



Responding to Climate Change

Supporting the Net Zero Transition Asset Resilience

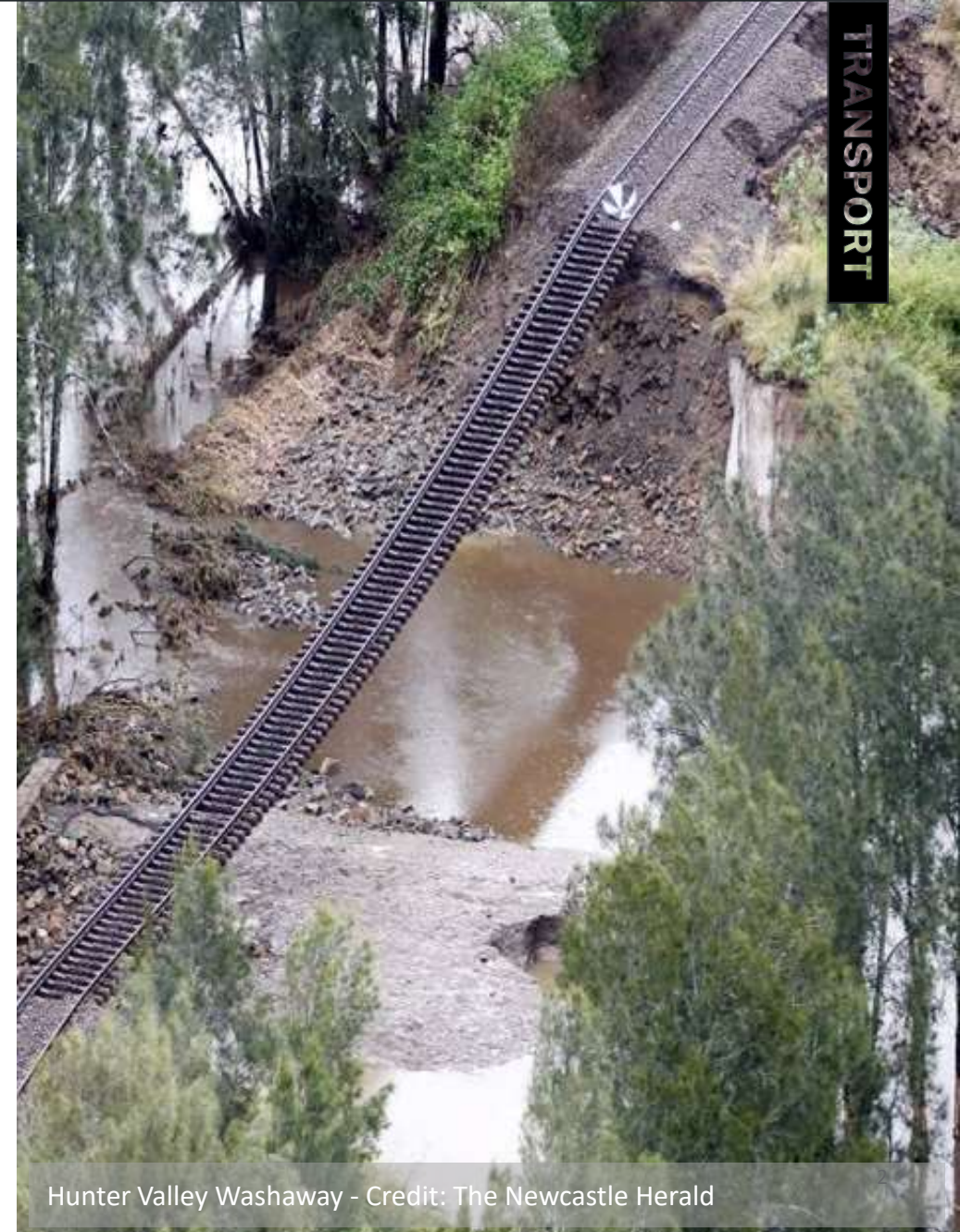


Mark Smith, Executive Director Advanced Technical Services
Gavin Cavanagh, Senior Manager Systems Engineering & Asset Resilience

PWI Technical Seminar
Resiliency In Rail Infrastructure
7th March 2024

Agenda

1	Introduction & Climate Change Policy Context	Mark Smith
2	Weather & Climate Effects	
3	TfNSW Asset Resilience Approach	
4	Asset Resilience Strategy & Framework	Gavin Cavanagh
5	Questions & Answers	



Hunter Valley Washaway - Credit: The Newcastle Herald

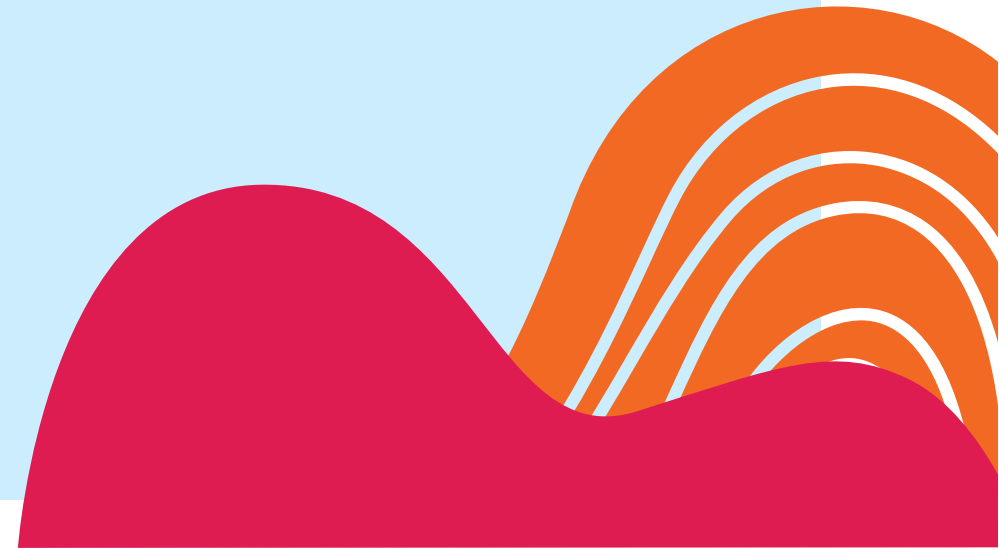
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Introduction & Climate Change Policy Context

Mark Smith

Executive Director
Advanced Technical Services

Technical Services, Infrastructure & Place Division
Transport for NSW

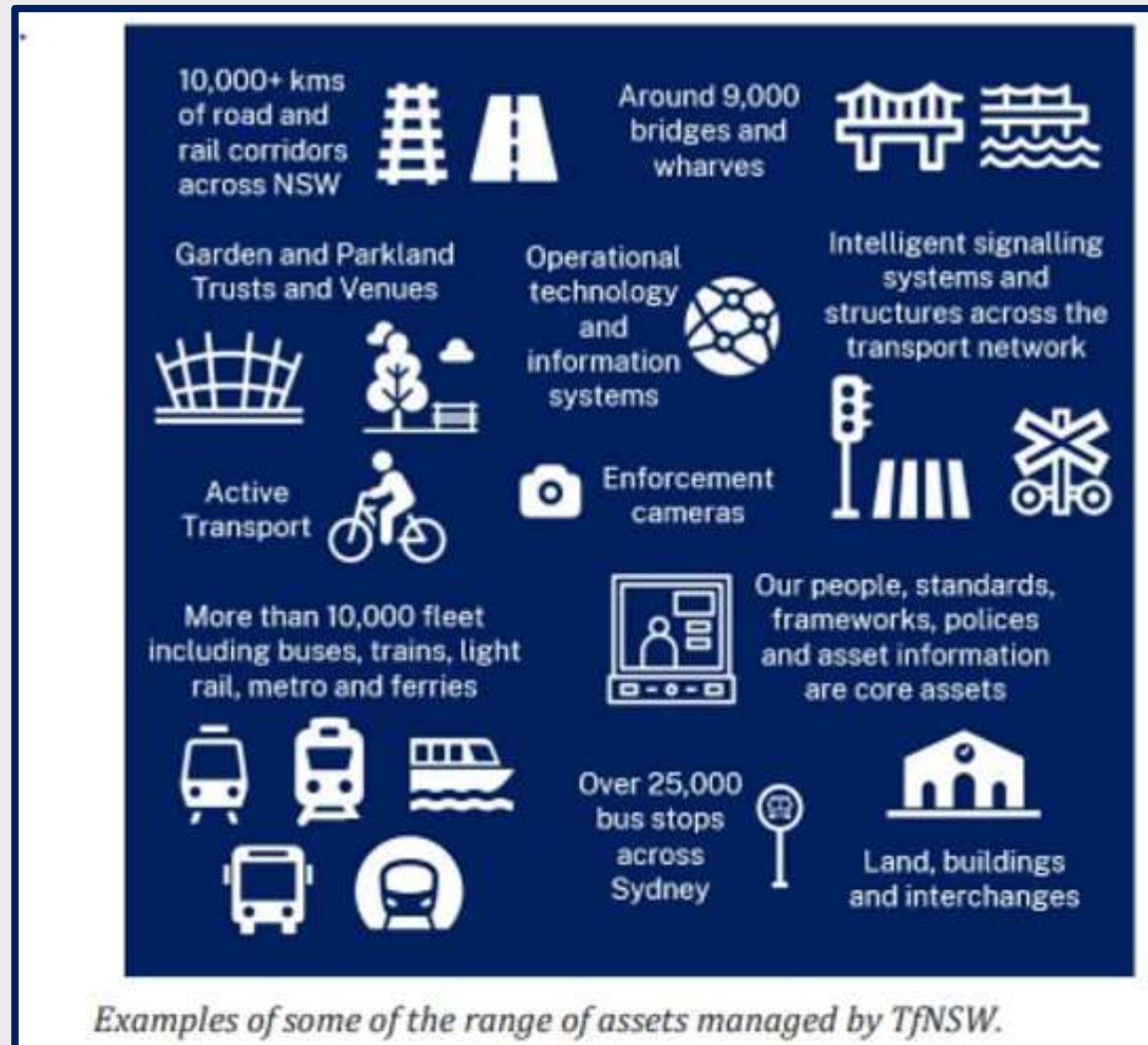


New South Wales within Australia



- New South Wales is Australia's most populous state - The 2023 population forecast for New South Wales is 8,297,000 and is forecast to grow to 10,048,000 by 2041).
- 5th largest state in size - The area of New South Wales is 809,444 km² (312,528 sq mi). The coastline is 2,137 km (1,328 mi) in length.

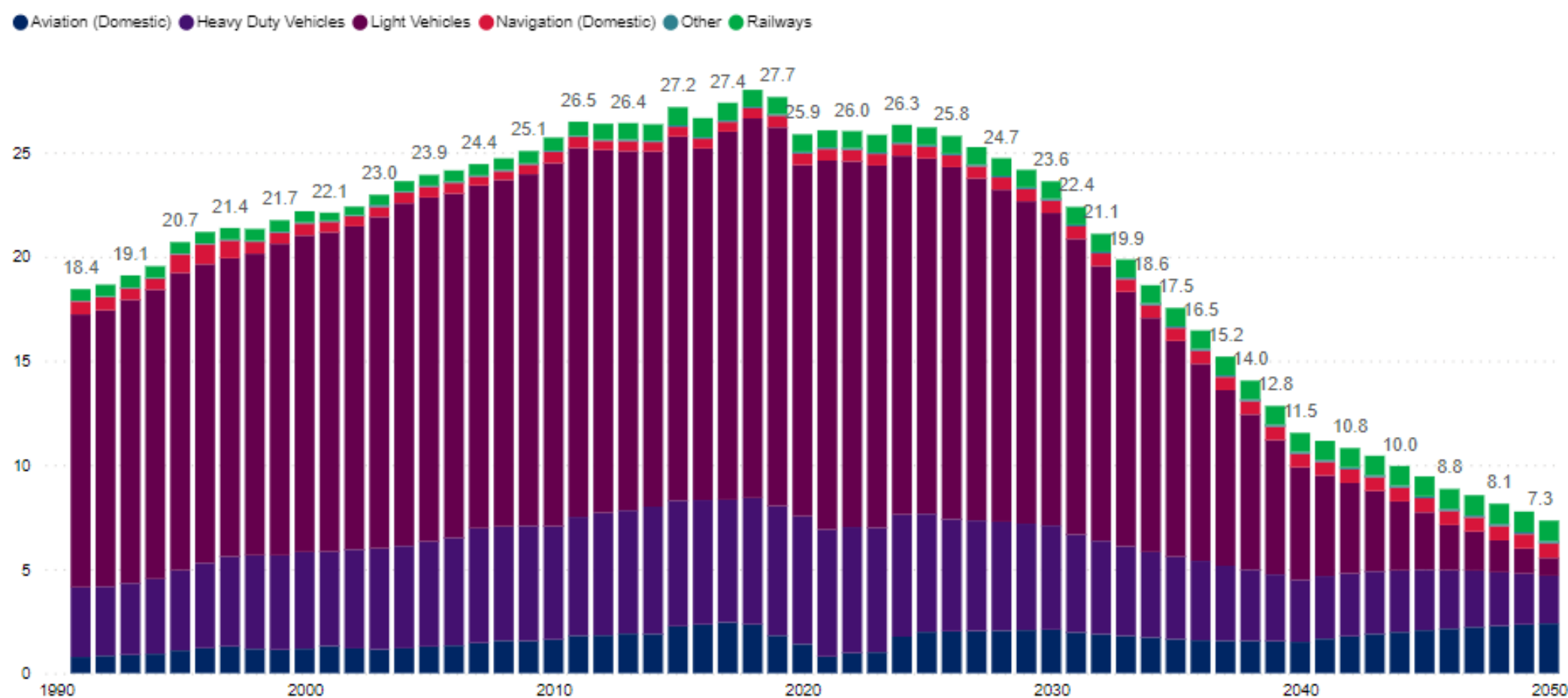
TfNSW Assets & Infrastructure



Transport for New South Wales

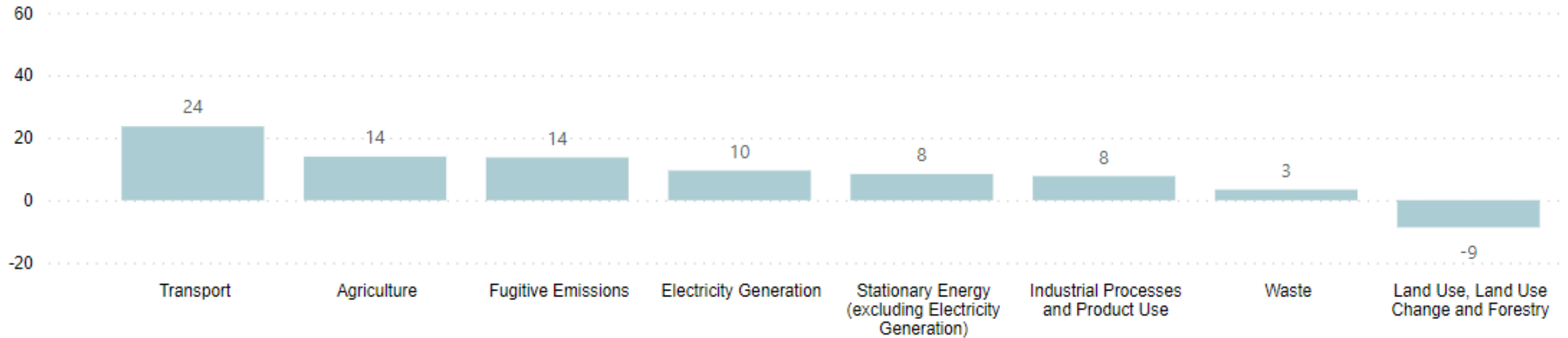
- Provision of transport services for the NSW population
- Multi modal – all transport modes
- Covers the whole of NSW & interstate
- Collective of transport agencies
- \$61 billion in asset & infrastructure value
- Significant investment in a statewide capital investment program in the last 10 years
- Work with industry partners to provide & operate/maintain assets over their life cycle

Transport sector emissions will increase to 2026



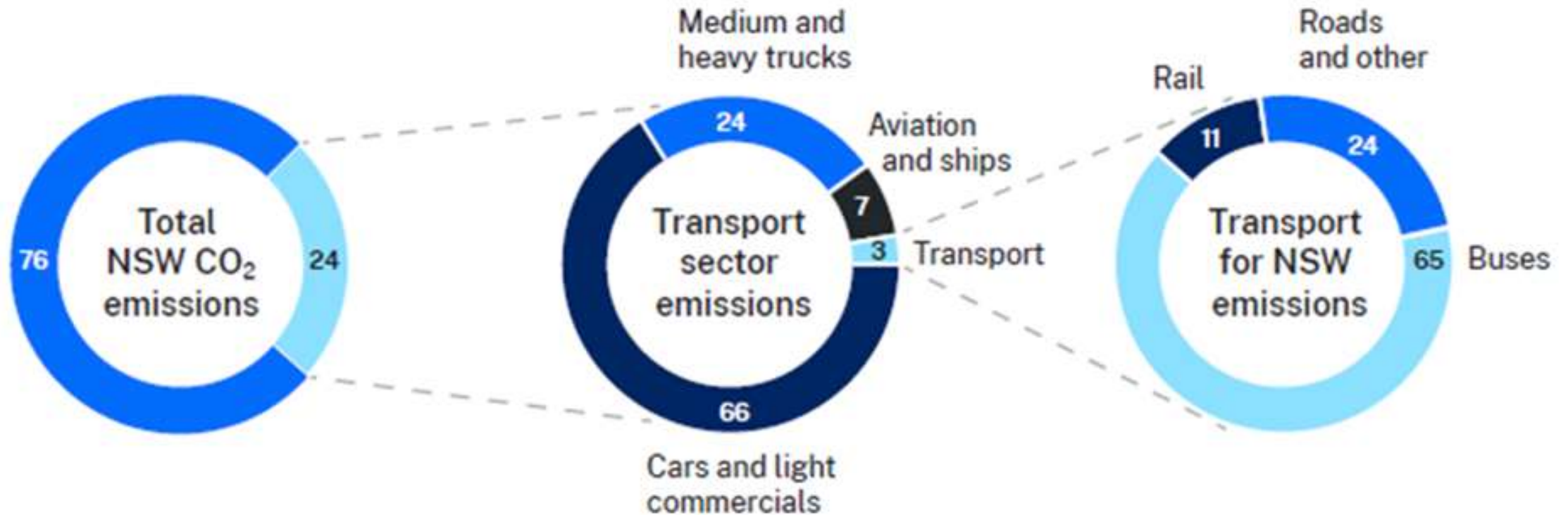
(MtCO2-e, Source: NSW Net Zero Emission Dashboard)

Transport will be largest sectoral source of emissions in 2030



(Emissions by sector under current policy, 2030, MtCO2-e, Source: NSW Net Zero Emission Dashboard)

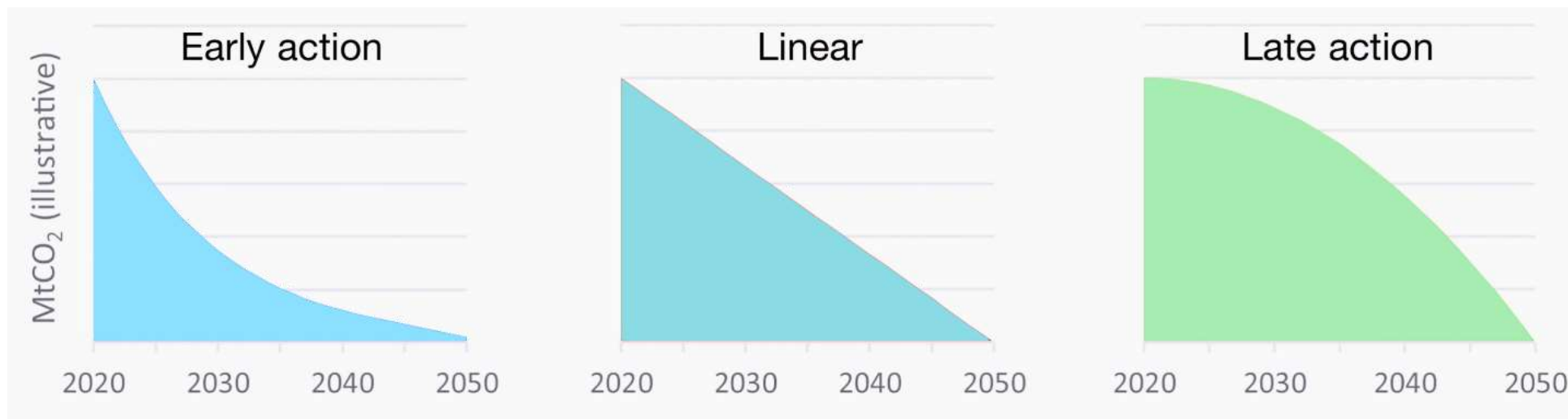
Users of Transport networks dominate emissions



Source: Future Transport, Future Energy Strategy

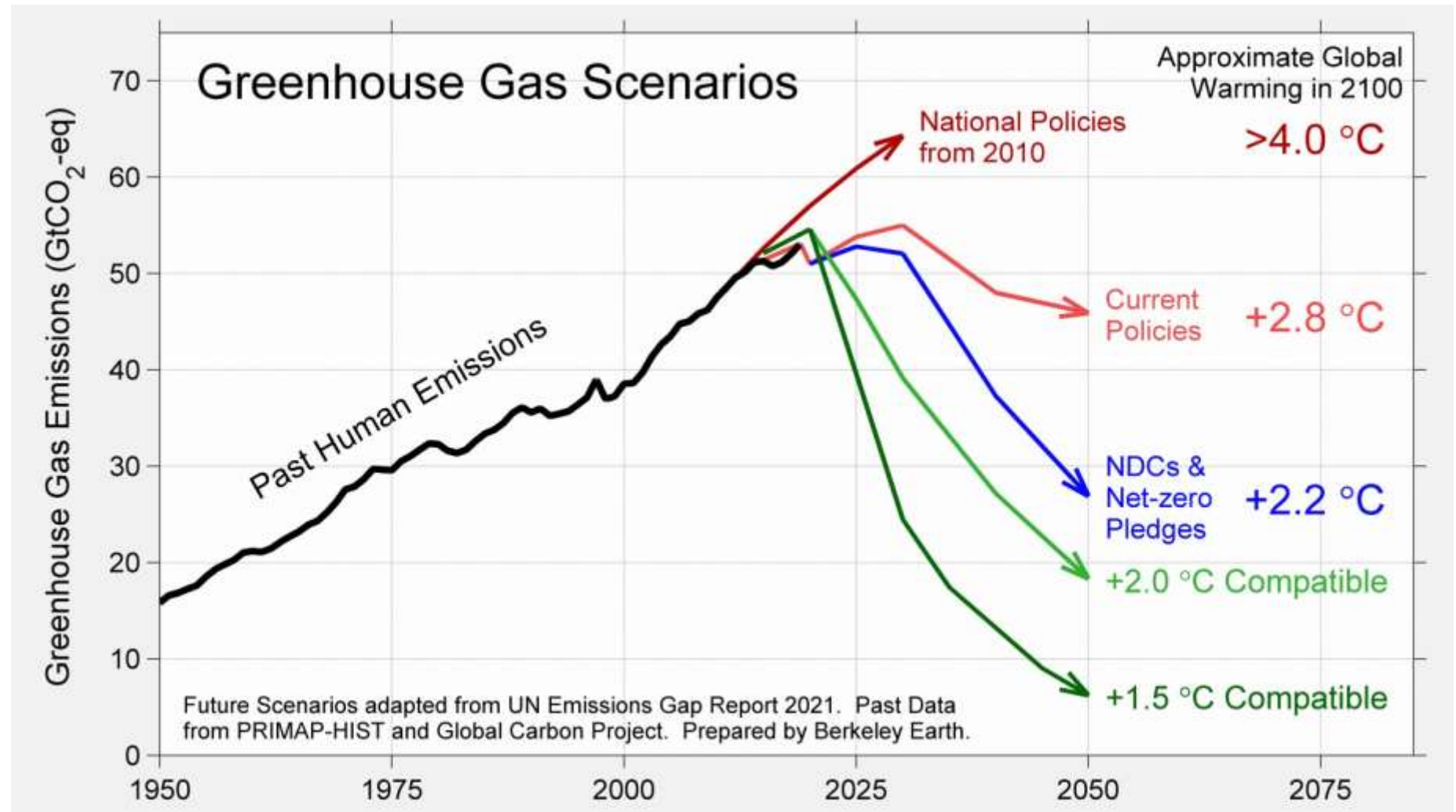
Our carbon trajectory is critical, not the end target

- Each action reaches the same 2050 Net zero goal
- But late action pathway results in 2x emissions of early action



**Transport
taking the
lead is
critical**

Our current trajectory



Our passengers want Net Zero Transport

- 49% indicate that the use of Zero Emission energy would **improve perceptions** towards public transport
- 30% are willing to **pay extra** for zero emission public transport
- 28% would **increase** how often they travel on public transport if powered by zero emissions energy
- Customers want to see ambition



“

I think they are covering themselves: *‘We’re going to do it but we’re going to do it in twentysomething years’*. Are we serious about this or not?

Western NSW

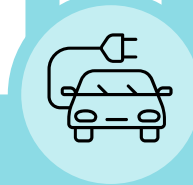
Four Pillars of Transport Decarbonisation



Operational Emissions

Electrify and use renewable electricity

Demand reduction and energy efficiency



Enabled Emissions

Accelerate uptake of EVs and infrastructure

Towards Net Zero Emission Freight Policy



Construction Emissions

Sustainable Infrastructure Program

Low carbon supply chains

Net Zero Cities Action Plan



Investment Decisions

Prioritise investments that support low carbon targets

Ensure veracity of carbon offsetting



NET ZERO

Avoid the
unmanageable

Reduce emissions
that cause climate
change

ADAPTATION

Manage the
unavoidable



Cope with impacts that
have already occurred
and will occur as a result
of climate change



Transport Net Zero and Climate Change Policy

The targets are:

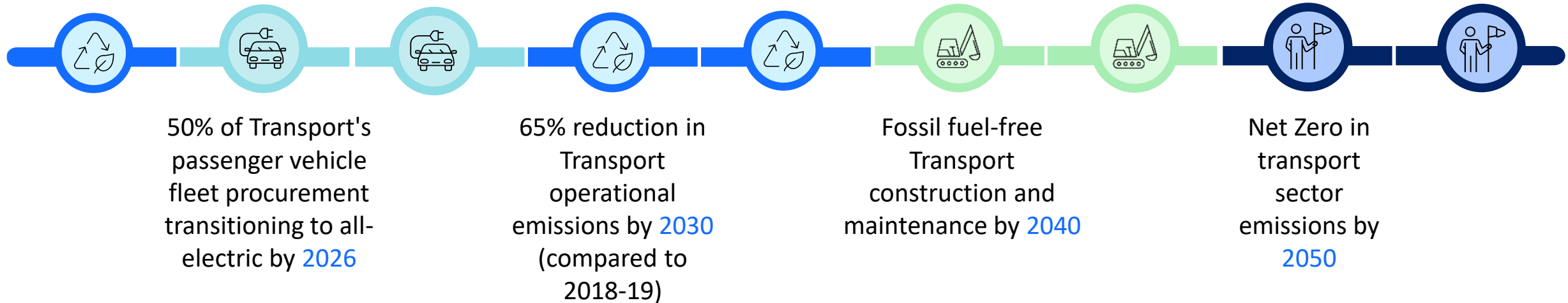
100% renewable energy for all operational electricity for the rail, light rail and metro train network by 2025

100% of Transport passenger vehicle fleet procurement transitioning to all-electric by 2030

Net Zero in Transport operational and fleet emissions by 2035

Net Zero in Transport's annual embodied emissions by 2045

Net negative transport sector emissions by 2060



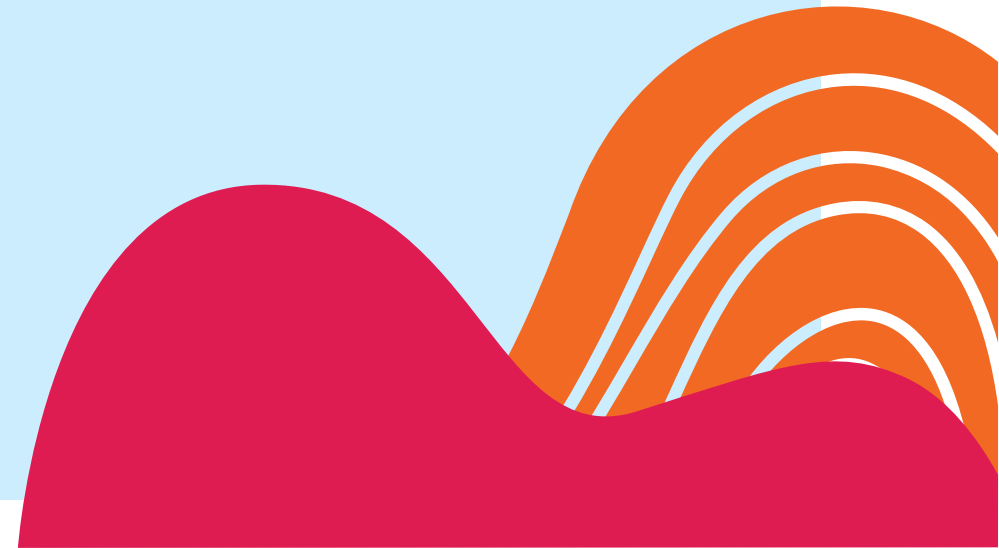
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Asset Resilience – Weather & Climate Effects Australia

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Senior Manager Systems Engineering & Asset Resilience

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Katherine – NT Floods 1998



- The flooded area was the size of France & Germany combined
- Weather system started in barrier reef & moved across to Western Australia
- The severity changed from a cyclone to a rain depression on three occasions

Condobolin Track Washout

- This occurred in Western NSW during October 2022
- Track repairs took three and half months to complete
- The result was no train services, which included the inter-state rail journey (Indian-Pacific) connecting Sydney to Perth

North Coast Line Fire Damage



- This occurred within the summer of 2019 due to intense bush fires
- The result was extensive buckled track on sections of the North Coast Railway
- Three years later same rail line dealing with a dozen or more washouts due to flooding

Bushfire Season

Its any dry summer !

- A typical Australian bushfire incident occurs anywhere between October and May
- Emergency Services have to deal with hundreds of fires simultaneously state-wide and nationally
- Bushfires have major impacts on road and rail corridors, especially in regional areas



Flood Season

Any typical wet season



- A typical Australian flooding incident occurs anywhere between October to May
- Flooding results in multiple road closures and follow on repairs
- The photo shows flood damage to the Cobb Highway (Western NSW) impacting 35km of road
- Floods have major impacts on road & rail corridors, again often worse in regional areas

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TfNSW Asset Resilience Approach

Gavin Cavanagh

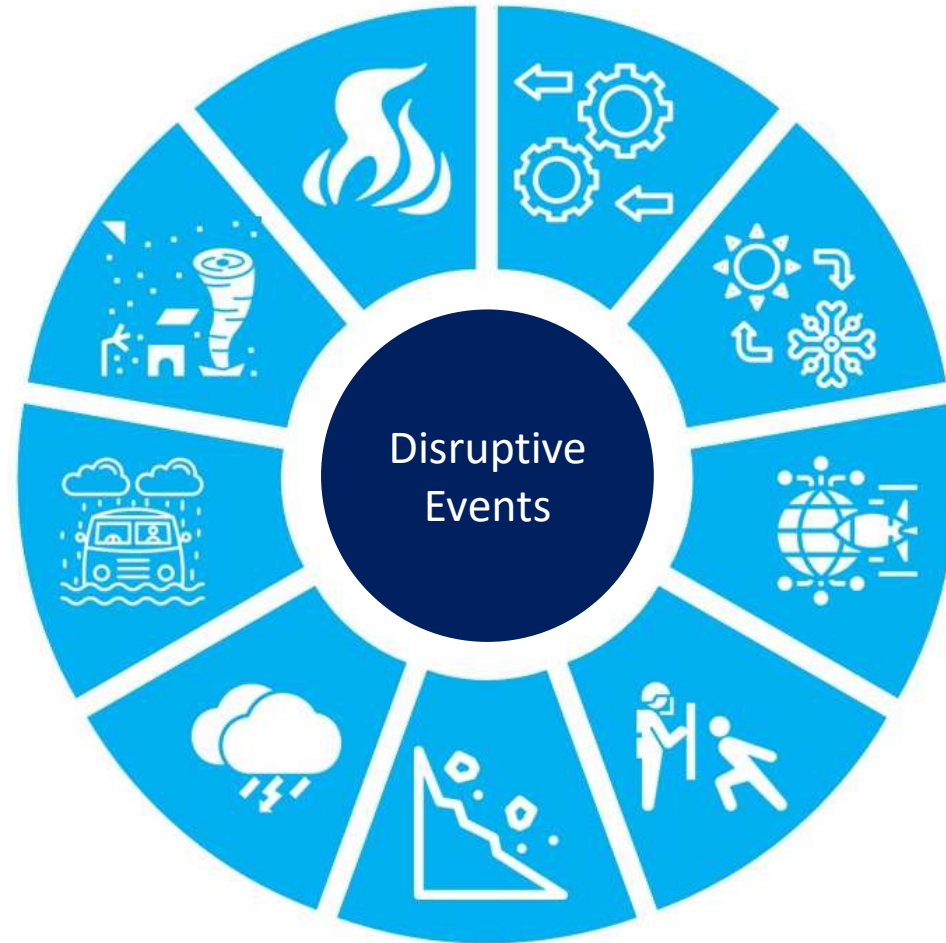
Senior Manager Systems Engineering & Asset Resilience

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Asset Resilience

The ability to recover to an acceptable level when subject to a hazard

Asset resilience is the ability to **anticipate, adapt, respond, recover** and **rebound** in the face of adversity, disruption and ongoing **change**



Asset Resilience

Typical threats to Transport Assets & Infrastructure



Asset Resilience

Objective and key principles

Aims to **improve**
Transport network **asset**
resilience ...

... and **assure** asset and
service safety, security,
availability, reliability and
performance

Government
Alignment



Whole of
Life



Financial
Sustainability



Transport
Consistency



Build Back Better



Innovation &
Improvement



Resilience Actions

Typical response options available to asset custodians and stewards to assure resilience



Threat/Risk
Prediction



Asset/System
Redesign



Emergency Planning



Threat Detection/
Early Warning



Emergency Response



Emergency Repairs



Long-Term Repairs



Lessons Learned



Adaptation

Resilience Engineering Techniques

Examples that could be applied to Transport assets & services



Absorption



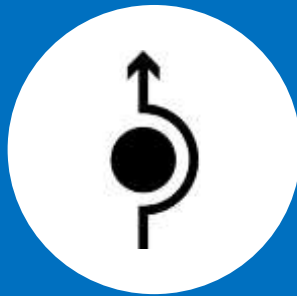
Redundancy



Human in the Loop



Shielding



Avoidance



Complexity Avoidance

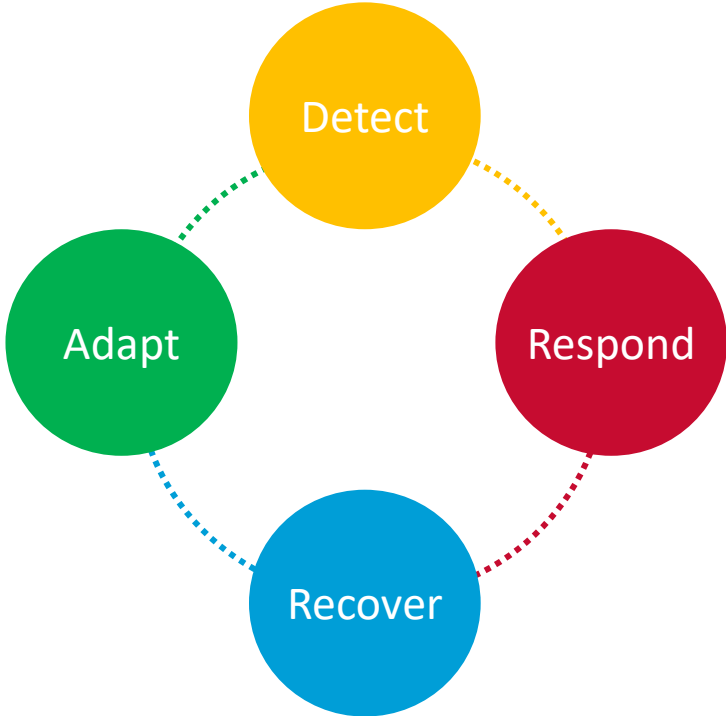


Modularity



Defence in Depth

Resilience Cycle



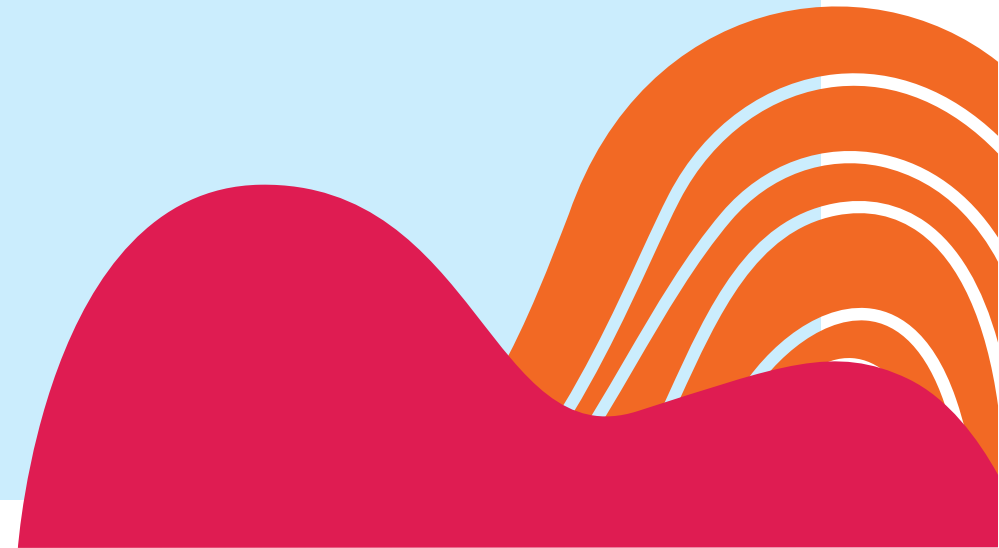
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TfNSW Asset Resilience Strategy & Framework

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Enterprise Resilience

Related resilience and management areas

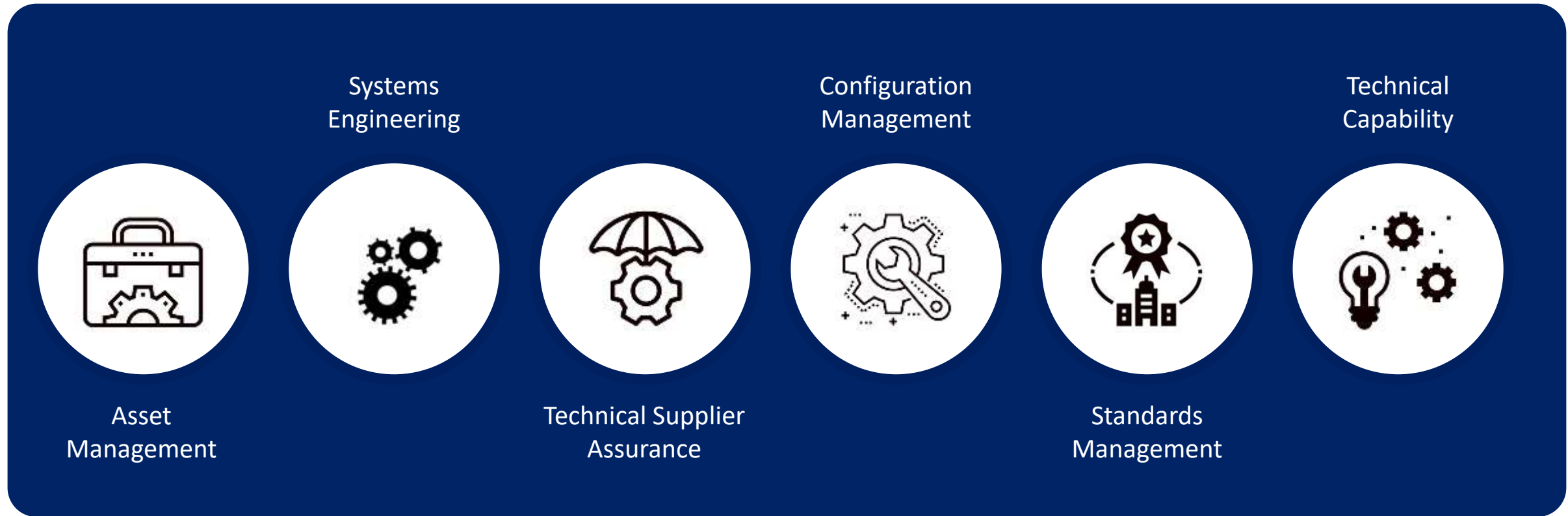
Enterprise Resilience			
Community Resilience	Asset Resilience	Economic Resilience	Financial Resilience
Systems (engineering) Resilience	Supply Chain Resilience	Non-operational Asset Resilience	Human Resilience

Sustainability Management	Business Continuity	Asset Management	Risk Management	Security Management
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Related management areas

Asset Resilience

Relationship to other governance frameworks



Asset Resilience

Context and Transport Planning

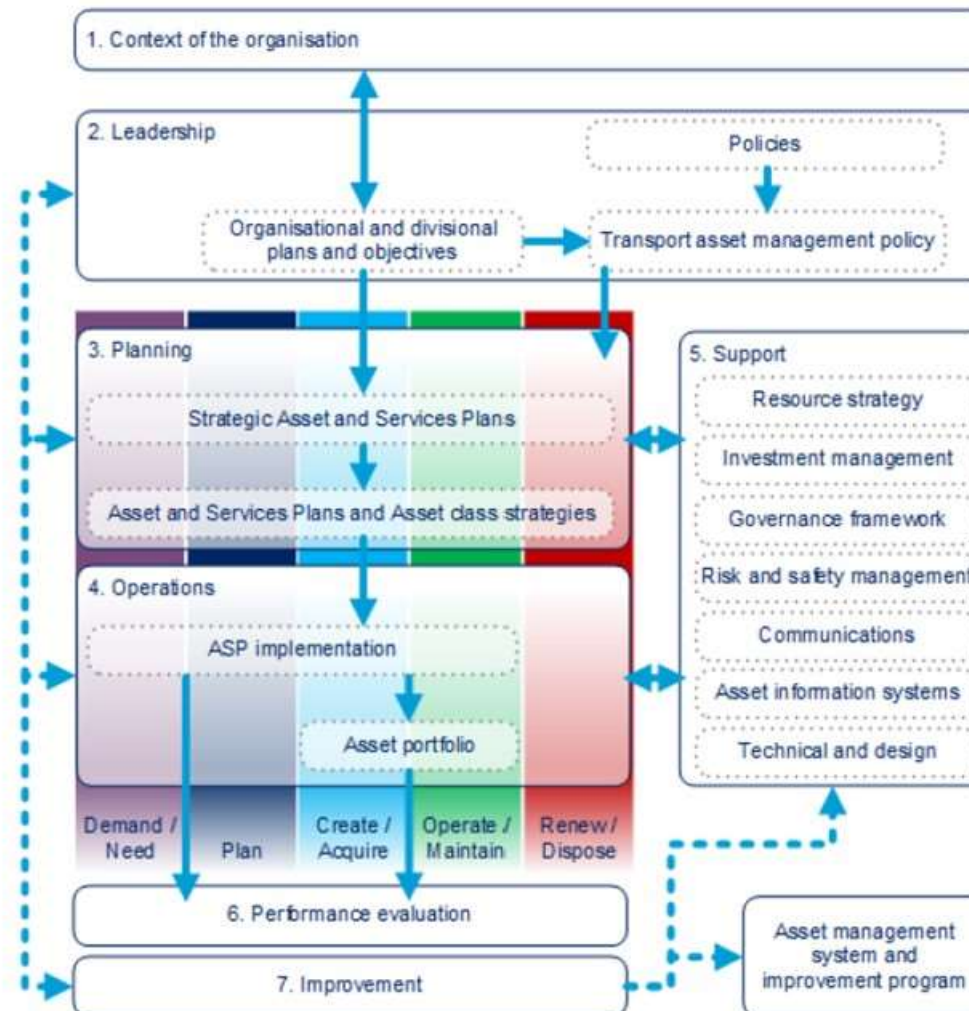
Context of the organisation:

(Examples related to resilience)

- Treasury NSW Asset Management Policy
- Future Transport Strategy
- NSW Reconstruction Authority
- NSW Climate Change Adaption Strategy

Planning:

- Strategic Asset & Services Plans - Cluster and divisional **resilience** planning
- Asset & Services Plans - Cluster, divisional, branch, modal, agency and steward **resilience** initiatives, mitigations and interventions



Leadership:

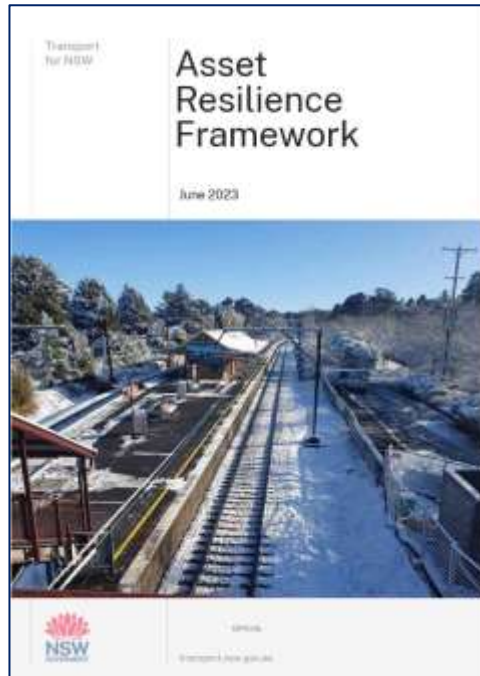
- Organisational resilience objectives

Support:

- Resilience Framework - outlines the integrated elements that work together to provide assurance that resilience outcomes are achieved
- Technical and design – resilience standards

Asset Resilience

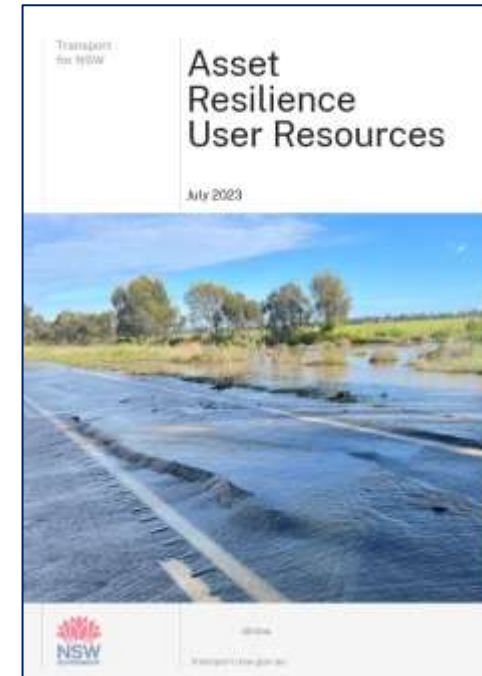
Supporting a structured and systematic approach



Providing a consistent whole of life cycle approach to asset resilience



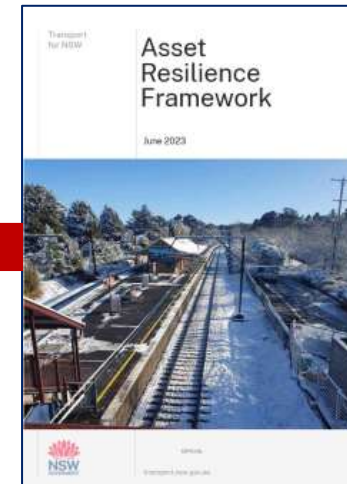
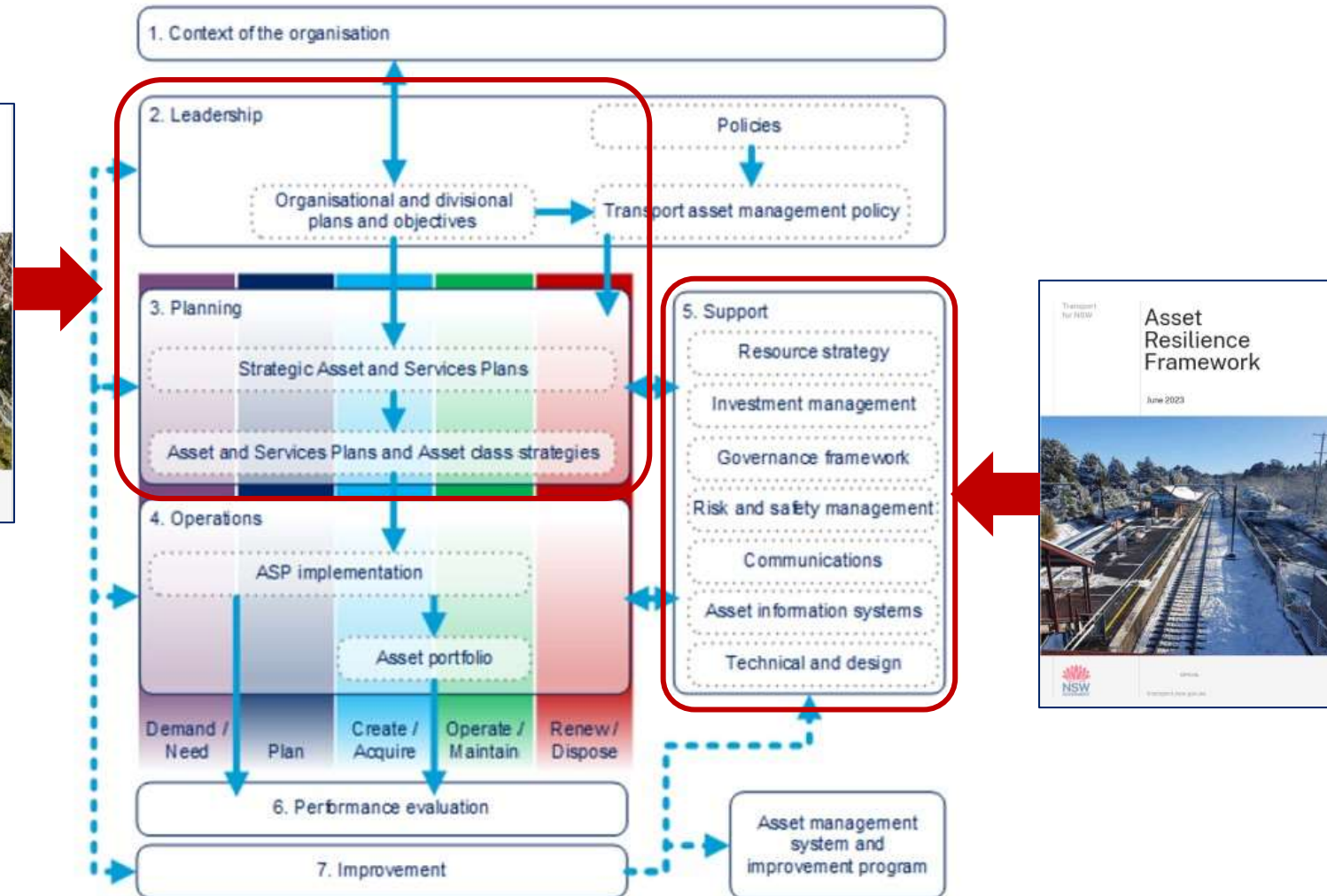
Strategic directions and responses that support a resilient transport system



Details current resources to support improved resilience outcomes

Asset Resilience

Context and Transport Planning



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Q&A

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