.

In support of the Flood Risk Management Strategy, Transport for NSW is delivering four initiatives:

- Flood Evacuation Directional Signage Scheme: developed to assist NSW State Emergency Service with evacuating people out of flooded areas and guiding them towards safer locations.
- Flood Resilience Guideline: Transport for NSW is developing a Flood Resilience Guideline to provide guidance on planning and design considerations of Hawkesbury Nepean Valley Road network to support safe and effective evacuation on identified

³ <https://www.infrastructure.nsw.gov.au/expert-advice/hawkesbury-nepean-flood-risk-management-strategy/>

regional evacuation routes. The Guideline aims to assist road network planners and land use planners from government agencies, including Local Government, to incorporate flood evacuation into road network planning, management and maintenance.

- **Flood Evacuation Model:** A Flood Evacuation Model has been developed to assess the road capacity during a flood evacuation of vehicles based on NSW State Emergency Service Flood Plan arrangements.
- **Flood Evacuation Road Resilience Program:** Transport for NSW has identified road infrastructure improvements across the four Hawkesbury Nepean Valley council areas (Penrith City, Hawkesbury City, The Hills Shire and Blacktown City). The improvement projects include road shoulder widening, new culvert and bridge structures, road raising, pinch point upgrades and drainage improvements. These projects will improve the resilience of the road network so that residents can evacuate from the area safely in the event of a flood. In January 2022, the Commonwealth and NSW governments announced \$33 million in funding (jointly funded) for the program to identify more than 100 infrastructure improvements that will boost the resilience of the flood evacuation network throughout the Hawkesbury-Nepean Valley.

Other NSW Government Programs

The NSW Government also has several grant programs in place to support Local Government to upgrade the road network. To date more than \$1.8 billion has been invested by the NSW Government to support the maintenance of local roads managed by councils through the following programs:

Fixing Local Roads Program

A \$691 million (\$500 million NSW Government and \$191 million Australian Government) program enabling councils to accelerate upgrades and maintenance on their local road network.

Fixing Local Roads Pothole Repair Round

The \$50 million Fixing Local Roads Pothole Repair Round supplements existing funding and supports additional efforts by local councils in repairing priority potholes and road repairs on local and regional roads in the short-term.

Fixing Country Bridges

A \$500 million NSW Government program, enabling councils to replace hundreds of timber bridges in poor condition to better connect regional and rural communities.

Fixing Country Roads

A \$543 million NSW Government program providing targeted infrastructure funding from Restart NSW for regional freight projects.

Fixing Country Rail

A \$400 million NSW Government program providing targeted infrastructure funding from Restart NSW for regional freight projects to improve capacity, access, efficiency and reliability by upgrading parts of the regional rail network.

Road Engineering and Construction Standards

Transport Standards

Transport for NSW has an array of published engineering and technical 'Standards' in relation to road engineering and construction. In doing so, Transport for NSW draws technical expertise and industry best practice from the following principal sources:

- [Austroads guides](#)
- International and Australian standards
- Internally developed supplements to third-party standards
- Internally developed technical standards, specifications, and guidelines

Austroads

Austroads is the collective of the Australian and New Zealand road agencies, representing all levels of government. Austroads guides provide practical advice on the design, management and operation of road transport networks, and are globally respected and continually updated.

Transport for NSW is a core member of Austroads and it is represented across the board of directors, taskforces, programs and a variety of technical working groups.

Austroads has a comprehensive list of research [programs](#) that cover the following principal work streams:

- Transport Infrastructure
- Road Safety and Design
- Transport Network Operations
- Future Vehicles and Technology
- Environment and Sustainability

Key current projects in relation to resilience are the following:

- AAM6389 Incorporating climate change resilience in asset management
- NEF6396 Opportunities to increase freight and supply chain resilience
- EAS6378 Climate Change Risk Assessment and Adaptation Planning Guidelines

Future Transport Strategy

The NSW Government's Future Transport Strategy sets the strategic direction to achieve world-leading mobility for customers, communities, businesses, and people. The Strategy recognises the impacts of climate change and the challenges this presents for the existing transport networks, outlining how Transport for NSW will meet those challenges head-on by building resilience into our systems.

To improve the resilience of our network we must anticipate and plan for short and long term risks, with strategies for preparedness, mitigation, adaptation, and recovery. This means we must identify the risks now and plan ways to mitigate them, including shifting from 'resilient infrastructure' to 'infrastructure for resilience' through a focus on the unique characteristics of places, including their vulnerability to several types of extreme weather and natural hazards, the level of redundancy in their road and rail networks, the capacity of evacuation routes, and the capability of local resources to restore and repair networks after major events.

Ensuring resilience requires a holistic approach of targeted capital investments to maintain and improve assets with a focus on ‘building back better’ to reduce the risk and impact on communities.

It is important to understand the interdependencies between key corridor assets, including pavements, drainage, bridges, culverts, slopes, embankments, road barriers, signage and interchanges. While assets are designed and constructed to withstand designed operating conditions within defined standards including extreme weather conditions, industry standard management practices are being challenged by the dynamic changes in climate patterns, variability and weather extremes.

Integrating possible climate futures in engineering standards is complex and multifaceted, particularly for long-lived assets. Key challenges are:

- There is no standard resilience framework to operationalise and provide direction to manage risks and long-term resilience challenges. A framework is required to articulate how Australian and state governments should strategically approach and manage network resilience, and how to evaluate and prioritise investment, coordinate the ongoing activity and programs to improve resilience outcomes.
- There is no regulatory climate change adaptation framework to evaluate an asset’s resilience performance over its lifetime, balancing factors such as cost and safety, environmental, social and economic impacts.
- With the recent changes in the frequency and severity of extreme weather and widespread impacts to infrastructure, significant research and development is required in partnership with the scientific community and infrastructure developers and managers. NSW regional climate modelling data requires specialised expertise and technologies to transform climate model datasets into useful data formats, to draw meaningful insights and inform hazard exposure.

Identification of climate resilient corridors suitable for future road construction projects

Transport for NSW has a significant role in both ensuring the network adapts to a changing climate and minimising the impact on natural hazards. With climate change expected to result in more frequent and intense extreme weather events, Transport for NSW is taking proactive steps to identify key climate change vulnerabilities and to appropriately adapt and respond.

Transport for NSW is taking a four-pronged approach to improve the climate resilience of its network, assets and services:

- Delivering climate resilient infrastructure
- Understanding and improving the resilience of Transport for NSW's existing assets, networks and services
- Building resilience through asset management and emergency response/recovery
- Cross-government collaboration.

Transport for NSW considers climate change risks in all key decisions. It uses Climate Risk Assessment guidelines and tools to assess the climate and natural hazard risk associated with new projects and to identify and inform project decisions and design adaptation measures. These are then embedded throughout project delivery design and construction stages.

Transport for NSW is developing a plan focusing on the regional and outer metropolitan network's exposure and vulnerability. The plan will identify where natural hazards have impacted the regional and outer metropolitan network. The aim of the plan is to understand how frequently the network has been hit by hazards and what were the associated impacts on regional outer metropolitan areas. This will identify the locations which will require further investigation for investment and resilience treatments.

Road corridors are important aspects of the transport network as they connect communities, promote economic activity, allow the movement of heavy goods and freight, provide evacuation routes at times of emergency among several other critical functions.

The standard to which road corridors are planned, designed, constructed, maintained and upgraded involve the application of road engineering standards and guidelines for the wide range of asset types that form components within a road corridor.

Corridor identification and protection is the first practical step in securing appropriate resilient infrastructure that can be optimally located and implemented to avoid environmental, engineering, and emerging land use constraints.

The protection of additional corridors is dependent on the availability of funds to address the statutory obligation to meet hardship requests from landowners in the designated corridors. To date, NSW has acquired some 15 properties in the corridors.

Corridor protection is a 'no regrets' approach to managing uncertainty. If the intended project proves not to be required, the land can be sold or used for other purposes. The protection of corridors also:

- Stimulates investment in adjoining land uses
- Provides for early planning for flood evacuation routes
- Provides certainty for the freight and logistics industry, knowing that freight will be able to be moved efficiently in the future

Future corridor resilience planning

Transport corridors provide coordinated transport networks that enable access, egress, and evacuation during a natural disaster event.

The importance of transport corridors was highlighted in the Royal Commission into National Natural Disaster Arrangements⁴. The report noted the disruption natural disasters may have on corridors and transport routes, the consequences of road closures for other sectors such as essential services, and risks to the supply chain.

In recent bushfire and flood events key road and rail corridors have been closed for prolonged periods of time. In some cases natural disasters have had a significant impact on access as all available key corridor routes experienced some level of damage.

In regional NSW, the resilience of our transport network is impacted by geographically dispersed infrastructure, the nature of surrounding environments, and the limited number of possible detour routes which can add considerable time and distance to journeys with the potential to impact safety and productivity.

In the past 12 months, Transport for NSW has been investigating options to improve the resilience of key east-west corridors. This includes considering improvements to key corridors (such as the Great Western Highway) as well as alternative corridors which may be used as detour routes during emergencies.

Transport for NSW is currently analysing a range of data sources to develop insights which will inform the prioritisation of corridors for more detailed resilience planning and investment.

Example: Main Western Line

Following a major landslide caused by heavy rainfall in June/July 2022, the Main Western Line (a key corridor connecting freight and passengers from Central West NSW to Metropolitan Sydney via the Blue Mountains and a critical interstate connection) closed to all rail services for four weeks. The collapse was of an embankment along a 20-metre stretch of track with a landslide of more than 60 metres deep.

When this line is closed, rail freight has three options:

- Alternative less efficient rail routes, which results in greater supply chain costs.
- Shift suitable freight commodities from rail to road causing pressures on the road network from a congestion and safety perspective (restrictions limit the ability to shift certain commodities such as coal).
- Pause operations having negative economic impact on local communities due to increase in unemployment.

Transport for NSW crews worked 24 hours a day, along with tight integration with external suppliers to restore the line on 30 July 2022, two weeks earlier than originally anticipated, with about 40,000 tonnes of gabion rock used to build up the embankment.

To preserve this critical interstate connection, further work is required to make the Main West Rail Line between Lithgow and Penrith more resilient to similar weather events in the

⁴ Royal Commission into National Natural Disaster Arrangements is available at: <https://naturaldisaster.royalcommission.gov.au/publications/royal-commission-national-natural-disaster-arrangements-report>

future. This will require significant technical assessments and a works program to cater for anticipated future growth in passenger and freight services.

Corridor Resilience Case Studies

Transport for NSW is developing resilience corridor case studies to:

- Provide an understanding and document the exposure and vulnerability of corridors and associated assets as the first step to identify appropriate resilience and/or adaptation methods
- Capture quantitative and qualitative data across the organisation on where the network is vulnerable
- Document historical impacts to understand the increased magnitude of impacts for when they occur in the future
- Understand what information we do/do not have to identify appropriate resilience/adaptation methods
- Provide insight into improvements required to uplift Transport for NSW's maturity in the way data is captured

These case studies will provide a blueprint for how resilience investment should be prioritised across the State Road network. This investment needs to balance the criticality of the corridor in comparison to how vulnerable it is to the impacts of natural hazards.

The case study locations have a predominant focus on the east-west road and rail corridors. There are limited passenger and freight crossings of the Great Dividing Range, and the existing networks are often vulnerable to severe weather events. There are limited available detours, particularly for heavy vehicles. The reliable functioning of these corridors is critical for maintaining regional connections, community access and functioning supply chains.

Some of the case studies being developed include:

- Road:
 - Gwydir Highway between Grafton and Glen Innes
 - Pacific Highway between Yelgun and Tweed Heads
 - Macquarie Pass
- Rail:
 - Moss Vale to Unanderra Rail Line
 - North Coast Line most vulnerable sections (Casino to Grafton or Taree to Maitland)
 - West Region: Great Western Rail Line – Lithgow to Orange.

The importance of reliable transport corridors

Weather events impacting the transport network affect connectivity and can have significant social and economic costs for regional communities and businesses. Inland and remote areas, in particular the Far West, face resilience issues in extreme weather events. Increased resilience in the transport system will improve access and reduce isolation for communities affected by severe weather events and avoid service disruptions and associated negative impacts on business costs and the regional economy.

Transport for NSW coordinates activities that support and minimise the impacts on customers including managing the development of operational frameworks, strategies, and emergency management and response plans. Transport for NSW has dedicated emergency management teams to build capacity and systems in addition to defined incident management thresholds to escalate response processes in accordance with the scale of the impact. For example, customer coordination centres are established to oversee and coordinate the response to region or state-wide disruptions, such as during the recent flooding in Northern and Western NSW.

Example: Live Traffic updates - OneRoad

Real-time traffic information on State roads and local roads in 38 Local Government Areas (LGAs) are now available on Live Traffic NSW⁵.

Since the 2019-20 bushfire season, Transport for NSW has delivered several updates to the real-time traffic information platform Live Traffic NSW. The latest of which is the launch of OneRoad, a cloud-based solution that enables real-time information on traffic conditions, incidents, and major events to be shared across State and Local council roads on Live Traffic NSW.

This information is shared with third-party navigation systems including Google Maps, Apple Maps, Waze and TomTom through one central hub. The real-time updates not only improve safety and give customers more time to avoid and react to incidents, it is also expected to create a more convenient day-to-day experience.

The technology is a response to feedback from communities and recommendations from the Royal Commission into National Natural Disaster Arrangements Report.

The roll out of LGAs is prioritised in consultation with combat agencies including the NSW Police, Rural Fire Service and NSW State Emergency Service. By 2024, all 128 LGAs will be given the opportunity to publish local road incidents onto Live Traffic NSW through OneRoad, expanding the reach of traffic information to all roads in NSW.

Example: supply chain connections

During the 2022 flooding events, Transport for NSW developed an approach to provide the supply chain industry with predictive information on impacts to the network to allow operators to improve their operational preparedness.

As part of Transport for NSW's response, daily briefings were established with industry providing real time information on network conditions, including any expected changes in consideration of their priorities and challenges, to ensure the continued movement of goods across a highly constrained network.

Transport for NSW also supported the efficient movement of essential supplies via air freight into cut-off communities in Walgett, Lightning Ridge and Collarenebri due to flooding, as well as with industry and the Australian Rail Track Corporation in supporting the continued movement of coal on rail to ensure power supply.

⁵ As at 30 January 2023, Live Traffic NSW has been expanded to a further 32 regional councils. Further information can be found here: [Live Traffic NSW expanded to more regional councils | NSW Government](#)

In areas where limited road access could be established for heavy vehicles, freight was escorted by Transport for NSW teams. This assisted in delivering critical supplies to the isolated township of Yamba.

Journey Resilience Plans

Transport for NSW has been developing Journey Resilience Plans to support access and egress to the transport network during major disruptions such as flooding and other natural disaster events (including road, rail and maritime). This includes ensuring appropriate evacuation plans in the event of a natural disaster.

These plans aims to create an agile and resilient “one network,” or state-wide, approach to reduce the impact of future unplanned events which cause major disruptions to customer journeys. This work will also ensure appropriate communication mechanisms to provide customers and communities with information on safety of the transport network, potential alternatives to travel and the duration of disruptions.

The work will include risk assessments of roads and bridges and will be informed by available flood risk modelling. Transport for NSW will continue to partner with all tiers of government, first response agencies, and bus, rail and freight operators, to develop these plans.

We will look to work will help to identify priority areas for upgrades where alternative evacuation points are limited. Transport for NSW will work with the NSW Reconstruction Authority (NSWRA), to determine immediate, medium-term, and long-term recovery and resilience priorities across the state-wide transport network.

Opportunities to enhance road resilience

Opportunities for betterment treatments in repair works

Transport for NSW considers key areas of opportunity for betterment works to improve network and asset resilience outcomes to include:

- Widening narrow roads to improve stability as allocation of a shoulder width leads to a stronger and more resilient pavement
- Route realignment to avoid known areas of repeated or frequent impact
- Enhancing drainage arrangements
- Bridge construction methods
- Extending scope of slope repairs to enhance stability
- Placement of asphalt or concrete on sections of bitumen sealed on roads frequently impacted by flooding. This approach was taken to repairs of the Sturt Highway at Gillenbah, near Narrandera – a known flood risk site damaged in late 2022 with a high likelihood of future impact. Transport for NSW crews repaired the road with asphalt rather than replacing like-for-like with a gravel and a sprayed seal. The new surface is more robust with enhanced durability during future inundation.
- Improvements to safety outcomes where like-for-like would not meet current standards. For example, Dunoon Road at Dorrroughby (25 kilometres north of Lismore) was significantly damaged during the February-March 2022 flood events. Like-for-like repair works to the road did not allow for guardrail installation, which makes the repair works non-compliant with current standards. This highlights a safety issue at the location with an approximate four metre drop down to the creek from road level on a sweeping bend near an intersection.
- For more information about opportunities to enhance road resilience, please refer to Appendix 1: Opportunities to enhance resilience outcomes on NSW transport network.

Example: Araluen Road, Knowles Creek

Araluen Road is a local road that stretches between Moruya and Braidwood, and falls partly within the Eurobodalla Shire Council and Queanbeyan-Palerang Shire Council boundaries.

Araluen Road has been impacted by compounding natural disaster events.

The most significant were the:

- 2019-20 Black Summer Bushfires
- flood events in August and November 2020
- flood event in March 2021 flood causing significant landslips and other road related damage
- flood events in December 2021 and March 2022.
- landslips that closed the road occurred in November 2020 (Knowles Creek) and May 2021 (West Merricumbene, 43 kilometres from Moruya)

One of the major landslips near Knowles Creek required slope stabilisation repairs, which were determined to be eligible under Natural Disaster Recovery Assistance (DRFA) Guidelines, 2018.

Transport for NSW worked closely with Eurobodalla Shire Council to determine the best outcome for the community and travelling public, as well as tourists who use this road as an access point to approximately 70 residential properties and National Park and Wildlife service campgrounds.

Under DRFA Guidelines the Council can propose to repair damaged essential public assets (roads etc) with 'like-for-like' replacement or to current Australian Design Standards. The slope stabilisation works were estimated to cost over \$7 million, with the likelihood of future impact to the asset by subsequent natural disasters.

Eurobodalla Shire Council proposed an alternative involving the re-alignment of 1.1 kilometres of Araluen Road at the Knowles Creek section. The new alignment has been designed to current standard and the road-side batters have been flattened to mitigate the need for future DRFA work or funding assistance. The estimate for this alternative scope was \$3.5 million, which was cross-checked and approved by Transport for NSW, and endorsed by the former Resilience NSW.

Importance of the sustainable renewal of waterproof seals

Experience indicates that significant loss of serviceability of rural pavements arises when widespread prolonged or repeated soaking rainfall patterns coincide with fatigued rural pavements, poor roadside drainage maintenance, and inadequate resurfacing of waterproof seals.

An appropriately funded, planned, and implemented bitumen resealing program is the most crucial factor in establishing and maintaining a more resilient road network. Safeguarding road pavements by timely renewal of waterproof seal must be prioritised as it is the most cost-effective way to:

- Protect the underlying pavement structure from water damage
- Significantly reduce the number and frequency of potholes that form
- Safeguard asset value and minimise whole-of-life costs
- Minimise the length of road that will need remediation following heavy and prolonged rainfall.

Transport for NSW has an annual a pavement resealing program, which is developed using sophisticated modelling techniques to minimise whole of life costs, and to optimise the timing, location and type of treatments, and to maximise customer service outcomes within the available funding. Benefits of sealing rural road shoulders

Benefits of sealing rural road shoulders

The structural life of road pavements can be extended by stabilising the moisture content, especially under the outer wheel path. Engineering research validates a strong correlation between stable moisture content and a sealed 3.5 metre lane width with a one metre sealed shoulder.

Therefore, there is a critical need to keep the moisture under the road pavement stable, especially within one metre of the outer edge of a lane because:

- Pavement materials are weakened by the presence of water
- Road pavements bend with the underlying supporting natural material and these materials also lose strength when wet
- The cross-fall of the road needed to effectively shed water off the road produces greater wheel loads on the outside edge of the lane
- More common outer wheel path failures produce increased road roughness and increased dynamic loads close to the edge of the lane

Western NSW experienced significant flooding during the summer of 2010-2011. At that time, Transport for NSW undertook a detailed analysis of the relationship between sealed width and loss of pavement strength. This analysis found that the loss in pavement strength before and after inundation was significantly lower with wider sealed width:

- Sites with a sealed width less than 7.5 metres were found to show on average a 35 per cent increase pavement deflection under a standard axle load (i.e., loss of pavement strength)
- Sites with a sealed width less than eight metres were found to show on average a 16% increase in deflection readings

This analysis suggests that even a 0.5 metre additional sealed width significantly reduces the adverse effects of moisture ingress on pavement strength. The study also found that bound pavements (stabilised pavements) showed little difference before and after inundation.

Therefore, two key factors for improving the overall resilience of rural road pavements includes providing increased sealed width and the insitu stabilisation (e.g. using foamed bitumen, lime, etc.) of the existing pavement materials to improve their stiffness and durability.

Rebuilding structurally unsound pavements

Periodic waterproofing treatments are effective in slowing the rate of structural deterioration of road pavements, but do not add to the structural strength. It is therefore necessary to also address the structural adequacy of road pavements.

Older pavements were typically constructed with poorer quality materials and are too thin for the current freight task. As such, they are more susceptible to rapid loss of condition, particularly following heavy and prolonged rainfall, or higher axle loads and truck movements.

As road pavements deteriorate over time, we must rebuild roads to ensure that the road network is sustainable and to restore pavement conditions to acceptable standards.

Cracked pavements are of major structural concern following periods of heavy and prolonged rainfall. Cracks let water in, which can cause softening of the underlying road pavement leading the road to deteriorate prematurely.

Urban roads in general display a higher level of cracking than rural roads but tend to be more resilient as they are made of manufactured materials like asphalt.

Choice of pavement type, design, and materials

Transport for NSW selects the most viable, resilient, cost-effective pavement design and materials, that minimise whole-of-life costs. It is imperative that the chosen contract form and design standards encourage the use of pavement materials that are fit for purpose and deliver value for money.

For major projects, Transport for NSW operates a tender process that allows contractors to bid both concrete and flexible pavement alternatives to provide the lowest overall cost to win the project. This approach has been successfully operating in NSW, under various delivery models, for well over two decades.

At times, Transport for NSW will specify a concrete or asphalt pavement configuration to meet a particular need of a site. The use of concrete in road construction offers several advantages, as evidenced by their extensive use on the Pacific and Hume highways. Over the last four decades, Transport for NSW has helped develop a successful concrete road construction industry in NSW and will continue to utilise concrete pavement construction where it offers the best value for money and community outcomes.

Typical pavement design life is 20 years and 40 years for heavy duty applications. However, there may be significant network benefits in adopting a shorter design life as longer length of the network can be rebuilt and customer service levels improved more quickly. For instance, lower cost thin granular overlays will correct pavement shape, improve roughness (driver comfort), and increase the width of the waterproofing protective seal. “Building back better” is ideal, but it is not always feasible given funding constraints. An incremental approach may be more appropriate and cost-effective where feasible on the network.

More flood resilient materials include stabilised aggregates (the addition of cement and other binders), foamed bitumen, full depth asphalt and rigid (concrete) pavements would enhance the resilience of roads. These materials are better suited for flood affected areas, but construction costs would be significantly higher.

Pavements are built on natural subgrade material including earthwork structures such as embankments and cuttings. Earthwork structures can be designed and constructed to be resilient to flooding and may require scour protection, with higher construction costs.

It is important to note that a 20-year design life is not the same as the expected end-of-service life. A well-designed and built pavement should only have minimal failures after 20 years and can be expected to perform well for more than 40 or more years before it needs to be rebuilt.

Improved network resilience

It is important that an appropriately designed asset preservation strategy is developed, the basic elements of which include reducing moisture content within and under road pavements by:

- Protecting and renewing waterproofing seals.
- Sealing cracks to maintain the integrity of waterproofing seals.
- Shaping roads so that the cross-fall of the road efficiently sheds water from it.
- Cleaning roadside drains to stop water soaking back into and under the road pavement.
- Repairing or installing sub-surface drains.

- Improving seal width to reduce water ingress under the outer-wheel path.

In addition, the timely rebuilding of road pavements to ensure adequate structural strength, including the use of more durable and resilient pavement materials is warranted.

Enhancing resilience of Transport's road assets

There are other opportunities to improve the resilience of road assets. Potential improvements in construction and maintenance practices of pavements, earthworks and drainage systems that will improve flood resilience include:

- Use of foamed bitumen, full depth asphalt and rigid pavements in areas subject to flooding will reduce damage after severe weather events.
- Improved selection of material used in earthworks and the sealing of verges can reduce the ingress of flood waters affecting pavements.
- Increasing the capacity of dams to provide flood immunity which involves a localised investment that reduces the need for the more significant broader investment required to make larger assets such as pavements immune to flooding and also protects a range of different assets.
- Attention to the design and protection of road batters is also required to prevent scour of earthworks and pavements.
- Drainage maintenance is essential to protect pavements and associated earthworks, bridges and retaining walls during heavy rain.
- More accurate scour estimation at bridges and structures based on latest industry knowledge and testing. Transport for NSW, in collaboration with University of Auckland NZ, is finalising the publication of a study to estimate realistic scour depths which is critical for the stability of both new bridges and existing bridges.
- Additional scour protection will further improve the resilience of bridges and the associated spill through batters, reducing the need for repairs after flooding.
- Slope stability of earthworks has been a significant issue in recent severe weather events. Transport for NSW is currently developing a Slopes Maintenance Standard to complement existing slope management strategies.

Investigation of pothole patching products

Unprecedented rainfall in 2022 has been a key contributor in the need to repair more than 128,000 potholes on State roads in FY 22-23 (to 31 Dec 2022).

In October 2022, Transport for NSW launched a pothole trial [project](#) in response to the extensive damage caused to road pavements as a result of the extreme weather. The project is currently underway across a number of locations, evaluating the application of cold-applied pothole repair materials across a variety of pavement categories. This will enable improved repair methods for potholes on State roads to adequately address time and weather constraints to meet customer expectations ([media release](#)).

In addition, NSW Government is investing \$50 million in repairing the number of potholes on road pavements across regional and rural areas under the [Fixing Local Roads Pothole Repair Round](#) program and the \$500 million [Regional and Local Roads Repair Program](#).

While pothole products may control moisture intrusion for the short-term, they cannot materially improve road resilience in the long-term. Long-term improvements in road resilience will require detailed investigation of the road layers, use of suitable materials and a rehabilitation design to strengthen the road.

The Commonwealth's role in road resilience planning

Well-targeted and sustained investment in resilience

The complexity, intensity, and economic impact of natural disasters in NSW is increasing. In 2020-21, disasters cost the NSW economy \$5.1 billion. This cost is expected to rise to at least \$15.8 billion by 2061.⁶ Current disaster spending patterns are focused on recovery, with 97 per cent of Australian disaster funding spent on recovery compared to 3 per cent invested in risk mitigation and resilience building.⁷

At a broad level, the Australian Government plays a critical supporting role in road resilience planning, across a range of proactive, pre-emptive and responsive activities. In particular, the Australian Government's provision of different types of program funding to enable the NSW Government to carry out key road resilience-related functions and achieve key policy and operational objectives is critically important.

At the national level, road resilience can be enhanced by governments continuing to review policy frameworks influencing road infrastructure investment, as well as heightened engagement through collaboration at national intergovernmental forums.

The 2022 NSW Flood Inquiry Report noted "when roads fail, or as they come up for renewal, betterment works should be pursued, and new funding found to support this, especially from Australian Government sources" (p. 309)⁸.

Well-targeted and sustained investment in resilience enables more connected communities, continuity of essential services for individuals, emergency services, and supply chains in impacted areas, alongside reduced environmental impact. Not only can we mitigate and adapt to future risks, but it will also save money. International disaster data research has found that for every \$1 invested in risk mitigation, up to \$10 is saved in recovery.⁹

Further, enhanced understanding of the suite of Commonwealth road-related funding programs (as well as supporting submission processes) among State, Territory, and Local governments would enhance the accessibility of such funding programs and enable improved asset management activities by road management bodies.

Recommendation 1: Improving Disaster Recovery Funding Arrangements (DRFA)

Funding arrangements for the repair and rebuild of disaster damaged transport infrastructure are complex, spanning multiple funding sources across different sectors and layers of government.

Category B under the DRFA funds infrastructure to be reconstructed to its pre-disaster condition, typically providing up to 75 per cent of costs to repair essential public assets, such as roads, bridges, stormwater infrastructure and flood levees.

While Category B does allow for the adoption of alternative, resilience-based approaches to the reconstruction of damaged, funding provided under Category B can only restore the

⁶ NSW Treasury. 2021. Intergenerational Report Treasury Technical Research Paper Series: An indicative assessment of four key areas of climate risk for the 2021 NSW Intergenerational Report

⁷ Productivity Commission, 2014. Natural Disaster Funding Arrangements. Inquiry Report 74, Canberra.

⁸ https://www.nsw.gov.au/sites/default/files/noindex/2022-08/VOLUME_TWO_Full%20report.pdf

⁹ Stafford Smith M, O'Connell D, Hardisty P. Systematically addressing disaster resilience in Australia could save billions. Ecos. 2016.

asset to its pre-disaster function. The opportunities for betterment within Category B are therefore limited and critically they are administratively complex and burdensome for councils to pursue.

There is an opportunity however to fund more significant betterment activities through Category B by expanding the guidelines to allow this in line with clear criteria and justification. This could include an instance of repeated claims on the same asset where it can be clearly demonstrated (from an engineering standpoint) that an improvement in the function of the asset will save money over the longer term (through a simple benefit-cost analysis) and deliver improved outcomes for the community.

Embedding the betterment funding available in the Category B process will not only reduce the administrative burden on councils by negating the need for councils to prepare a separate grant program application but it will also allow councils to mobilise more quickly on betterment opportunities rather than potentially holding up projects which would otherwise be subject to the determination of a separate grant application process.

Transport for NSW has established a Disaster Recovery Improvement Program to improve the community's ability to recover from natural disasters whilst maximising the potential financial reimbursement from the Commonwealth Government by improving interagency workgroup capability together with policy, administrative and economic management improvements.

Notably, this aligns to a number of recommendations of the Royal Commission into National Natural Disaster Arrangements Report 2022 related to opportunities for betterment and simplifying funding process.

Further, the DRFA, through Category D, allows funding to be provided to enhance disaster recovery funding by embedding betterment design in the restoration and repair of these assets, so they can better withstand the impacts of future natural disasters compared to their pre-disaster standard or function.

Under Category D, betterment funding is discretionary. It requires agreement by the Prime Minister in exceptional circumstances and is an inherently reactive approach to funding critical works. As an example, the \$312.5 million Regional Roads and Transport Recovery Package is jointly funded by the Australian and NSW Governments under Category D of the DRFA. Calls from all levels of government have been made to focus on betterment funding into funding made available, ensuring value for money and ability of network to handle shocks and stresses. The NSW Government welcomes all funding that embeds betterment into asset restoration – through Category B in limited circumstances as noted above or more significantly through Category D.

The NSW Government also welcomes the Australian Government's appointment of Mr Andrew Colvin APM OAM to undertake an independent review into Australia's disaster funding arrangements. The NSW Government looks forward to participating in this process to ensure disaster funding is fit for purpose and effective.

Recommendation 2: Improving support and more effectively partnering with Local Government

The NSW Government welcomes the opportunity to reconsider how we support Local Government in uplifting network resilience, expenditure could be considered simply in two ways - renewals vs upgrades:

- **Renewals** - This is the works program required to restore a road to its original design standard, undertaken periodically to improve reliability and safety. For example,

pavement replacement or drainage renewals. This would require the Australian and State governments to work closely with councils to undertake 5-year and 10-year renewals forecast.

- **Upgrades** - Enhance level of service provided by the asset, to achieve greater safety, increased capacity or greater resilience to shocks and stresses. For example, widening and lifting of a narrow bridge.

State and local governments, as road managers, cooperate to assess and determine what upgrades might be required given the need to improve overall network resilience or ensure evacuation routes are in place when disaster strikes. Upgrade priorities and funding would then be submitted to the Australian Government on a regular basis as a broader program and appropriate business case processes followed to request funding. There are well-established ways to assess business cases for upgrade funding via Infrastructure Australia, particularly if it is formally separated from maintenance budgets.

Linking expenditure with agreed customer outcomes, building Local Governments' role as an essential partner, investing in digital solutions rather than manual processes as well enhancing transparency and accountability are all key initiatives to be explored to ensure outcomes are clearly identified, fit for purpose and deliver value for money.

The Draft Australian Government-led National Service Level Standards framework (NSLS) may also help identify where roads are not meeting an acceptable level of service, what might be customer preferences for enhanced service, and importantly, identifying the resilience level that routes, corridors and roads should meet.

Improving governance arrangements for resilient transport networks

Recommendation 3: Making resilience of transport networks a standing item for ITSOC and ITMM

Road resilience, or resilience of transport networks more broadly, could be included as a standing item on the agendas for both the Infrastructure and Transport Senior Officials Committee (ITSOC) or Infrastructure and Transport Ministers' Meeting (ITMM). The benefit of this approach would be to enable national cooperation and consistency on enduring strategic issues and to address issues requiring cross-border collaboration. This collaborative approach could be particularly beneficial to the management of the heavy vehicle freight sector.

ITSOC has a Memorandum of Understanding with Austroads (an interjurisdictional body that sets technical road standards) to facilitate a closer collaborative relationship when delivering national projects. Austroads has initiated a project to develop and publish a guideline which incorporates climate change resilience in asset management (AAM6389).

Recommendation 4: Developing national road infrastructure resilience guidelines

The issues with infrastructure damage due to flooding and fires is not uniquely a NSW issue. Other states face similar issues.

Specific State or National guidelines to address resilience in road infrastructure do not exist, other than some existing guidance for bridge design.

It is recommended that a broader Australian perspective is considered, and 'Road Infrastructure Resilience' guidelines are developed through an Austroads project, alongside

being given consideration through the work underway on the national Infrastructure Policy Statement and Project Selection Framework (PSF). This would assist in providing more concerted consideration in project funding.

Recommendation 5: Creating a common data environment

Floods occur at a river basin level and what happens in one location can easily affect other locations either upstream or downstream. Furthermore, there are number of stakeholders/agencies/authorities utilising or responsible for the management of the same water resource.

It is beneficial to approach this issue at a river basin level (e.g., Murray Darling Basin level) and create a Common Data Environment (as has been initiated in Transport for NSW Digital Engineering Services for Transport Infrastructure), to enable all stakeholders to have access to a single source of truth. Any development, modification or changes to the infrastructure that is proposed or carried out by one agency/authority would available to all stakeholders in real time, so that they can provide their timely input, at the early stage of development and eliminate conflicts or late changes to the project.

Any related issues

New ways of working with councils

In response to the February and March floods of 2022, Transport for NSW worked alongside northern NSW councils to better understand the urgent repair works required by each council and piloted offering tailored support models as a result. The support models included:

- Entry support: Transport for NSW provides proactive, administrative and claims management support to ensure that Natural Disaster Recovery funding claims are completed, assessed, and paid in a timely manner
- Enhanced support: Transport for NSW light management/surveillance and technical advice such as engineering, geotechnical and other specialist advice as required
- Embedded support: Transport for NSW provides councils with a dedicated project manager whose role is to facilitate direct negotiations with NSW Reconstruction Authority to support assessment and approval process
- Direct delivery support: Transport for NSW negotiates based on council need and provides direct delivery on behalf of councils

As part of the NSW Government's expansion of the above pilot and in collaboration with Lismore City Council, Transport for NSW has embedded a dedicated project manager to support Council rebuild its network with repairs to local flood-affected roads and bridges in response to the February and March 2022 severe weather and floods.

Transport for NSW regularly meets with councils to progress their individual DRFA funding, with multiple site inspections covering and assessing claims.

Transport for NSW has also established a formal natural disaster team with 12 staff supporting northern NSW councils to help with natural disaster funding advice, assessment, processing, and management.

Transport for NSW recognises that natural disaster management must be viewed as an ongoing and ever-present challenge. It is no longer an ad-hoc challenge to be managed on rare occasions. As such, investment must be made in a permanent focus on preparedness, response and rebuilding. Transport for NSW is investing in an appropriate level of permanent team expertise to ensure this occurs and welcomes the opportunity to build processes, systems and governance arrangements streamlining government support to Local Government.

Future opportunities

The NSW Government welcomes the chance to contribute further on opportunities to enhance resilience on the transport network, both road and rail, and is eager to assist the Australian Government representatives on working groups and other collaborative cross jurisdictional approaches.

Similarly, the NSW Government would welcome a similar review of the rail network, because when there is a failure in the rail network, there is a significant impact on the road network. This was evident in 2022, when thousands of tonnes of freight was moved to the road network, as a result of disruptions experienced on the rail network.

Appendix A

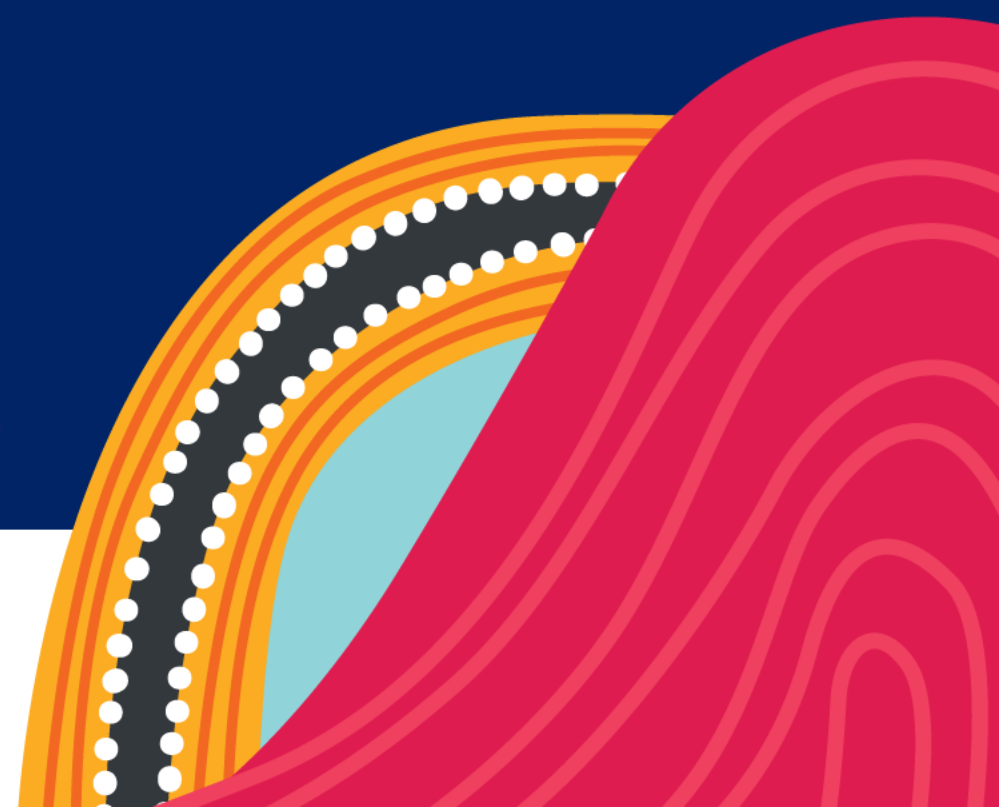
Opportunities to enhance resilience outcomes on NSW transport network

Standing Committee on Regional
Development, Infrastructure and
Transport

Inquiry into the implications of severe
weather events on the national, regional,
rural, and remote road networks



transport.nsw.gov.au



Regional Transport Resilience Program

Since July 2018 NSW has been impacted by 65 natural disasters devastating our regional communities, state transport infrastructure and particularly hitting local and regional networks, stretching local government capacity. The floods that impacted NSW and south-east Queensland in February-March 2022 were the fourth most-expensive natural disaster in the world last year (Munich Re's 2022 natural catastrophe report shows) and resulted in an estimated loss of economic activity at \$5 billion. The damage from these events has resulted in 13,000 kms of road infrastructure damage and between \$2.5-3 billion in new work over three to five years for which Transport for NSW is responsible.

Strategic investment in resilience enables us to save money in the long run, and builds capacity to better withstand and bounce back from natural disasters, mitigate, and adapt to future risks. International research shows currently 97 per cent of Government investment is in disaster recovery and only 3 per cent is in mitigation yet we also know that for every \$1 invested in mitigation, \$10 is saved in recovery.

This program will establish the requirements to uplift Transport for NSW ability to deliver infrastructure, community, and organisational resilience. As the impact of natural disasters in NSW increases, a greater investment is required in prevention and preparedness to move beyond responding and recovering from natural disaster to strategies that decrease community disruption impact and infrastructure recovery costs.

This program is currently being considered through funding prioritisation processes, including within Transport for NSW and Federal Budget Submissions.



Scope

- Develop case studies to outline the function and need of selected corridors and provide a holistic view into current network performance.
- Develop a network exposure and visualisation tool to provide insights into improvements required to uplift TfNSW's maturity in the way data is captured for natural hazard vulnerability, exposure and criticality.
- Develop a 10-year road map and supporting business cases, to build lasting resilience in communities. This will identify the frameworks, processes, systems, and partnership agreements required to help mitigate the impacts of natural disasters and improve organisational, community and network resilience.
- Develop a strategic program business case, to fast track road infrastructure resilience improvements at known network locations identified through resilience case studies

Program objectives

- Establish the requirements to uplift Transport for NSW ability to deliver regional and outer metropolitan infrastructure, community and organisational resilience.

- ☐ **Case Studies – In Progress** Seven case studies underway across all three regions.
- ☐ **Regional Transport Resilience Road Map – Unfunded**
- ☐ **Program Business Case – Unfunded**
- ☐ **Individual Final Businesses - Unfunded**

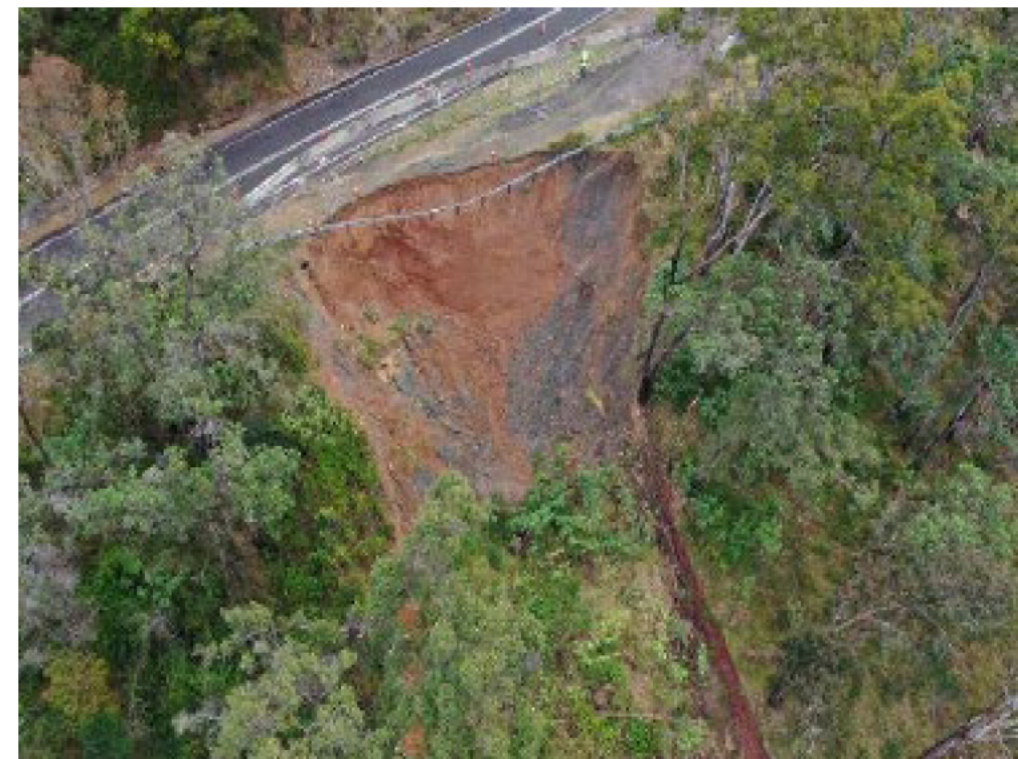
DRFA Improvement Program

NSW has been impacted by multiple significant natural disasters, from extreme storms and flooding in 2021 and 2022, the 2019-20 NSW Bushfires and extreme drought through 2017-19. The severity of these weather events in NSW has had devastating impacts on communities and the economy.

Funding arrangements for the repair and rebuild of disaster damaged transport infrastructure are complex, spanning multiple funding sources across different sectors and layers of government.

Transport for NSW has established a Disaster Recovery Improvement Program to improve the community's ability to recover from natural disasters whilst maximising the potential financial reimbursement from the Commonwealth Government through the establishment of an interagency workgroup to streamline and optimise policy, administrative and economic arrangements.

This program is focused on establishing fit-for-purpose governance, processes, systems, tools ensuring funding is provided to areas of the transport network where is needed most. For councils, it aims to simplify processes and free up cash flow to enable faster, more efficient recovery and reduce community impacts.



Scope

- Problem identification – Understanding the current state, root cause analysis and areas for improvement
- Governance frameworks – Develop fit-for-purpose governance frameworks to enable effective assurance
- Project administration costs reimbursement – Proposal to seek reimbursement for administration cost for the DRFA
- Internal system and process improvements – Identification and development of systems and processes
- Structural improvements in collaboration with NSWRA and NEMA

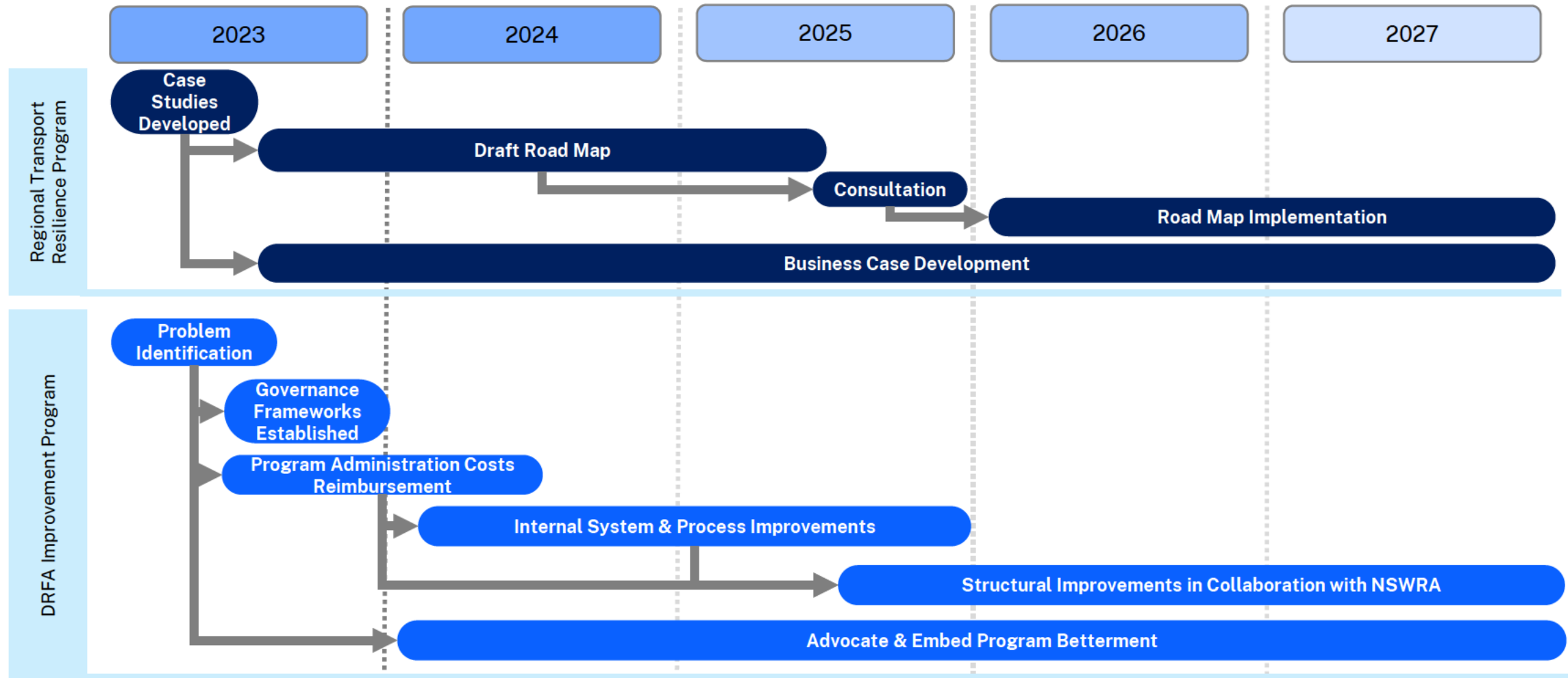
Program objectives

- Fit for purpose governance, processes, systems and tools which ensures funding is provided to areas of the transport network in most need and for councils it will enable faster more efficient recovery by significantly reducing their financial burden and ensuring community impacts are greatly reduced.

- ☐ Problem identification – In progress
- ☐ Governance frameworks – Initiated
- ☐ Project administration costs reimbursement proposal – Initiated
- ☐ Internal system and process improvements – Not commenced
- ☐ Structural improvements in collaboration with NSWRA and NEMA – Not commenced

Timeline

TRANSPORT



Hawkesbury Nepean Valley Flood Evacuation Road Resilience Program

TRANSPORT

Floods in the Hawkesbury Nepean Valley (HNV) can significantly impact people's lives, livelihoods, and homes. It has the highest flood exposure in NSW due to its unique landscape and large existing population.

The HNV Flood Evacuation Road Resilience Program is a key initiative of the HNV Resilient Valley, Resilient Communities – Hawkesbury Nepean Valley Flood Risk Management Strategy, which was released by the NSW Government in 2017. This program is among the four initiatives being implemented by TfNSW to address the challenges posed by flood risks in the region.

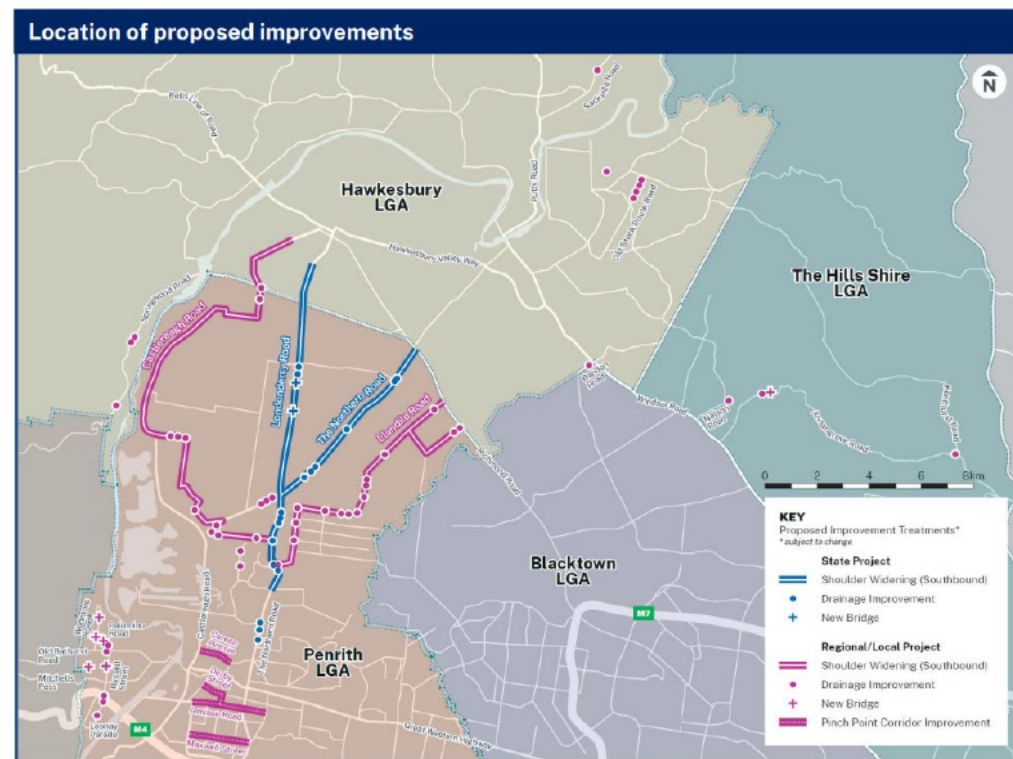
The NSW and Australian Governments have committed \$33 million towards planning for more than 100 improvements to make the flood evacuation network more resilient.

Scope

- TfNSW has identified road improvements along the flood evacuation routes to improve road resilience and help mitigate the risk of local and flash flooding by providing adequate drainage at key low points to provide safe evacuation for the impacted population. The proposed works will provide a local flood immunity of 1:500.
- The proposed infrastructure improvements include road widening, new culvert and bridge structures, road raising, pinch point upgrades, and drainage works across four Western Sydney LGAs (Penrith, Blacktown, The Hills Shire, and Hawkesbury).
- The Road Resilience Program does not address major/riverine flooding nor the day-to-day road network requirements under normal traffic conditions.

Program objectives

- Improve the capacity and efficiency of existing evacuation routes
- Minimise the potential for disruption to the flood evacuation route network
- Lower flood risk within the valley, supporting its continued future development



☐ **Strategic Business Case – completed.**

☐ **Concept Design / Final Business Case – in progress.** TfNSW will be undertaking the Concept Design activities in collaboration and consultation with key stakeholders, including iNSW, SES, DPE, local councils and utility providers.

☐ **FBC completion and INSW Gate 2 review for an Investment decision for delivery - targeted for the end of 2024.**

