

# Resilient transport networks

Severe weather events and other major shocks have an inordinate impact on our large and complex transport networks. While we cannot eliminate disruption, we can improve the resilience of passenger and freight transport, build redundancy into our networks, and build the digital platforms that keep our customers safe and informed. Our goal is to support resilient communities and a resilient economy.



## Costs of disruption

Extremes of weather carry enormous costs. Recent disasters, such as the 2019–20 bushfires, floods and the COVID-19 pandemic, have demonstrated the impact of unanticipated events on infrastructure networks, with regional areas often disproportionately impacted. The bushfires caused \$90 million of damage across the State and affected 880 kilometres of State roads, as well as major rail lines. While many major events are unanticipated, the increasing frequency of extreme heat events is one example of how disruption risks could grow in the future. In 2019, there were 33 days that exceeded 39°C, nine more than the number from 1960 to 2018 combined.<sup>1</sup>

These events have ramifications not just on the costs to rebuild existing infrastructure, but on decisions about where growth will occur, to what standards new infrastructure should be built, and at what cost.

In addition to the damage to roads, railways, bridges and other assets, and the disruption to freight and the businesses and people who rely on deliveries, natural disasters bring less tangible social costs. These include stress, emotional trauma and short-term unemployment. According to Deloitte Access Economics, the social costs of natural disasters in Australia can equal the physical costs, and will rise to an average of \$33 billion per year by 2050 unless action is taken to increase resilience.<sup>2</sup>

Today, as Transport for NSW works to keep critical transport networks operating amid the COVID-19 pandemic, we are reminded that resilience is more than coping with extreme weather. As more and more of our systems and services move online, digital disruptions and cyber threats are real risks to our networks and our customers.

We are working with Resilience NSW, other NSW government agencies, councils and the Australian Government and to be part of coordinated efforts to help communities, particularly our passenger and freight customers, during all types of disruptions.

Alongside other NSW government agencies, we are contributing to the State Resilience Strategy to help bring cohesion to work across government, contribute to Statewide priorities, and engage communities in resilience work.

## Our climate is changing

Australia's climate has always been characterised by variability. But cycles of flood and drought as well as extreme weather are becoming more intense and frequent. Last year, 2020, was the warmest year on record, and the preceding seven years were the warmest seven on record.

The NSW and ACT Regional Climate Modelling project has developed regional climate projections for south-eastern Australia. Projections to 2030 are described as 'near future', while 'far future' is used for 2060–2079.

### Western Sydney heat

While the frequency of very hot days varies considerably from year to year, the number of very hot days in Greater Parramatta has doubled since the late 1960s and there have been significant increases in Penrith since the mid-1990s. Climate projections from the NSW and ACT Regional Climate Modelling project suggest that very hot days will become increasingly common. The frequency of very hot days in inland locations such as Penrith, which already experience more very hot days, may increase at more than double the rate of locations close to the coast.

This means there will be more disruptions to transport networks and risks for people walking and cycling, particularly for those people who are older or otherwise vulnerable. It leads people to using cars more often, even for very short journeys.

<sup>1</sup> Bureau of Meteorology, 'State of the Climate 2020', Australian Government, Canberra, 2020.

<sup>2</sup> Deloitte Access Economics and Australian Business Roundtable for Disaster Resilience & Safer Communities, 'The Economic Cost Of The Social Impact Of Natural Disasters', Sydney, 2016

NSW is expected to experience an increase in all temperature variables (average, maximum and minimum) for the near future and an even greater increase in the far future. Maximum temperatures are projected to increase by 0.7°C in the near future and up to 2.1°C in the far future. Summer and spring will experience the greatest change with maximum temperatures increasing by up to 2.4°C in the far future.

Minimum temperatures are projected to increase by 0.7°C in the near future and up to 2.1°C in the far future. Increased overnight temperatures (minimum temperatures) can have a significant effect on human health especially during heatwaves. The greatest increases in average temperatures are projected for north-western NSW during summer.<sup>3</sup>

Changing climate conditions have also led to an increase in extreme climate events. According to the CSIRO's 'State of the Climate 2020' report, higher average temperatures have increased the frequency of observed extreme weather conditions including:

- › more days with dangerous bushfire conditions (particularly in western and south-eastern NSW)
- › more heat extremes
- › more intense, short rain events
- › more time in drought (particularly in southern NSW) due to lower winter rainfall and higher temperatures
- › increased flooding events in coastal areas as sea levels are now 25 centimetres higher than in 1880.

Governments and industry will increasingly need to consider climate change adaptation and system resilience to minimise the consequences of asset and service failure. Climate change adaptation and emissions reduction efforts will not only reduce social, environmental and economic risks, but enable new opportunities to be exploited and stimulate innovation.



**How should we incorporate climate change when planning for new centres or cities, and major new infrastructure?**

## Managing journeys during disruption

### Improving vital routes

In light of these increasing challenges we face as a community, Transport has shifted from a traditional risk planning approach – which attempts to avoid threats to transport networks – to improving the resilience of passenger and freight customer journeys. We do not measure our success solely on the number of landslides we clear or highways we open, but on how our passenger and freight customers get through major disruptions.

Where there are no alternative routes for passenger and freight customers we must manage the road, rail or other infrastructure in a way that pre-empt impacts from various threats, such as maintaining drainage before major storm events, maintaining roadside vegetation before fire seasons, or planting around corridors with more fire-resistant plants.

<sup>3</sup> NSW and ACT Regional Climate Modelling. Available at Adapt NSW, '[NSW and ACT Regional Climate Modelling](#)'

Where surrounding secondary networks or transport modes exist, we must work in partnership with industry, councils and others to invest in the networks to safely detour passenger and freight journeys along these routes or transfer to other modes to minimise disruptions.



**What are the best ways for Transport to improve the resilience of passenger and freight journeys during major disruptions?**

## Information leads to safer journeys

Getting information to our customers is critical to understanding how and when journeys can be safely resumed or redirected. This is particularly important in communities at higher risk from natural disasters such as bushfires and flooding. Certainty for customers allows them to make better judgements about safety and risk, including the decision to avoid travel altogether and seek assistance in other ways.

During the 2021 floods, Transport's website [livetraffic.com](https://www.livetraffic.com) experienced a surge in customers seeking real-time information about road conditions. Visits to the website and mobile apps increased to 20 times the daily average. On the busiest day, there were over 586,000 visits, and throughout the 16-day weather event, there were more than 3.36 million visits to the website and apps. We also share real-time data openly with platforms such as Google Maps, Apple Maps, Waze and Tom Tom.

Information is important long after the emergency is over. Using regular social media updates, Transport kept the residents of the mid-North Coast and Port Macquarie areas informed of progress to reopen roads and bridges, and explain why some routes remained closed.

Some corridors affected by the 2019 bushfires were cut again by the floods of March 2021, isolating communities again, and exposing vulnerability in important east-west routes. Sharing information helped retain trust, gave certainty to affected communities, and encouraged a two-way flow of information about local conditions and needs.

The COVID-19 pandemic demanded safety and travel information of a very different kind. Transport monitored patronage and crowding in near real time, giving our customers predictive and personalised notifications to support physical distancing. We delivered it via the Opal Travel app, and made it freely available in real time to third-party apps, such as Google Maps and Tripview. A travel insights tool was used to show trends on the network, and help inform public health responses.

## Mobile coverage to bolster resilience

Improving mobile coverage along major transport road and rail corridors across the State means customers can contact family, friends or emergency services for help or for information about disruptions; can use digital accessibility tools such as translation, visual or hearing tools; can access information about connecting services, disruptions or traffic conditions; and can enable customers to stay connected during major disruptions.

Better coverage also helps Transport operate safer and more efficient networks.



**What options are there for improving communications in remote and regional areas?**

## Investing in one transport network

Taking a one network approach to customer journeys recognises that ownership or funding of infrastructure is of little relevance to our customers during disruptions to their journeys. Customers are not concerned whether a motorway, bridge or street is owned by the local or State Government – their focus is travelling to their destination in the safest and most efficient way.

Local roads often provide crucial regional connections and network redundancy. Transport is looking at developing network plans to identify routes on the basis of their contribution to journeys rather than ownership, and investigate funding pathways to enable more agile and resilient networks for customers to safely travel on, particularly when disruptions take place.

Further, to help improve the quality and function of local roads, Transport is undertaking the NSW Road Classification Review which could see the transfer of up to 15,000 kilometres of council-owned and managed roads to State management. A key consideration for reclassifying a road is whether it could support network resilience, emergency planning and regional economic productivity.



**What are the main obstacles to a one network approach and how can they be overcome?**

## Technology and systems for infrastructure resilience

Risks are constantly evolving and Transport needs to stay alert to future risks that may impact the community and businesses. Beyond climate change, shocks and stresses can come from cyber risks, financial risks, terrorism, geopolitical risks that might affect supply chains, and pandemics.

### Technologies for resilience

New technologies are improving our ability to identify risks, monitor our assets, and accelerate recovery. These technologies include:

- › Connected sensors and processors on assets and vehicles, which allow information on conditions to be collected and analysed quickly.
- › Big data analytics allow Transport to turn vast volumes of data into useful information that can help identify trends, predict outcomes, and support swift decision making and responses.
- › Early warning systems provided by the Bureau of Meteorology, Rural Fire Service, State Emergency Service, Geoscience Australia, NSW Police and Department of Defence can be used to improve our preparedness for natural hazards and human-induced risk events.
- › Aerial drones are a versatile tool for gathering information. They can be used for routine inspections of both transport assets and background conditions, such as bushfire fuel loads or soil moisture. During emergencies, they can safely monitor rapidly changing flood levels and fire fronts, and in the immediate aftermath help inspect damage and coordinate recovery.



**How can the three levels of government better coordinate responses to improve the resilience of communities during major disruptions?**

## Security for digital systems

Risks are constantly evolving. As digital systems become a critical part of transport networks, Transport is focusing on keeping them secure, safe, private and robust. We are improving data governance, upgrading privacy protections, investing in cyber security, and training staff to better understand cyber security risks.

## Resilience for energy supplies

Australia's supply chains have so far proved generally resilient in response to the COVID-19 pandemic, but that experience, following soon after the devastating 2019 bushfires has highlighted Australia's potential vulnerability to supply chain disruptions. Panic buying of some goods, notably personal protective equipment, and the imposition of export restrictions on these products by some countries added a degree of urgency to the unfolding situation. For Transport, supply chain issues pose a risk to delivering and maintaining assets, and to the delivery of freight goods.

Dependence on imported technologies and fuels is a key long-term risk for transport systems. Australia relies heavily on international imports for liquid fuels, most of which are consumed by the passenger vehicle fleet. Diesel fuel is important for resilience because it can fuel heavy vehicles, construction equipment and emergency generators. Emergency reserves hold just over 3 weeks of diesel and petrol. In early 2021, the Australian Government announced a Fuel Security Package to increase local storage of petrol and diesel, maintain local refining capacity, and establish minimum stockholding obligations.

The **'NSW Electric Vehicle Strategy'** and the **'NSW Zero Emissions Bus Transition Strategy'** will reduce fuel risk by accelerating the uptake of zero emissions vehicles powered by the NSW grid. Transport's new zero emissions bus fleet, which will replace its 80.00 diesel and compressed natural gas buses, will be powered by locally produced energy sources.



**How can fleet electrification support both strategic and weather related resilience?**



**Have your say**

Please provide your feedback at  
[haveyoursay.nsw.gov.au/future-transport](https://haveyoursay.nsw.gov.au/future-transport)

## What happens to my feedback?

Thank you for sharing your views with Transport for NSW. We will consider your input and will share the draft Future Transport Strategy when it is published via the email address you provided.