

Draft Future Transport Strategy 2056

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Future Transport starts with a vision of the future we want, so we can address challenges as they arise and meet our economic, social and environmental goals. Future Transport will not predict what is to come, but will ensure we are ready to seize opportunities to harness the rapid changes in technology and innovation and create an efficient and reliable transport system for our customers.

To date, more than 5,000 people have responded to our online surveys, and more than 40,000 people have been involved in digital or face-to-face consultations. We have held 27 engagement sessions with councils, business associations and community groups in rural and Regional NSW including Inverell, Wauchope, Griffith and Cobar, as well as business roundtables to discuss the future of connected and automated vehicles and placemaking.

The Draft Future Transport Strategy and Plans

Future Transport is an update of NSW's Long Term Transport Master Plan. It is a suite of strategies and plans for transport developed in concert with the Greater Sydney Commission's Sydney Region Plan, Infrastructure NSW's State Infrastructure Strategy, and the Department of Planning and Environment's regional plans, to provide an integrated vision for the state.

The Draft Future Transport Strategy sets the 40 year vision, directions and outcomes framework for customer mobility in NSW, which will guide transport investment over the longer term. It will be delivered through a series of supporting plans.

The Draft Services and Infrastructure Plans set the customer outcomes for Greater Sydney and Regional NSW for the movement of people and freight to meet customer needs and deliver responsive, innovative services. The plans will define the network required to achieve the service outcomes.

The Draft Supporting Plans are more detailed issues-based or place-based planning documents that help to implement the Strategy across NSW.

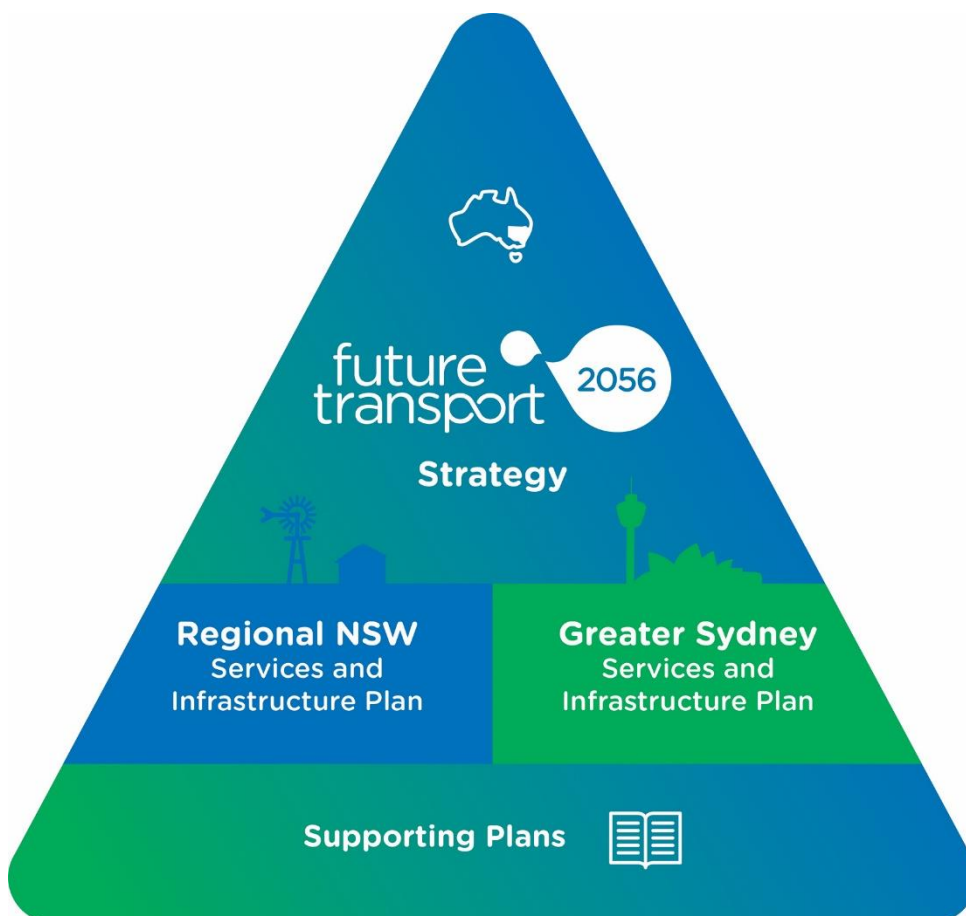


Figure 2 Suite of Draft Future Transport 2056 documents

Ministers' Message

Transport is critical to the future of NSW. Our transport system serves every one of our state's 7.5 million residents, 800,000 businesses and 30 million visitors – and today, it is undergoing rapid change, making us more mobile than ever before, and our lives more interconnected.

By 2056, NSW will have 11.2 million residents and be the country's first trillion dollar state economy¹. Sydney, one of the developed world's fastest growing cities, will be a global city similar in size to London or New York today. This growth will mean our networks will handle 28 million trips a day and double the current metropolitan freight task.

These challenges and opportunities highlight the importance of our choices today and call for bold, new ideas and approaches that ensure the productivity, liveability and sustainability of our communities.

The draft Future Transport Strategy is an update of the 2012 Long Term Transport Master Plan for NSW. It is a 40 year strategy, supported by plans for Regional NSW and for Greater Sydney. It is the first transport plan in Australia to harness technology to improve customer and network outcomes, and it starts with a long term vision for our communities and places. For the first time, we are aligning how we plan the future of the transport network with how we plan places and land use by working closely with the Greater Sydney Commission, Infrastructure NSW and the Department of Planning and Environment.

Future Transport builds on the achievements of the Long Term Transport Master Plan, which has unlocked unprecedented local and international investment in the NSW transport network and placed our customers at the centre of everything we do.

The draft Strategy also continues our program of innovation – starting with the Future Transport Technology Roadmap, the Smart Innovation Centre, automated vehicle and on-demand services pilots, and our development of contactless payment systems.

Continued planning is critical if NSW is to have a world-class transport system with infrastructure investments and initiatives that support growth, and meet our aspirations for how we want to travel and live.

We want to thank everyone who has contributed to the draft Future Transport Strategy and its Plans. This is your opportunity to provide input on the work we have done so far and we encourage the community and industry to work with us in coming months.



The Hon Andrew Constance MP
Minister for Transport and Infrastructure



The Hon Melinda Pavey MP
Minister for Roads, Maritime and Freight

¹ NSW Intergenerational Report 2016

2. What is Future Transport 2056?

Future Transport is the NSW Government's 2017 update of the 2012 Long Term Transport Master Plan. The Draft Strategy and its supporting Plans respond to the significant changes occurring today, and build on the achievements of the Master Plan, which established a once in a generation transport and infrastructure investment pipeline for the state.

This chapter introduces Future Transport in five parts:

- What is Future Transport 2056?
- Why planning transport for 40 years is critical
- Building on our achievements
- What change is Future Transport responding to?
- How you can help shape Future Transport

What is Future Transport 2056?

An update of the 2012 Long Term Transport Master Plan that responds to rapid change

Future Transport 2056 is the 2017 update of the NSW Long Term Transport Master Plan. It is a 40 year vision for mobility in NSW being developed with the Greater Sydney Commission, the Department of Planning and Environment, and Infrastructure NSW.

The draft Future Transport Strategy sets out a vision, strategic directions and customer outcomes, with infrastructure and services plans for Greater Sydney and Regional NSW to deliver these directions across the state.

Future Transport also sets out a series of issue-specific and place-based plans. These plans help us move away from looking at the network in terms of individual modes of transport, towards more integrated solutions. We will work closely with land use agencies on the place-based plans to ensure the transport system can effectively serve new growth areas.

Like the 2012 Plan, Future Transport firmly places the customer at the centre of everything we do. New technology and innovative service models are providing opportunities to change the way we travel. We want to make sure these changes empower customers to better plan and personalise their journeys.

Today, four in every five public transport customers use online resources and apps to plan their travel, and 37 per cent of customers reported using a rideshare service in the past six months – a service type that did not exist in Australia five years ago.

Future Transport 2056 is the first plan of its kind to look at ways we can harness the rapid advancement of technology and innovation across our transport system to transform the customer experience, improve communities, and boost our economic performance.

Planning ahead for 40 years is a bold undertaking when rapid technological innovation is the new norm in transport as in other sectors. With NSW set to grow to more than 11 million people by 2056, freight volumes estimated to double in the Greater Sydney area and grow by a quarter in Regional NSW, and the network preparing for 28 million trips a day, planning for future mobility has never been more important.

Long term planning for an uncertain future needs both vision and agility. The draft Future Transport Strategy focuses on the quality and character of places and communities we want for the future – on the fundamental way transport supports both movement and place outcomes.

We want to hear from you, our customers, as we plan for the future transport system our communities and businesses need. We've already had contributions from more than 43,000 people across NSW and urge you to get involved through the [Future Transport website](#).



Figure 3 NSW's growing population

Why planning transport for 40 years is critical

Transport matters to every person, business and visitor in the state, and supports economic, social and environmental outcomes

The importance of our choices today

The past 40 years saw tremendous change. Globalisation, the advent of the internet, computer and smartphone technology, faster and cheaper air travel, and social and economic change have made Sydney one of the best cities in the world and connected the state's productive regions to fast growing global markets.

Today, the pace of change is quickening still, making predictions about future technology use or even our future behaviours a risky practice. While it is impossible to predict the future, our actions and decisions today can change the course we are on.

Economic and population growth, with inevitable constraints on our resources, mean that we face 'fork in the road' decisions with long term impacts. We don't want to risk business as usual approaches that miss opportunities to reshape future travel behaviours, revitalise regional areas, dramatically improve safety, or reduce the future cost of providing infrastructure. Long term transport planning – even in an era of technological uncertainty – can support a productive economy, liveable communities and a more sustainable society.

A productive economy

The transport network enables economic activity across the state. Each day, trucks take cattle from feedlot to port, trains and buses bring commuters to work and

students to school, and trade vehicles deliver services to households and businesses.

The more efficient the transport network, the better our economy performs, allowing businesses to reach new markets, attracting new investment, and catalysing new job and training opportunities for our people. By contrast, congestion, poor planning decisions and network inefficiency increase transaction costs, constrain growth, and stifle economic development and labour mobility.

The map below shows how Future Transport initiatives for investigation would dramatically expand the 30 minute public transport catchment for Parramatta improving accessibility of the Central River CBD and supporting greater liveability in the broader area.

Long term planning also provides industry and communities with the certainty they need for their own plans – decisions about where to invest, locate and live.

Liveable communities

Transport is a ‘placemaker’. It can transform the public domain, activate centres and unlock new activity. Transport can also generate new commercial and housing developments and renew existing neighbourhoods and spaces.

The best places take time and strong partnerships to develop. Transport improvements made today activate the public spaces, corridors and networks that future generations will enjoy, and impact on the delivery of health, education and local government services. Transport can improve the liveability and character of places across the state, achieve wider benefits from investment and encourage more desirable patterns of development.

A sustainable society

Transport is a public good that accounts for over 42 per cent of the state’s* total energy consumption² and for a growing share of total public infrastructure investment.

While growing transport investment is critical to the wellbeing of our communities, unsustainable investment decisions risk deteriorating the government’s budget position and its ability to respond to community needs in health, education, and other critical services.

Long term planning will ensure we deliver more with less, maximise the benefits of planned investment, and improve the emissions intensity and environmental costs imposed by the transport system.

² NSW Environment Protection Authority (EPA) State of the Environment Report 2015

*Includes Australian Capital Territory (ACT)

Building on our achievements

The journey so far...

The 2012 Long Term Transport Master Plan responded to long term underinvestment and poor planning of transport infrastructure in NSW. It undertook a comprehensive analysis of transport problems and generated an unprecedented pipeline of investment.

In total, over 700 projects are linked to the 2012 Plan, with 438 complete, 200 under construction and the remainder in planning. These include city-shaping projects such as Sydney Metro, Sydney CBD & South-East Light Rail and WestConnex as well as much needed infrastructure in our regions, such as Fixing Country Roads and Fixing Country Rail. The 2012 Plan also extended state-wide programs like the Transport Access Program and delivery of the Disability Action Plan.

The projects delivered under the 2012 Plan are supporting big picture priorities for NSW, including the Premier's priorities to deliver better infrastructure and services, create safer communities, reduce road fatalities by more than 30 per cent by 2021 and improve road travel reliability and on time running.

Since 2012, other government initiatives have improved alignment across Government to integrate strategic planning and join up service delivery. The Government's metropolitan plan identifies opportunities for urban renewal and new housing development around major transport investments, while the Greater Sydney Commission's Growth Infrastructure Compacts will bring together service and infrastructure planning to better meet the place-based needs of communities.



Figure 4 Status of 2012 Long Term Transport Masterplan Projects

For the detailed project map see future.transport.nsw.gov.au/business/detailed-project-map-embed/

Commencing the next phase of transport improvement

Improved services and a future-ready transport network resulting from the 2012 Long Term Transport Master Plan are a solid foundation – and a more developed infrastructure backbone – for the deployment of new technology and more innovative service models.

Since 2012, rapid advances in technology and a growing mobility services market have begun to alter the landscape for transport delivery in NSW. The advent of ridesharing services, the introduction of demand-responsive services and the widespread use of technology are the early forerunners of how technology can reshape transport.

Considering these developments, Future Transport will set out a long term framework for developing the network that delivers our ambitious vision for thriving communities and centres across NSW, starting with 16 regional cities in regional NSW and the Greater Sydney Commission's economic vision for three cities in the Greater Sydney area.

Future Transport positions NSW to take advantage of emerging opportunities to improve mobility and services for customers.

What change is Future Transport responding to?

The next 40 years will see more technology-led transformation than the past two centuries

Technology is changing how we travel – and how we deliver transport

Transport is a technology business. Cheaper sensors, faster processing speeds, smartphones, Wi-Fi and automation are transforming passenger and freight mobility – the services provided, how customers use them, and who provides them.

Rapid innovation is already changing traditional modes of travel. Buses, trains, cars and trucks are increasingly automated, safer, and will increasingly need connection to a smarter network. But the changes we are witnessing come not just from the hardware but from the new operating models this technology can support.

Data sharing and mobile technology give customers smarter ways to choose and buy services, and allow providers to respond to customer needs flexibly and creatively. In the future, it is likely people will have moved beyond making daily choices between mobility options, and will instead be making choices about their experiences – how they will spend their day, who they will meet – where the mobility components are delivered automatically, in ways that reflect their personal preferences.

The rise of ridesharing in NSW suggests our customers are early adopters. In the two years following the introduction of rideshare services, one-third of Sydneysiders had used one, new service models were extending to outer metropolitan areas, and driver authorities for hire car and rideshare drivers grew ten-fold.

Technology-led innovation has the greatest potential for Regional NSW, where we believe new technologies could transform service offerings over longer distances and

for smaller populations, with data-driven service models better matching demand to a range of service and vehicle types.

The Future Transport Technology Roadmap for NSW, delivered in 2016, set out five 'no regret' strategies for our network:

1. Personalise customer interactions: moving to customised, integrated service systems, smart digital mobility platforms, and frictionless access and payments
2. Transform the mass transit network: incorporating automation to improve safety, service frequency and travel times and attract customers from private car use
3. Foster shared, demand-responsive services: enable flexible, shared use service models
4. Enable connected and automated vehicles: support vehicles and enabling infrastructure that improves mobility services, efficiency, reliability and safety
5. Create intelligent transport networks, managed with data: install technologies and build networks that actively gather data, use Artificial Intelligence and real time analytics to optimise capacity and planning.

In setting out a 40 year vision for transport in NSW, our aim is not to predict the future, but to prepare for change.

The draft Future Transport Strategy and its Plans identify how our long term priorities for transport can take advantage of emerging technology and service models to better meet customer needs.

This is informed by our review of global and domestic trends and their unique challenges and opportunities in NSW, including a growing and ageing population, increasing international trade, changing customer demands and our desire for healthier lifestyles.

How we respond in this ever-changing environment will determine the NSW of tomorrow. We, as Government, the community and industry, need to decide what kind of NSW we want and how we will get there.



Figure 5 Responding to rapid change

How you can help shape Future Transport

Have your say on the future of transport

The draft Future Transport Strategy is a new approach to planning transport and engaging with our customers. It has been developed through an extensive program of multichannel digital and face-to-face consultations to ensure that our draft plans have the support of customers and will meet their future needs.

The staged release of the draft Future Transport Strategy, Plans and supporting plans, aims to maximize the opportunities we have to talk to the community and to industry. In addition, Transport for NSW is working with the Greater Sydney Commission and Infrastructure NSW to integrate our engagement and to coordinate the release of the state's three draft strategic plans later in 2017.

Our first phase of engagement raised awareness and began a discussion about what communities and businesses value from transport and how we can make mobility more customer-focused, efficient and accessible.

Our engagement program has allowed us to hear and respond to thousands of customers in regional and metropolitan areas:

- 27 engagement sessions with councils, business associations and community groups in rural and regional NSW including Inverell, Wauchope, Griffith and Cobar
- Regional and community forums in Sydney, North Sydney, Rooty Hill, Parramatta, Gosford and Wollongong
- Business and industry roundtables, to discuss the future of connected and automated vehicles and placemaking

More than 5,000 people have responded to our online surveys since May 2017, including over 1,300 people in regional communities. To date, more than 43,000 people have been involved in digital or face-to-face consultations. In addition, our engagement efforts have trialled innovative ways of engaging young people, including a social media campaign that reached 1.2 million people.

Our website at future.transport.nsw.gov.au contains a range of information and data on the performance of the current transport system, discussion starters on important topics for consideration, a Future Transport Technology Roadmap update, an engagement survey and a mapping tool, which highlights the 700 or so projects underway or complete since the NSW Long Term Transport Master Plan was launched in 2012.

We invite you to explore the website and provide your feedback to help us plan the transport network of the future.



Figure 6 Future Transport 2056 Timeline

3. A vision for Transport

Transport is a major enabler of all economic and social activity in our state and contributes to long term economic, social and environmental outcomes.

This chapter sets the long term vision for mobility and transport provision in NSW, explains how the customer experience of transport will change and what this means for Greater Sydney and Regional NSW. The vision is built on six outcomes:

- A Customer Focus
- Successful Places
- A Growing Economy
- Safety and Performance
- Accessible Services
- Financial and Environmental Sustainability

A vision for transport focused on six outcomes

The draft Future Transport vision for the next 40 years sets six state-wide outcomes to guide investment, policy and reform and service provision. They provide a framework for network planning and investment aimed at harnessing rapid change and innovation to support a modern, innovative transport system that serves the community and economy well into the 21st century.



Figure 7 Six customer and network outcomes

A Customer Focus

Every customer experience will be seamless, interactive and personalised by technology and big data

Moving from 'Planes, Trains and Automobiles' to 'Mobility as a Service' and beyond

Our current network delivers 385 million rail trips and 315 million bus trips each year. It also delivers 16 million ferry trips, 10 million light rail trips each year and consists of over 185,000 kilometres of road infrastructure for private, commercial and freight use.

Today, we are moving away from a view of transport as only being the infrastructure and vehicles we use to travel, to a future that evolves with the customer and integrates technology into the network to offer seamless experiences.

The future of mobility is customer-focused, data-enabled and dynamic. Personal mobility packages will bundle traditional 'modes' with technology platforms and new service offerings like car share, rideshare and smart parking. This will improve the customer experience and deliver far greater levels of responsiveness, safety, and congestion management.

Tomorrow's ticket booths will be our smartphones, with a host of services at our finger tips for each part of the journey. Customers will make travel choices based on factors that matter most to them – service frequency, cost, emissions, comfort, or travel time.

Customers will directly deal with the Mobility as a Service (MaaS) provider, not the network operator or service provider. The MaaS provider will sell seamless multimodal journeys, offer convenient payment methods such as subscription services, and communicate directly with customers.

Big data and technology will enable service providers to connect with customers, know their preferences, and tailor service offerings in real time. How customers choose to travel will directly influence and shape their experience.

Regional customers will access innovative, on-demand services that aggregate similar trips quickly for more efficient travel, and provide responsive travel choice, with a range of public, private, and community transport providers offering a mix of services. The investments we make in cross-network information management systems will enable real-time and innovative regional service responses that better use the network.

Seamless experiences will also connect customers to facilities for active transport such as walking routes, bike paths and bike hire services.

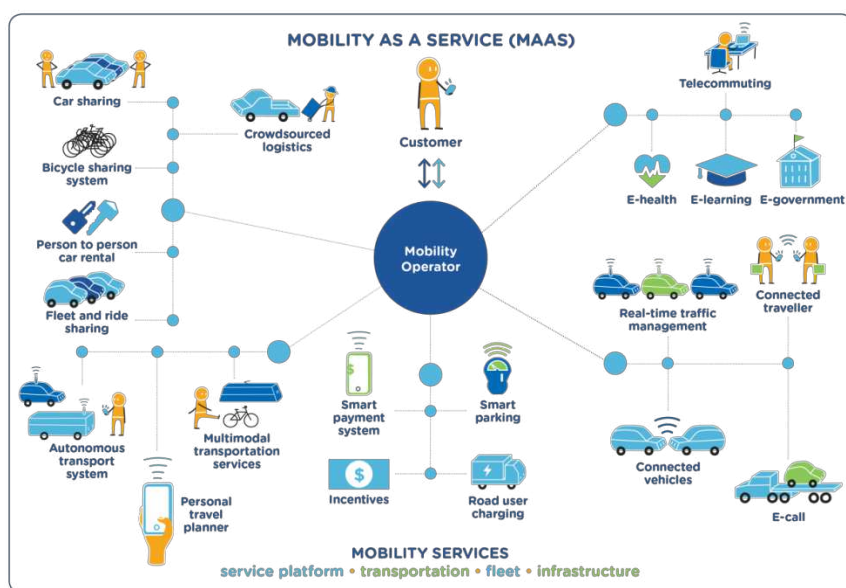


Figure 8 Mobility as a Service

Supporting Successful Places

People enjoy 'living local' with fast connections to strong centres that drive economic growth and social cohesion

Activating centres and forging stronger partnerships

Population and economic growth will support a stronger network of thriving centres across the state. Technology and improved communications will enable more people to 'work anywhere, live anywhere,' with telecommuting and remote and flexible working becoming the norm.

A transport network across the state that better connects regional cities and centres will improve amenity for regional communities and increase access to regional jobs, services and education.

The state will benefit from its access to three Global Gateway Cities: Greater Sydney, the Australian Capital City of Canberra and the growing city of Greater Newcastle. Improved transport will broaden the catchment around each of these Global Gateway Cities, improving access to major service precincts, advanced industries and international infrastructure for the purposes of travel and trade.

Greater Sydney will grow as a global tourist and skilled worker destination, and as Australia's gateway to Asia. It will be supported by growth in its three cities – the Eastern Harbour City, the Central River City and the Western Parkland City.

By 2056, economic and housing growth around Greater Sydney will drive integration across the city's hinterland, establishing Gosford and Wollongong as 'Satellite Cities' and connecting them to Greater Sydney with fast transit.

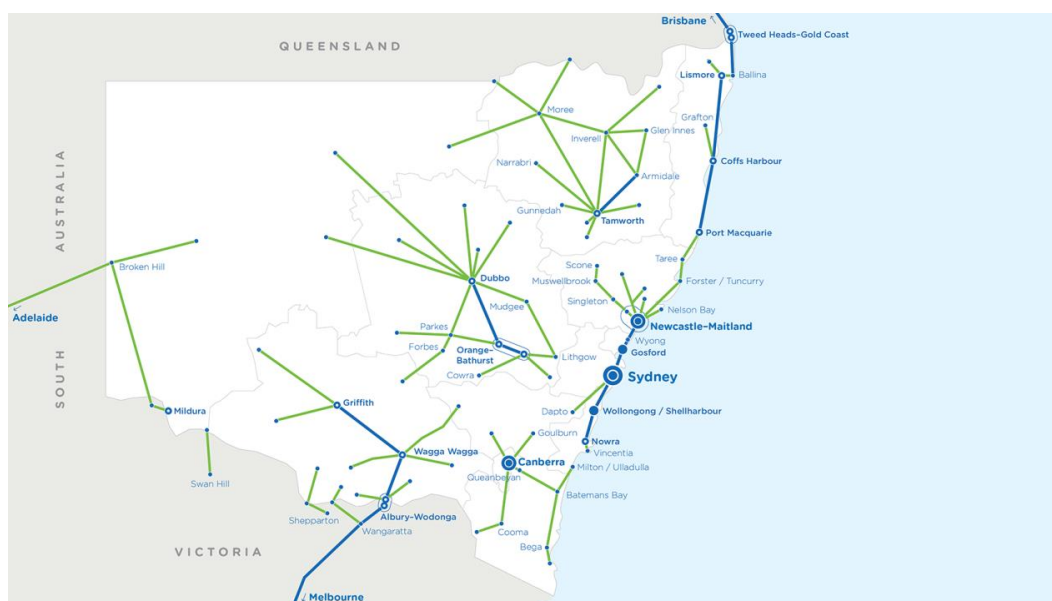


Figure 9 Activating regional and metropolitan centres

An equitable transport system that provides regular, high quality connections to regional settlements will increase the attractiveness of small towns as places to live and visit. Quality services will reach across state borders, providing regional areas with efficient access to their closest capital city.

Strong partnerships with Local Governments will drive place based planning and renewal in regional centres and local towns.

A strong vision supported by sound development and planning decisions will sustain a long term focus on growing the vitality of places and activating emerging cities. The vision will help us improve the accessibility of local communities in Western Sydney and in the regions to areas of major economic opportunity.

The NSW Government will work with local councils and communities on integrated transport and land use planning and investigate the potential to develop 20 year precinct plans for all strategically important centres and places. The plans will focus on balancing the transport movement needs of the community with high quality urban design that supports community safety, health and wellbeing and enhances community assets and local character.



Figure 10 Successful places, an artist's impression of Barangaroo Ferry Wharf

A Growing Economy

A powerhouse economy, enabled by efficient links between people, places, businesses and markets

A transport system that powers our future \$1.3 trillion economy

By 2056, high levels of automation, increased freelancing and ‘virtualisation’ and a strong services economy will enable a vibrant, modern economy with new industries and jobs of the future growing strongly in Regional NSW and Greater Sydney.

In the future, NSW will be Australia’s first trillion dollar state economy, with growth that is broadly-based and diverse. Economic productivity will grow as the network moves people more efficiently to jobs centres and provides firms with access to the right workers, skills and customers. Future technology will also enable productivity-enhancing flexibility in the way people work and the times of day they travel.

Technology will drive new industries – with the World Economic Forum predicting that some 65 per cent of children entering primary school today will hold jobs in the future that do not yet exist.³ Technology will enable transformational efficiencies in logistics and small parcel deliveries, with innovative direct-to-consumer deliveries, ‘freight as a service’ or new delivery models, freight drones, and 3D printing.

At the same time, today’s substantial freight task will continue to grow. Our primary industries, which today contribute around \$14 billion to State Gross Value Product⁴, will continue to grow strongly, strengthening links to global export markets.

NSW’s freight networks will need rapid innovation and development to support import and export markets and meet growing consumer demands.

By 2056, the state will be served by two high performing container ports, with Port Botany and Port Kembla servicing our growing population centres. Integrated road and rail logistics chains supported by intermodal terminals and dedicated, high performing freight pathways will connect the city and regions.

The Global Gateway of Newcastle and the satellite city of Wollongong will play an increasingly important role in the NSW economy with populations expected to grow to more than 750,000 and 500,000 people respectively by 2056.

Regional cities will act as centres for health, education, and justice services as well as providing access to employment opportunities and air transport connections. Regional centres will also play an important role for service provision and employment.

³ The Future of Jobs, Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution, World Economic Forum, 2016

⁴ NSW Primary Industries Performance Data and Insights 2016, Department of Primary Industries

Towns and villages will offer employment and housing and will continue to be important in attracting domestic and international visitors, bringing job opportunities and economic benefits to rural communities.



Figure 11 Freight transport in NSW

Safety and Performance

Every customer will travel safely across a high performing network

Safety, security and performance are interlinked

As our population and the network grow, innovation and technology will achieve the dual objective of both improving performance and significantly improving safety. For example, connected and automated vehicles are expected to reduce rates of road trauma caused by human error, improve traffic flow and efficiently manage higher traffic volumes.

Towards 2056, NSW will approach a trauma-free transport network, saving up to 350 lives and 12,000 serious injuries each year and cutting the cost of road trauma to the community by over \$7 billion a year in today's dollars.

A safe, higher performing system will focus on the provision and management of networks, people and fleet across NSW to the highest design and technological standards with intermodal and collaborative IT systems.

Achieving our safety vision will mean ensuring the majority of road travel occurs on 4-5 star roads. To do this, we need to design all new roads to this standard, which is informed by Safe System design principles for corridor planning. These principles

identify key safety measures known to reduce road trauma along with other requirements. Key safety measures will include median and roadside safety barriers, wide centreline audio tactile line marking and traffic calming methods such as 2+1 treatments, which incorporate two lanes in one direction and one lane in the opposite direction, separated by a flexible safety barrier.

New vehicles and smart infrastructure will also design trauma out of the network through technology such as Intelligent Speed Adaption (ISA).

A quicker, more resilient network of high performing corridors will provide an efficient backbone for mobility across the state. Efficient links will connect cities and centres, towns and villages with investment targeted at improving service levels and building demand along major regional and metropolitan corridors. New radial networks will support higher service levels and better connectivity in regional and remote areas.

Major passenger and road corridors will be upgraded with automated mobility and smart networks, including all NSW Motorways, and will be supported by a developing market of flexible and convenient first and last-mile service providers that enable rapid and seamless connections to trunk corridors.

Greater separation of major traffic flows will support higher performance and safety with freight bypasses of major regional cities and centres.



Figure 12 The Safe System approach

Accessible Services

Seamless mobility will enable the participation for all members of the community

A choice of services that empowers every customer

One in five people who responded to our online survey reported that they cannot travel by private vehicle, and more than two in five reported that they cannot access public transport because they are living with disability, are elderly or live in areas with low or no public transport services.

Tomorrow's transport system will see personalised, integrated service provision and a fully accessible network that enables people who find it difficult to access transport services today to use transport when and how they want to in the future.

Customer choice will drive a market for more accessible services. Assistance for customers will become more targeted and personalised, and individuals will be able to choose the services that best meet their needs across public, private and community transport service providers.

Market development will be driven by initiatives including public procurement of innovative service offerings, on-demand services and new technology-enabled services. Smart service procurement by Government that focuses on customer outcomes will grow the level of competition, innovation and entrepreneurship needed to deliver service improvements and accessibility for all customers.

Procuring service outcomes will also address service deficit in Regional NSW and in some areas in Greater Sydney through the delivery of flexible transport, fleet services, rideshare and Mobility as a Service (MaaS) models.

The Sydney Metro and Sydney Light Rail are among the first projects to deliver a fully accessible fleet and assets. Over time, the whole transport network will be accessible through the delivery of new assets or by upgrading or repurposing existing assets, like the renewal of the state's bus stops for accessibility and shelter.

A physically accessible network will mean more choice for people with mobility constraints, which is particularly important with our growing and ageing population. Greater accessibility will also mean better connections to places and opportunities for employment, education, business and enjoyment, especially in areas with few transport options today.



Figure 13 Empowering every customer

Also see **Chapter 6 – Our Customers** and **Chapter 8 – The Future of Services**

Sustainability

A transport system that contributes to a strong economy and environmental and community wellbeing

An affordable network that is responsive to change and sustains strong investment

A strong, financially sustainable transport system will enable continued investment in infrastructure and service improvements for our customers, while sharing the costs equitably across users, taxpayers and other beneficiaries.

Today public transport revenue in NSW is amongst the lowest in the developed world with levels of recovery reduced from more than 60 per cent in the 1980s to around 29 per cent today.

A modern and efficient fare system will continue to promote access and inclusion, and support customer loyalty. Efficient service delivery through improved operations and maintenance, innovation and a commercial focus on asset management will drive better value for taxpayer dollars and enable new forms of revenue.

Supporting more environmentally sustainable travel

Moving people from private vehicles to more sustainable transport modes will lower congestion and the state's emissions intensity, improve air quality and support better health and wellbeing.

Well planned centres and cities, with accessible public transport systems and better connected green spaces, will enable many more of our customers to shift from private cars to public transport and active transport modes such as walking and cycling - which will improve urban vibrancy and liveability. In Sydney, the key to this will be the delivery of three 30 minute cities, supported by reliable 'turn up and go' mass transit services.

Managing the transport system's cost-effective transition to a low emissions environment and managing its climate change risks will help deliver the government's Climate Change Policy Framework and its aspirational target of zero net emissions by 2050, setting the state up as a leading and competitive low-carbon economy.

The transport network's physical assets will be built and maintained to a standard to withstand extreme weather and sea-level rise with minimal damage and disruption to network functionality.

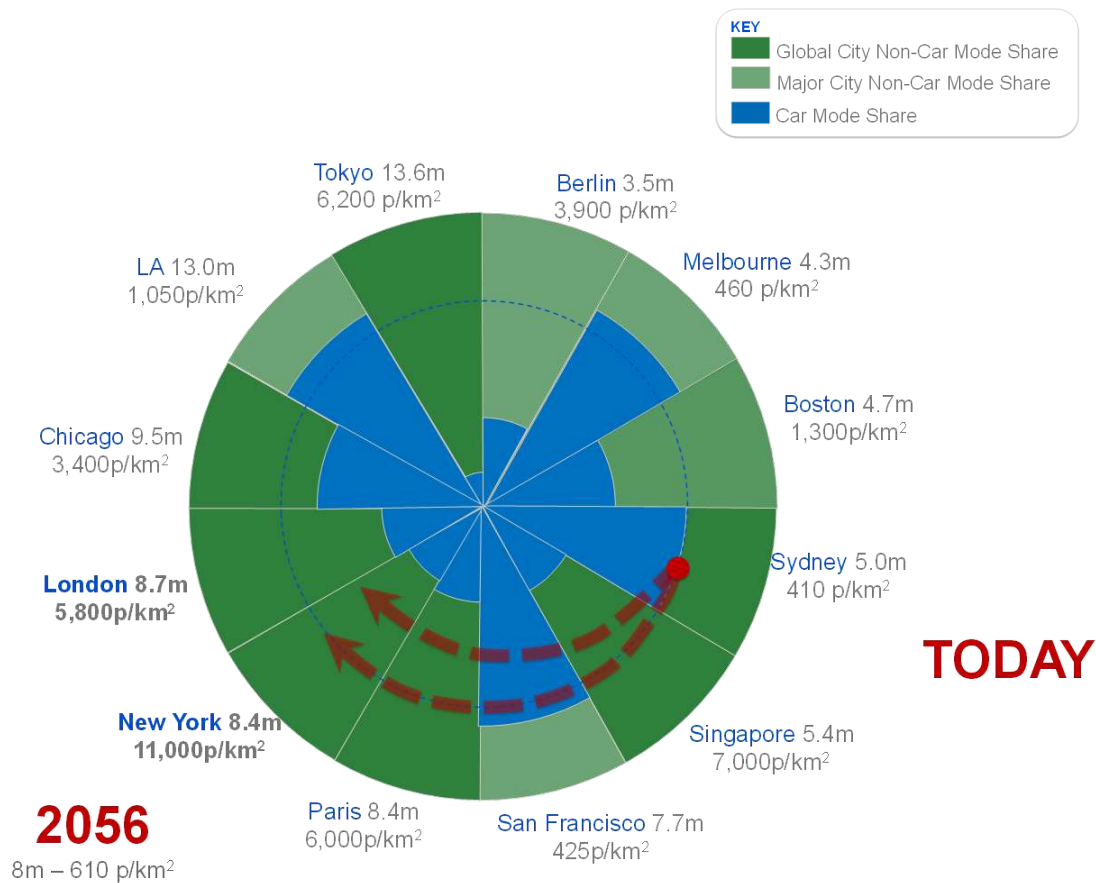


Figure 14 Private vehicle mode share – international comparison

Also see **Chapter 10 – Delivering Sustainability**

4. What does Future Transport mean for Regional NSW?

A network of services in regional areas that provides better connections between communities and improved access to regional cities and centres

The six priorities for Future Transport have clear implications for the vision and service outcomes we set for regional communities, which currently experience lower service levels and slower population growth than Greater Sydney. A marketplace for services in regional areas will be driven by significant investment in Regional Cities, smarter procurement and the deployment of technology-enabled and innovative service models.

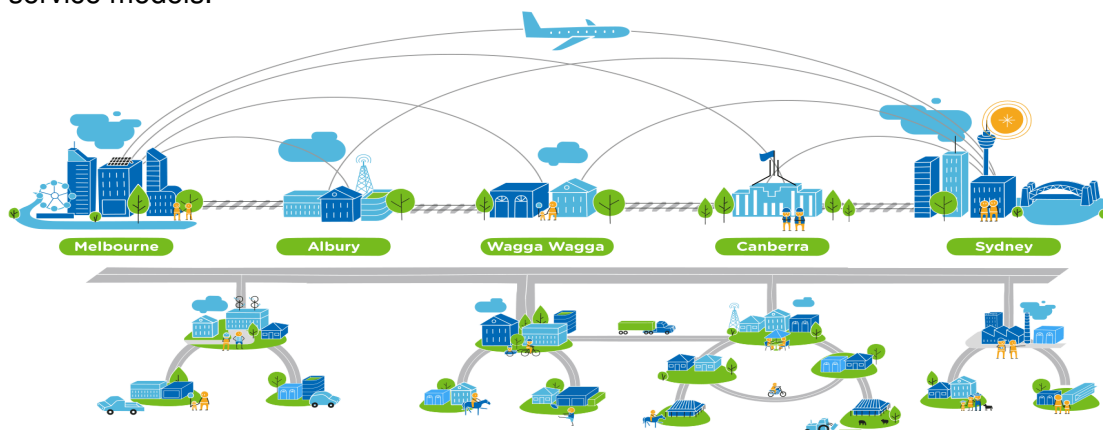


Figure 15 Connecting communities

Regional NSW customer outcomes
1. A safe transport system for every customer with zero deaths or serious injuries on the network by 2056
2. A transport system which is resilient to significant weather events including floods, fog, bush fires
3. Customers enjoy improved connectivity, integrated services and better use of capacity
4. The appropriate movement and place balance is established enabling people and goods to move efficiently through the network whilst ensuring local access and vibrant places
5. Increased accessibility to employment and services such as health, education, retail and cultural activities within Regional Cities and Centres
6. A transport system that adapts to and embraces new technology
7. Changes in land use, population and demand, including seasonal changes, are served by the transport system
8. Flexible services are an integral part of the transport system helping to deliver the most appropriate type of service for customer needs
9. Support the development of the Global Gateway Cities of Newcastle and Canberra
10. Improved efficiency of the network to/from/within the two Satellite Cities of the Greater Sydney by 2056 – Gosford and Wollongong

Figure 16 Customer outcomes in Regional NSW

For more information see the **Regional NSW Services and Infrastructure Plan**

5. What does Future Transport mean for Greater Sydney?

A global metropolis where personal and business-related mobility are amongst the best in the world

Sydney will grow as a global metropolis with benefits distributed more evenly across the city, driven by major place-based planning and investment around the new Western Sydney Airport and Badgerys Creek Aerotropolis. New technology and innovation will make the network far more responsive to demand and better able to manage congestion. The vision for Greater Sydney as a metropolis of three 30 minute cities will guide many of the planning, investment and customer outcomes for the city including faster, convenient and reliable travel times to major centres.

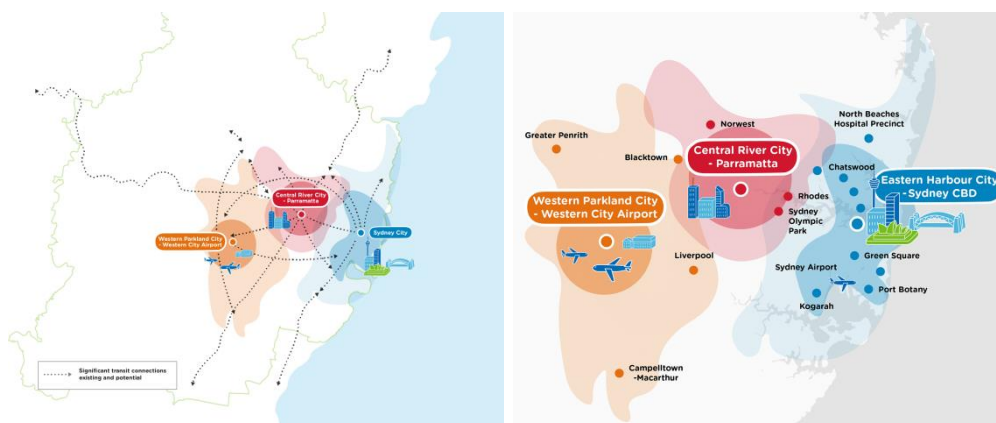


Figure 17 A metropolis of three cities

Greater Sydney customer outcomes	
1.	Efficient, reliable and easy-to-understand journeys for customers, enabled by a simple hierarchy of services
2.	Efficient and reliable freight journeys supported by 24/7 rail access between key freight precincts and convenient access to centres
3.	A safe transport system for every customer with zero deaths or serious injuries on the network by 2056
4.	30 minute access for customers to their nearest centre by public transport 7 days a week
5.	Fast and convenient interchanging, with walking times of no longer than 5 minutes between services
6.	Walking or cycling is the most convenient option for short trips around centres and local areas, supported by a safe road environment and attractive paths
7.	Vibrant centres supported by streets that balance the need for convenient access with enhancing the attractiveness of our places
8.	Fully accessible transport for all customers
9.	New technology is harnessed to provide an integrated, end-to-end journey experience for customers
10.	Future forms of mobility are available to customers and integrated with other modes of transport
11.	Transport services and infrastructure are delivered, operated and maintained in a way that is affordable for customers and the community
12.	A resilient transport system that contributes to the NSW Government's objective of net-zero emissions by 2050

Figure 18 Customer outcomes in Greater Sydney

For more information see the Greater **Sydney Services and Infrastructure Plan**.

6. Our Customers

Placing the customer at the centre of everything we do is at the heart of all our transport service and infrastructure decisions.

Our customers rely on us every day – whether they are regional students travelling to school, commuters travelling to work or drivers delivering goods to retailers and consumers. Every one of our customers expects reliable, convenient and timely services and high quality, safe infrastructure.

This chapter explains who our customers are, what they value and how their priorities will shape the plans we make in Future Transport. The chapter also looks at how we can improve services to attract more people onto public transport and considers the major priorities for key customer groups including:

- Public transport customers
- Road customers
- Freight customers
- People who require greater access to the transport network to support inclusion and participation
- Aboriginal and Torres Strait Islander communities
- Visitors and tourists

Our customers rely on us everyday

Our customers are at the centre of everything we do

Who are our customers, and what do they value?

We provide services and network infrastructure that serve the mobility of every one of the state's 7.5 million residents, 800,000 businesses and 30 million visitors each year.

The reliability of transport services will always be a key indicator of customer satisfaction. However, our customers increasingly expect greater technology-enabled personalisation, flexibility and ease of use.

Mobile phone technology is prompting a culture of immediacy, evident in the growth of tech-enabled point to point services, flexible on-demand services and applications of shared mobility. In the future, our customers will expect to give immediate feedback to providers and even shape service provision in real time, based on their immediate needs.

The way people use the network is also changing. Our future customers are less likely to have a driver's licence or own a car. Their travel patterns will also be different from today because they are more likely to be flexible about where and what hours they work, and to consider walking and cycling as part of their journey.

Meeting our customer needs goes beyond the journey experience to the wellbeing of the whole community. A successful transport system that encourages greater active and public transport can deliver positive outcomes in terms of physical and mental health, social capital and social and economic participation.

With such a diversity of needs, growing demand and increasing expectations, providing reliable services that get people where they need to go is a complex task, and we can no longer continue with a 'business as usual' approach to serving our customers.

At Transport for NSW we are increasingly using "human-centred design" approaches, aimed at identifying factors that impact the customers travel experience and assessing, testing and validating solutions with customers. This collaborative approach has a high rate of success in providing solutions that address the root cause of customer pain points.

This chapter sets out our directions for future transport that will help meet the needs of five key customer groups:

- Customers who have choices for their mobility and can access private and public transport
- Road customers including cyclists, car users and passengers, motorcyclists and pedestrians
- Freight customers who rely on transport to create economic value
- Disadvantaged groups who have fewer travel choices for personal mobility

- Aboriginal and Torres Strait Islander communities
- Visitors and tourists whose transport is integral to their experience of NSW



Figure 19 Transport customers

Encouraging more customers to use active and public transport

Moving more people by active and public transport has benefits for all

We will continue growing customer satisfaction and changing customer attitudes

Each year, our customers take 328 million trips on Sydney, intercity and regional trains, 250 million trips on metropolitan and outer metropolitan buses and 4 million trips on rural and regional buses. People in metropolitan areas also undertake 3.5 million walking-only trips and 448,000 cycling trips on an average week day.

We've listened to what our customers value, and improved their travel experiences to provide more reliable, safe, convenient and accessible travel. Since 2012, this has significantly boosted customer satisfaction levels across public transport modes.

Our Customer Satisfaction Index, which reflects the voice of over 17,000 customers, demonstrates average annual increases of 9 per cent in customer satisfaction with buses and trains. Customer satisfaction is even higher for ferry, light rail and community transport customers.

Service innovation has played a key role in increasing customer satisfaction. The introduction of the Opal Card significantly improved satisfaction levels by enabling greater convenience and ease of connection between modes.

However, Future Transport consultations emphasised that while many of our customers enjoy greater choice than ever before, there were many who would use

public transport more if further improvements were made. Customers tell us the main barrier to using public transport is the availability of frequent and reliable services to take customers where and when they need to go. This is especially the case in regional communities and in outer metropolitan areas, where public transport services are more limited.

To attract more people to public transport and grow customer satisfaction levels, we need to provide better connections, improve service frequency out of peak hours and offer more flexible services. We need to continue expanding the reach and responsiveness of services, while addressing pain points such as overcrowding and congestion to convince reluctant customers and customers of different ages and abilities to use our services.

Encouraging more people to use active transport to move around will require us to look at safe, well connected infrastructure such as bike paths and walking routes. We will also need to enable innovative models including bike-sharing models. More active transport will improve network outcomes overall, but more importantly, will deliver positive health, wellbeing and environmental outcomes too.

Future directions to investigate

Customer satisfaction will be enhanced, and more people will choose to travel by public transport, walking and cycling.

- Provide safe, quick and convenient services that offer journey times competitive with private cars
- Conduct research and utilise Opal data to improve the customer experience and address 'pain points' that discourage public transport use
- Encourage changes to customer behaviour to Remode, Retime, Reroute and Reduce travel across Greater Sydney
- Establish a complete network of safe separated pathways to encourage walking and cycling to and within centres
- Support the establishment of bike share services

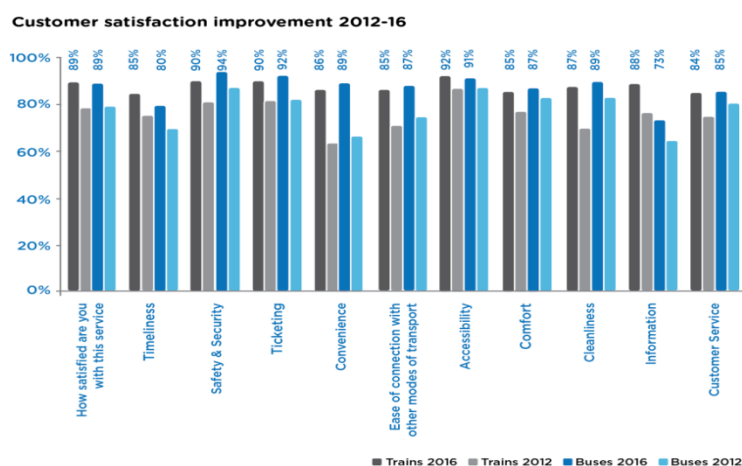


Figure 20 Public transport customer satisfaction

Our road customers

We will meet the changing needs of our road customers to ensure safe, direct and timely journeys

The NSW road network is the state's largest asset and carries the majority of NSW passenger and freight travel. To meet the needs of growing populations and move increasing numbers of people and goods on our road network, we need to respond to the changing needs of our road customers.

There are many different customer groups who travel on our road network, including motorists and passengers of private cars, bus customers, light and heavy trucks, taxis, hire cars, motorcyclists, cyclists and pedestrians.

We know a lot about how our customers use the road today. For example, we know that most people use more than one mode of transport and that private motor vehicle users can also be pedestrians, cyclists and public transport passengers at different times. Three quarters of people aged 60 years and over drive a car and the same proportion use public transport. We also know that taking buses and walking increases as people age beyond 70 while use of other modes declines.

The development of automated road vehicles over the coming years will bring about different opportunities for our road customers. Greater automation is expected to increase safety and reduce congestion and environmental impacts, particularly if used for shared vehicles.

'Smart' motorways will also improve congestion for road users, including users of trunk passenger bus services, as real time data is used to manage the network and help road customers avoid pinch points, disruptions and scheduled maintenance.

Improving our customers' experience requires an understanding of their needs so we can design the road network to provide safe, direct and timely journeys.

Future directions to investigate

Road customers will have access to a world class network that supports private journeys, high capacity public transport services and high productivity freight vehicles.

- Provide better road connections between key centres, particularly in Regional NSW
- Prioritise efficient vehicles, taking into account the type of corridor, customer mix and the importance of local spaces
- Physically separate different road user groups with an expanded network of bus lanes and freight priority where possible
- Deliver safer roads that support optimum speeds and are resilient to weather events and climate change
- Deliver 'smart' motorways and work with industry and innovators on new technologies that can improve the road user experience

- Incorporate safety measures at the planning and design and construction stage for all new and repurposed road asset projects
- Apply the 'movement and place' approach to match road function with user groups and create better places and communities.



Figure 21 Road customers

Our freight customers

A market for freight pathways will benefit our freight customers and support innovation in the sector

We will enable innovation across the freight network and encourage new service models

Our freight customers are major partners in securing the future NSW economy. They are the people and businesses who move freight from producers and manufacturers and run deliveries right through to the consumer. The sector contributes \$13 billion in Gross Value Added each year, conveying 280 million tonnes of road freight, 192 million tonnes of bulk cargo and 150 million tonnes of rail freight.

Freight customers value reliability, efficient travel, and certainty to maximise productivity and reduce energy intensity. Network inefficiency, inconsistent regulation, and poor planning decisions impose operational constraints, extra costs, and slower or unreliable delivery times, which reduce the competitiveness of businesses.

Australian Governments are currently investigating heavy vehicle road reforms aimed at turning the provision of heavy vehicle road infrastructure into an

economic service where feasible. This would see a market established that links the needs of heavy vehicle users with the level of service they receive, the charges they pay and the investment of those charges back into road services. Heavy vehicle road reform will provide a basis for comparing road and rail freight pricing, a stepping stone towards the development of a market for freight where technology, data and analytics could support innovative ways of providing dynamic priority, and freight-as-a-service multimodal offerings.

Freight customers will increasingly harness data and analytics to improve efficiency and competitiveness. Load sharing applications and platforms will combine freight loads from different network users to maximise capacity utilisation of each vehicle. Future technologies could dramatically increase the range of ways that freight can travel and the types of service that can be provided.

Direct business-to-consumer delivery models and on-demand service models will blur the lines between traditional freight companies and retail businesses, and lead to innovative partnerships. For example, Toll and eBay now offer a business-to-consumer logistics solution to connect Asian businesses to Australian customers purchasing products online. Uber and Amazon are new entrants to the freight market for 'last mile' and on-demand deliveries. Drones could also alter the way deliveries occur in dense urban areas.

The future transport network will cater for many different types of freight trips, with more 'last mile' deliveries as well as a growing traditional container and bulk freight task. We will need a smart freight network that offers greater physical separation of freight trips and land uses and supports Intelligent Transport Systems, Cooperative-ITS technology and Connected and Automated Vehicles.

Future directions to investigate

Freight will be technology-enabled, offering dynamic, tailored services with high volume freight pathways, new service models, and more last-mile deliveries.

- Create 'smart' networks that support integrated 'freight as a service' offerings with a unified access and pricing framework, that reflects the quality of service
- Integrate transport and land use to separate freight and passenger traffic on major freight corridors and efficiently plan collection points in centres and at network interchanges (e.g. around Moorebank and Inland Rail)
- Maximise the long term capacity and performance of the state's three ports, expand intermodal rail capacity in Western Sydney, and improve east-west connections to support the regional export task.

The Cooperative Intelligent Transport Initiative in the Illawarra

The Cooperative Intelligent Transport Initiative (CITI) is a testing facility for heavy vehicles based in the Illawarra region. It is the largest test facility in the Southern Hemisphere. Around 60 trucks and 11 buses are fitted with CITS so far, with three intersections equipped to provide red traffic signal information. More than 1 billion records have been collected for analysis.

A roadside transmission station broadcasts speed limit information to heavy vehicles about the 40km/h truck and bus zone down the Mount Ousley descent on the 5.9GHz radio spectrum. Drivers in participating vehicles see the following messages:

- Intersection collision warning
- Heavy braking ahead warning
- Traffic signal phase information
- Speed limit information



Figure 22 Cooperative Intelligent Transport Initiative (CITI) – radio spectrum

Better transport to support access, inclusion and participation

Customers who experience mobility constraints need affordable, accessible and personalised services

We will improve transport access and inclusion

Many of our customers have difficulty getting to where they need to go because of their age, physical disability, low income, cultural or language barriers or limited local service options. These factors can constrain people's mobility and limit their ability to

fully participate in work, education, social activities or contribute to their communities. A fully accessible transport system will mean that seamless mobility is available to everyone in NSW, which in turn will contribute to broader social and economic goals.

The Transport Access Program is progressively making the network more physically accessible, with \$1 billion invested since 2011 and 450 projects completed or underway. These projects, and the delivery of new physically accessible transport assets, will mean that the network will be fully accessible within 10 years, with some minor exceptions.

Improving the responsiveness of transport services to the needs of customers with mobility constraints is also a significant priority. Technology-enabled service models, the sharing economy and new funding programs provide an opportunity to rethink how we deliver services to people who need transport assistance.

In the future, technology will play a greater role in improving transport accessibility through:

- Direct communication between customers and service providers using mobile and web based apps – assisting customers to book, pay for, plan, give feedback and access real time information
- More modern vehicles providing better physical access and CAVs allowing more personalised, on-demand services
- Collection of data, allowing providers to capture detailed information on customer preferences and better tailor individual services.

In some regional areas, older people now make up a third of the population and also represent a significantly growing visitor market. One in four drivers are already aged over 65 and will need to transition away from driving over coming years, which will increase demand for accessible transport to meet their individual mobility needs.

Greater numbers of older customers will increase demand for leisure travel and travel for shopping, health, social and recreational activities, mainly between peak hours. Integrated planning for safe, accessible travel by walking, accessible buses, flexible services and assisted transport services will be essential to support older people and help them to remain healthy, active and independent.

Children and young people are another group of customers who need better access to safe, accessible and affordable transport. School bus travel is subsidised but many children are unable to participate in excursions and sporting, social and cultural activities that can supplement their education and promote their health, especially in Regional NSW.

Our plans to expand the network of separated walking and cycling pathways will enable more children and young people to get to schools, social gatherings and local facilities using healthy active transport options.

New technologies will also be used to better understand changing travel needs across all customer groups, target concessions and subsidies more effectively, and develop new services to provide Government support where it is most needed.

Future directions to investigate

Our customers will have access to simpler, better services regardless of their level of mobility or where they live.

- Ensure all infrastructure and vehicles are physically accessible by applying Universal Design principles and standards to all infrastructure and service investments
- Improve service provision for people with little or no access to transport through the development of flexible, on-demand and personalised service models
- Review concession policies to ensure support is provided where it is most needed
- Improve direct, customer-based assistance, information and wayfinding products
- Provide alternative booking, planning and payment methods for people without access to digital platforms, such as smartphones and the internet



Figure 23 Designing fully accessible infrastructure

A transport vision built on respect for the first Australians

Supporting strong and connected Aboriginal communities

Honouring Aboriginal connection to the land

In looking four decades ahead, Future Transport 2056 acknowledges the more than 40,000 years of continuous Aboriginal connection to the land that has brought NSW to where it is today.

As the world's oldest living culture, the traditional Aboriginal and Torres Strait Islander owners and custodians of Australia's continent and adjacent islands share a unique bond to Country. This has been forged through thousands of years of travelling across lands and waterways for the purposes of ceremony, religion, trading and seasonal migration.

The draft Future Transport strategy and its Plans acknowledge that many transport networks developed in NSW since European settlement have been guided by Aboriginal peoples' patterns of movement. Australia's oldest city-to-city highway, Parramatta Road, connects sections of track in long use by Aboriginal peoples of the Greater Sydney basin, in particular the Eora nation.

Future Transport honours this history as the foundation for NSW's way ahead. With transport networks continuing to use and connect the traditional lands of Aboriginal peoples across the state, the NSW Government will continue to improve the transport network in a way that respects the traditional owners of the land including the protection of cultural heritage items.

Supporting reconciliation and strengthening Aboriginal communities

Future Transport supports OCHRE (Opportunity, Choice, Healing, Responsibility and Empowerment), the NSW Government's plan to improve outcomes for Aboriginal peoples. Future Transport also acknowledges the special role to be played by the transport sector in strengthening Aboriginal communities.

Under Future Transport, respecting and embracing the culture and values of our first nations at every stage of investment will realise the power of transport projects to make great places, as part of the broader move towards reconciliation.

Future Transport recognises Aboriginal peoples' need for strong connections to social, professional, sporting, medical, education and employment activities. Using innovative technology and service delivery models, transport will aim to reduce isolation.

Initiatives such as the NSW Aboriginal Participation in Construction policy will bring more Aboriginal people into the business of transport, and share in the economic and other benefits of the state's growth.

Future directions to investigate

NSW will use transport improvements to deliver better outcomes for Aboriginal communities.

- Use transport planning and social procurement to help achieve "Closing the Gap" targets by better connecting Aboriginal communities to employment, education and health services
- Continue implementing the Aboriginal Road Safety Plan, which includes training for child car seat installation, driver licensing access programs, provision of more transport options and targeted road safety improvements
- Improve opportunities for people in Aboriginal communities to access sporting, cultural and social events as well as meet family and community obligations

A world-class travel experience for visitors

Improvements that make it easier for visitors to travel also benefit the whole community

A visitor-friendly network connecting our most beautiful places

NSW is Australia's top performing state for tourism. The sector is worth \$38 billion a year and employs 260,000 people, or one in every 14 jobs, in the state. Tourism is especially important to Regional NSW, which accommodated 45 per cent of overnight stays in NSW in 2016, generating \$14.5 billion in visitor expenditure.⁵

Camping and caravan tourism, which relies on a safe and efficient road network, is also popular, with more than 2.2 million domestic caravan and camping visitors spending an estimated \$1.8 billion in 2015.

Transport is essential in connecting visitors to our cities and regions, and customers from overseas and interstate expect services that are accessible, comfortable, easy to use and well connected to destinations. Visitors also value easily understood wayfinding signage and access to mobile apps that help them plan and pay for seamless journeys.

Connecting transport modes seamlessly enriches the tourism experience. In the future, tourists will increasingly expect connections between airports, cruise ship terminals, mass transit services, on-demand services and car and bike rentals.

Intrastate aviation will also be important in connecting Greater Sydney with our regions. The intrastate air routes that connect the North Coast holiday destinations of Ballina, Coffs Harbour and Port Macquarie are currently the busiest on the NSW air network.

Improvements to infrastructure and services that support our citizens will also have a flow-on effect for tourism, particularly where investment focuses on technology-enabled customer information, network connectivity and service integration.

Creating attractive and vibrant places that are well connected to the transport network will also boost tourism. A recent example is the plan to upgrade Circular Quay, where a decision was made to leverage Government investment to unlock private capital. This will allow a whole-of-precinct renewal that includes retail, dining and entertainment attractions as well as a modern transport interchange.

Future directions to investigate

NSW will enable visitors to move around the network seamlessly and enjoy transport connections to attractions and tourist precincts.

- Improve public transport connections to arrival and departure points such as airports and cruise terminals

⁵ Economic Contribution of Tourism to NSW 2015-16, Destination NSW

- Facilitate the development of new smartphone apps that provide a single point of information and allow tourists to purchase products that bundle travel with cultural activities and tourist attractions
- Provide clear wayfinding to assist visitors and infrequent transport users to navigate the network easily and seamlessly
- Promote accessible tourism opportunities, including rural rail journeys, and provide accessible roadside facilities



24 Camping and caravanning tourism



Figure 25 The 'Elvis Express' to Parkes

For more information about how we are improving transport for visitors see **Supporting the Visitor Economy**

7. Future Mobility

Technology is transforming the customer experience. Even in 2012, we did not anticipate how smartphones would so dramatically change the way customers plan and purchase transport, and engage with service providers. Emerging transport technologies will continue to evolve and to change customer behaviour in ways that are difficult to predict today. With technology becoming a key factor in transport planning, we will need to be more nimble, and to plan for a wider range of options than ever before.

This chapter considers opportunities and challenges posed by a number of technology developments and how these could change customer mobility, and the capabilities of transport providers:

- Technology enabled mobility
- World-class mass transit
- More service possibilities with Connected and Autonomous Vehicles (CAVs)
- New personalised devices for short trips
- Using drones to support the future transport task
- Technology that enables the use of alternative fuels

Technology enabled mobility

Technology brings new service possibilities and government has a role as an 'enabler'

Raising customer standards through technology

Picture a future where you can get from door to door seamlessly without pausing to buy a ticket, check timetables, book your trip or park your car.

Mobility is increasingly technology-led, where data sharing and smartphone apps are enabling more flexible models to develop by matching customer demand with services. Mobile technology is also improving the customer interface, by providing a single platform for trip planning, payment and service information.

The rise of ridesharing in NSW is an example of how service models have been disrupted by technology through advances in GPS navigation devices, smartphones and networks that can coordinate drivers, customers and payment systems.

As the speed of innovation has increased, so has the unpredictability of technology adoption. Our customers appear to be early adopters of new service models, with one-third of Sydneysiders reportedly using ridesharing in the two years following its introduction. However, predictions about the likely use of driverless vehicles vary wildly. By 2036, estimates of take up of driverless vehicles range from 30 per cent to 100 per cent of total vehicles. (See graph below)

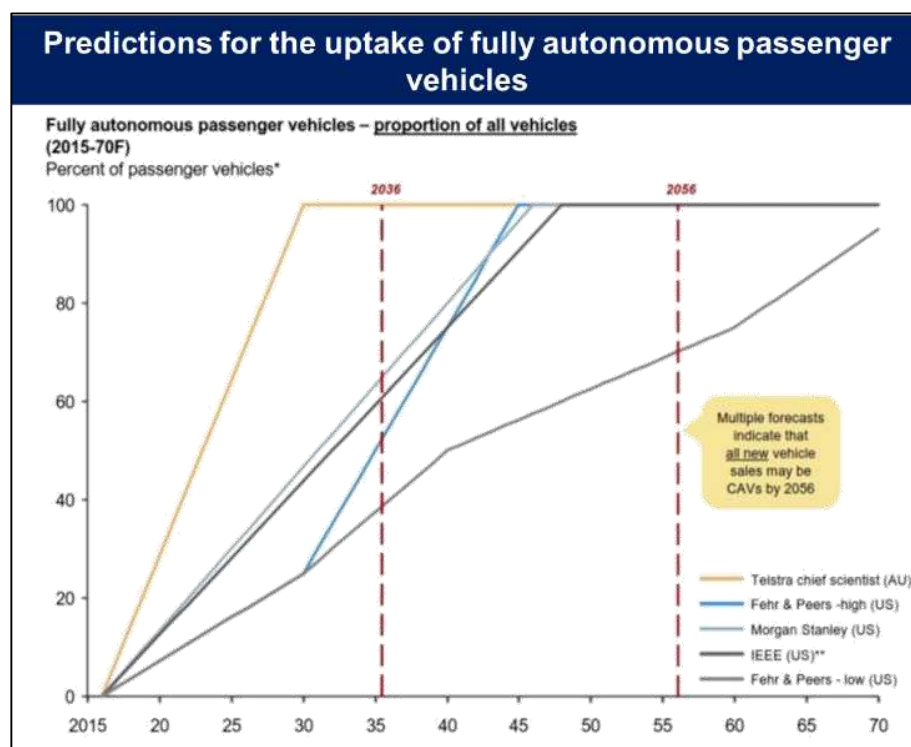


Figure 26 Predictions of the uptake of Connected and Automated Vehicles (CAVs)

This uncertainty has implications for planning. What type of trips will be done by car in the future? How much road capacity and supporting facilities will they require?

While customers – and markets – ultimately determine whether a technology is widely used, governments play a key role in enabling the use of new technology, through regulation, service provision, and collaboration with the community, private sector and universities, and in regulating appropriately for safety and public interest

For example, the NSW Government has passed legislation to enable the Minister for Roads, Maritime and Freight to approve trials of automated vehicles, so we can properly assess their ability to meet our policy objectives of improving safety, boosting service frequencies and reducing congestion. The legislation allows Government to partner with industry, researchers and universities to make NSW a premium testing ground for automated vehicles.

Transport Legislation Amendment (Automated Vehicle Trials and Innovation) Act 2017

- Automated vehicles cannot be used on NSW roads as vehicle standards and driver laws require a steering wheel and a driver.
- Under the Act, the Minister can approve applications to conduct trials of automated vehicles by order which specifies the trial area and roads used, the time period of the trial and any other necessary conditions.
- The Act also sets out insurance and vehicle supervision requirements and contains penalties for improper vehicle use or interference.

This chapter considers the following emerging technology developments, and how these could impact customer mobility and future services:

- Automated Mass Transit
- Connected and Autonomous Vehicles (CAVs)
- Assisted Mobility Devices
- Aerial mobility
- Alternative fuels

For more information see the **Future Transport Technology Roadmap**

World-class mass transit for our customers

Automation makes the emergence of more responsive, capable, 'smart' systems possible

Automated metro systems around the world will double by 2020

Technology is already helping us improve the network for customers in Regional NSW and Greater Sydney. Customers can now use apps to receive information in real time and plan their trips. They can also use electronic ticketing via the Opal card, which provides a seamless journey across transport modes in areas covered by Opal.

Our network will require employees to physically manage and attend systems for some time and deliver customer services. However, with greater automation, safety benefits will be achieved by reducing the risk of human error and using computerised failure detection and response systems. Automated systems also offer more predictable running times and energy optimisation.

The Sydney Metro will be Australia's first fully-automated rail network, reflecting global trends. China will soon deliver two new automated systems and several European cities are planning to convert existing metro lines.

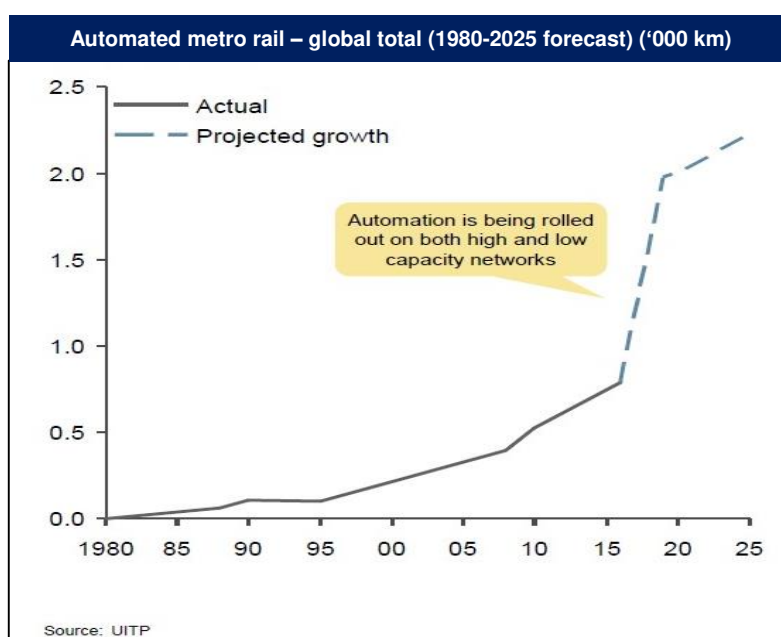


Figure 27 Increasing automated metro rail projects

As technology continues to improve and change, we need to be prepared. For example, the future of rail may be a high speed intercity rail system able to compete with commercial airlines. We need to be in a position to ensure the safety of this type of technology, and that it contributes to our overall vision for transport.

Advances in communications and control systems will create opportunities to further improve capacity on our existing network, an approach that will be more cost effective than building additional infrastructure.

To improve efficiency and reduce travel times on the road network, the NSW Government is investing in "smart motorways" and has committed \$470 million to the M4 Smart Motorway project. Smart motorways use complementary technologies to monitor traffic conditions, manage congestion and respond to incidents in real time.

Numerous trials and pilots of automated passenger vehicles are also underway in Australia and internationally. NSW is currently conducting a two year trial of a driverless shuttle bus at Sydney Olympic Park with delivery partners HMI Technologies, NRMA, Telstra and IAE.

The NSW Government will investigate the introduction of automated transit services across 210km of the network over the life of this strategy.

With the advent of new technology, the Government will need to consider associated risks, including the cost of transitioning to automated systems, cybersecurity and upskilling our workforce.

Future directions to investigate

NSW will continue to embrace automation to achieve safety and efficiency benefits and service improvements for customers.

- Enable new and upgraded physical and digital assets to support new technologies and adapt to future developments
- Identify road infrastructure and furniture required to support automated vehicles
- Implement intelligent traffic management methods to improve road network efficiency
- Deliver “smart motorways” on all NSW motorways
- Support the NSW Innovation Strategy to manage the workforce transition as automation increases

Blurred lines between a private vehicle and a mobility service

Driverless vehicles are the next big game-changer in terms of safety, efficiency and unlocking new service offerings

Could driverless vehicles help deliver our vision for Future Transport?

Automated safety systems are already available on many new vehicles today, with car manufacturers working to deliver fully automated vehicles within the next decade.

These vehicles have the potential to provide our customers with a broader range of more flexible travel options, and safer, smoother and faster journeys. If CAVs are predominantly used to run shared services, they could also help reduce congestion and get more people out of their cars by extending the catchment of traditional public transport systems.

A wholly automated vehicle fleet could dramatically improve safety on our network by removing the risk of human error which is estimated to cause 90% of vehicle crashes. Austroads has previously estimated that full deployment that connected vehicles with collision avoidance applications could prevent 25-35 per cent of fatal crashes.⁶

Long term reductions in road crashes and improved travel time savings, road productivity, and vehicle running costs promise tangible economic impacts too, with a

⁶ Austroads (2011), *Evaluation of the potential safety benefits of collision avoidance technologies through vehicle to vehicle Dedicated Short Range Communications (DSRC) in Australia*

UK study⁷ predicting that by 2030, CAVs alone could increase the UK's Gross Domestic Product by around 1 per cent. The benefits promised by CAVs are highly dependent on the cost and rate of take up, the degree to which they attract users away from public transport, and the ownership models that develop. Future Transport modelling shows that widespread CAV use for private trips could reduce metropolitan public transport use to around 18 per cent. This would have significant negative impacts across the network, with increased traffic volumes, an increase in vehicle kilometres travelled, and higher greenhouse gas emissions.

The NSW Government is working with our industry partners to undertake testing of technologies, so we can understand the risks and benefits and better engage with customers on what these vehicles will mean for the network.

Once tested, Government will work with industry to deploy automated technology where it can immediately improve services and service levels. First deployment would focus on regional and remote communities where better connections are needed.

Future directions to investigate

NSW will be proactive and prepare for the emergence of CAVs, and work with the Federal Government and other jurisdictions to develop national standards and road rules.

- Identify small scale infrastructure enhancements needed to support CAV operations, including CAV drop off facilities at rail stations, road signage and high contrast road markings
- Work with other jurisdictions to identify and implement the digital infrastructure needed to support CAVs
- Conduct CAV trials across NSW
- Engage and educate the public on CAVs

NSW Smart Shuttle Trial – Sydney Olympic Park

- The NSW Government is partnering with HMI Technologies, Telstra, NRMA, Sydney Olympic Park Authority and General insurer IAG on the two year trial.
- The aim of the trial is to understand what supporting technology and infrastructure is needed to operate an automated shuttle in this environment, how it interacts with other precinct users (pedestrians, cyclists etc.) and how it integrates with the broader transport network. It will also assess passengers' responses to this type of vehicle and the services it can enable, like on-demand transport in off-peak times.
- Stage 1 (Q3 2017) – testing in an enclosed off-road environment at Newington Armory, adjacent to Sydney Olympic Park.
- Stage 2 (Q4 2017) – operation at a closed section of Sydney Olympic Park.
- Stage 3 (Q1 2018) – live operation at Sydney Olympic Park.

⁷ Connected and Autonomous Vehicles, The UK Economic Opportunity, KPMG, March 2015



Figure 28 Smart Shuttle Trial – Sydney Olympic Park

New personalised devices for short trips

Transforming personal mobility and boosting active transport in centres

By 2056, two-thirds of us will live within 2 km of a centre

Assisted mobility devices have the potential to move people out of single occupant cars for first mile and last mile trips, freeing up capacity on the roads for people who need to travel further.

These devices are appealing because they are faster and require less physical effort than walking or cycling and people can use them for longer trips, over more difficult terrain, even with a lower fitness level. The cost of the devices also makes them appealing with upfront and operating costs significantly lower than private vehicles. Costs are even further reduced when sharing schemes are available.

E-bikes are one of the most popular types of assisted mobility devices. Australian and international trials and research shows the take up of e-bikes is growing significantly. A trial conducted in Western Australia showed a decrease from 61 per cent to 32 per cent of participants commuting by car either as a driver or passenger⁸. E-bike sharing

⁸ RAC e-bike trial, Top line results, December 2015

at interchanges also has the potential to grow public transport use by better connecting people to the mass transit network.

Other devices such as mobility scooters can enable people with mobility constraints to access public transport from their homes without the need for a private vehicle. The ageing population is contributing to the increasing uptake of these devices.

To realise the potential benefit of assisted mobility devices, we need to create an environment where they can be used safely and can help deliver a more efficient network.

One of the issues that will be important to resolve is regulation. At present, some devices are only allowed on private property and not on road or road related areas. E-bikes that are considered power-assisted pedal cycles are allowed on public roads and relevant road related areas. Motorised scooters and wheelchairs are not allowed to travel faster than 10km/h and are considered to be pedestrians under the Road Rules.

As technology advances these devices may become faster, heavier and have a degree of automation that may increase risks to passengers and other road users – all of which will need to be managed with an appropriate policy and regulatory framework.

Sharing schemes will also need to be monitored to ensure loaned devices, such as e-bikes, are kept securely in appropriate spaces around interchanges and that charging and repair facilities are available.



Figure 29 e-bikes for shorter trips and connecting people to public transport

Future directions to investigate

NSW will enable assisted mobility devices to be used safely on the network to assist with short journeys within centres.

- Deliver complete cycling networks, pedestrian space and interchanges that safely support a wider range of devices
- Enable shared use service models in key centres (e.g. E-bike hire)

- Develop and adopt safety standards for new devices entering the market and review existing regulatory frameworks

Using drones to support future transport

Rapid point-to-point services that could transform emergency services and deliveries

Automated aerial mobility could be in use by 2056

Australia's safety laws for drones currently depend on whether the operator is flying commercially or recreationally, with recreational and very small commercial operations generally exempt as long as they pose no risk or hazard to the public, property or another aircraft.

If the use of drones expands to include routine freight delivery and point to point transport for people, standardised regulations and access arrangements will need to be implemented to ensure safe operations. Investments in infrastructure to support drone use would also be needed.

Amazon has already proposed how airspace could be segregated to ensure safe and efficient drone use. In this model, the area between 200 and 400 feet is reserved as a "drone highway" where drones operate autonomously and are equipped with "sense and avoid" technologies that allow them to dodge other vehicles and potential hazards like birds and tall buildings.

If properly introduced, drones could be used for last mile freight delivery as well as the surveillance and rapid deployment of emergency personnel or equipment.

Uber Elevate intends to undertake trials of passenger drones in Dallas and Dubai by 2020. The EHang 184 passenger drone will also be tested in Nevada and is being considered for use in Dubai this year. Dubai has signalled it may introduce a passenger drone by 2017.

There are a number of issues that would need to be resolved if drones or other aerial mobility devices were to be used more widely, including safety, noise impacts and landing infrastructure. Improvements in battery technology and vehicle efficiency and reliability would also need to be addressed.

Future directions to investigate

- Policies around the management of airspace and air safety will be reviewed and established to enable a potential future of aerial mobility.
- Work with the Federal Government and other jurisdictions on a national regulatory response around air space, safety and aircraft standards
- Investigate the role drones may play in first and last mile freight delivery and emergency response transport

- Investigate future land use options for aircraft take-off and landing infrastructure

PROPOSED AIRSPACE CORRIDORS FOR DRONE SERVICES

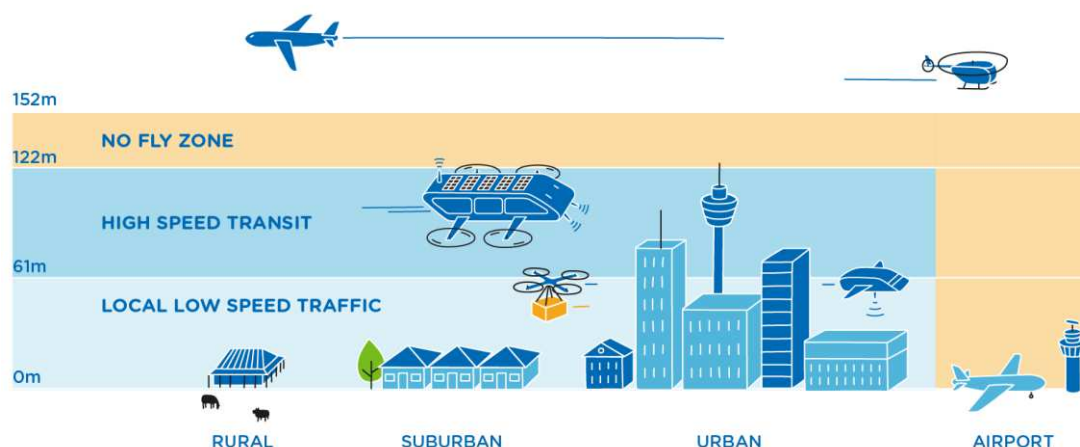


Figure 30 Inspired by Amazon's proposal for segregated airspace below 500ft for the operation of drones (*Forbes Magazine*, July 2015)

Transport that is powered by alternative fuels

Early signs point to the beginning of a transition away from internal combustion engines

Alternative fuels will benefit the environment, improve energy security and lower costs

A number of governments abroad have announced their intention to phase out internal combustion engines (ICE). For instance, from 2025 all new passenger cars and vans sold in Norway will be zero-emission vehicles.

Manufacturers and corporations are following suit with Volvo's commitment for all vehicles to be electric or plug-in hybrid from 2019.

Alternative fuels have several benefits, including:

- Lower costs for users – running costs are one third to one quarter of traditional vehicles (although up-front costs are currently higher)
- Reduced air pollution and lower greenhouse gas emissions compared to internal combustion engines
- Health benefits from air quality improvements
- Reduced noise in vehicle operations (particularly buses), which will improve liveability

- Improved energy security through reduced reliance on non-renewable imported fuels.

Electric vehicles are a wide class that includes hybrid, plug-in hybrid, all-electric, hydrogen fuel cell, and solar powered vehicles.

Two barriers to greater take up of EVs have been cost and the improvements to battery technology required to enable mobile electricity storage.

EVs can currently cost around \$15,000 more than a comparable car with an internal combustion engine. However, with improving battery functionality and falling battery prices, some manufacturers are now pricing hybrids at the same level as petrol vehicles to encourage take-up and create a market. Stockholm Environment Institute researchers expect cost parity with ICE vehicles will be reached when batteries cost \$150 US per kwh. This could be achieved by 2025.

The need for supporting infrastructure and facilities may also present a barrier, particularly in regional and remote areas. Encouraging take up will rely on access to publicly accessible charging stations to ensure energy availability and address “range anxiety.”

Future directions to investigate

NSW supports an industry-led response to the development of EVs and alternative fuels.

- Investigate the opportunities and challenges of EV use in NSW
- Develop a strategic approach to EVs to maximise benefits for passenger and freight mobility, productivity and liveable communities

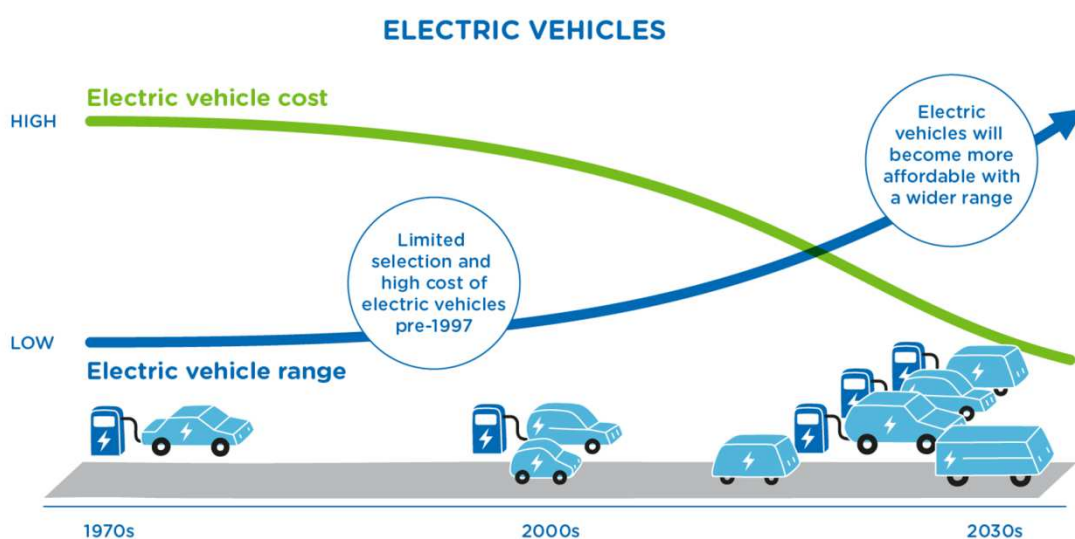


Figure 31 Affordability of Electric Vehicles (EVs), Interpreted from data sources Toyota; caranddriver.com, Mitsubishi; BMW; Cars Guide; motoring.com.au

8. Future of Services

The transport service ‘ecosystem’ is undergoing significant change. Services are increasingly being delivered by a market of providers, including community groups, businesses, automobile and technology companies, and recreational or tourism planners – boosting choice, service quality and customer convenience.

This chapter addresses six ways the future of transport services will change for the better:

- A focus on service outcomes for customers
- Technology is catalysing new services
- Providing customers with integrated information, pricing and trip planning
- Customer-led services
- The role of government in enabling new services
- A service hierarchy for the future

A focus on service outcomes for customers

New service models and competition are giving customers more choice and making transport increasingly outcomes-focused, with important implications for the role of government

New services should improve the customer experience and help us achieve our vision

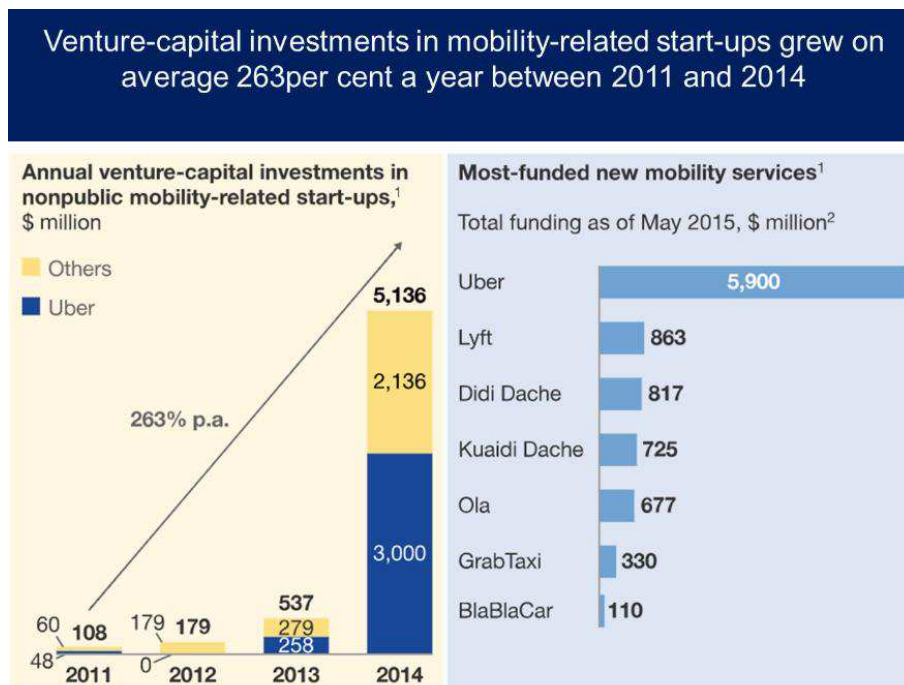
The delivery of transport services is undergoing significant change. In cities and regions across the world, technology is enabling the emergence of new transport providers, generating greater choice and personalisation for customers. These changes also pose a challenge for government as to how to enable innovative services, while ensuring they are effectively integrated into the network.

Technology is transforming the transport services market. Where market entry previously required significant capital investment, mobile apps are allowing smaller companies and individuals to enter the market with lower upfront costs. This is evidenced by the growth in venture capital investment in non-public mobility companies in the chart below.

The emergence of rideshare companies has significantly changed the point to point market, with new online service providers emerging and being embraced by customers. The NSW Government has harnessed the potential of new point to point models through changes to legislation. However, this experience has taught us that the pace of change can be swift and unpredictable and government needs to be responsive and agile to get the best value from new services and models.

Today, we are at a 'tipping point' with more companies developing or operating innovative transport services. Unlocking the potential of new services for the benefit of customers requires us to set clear customer outcomes for transport services, engage closely with industry and ensure our infrastructure can support new services. It also requires us to be agile in our planning so we can quickly respond to new developments.

This chapter details the significant changes underway in the provision and use of transport services and our approach for harnessing the potential of these changes.



Source: McKinsey, Urban Mobility is at a tipping point, September 2015

Figure 32 Investment in new service models

Technology is catalysing new service models

Technology unlocks service opportunities above the physical network, empowers new providers and breaks the nexus between asset ownership and service delivery

A marketplace for innovation

A dynamic, customer-oriented marketplace for transport services is emerging around traditional transport networks.

Rather than planning a journey using a train or bus timetable and purchasing individual tickets, customers today have access to a range of transport options at the touch of a button. This is placing greater importance on the availability of data and is driving the need for the integration of pricing and information so customers can benefit from new services.

Traditionally, transport services were strictly the operation of transport infrastructure and fleets. This meant that service providers were dependent on their control or ownership of the physical assets or network. Mobile technology better connecting providers directly to customers enables different ways for creating customer value. This can involve packaging transport with other services and customer products and enabling shared use of transport assets.

Unlocking customer value in the transport system

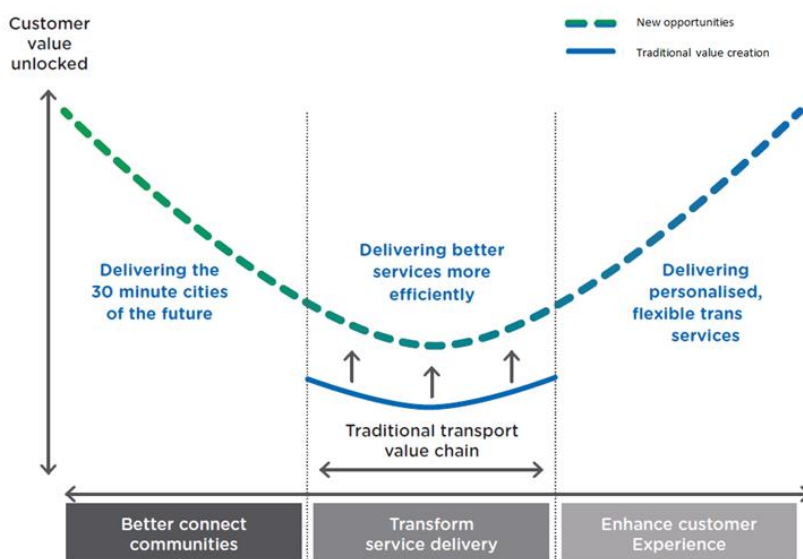


Figure 33 New ways of unlocking customer value

The emergence of new services enabled by technology has a number of significant implications for government. It places greater importance on the availability and sharing of data as markets operate most efficiently and deliver better customer outcomes when people have access to information

A new market of service providers is also driving the need for integration of payment systems and information. With so many transport services potentially on offer, government has a critical role as a 'network integrator.'

Enabling customers to have an integrated, end-to-end journey experience regardless of the services they use may require integrated, end-to-end journey pricing, so customers can use different services without needing to purchase different tickets. It potentially means enabling retailers to package public transport trips innovatively, offer different payment and subscription opportunities, and negotiate commercial deals with transport service providers (see MaaS section overleaf).

TAILORED TRANSPORT



Figure 34 Smartphone technology supporting transport

As outlined in the Future Transport Technology Roadmap, a new market for service providers also requires clear information to be made available to customers in real-time so that the transport system is simple to understand, easy to use and can deliver personalised services relevant to individual needs and preferences. For transport customers, this means being able to compare travel times and prices across different transport modes in real-time to make the best choice about how to reach their destination.

Future directions to investigate

NSW will work with service providers and technology companies on the sharing and innovative use of data, to better match services with customer needs.

- Expand open data and data exchange initiatives to improve customisation of services and journey planning across providers
- Support data platforms for Mobility as a Service (Maas) models
- Resolve issues relating to privacy, data protection and liability
- Lead innovation nationally, with a Data Science Incubator and Open Data policies across public and private services to enable safe and effective use of technology

Providing customers with integrated information, pricing and trip planning

Customers will access a market of mobility services in a simple, easy-to-understand way

Mobility as a Service (MaaS) is a service model that enables customers to plan and pay for their journeys using a range of services via a single customer interface. It is an important tool for enabling customers to access integrated, easy-to-understand journeys in a broad market of transport services.

As new transport service providers emerge, customers will have more choice in how they travel. A customer travelling from south-west Sydney to Parramatta, for example, could potentially use a sequence of different transport modes and services to reach their destination. The challenge, however, is enabling customers to use these services in a way that delivers an integrated and efficient end-to-end journey. MaaS provides a model for this.

MaaS relies on sharing real time information across different service providers to help customers optimise their journeys. It enables customers to plan and purchase their end-to-end journey from a retailer (most likely via an app) from a range of travel options, such as travelling by public transport, rideshare or bike hire. In real time, the app then guides the customer through their journey.

Data drawn from customers on a MaaS platform helps providers offer more personalised services and to link customers to non-travel related products such as park 'n' ride, restaurant delivery, event ticketing and retail.

MaaS platforms have the potential to reduce the need for car ownership by simplifying the complexity of multi-modal trip choices for customers and diverting them to the most efficient mode of transport available.

MaaS platforms are already being used in other countries. An example of a recent successful roll out of MaaS was in Turku, Finland. Under this MaaS system, passenger journeys increased by 20 per cent and 98 per cent of surveyed customers said the attractiveness of public transport had improved. The system also engaged new customers, with 9 per cent of customers on regional lines reporting they had previously not considered themselves to be public transport users.⁹

A trial of MaaS in Sweden also indicated positive results for public transport use, with patronage increasing from 35 per cent before the trial to 45 per cent during the trial¹⁰.

⁹ Intelligent Transport magazine (formerly Eurotransport)

¹⁰ UbiGo: trial participant - Chalmers University of Technology in Sweden

Our Pathway to enabling Mobility as a Service	
A unified mobility account	<ul style="list-style-type: none"> Develop a unified mobility account that enables customers to plan, book and pay for transport services. Enable integrated payments across transport modes for end to end journeys.
Utilise apps and APIs to create customer facing platforms	<ul style="list-style-type: none"> Enable the creation of additional Application Programming Interfaces (APIs) to support MaaS. Make APIs available through Open Data for 3rd party App developers to integrate into their products.
A Data Exchange for Transport Providers	<ul style="list-style-type: none"> Upgrade the Open Data portal to enable licensed, non-contracted Transport operators to feed vehicle availability, capacity and cost into our Journey Planner Application Programming Interface (API) so that all providers can see network supply; and or Work with industry to share data through APIs and facilitate integration into 3rd party applications.
A predictive algorithm to manage supply and demand	<ul style="list-style-type: none"> Build a dashboard available to the Transport Management Centre (TMC) and the Open Data portal to show customer journey demand. This information depicting the most efficient real-time journey paths will be passed to operators.

Figure 35 NSW's potential pathway to Mobility as a Service (MaaS)

Customer-led services

Customers will have even greater input into transport services, including where they go, how much they cost and even how they are packaged with other services

Customers influencing service provision

The emergence of new services presents an opportunity for customers to have even greater input into their transport experience. Personalisation of many transport services means customers will have more choice of where services go, their price and even how they are packaged with other services, such as events and shopping.

As technology unlocks new service possibilities, transport will increasingly resemble a retail industry, where individual service providers can tailor offerings to individual customer needs. This presents an opportunity for customers to have unprecedented input into how transport services are delivered.

One way in which customers will have greater influence on transport services is in relation to where they go. The emergence of on-demand bus services and other forms of shared transport will allow customers to directly influence where their local services travel on a day-to-day basis. For example, if few customers happen to board a local, on-demand bus service in the evening, a more direct route may be taken to ensure each customer arrives home sooner.

Pricing is another area in which customers will have more influence. The emergence of MaaS means providers will be able to sell a range of different transport packages. For example, based on customer input, service providers may offer 'premium' packages that enable customers to take a faster mode of transport at a higher price. Special 'last minute' discounts may also be offered based on capacity on selected modes of transport.

An example of an innovative development in packaging transport and other products together is the “virtual shopping wall.” The first “virtual shopping wall” combining travel and shopping experiences was set up in Seoul in 2011, and allowed customers to view, purchase and arrange the delivery of groceries at the train station. China plans to roll out 1,000 virtual supermarkets across the country in the near future.

Other opportunities might include the ability to salary package public transport costs, taking account of public transport use in health insurance premiums or packaging public transport into rents in high density areas.

Future directions to investigate

Customers will have unprecedented input into service planning enabled by digital platforms that connect customer needs to service provision.

- Transform the customer experience and service interface, with integrated digital channels, contactless payment and seamless interchanges
- Develop and introduce customised service models including Mobility as a Service, shared services and on-demand models, with priority roll out in regional centres and for people who find it harder to access transport services.

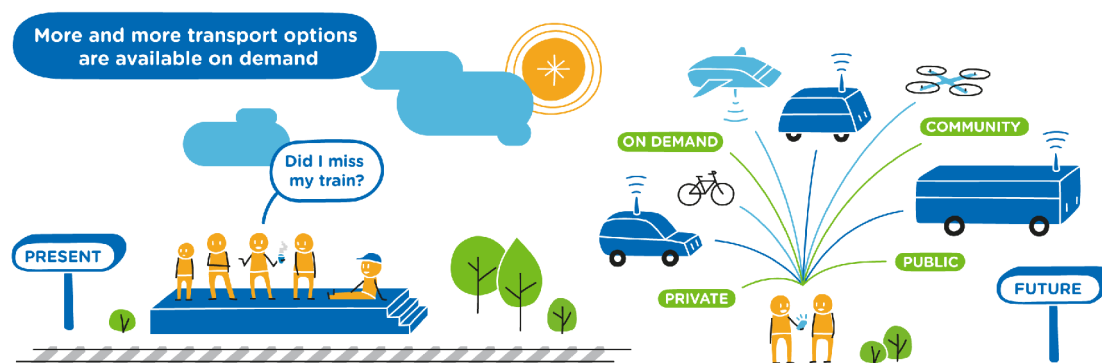


Figure 36 Customers directly influencing service providers

The role of government in enabling new services

Government sets the right environment to get the best from a growing market

Creating the right environment for quality service provision

The changing landscape for transport services means a different role for government. Typically, government has been the default provider of transport services. However, the emergence of new services is changing this role, with the private sector becoming increasingly involved in transport service delivery and operating in environments that are traditionally the domain of governments alone.

The future role of government will be to focus on setting network outcomes and ensuring policy and regulatory frameworks are in place to support new service operators. This will likely involve reducing regulatory burden and setting safety and service standards to ensure positive outcomes for our customers and the community.

In some instances, the role for government will be to get out of the way and allow the market to deliver services. This may be the case where demand for services is high or where the private sector is better equipped to meet customer needs. This aligns with the NSW Government's position on regulatory frameworks to ensure unnecessary restrictions on competition are removed unless the community benefits of the restriction outweigh the costs and the objectives of the regulation.

A recent example of government creating a more contestable market is its response to the emergence of rideshare companies. Many customers were quick to embrace ridesharing but regulation did not reflect the "shared economy" approach, meaning rideshare companies were unable to operate legally. Similar services like taxis and hire cars were able to operate legally but were heavily regulated in a way that hampered innovation and created unnecessary barriers to new market entrants.

The NSW Government has now removed 50 unnecessary regulations on the point to point industry and allowed rideshare companies to operate legally, while continuing to regulate on issues in the public interest such as safety and consumer protection.

Future directions to investigate

NSW will create a service ecosystem where government enables services and is no longer the default service provider.

- Conduct or facilitate pilots of new service models and work in partnership with industry and communities
- Review regulation governing road, rail and bus operations to provide new regulation that can pre-empt or respond quickly to market disruptions

Introducing an element of competition to smaller markets

The NSW Government takes an integrated approach to services where the customer outcome drives delivery choice, regardless of organisational boundaries and constraints. Where government has traditionally had to directly provide public services to meet its obligations to the community, it is now able to play a more sophisticated role in developing a marketplace for services and purchasing high quality, innovative services - where these deliver better outcomes for customers.

In markets with lower contestability, such as some areas in Regional NSW and customer segments where disadvantage exists, we will need to look to more innovative procurement practices, where services that better respond to customer needs and deliver better value for money for government are purchased.

This procurement approach has the potential to empower customers by including outcomes-based provisions in contracts that can be tied to financial incentives.

A recent example of a new procurement approach is the awarding of a contract to a private entity to operate bus, ferry and new light rail services as well as manage interchanges in the Newcastle area.

The contract is outcomes-based and sets minimum service levels but provides a greater level of autonomy to the service provider to plan and reshape the network. The contract also contains provisions for incentive payments for patronage growth above the base contract rate.

This approach introduced a level of competition in the Newcastle transport service market that has not existed before as the government went out to competitive tender before appointing the service provider. The tender process looked at the companies' ability to deliver services in Newcastle and the value for money for government.

The new network is expected to increase the quantity and quality of services in Newcastle within a more efficient cost structure for government.

Future directions to investigate

Government service delivery and procurement will focus on achieving the market and service outcomes – not prescribing fixed service levels.

- Go to open market tenders when procuring services, to introduce competition in markets with low contestability
- Include arrangements that reward innovation and patronage growth into service contracts
- Continue creating a workplace culture where Transport for NSW is equipped to achieve best value for money outcomes from private sector providers



Figure 37 Newcastle – artist's impression

A service hierarchy for the future

New providers entering the market will result in more personalised services, which will complement 'turn up and go' services on trunk corridors

An easily understood and efficient network

The emergence of new service providers will result in customers having more choice than ever. However, it is important that the transport system also remains easy-to-understand. In high demand areas including Sydney, the Global Gateway City of Newcastle and the Satellite Cities of Gosford and Wollongong, frequent, high capacity trunk services will be provided to move the majority of people. These will be complemented by more flexible or on-demand services on local corridors.

In Regional NSW, the focus will be on services that operate on more localised networks radiating from regional cities rather than Sydney. Services will include scheduled public transport services such as in town bus services, NSW TrainLink rail, and coach services connecting towns and cities. Communities will also be supported by flexible or on-demand services that better personalise journeys in service areas where traditional public transport is harder to provide and access.

The NSW Government has already launched a program to identify and pilot creative new ways to deliver flexible services in Regional NSW and in less dense metropolitan areas so people can reach their destinations quickly, safely and efficiently and at a time that suits them. Expressions of interest were sought from industry and tech companies in December 2016. All selected pilot programs are expected to be operational by the end of 2017.

The service hierarchy in NSW will evolve towards:

- **‘Turn up and go’ services on trunk corridors in metropolitan areas.** These will include city-city and centre-centre corridors in Greater Sydney and on major corridors within Greater Newcastle, the Central Coast and Wollongong. Trunk corridors will carry large numbers of customers on predictable and reliable services without timetables – customers will ‘turn up and go’.
- **Frequent and reliable services in regional areas.** Services will operate on a ‘hub and spoke’ network and provide reliable, timetabled services on certain routes allowing same day returns between regional cities and centres. Modes may include rail, coach, bus or air services, determined by journey length and demand.
- **Flexible or on-demand services.** These services support both metropolitan trunk services and regional services. They will operate as on-demand services on local corridors in metropolitan areas, such as between a local train stations and residential areas, and in less densely populated areas where customers’ travel patterns are more disperse. In Regional NSW, they will provide more personalised, end to end journeys by connecting transport hubs in cities and centres to smaller towns and villages, providing efficient transport in areas that currently have few or no services.

Future directions to investigate

Transport planning will focus on high capacity trunk corridors and major regional transport routes, supported by flexible or on-demand service offerings.

- Prioritise investment in services on trunk corridors including automated systems to support ‘turn up and go’ services in high demand areas
- Conduct pilots of flexible services in rural and regional areas and investigate government support to run these services
- Move towards dynamic scheduling for some transport services, so routes and timetables can be altered to better match demand
- Improve multimodal interchanges, particularly in Regional NSW, so customers can more easily connect to flexible services and experience seamless and reliable journeys

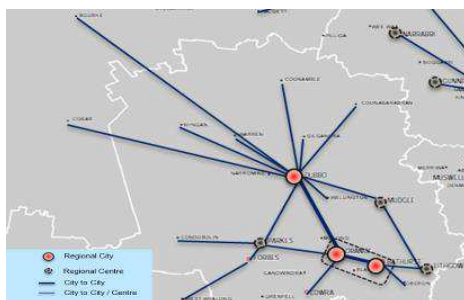


Figure 38 Regional services

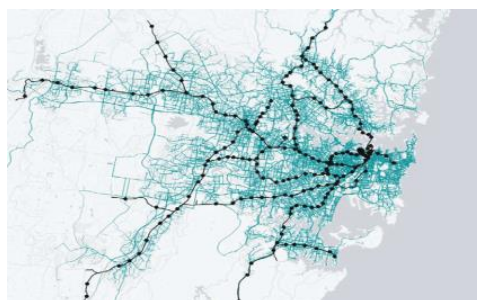


Figure 39 Trunk and flexible services

9. The Future Network

The infrastructure network – the physical corridors, road and rail infrastructure, and surrounding land uses – are the backbone upon which technology and services operate, and transport customers travel. The network has long lead times for development, and once built, is difficult and costly to alter.

Therefore, network development must be as flexible as possible, and embed future optionality, maximise capacity and re-use of assets, and support innovative service and technology provision and demand management to optimise network performance.

This chapter looks at network issues that we will need to address as part of Future Transport for the improvement, use and management of the future network over the next 40 years:

- Planning tomorrow's network
- Promoting sustainable development and healthy lifestyles
- Developing the digital network
- A safely operated network
- Optimising the network and better using existing infrastructure
- Growing the Greater Sydney and Regional NSW networks to deliver our vision of places

Planning tomorrow's networks

Building our way out of congestion is not the only solution – network optimisation through technology and more responsive service can help tackle congestion more flexibly in the short term

Planning a more dynamic network

The infrastructure network in NSW is made up of fixed assets and corridors that form the backbone for service provision, and are difficult to alter once built. The Cumberland scheme from 1951 still remains the backbone of today's motorway and arterial road network.

Large infrastructure projects have long lead timeframes, are disruptive to communities to build, and once built, are difficult or costly to alter. As a result, the infrastructure network has often lagged behind the rapidly changing needs of communities. Remnants of past transport solutions exist everywhere today, from many of our bus routes, which follow Sydney's old tram tracks, to old tram shelters which have been repurposed for buses.

Planning for the future network means preserving optionality for future uses and travel behaviours. It also means repurposing existing infrastructure and corridors to optimise their performance and innovatively maximise their carrying capacity, as congestion and passenger and freight traffic volumes grow.

While the course or footprint of a corridor is fixed, its capacity is not. Different modes of transport have different carrying capacities when using equivalent 'space' – public transport on roads uses one-twentieth of the road space of car travel.

Technological advances such as driverless trains and road vehicles allow vehicles to operate closer together, while technologies available today, such as Smart motorway systems and ICT, improve incident response and congestion outcomes on roads and optimise their ability to manage growing car volumes.

For these reasons, the services and technology systems that manage demand are far more responsive ways to meet growth and varying customer requirements. These more agile solutions should be our first response to congestion and performance variability.

Greater Sydney and some areas of Regional NSW are experiencing noticeably higher levels of road congestion over longer periods of the day and week, and growing travel times. Congestion negatively impacts productivity of the economy, and the vibrancy and liveability of places.

The Sydney Harbour Bridge was built in 1932 to carry 11,000 vehicles a day – it now carries 160,000



Figure 40 Sydney Harbour Bridge capacity

Promoting sustainable development and healthy lifestyles

The success of our cities and regional towns depends on our network supporting attractive and healthy places

Improving the urban form through transport

The Movement and Place Framework underpins Future Transport and aims to improve the liveability of places in Sydney and Regional NSW through an integrated land use and transport planning tool that sets customer focused outcomes and delivers wider benefits for the health and wellbeing of the community.

Some of the most challenging decisions we face in managing the network arise when trying to balance different uses of the road network. Historically, many of our most vibrant eating and shopping districts grew alongside our busiest road corridors that today suffer acute congestion during peak periods.

The Movement and Place model aims to balance the needs of:

- Vibrant commercial centres, where customers want easy access and pedestrian friendly environments
- Public transport customers who depend on corridors for efficient movement to their destinations
- Private car users who want to access the corridor and on-street or nearby parking areas
- Freight operators who need efficient corridors and kerbside access to meet delivery timeframes.
- Local communities who are interested in 'liveability' and places that are walkable and easily accessible

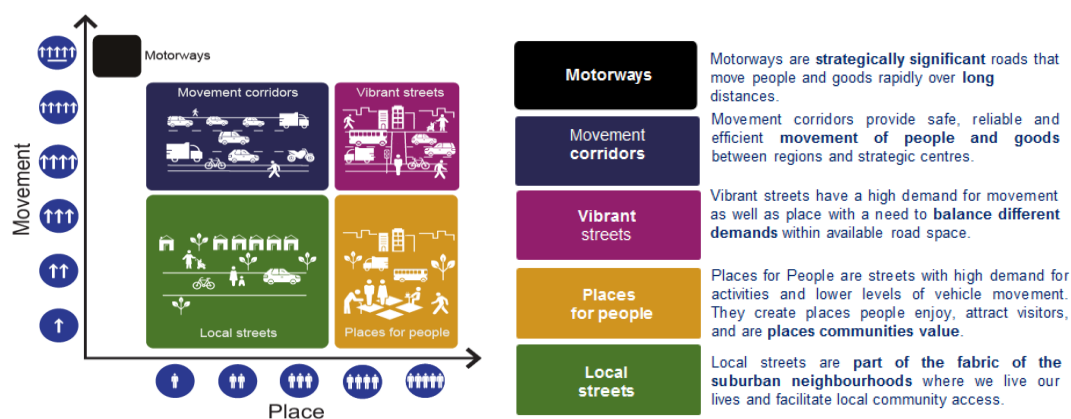


Figure 41 Movement and place

Transport projects that reduce unnecessary vehicle traffic, increase foot traffic, or support higher levels of housing supply are opportunities to improve the public domain and liveability of an area. Planned town bypasses, for instance, should be delivered alongside town renewal projects that enhance retail and recreational experiences and walkability, and support safe active transport.

Walking and cycling have significant benefits for customers and the wider city. As well as supporting active and healthy lifestyles that prevent chronic illnesses, walking and cycling are efficient and community-centred ways to travel that can extend public transport catchments, reduce congestion and lower carbon emissions and air pollutants.

Coordinated investment to connect green corridors and spaces across the city will support compact development across the city, promote a more resilient urban environment, and reduce obesity and inactivity. This 'green grid' will support walking and cycling around and between centres, extend public transport catchments and reduce car dependence.

Future directions to investigate

The NSW transport network will support healthy communities and encourage active transport like walking and cycling.

- Complete walking and cycling networks to and within centres and invest in safe, direct and continuous green corridor connections
- Incorporate multimodal network improvements and place based planning in the design of all major transport projects
- Plan centres with a greater focus on walking and cycling as well as public transport priority options.
- Encourage workforce planning to ensure employees have an option to work near home and the ability to commute using active transport



Figure 42 Artist's impression of George Street, Sydney\

Developing the digital network

Digital infrastructure will overlay the physical network and reduce network complexity

Smart devices and intelligent vehicles will need a smarter network

Transport services in the future will require an extensive and increasingly sophisticated technology enabled network. This will be particularly important for high capacity corridors for mass transit, including motorways, where 'smart' technology will be built into the network.

Systems that manage network operations and prioritise traffic movements are being developed, improving overall network reliability. The Transport Management Centre is currently developing a system under the Intelligent Congestion Management Program that will use the most up to date and predictive data to monitor and manage performance in real time across all modes and networks. The NSW Government is investing \$470 million to upgrade the M4 to a 'smart' motorway. In the future, all motorways in NSW will be 'smart.'

Freight customers will also harness data and analytics to improve efficiency and competitiveness. Load sharing applications and platforms will combine freight loads from different network users to maximise capacity utilisation of each vehicle. Increasing automation technology at delivery centres and around intermodal terminals will help freight customers reduce dwell times in the supply chain. As technologies evolve, the freight industry will also be able to re-organise their businesses to provide customers quicker and more convenient deliveries matched to their individual needs.

Rapid technological innovation and big data has the potential to deliver much broader digital applications for customers. New developments in machine learning and artificial intelligence are likely to emerge in the near term and NSW will need to be ready to incubate new applications, trial new uses and become early adopters of technology, particularly where there are opportunities to enhance the customer experience or personalise service.

Embedding sensors and intelligent transport systems technologies across key assets such as bridges, cameras, car parks, streets, traffic lights and toll booths, will generate enormous volumes of new data on road conditions and traffic patterns. This information will be conveyed in real time to serve the customer and help personalise their journey.

Future directions to investigate

NSW will ensure the digital network is fit for purpose and has the capacity to support future technologies.

- Embed flexibility and optionality into network design to support changes in technology systems

- Work with industry partners and tech companies to incubate and trial new technologies
- Identify new ways for intelligent systems to bring together services and assets on the network to deliver better connections and integration between services
- Support the development, prototyping and deployment of “smart networks” including a road network that connects to smart vehicles
- Apply the NSW Government’s Digital Strategy.



Figure 43 NSW Transport Management Centre

A safely operated network

Our highest priority is getting our customers home safely

Technology is critical for working towards a zero trauma network

NSW has set a target of zero trauma on the transport system by 2056, committing to significant reductions in absolute and per capita rates of trauma across road, rail, waterway and air transport infrastructure and service delivery.

The Safe Systems approach involves designing a transport system integrated with human behaviour to ensure users are not harmed. It involves all elements of the system (infrastructure, vehicles, speeds and user behaviour) working together and interacting with the system itself to ensure safety. It also requires the right mix of conditions in place to keep different users safe within the system – for example, pedestrian safety measures in shared use areas or car and truck safety treatments on movement corridors.

There are several guiding principles to the Safe Systems approach:

- All parts of the system must be strengthened, so if one part fails, transport users are still protected

- The transport system must be designed to account for human error
- The human body has limited ability to tolerate crash forces
- Transport planners, designers, and users must all contribute to safe networks – there must be shared responsibility for preventing crashes.

A safe transport system has important benefits to the overall performance of the transport system. In particular, it minimises disruptions caused by incidents, improves the wellbeing of the broader community and protects people who operate and maintain services.

In addition, safety by design ensures the network is resilient to adverse or significant weather events, and can safely support optimal speeds.

Technology has the potential to be highly impactful, through measures such as advanced safety systems, removal of trackside equipment, and equipment that uses 'self-healing' materials such as polymers and composites.

It will also play an increasing role in network security, in particular, data authentication within the safety system and best-practice frameworks to better predict and manage tension across the network.

Investments in Connected Intelligent Transport Systems will improve the safety and efficiency of transport services and infrastructure. This will be achieved through faster adoption of critical vehicle safety technologies such as autonomous emergency braking and lane assist.

It will be vital to implement safety technology and safe system principles in Regional NSW, which accounts for 40 per cent of the state's population, but experiences two-thirds of fatalities each year. A person is around four times more likely to lose their life on a country road than on a metropolitan road.

The regional network is also particularly vulnerable to impacts from climate change and severe weather events, which can reduce its productivity overall and lower safety outcomes. The draft Future Transport Strategy and the draft NSW Road Safety Plan 2021 place a particular focus on improving safety outcomes in Regional NSW.

Future directions to investigate

By 2056, technology and safety will be in-built to all networks, delivering zero trauma on all parts of the transport system.

- Deliver a 30 per cent reduction in road fatalities or serious injuries by 2021
- Incorporate safety measures at the design and construction stages of all new and repurposed transport assets and infrastructure
- Ensure road infrastructure supports fully automated vehicles on high volume and dedicated freight and mass transit corridors
- Incorporate safety technologies on shared road space and interchanges for pedestrians and cyclists, and on waterways
- Prioritise separation of road users to reduce risk, including median barrier separation on all key road corridors with high traffic volumes

- Incentivise the faster take up of five star vehicles, and ensure all new passenger vehicles are fitted with highly automated or fully automated systems
- Ensure all new roads are designed to 4 or 5 star standard, and that investment is prioritised to achieve majority of customer travel on 5 star roads.

Fatalities

Serious Injuries

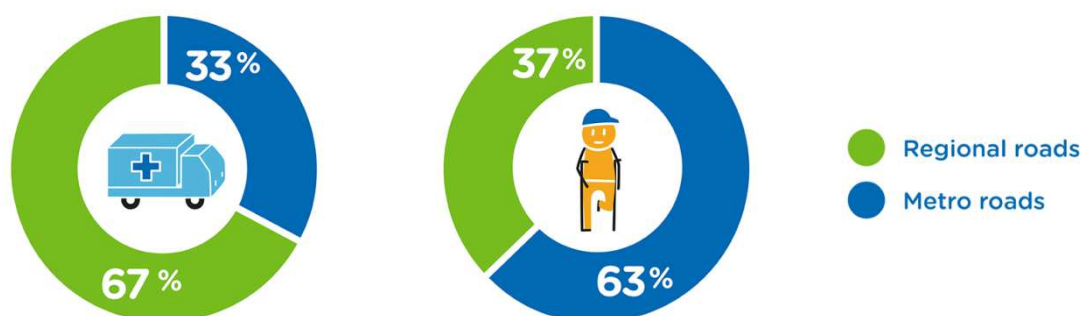


Figure 44 Road trauma on metropolitan and country roads

For more information see the **NSW Road Safety Strategy**

Optimising the network and better using existing infrastructure

Congestion and under-use: two symptoms of the same problem

Congestion and crowding occur when demand for travel on a part of the network nears or exceeds capacity, resulting in increased travel times, reduced reliability and a poorer customer experience.

While congestion is a major driver of new investment particularly in metropolitan areas, its concentration in relatively short peak periods conceals significant capacity and underuse in off-peak hours, or in the counter-peak direction.

Data from 2014 revealed that there were 78,001 empty train kilometres each weekday on Sydney Trains, and 34,799 kilometres on NSW Trainlink. Similarly, analysis of 2016 Opal card bus data found 55 per cent utilisation on the bus network on a particular morning during the AM peak, with significant 'empty running' on certain corridors, particularly in outer metropolitan areas.

A major focus when planning the network is mitigating the costs and impacts of congestion. While congestion is also an issue in some regional areas, network design needs to better address connectivity. Historically, network connections have been focused on access to capital cities, an approach which does not necessarily reflect the places people in the regions want to go to.

Planning for Regional NSW over the next 40 years will be delivered under a 'hub and spoke' network model. This model will connect regional towns and villages to their nearest regional centre, providing services and ease of access to other destinations.

Planning the freight network will also be critical to Regional NSW, where there are already a number of nationally significant transport corridors, in particular the Hume, Newell and Pacific Highways. Collaborative planning will also be done with the Federal Government on the new Inland Rail, which will establish intermodal hubs through inland NSW.

Access to the trade gateways of Port of Newcastle and Port Kembla from inland NSW will continue to be important for the next 40 years as will inland connectivity to the future international airport in Western Sydney.

Future directions to investigate

NSW will optimise the use of the current network in Sydney and Regional NSW, and invest in projects that improve connectivity and tackle congestion.

- Dynamic, real time management of the network to improve performance and reduce the impact of incidents, events and planned maintenance
- Design a 'hub and spoke' network that better serves regional communities
- Plan and manage transport networks for the best use and optimum movement of people and goods along and across transport corridors and within precincts, whilst creating better places and amenity for communities
- Progressively review roads and road space allocated on best use to achieve better customer outcomes and better places
- Encourage customers to use the transport system differently by shifting to walking, cycling or public transport and traveling outside the peaks to reduce congestion and channel demand where there is capacity
- Reserve corridors for future network development.

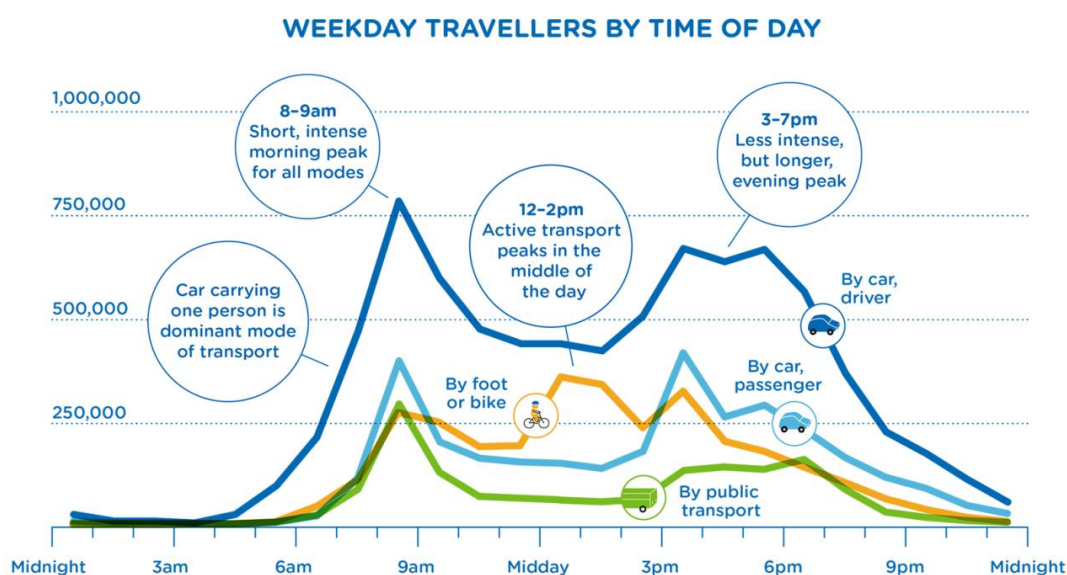


Figure 45 Weekday peaks

A flexible, agile investment approach

Our staged investment approach is designed to be flexible, responding to change and uncertainty.

The draft timeframes are indicative, based on preliminary evidence, of when potentially these initiatives may be need to be implemented or committed. Capital constraints will mean that initiatives will need to be prioritised and all may not be able to be delivered within indicative timeframes.

Further investigation of all initiatives in the Draft Strategy and Plans will be undertaken within the next 10 years to ensure any major impacts in growth patterns or use are considered.

Initiatives have been divided into the following categories:

1. **Committed / funded initiatives (0-10yrs)** – initiatives that either have committed funding, are committed/contractually committed, are for immediate detailed planning, or are part of key maintenance, renewal or safety programs. Some initiatives subject to a final business case.
2. **Initiatives for investigation (0-10, 10-20yrs)** – intended to be investigated for potential commitment or implementation within the next 20 years. Those listed in 0-10 year horizon will be prioritised for more detailed investigation to determine if they are required in the next decade.
3. **Visionary initiatives (20+ years)** – longer term initiatives that may be investigated within the next 10 years, but are unlikely to require implementation within 20 years.

Growing the Greater Sydney Network

Staged investments will expand the Greater Sydney network to serve three cities and improve 30 minute access to centres

Future Transport investment priorities will be guided by a vision for our cities and regions, and how the networks supporting these should evolve over time.

In Greater Sydney, the three cities vision will require a sustained and staged investment program to protect corridors and then develop a connected mass transit network across the city. Current investments are focused on city-shaping and radial connections to centres in the Eastern Harbour City. These support improved public transport, congestion management and urban renewal outcomes, unlocking capacity on existing road and rail corridors and supporting renewal and walkability by drawing traffic away from centres. Long term, mass transit network extension will support densification in the south-east and the Bays Precinct.

The development of the Central River City will require improved 30 minute access to Greater Parramatta. To support this, the focus will be on new mass transit connections, particularly from the north and south. A new light rail network for Greater Parramatta will also support local access and urban renewal.

The developing Western Parkland City will require investment in the mass transit network to shape a sustainable urban form and, in the longer term, support 30 minute access to centres. To support this, we will investigate a north-south train link through

Integration with Gosford and Wollongong as future satellite cities will require improvements to existing connections and, in the longer term, consideration of higher speed rail.



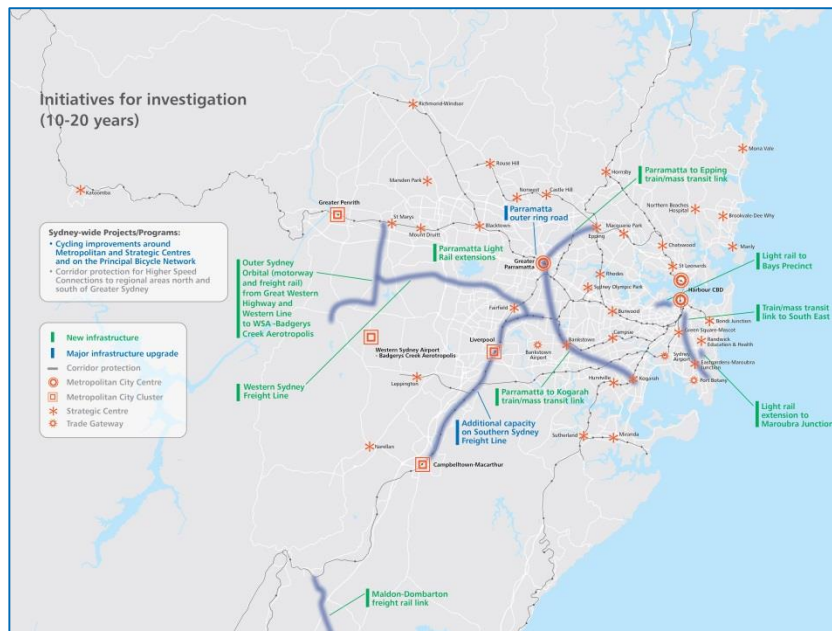


Figure 48 Initiatives for investigation (10-20 years)



Figure 49 Visionary initiatives (20 + years)

The Greater Sydney's future mass transit network will form the backbone of the city's transport network, providing safe, efficient and reliable 'turn up and go' services. This will be supported by the intermediate transit network of buses, light rail and ferries, which will enable customers to reach their nearest mass transit interchange. Where appropriate, local intermediate services will interchange with on-demand services, providing convenience for customers and improving the network's efficiency.



Roads in Greater Sydney – a mass transit network supporting trunk journeys

The future strategic road network for Greater Sydney will support key movements by road, including public transport, private vehicles and freight. By supporting trunk road journeys, the strategic road network will reduce pressure on local roads, enabling these to facilitate local journeys and become attractive places. The strategic freight network will use major road corridors and increasingly rely on dedicated freight rail corridors for movements between ports and intermodal terminals in the Central and Western Cities.

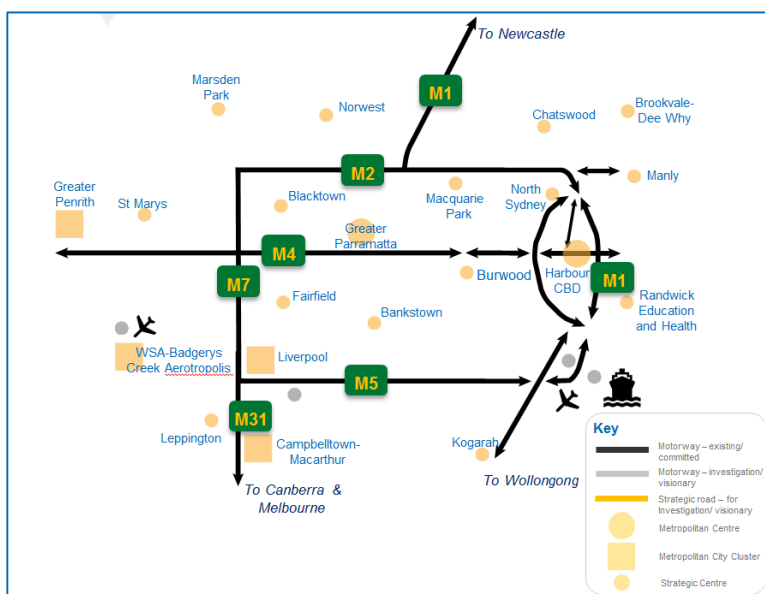


Figure 52 Greater Sydney Road Network 2017 (existing and committed)

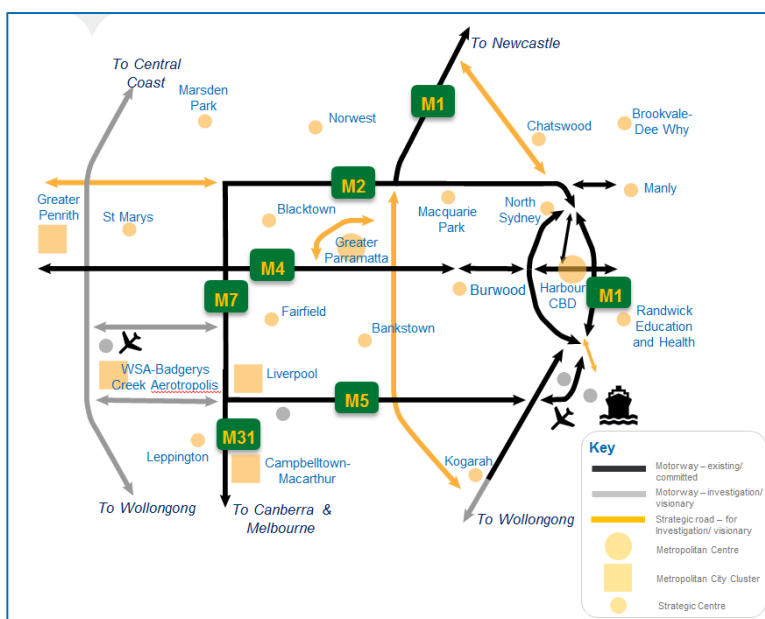


Figure 53 Greater Sydney Road Network 2056 (visionary)

The intermediate network in Greater Sydney – connecting people to mass transit services

The future intermediate transit network for Greater Sydney will support high capacity, ‘turn up and go’ journeys. Many services on the intermediate network will be on-demand, flexible and focused on connecting people to the mass transit network.

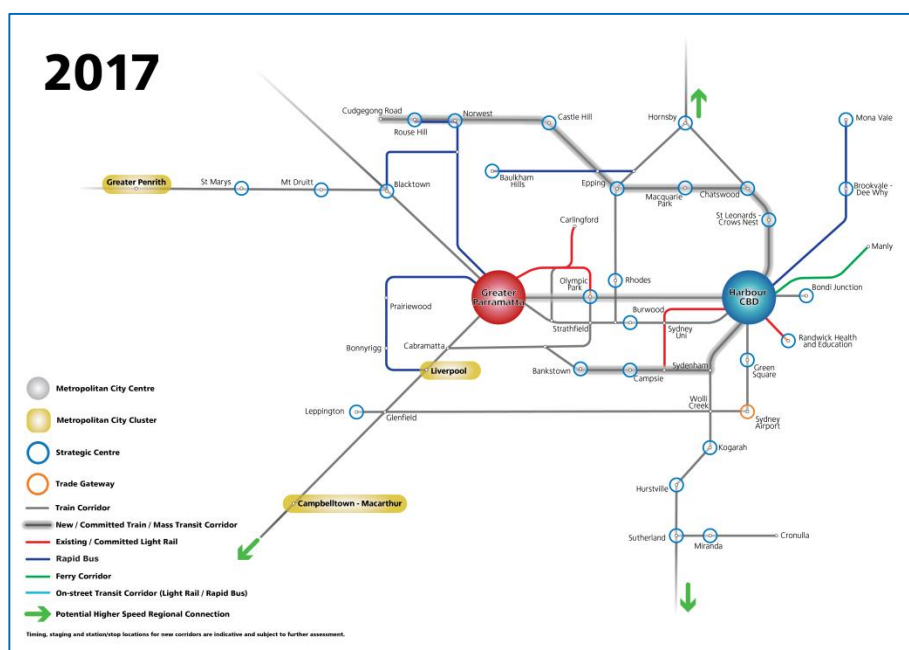


Figure 54 Greater Sydney Intermediate Transit Network 2017 (existing and committed)

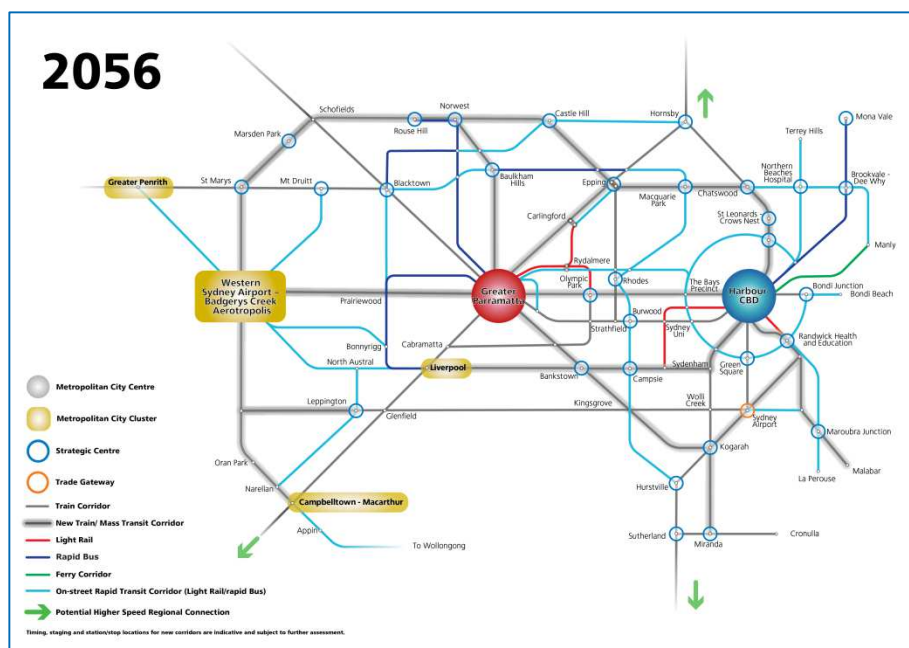


Figure 55 Greater Sydney Intermediate Transit Network 2056 (visionary)

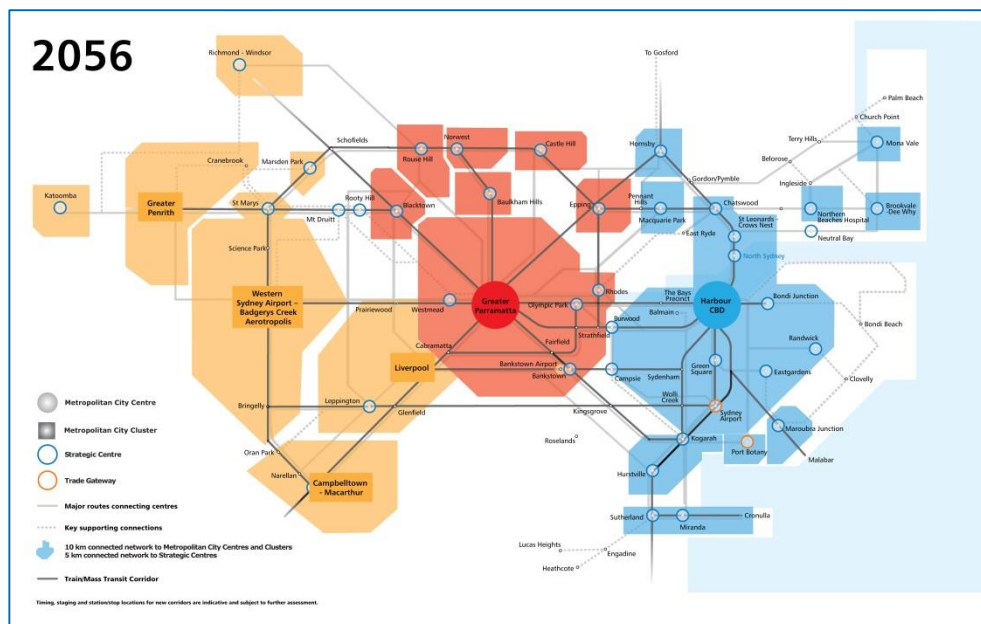


Figure 57 Growing Sydney's bicycle network (visionary)

Growing the network in Regional NSW

Staged investments that develop economic centres and corridors in Regional NSW

Regional NSW has 19 Regional Cities and 27 Regional Centres. The 19 Regional Cities include two Global Gateway Cities (Greater Newcastle and Canberra), which serve extended catchments around Canberra-Queanbeyan and the Hunter, New England, North-West, Central West, Orana and mid-North Coast areas. Regional Cities also include two Satellite Cities (Gosford and Wollongong, which will become Satellite Cities in Greater Sydney as the outer metropolitan area continues to grow).

Investment priorities in regional NSW are guided by a vision for the growth and vibrancy of the regional cities and centres, with a focus on road upgrades and bypasses to improve liveability and road safety, and expand the regional public transport network.

Regional precincts will be first candidates for technology roll out, with a focus on CAV readiness in the first decade. Major road corridors will be upgraded in stages, with emphasis transitioning from high volume north-south corridors towards improving critical east-west movements. In the medium term, a corridor will be secured for the development of high speed travel on the eastern seaboard.

Road and rail network improvement and development to serve Global Gateways in Newcastle and Port Kembla will be linked to anticipated freight growth and the need for an overflow port once Port Botany reaches capacity. On a range of scenarios, Future Transport expects this will occur between the early 2030s and mid-2040s, depending on rates of trade growth and the productivity of the Port Botany interface and supply chains.

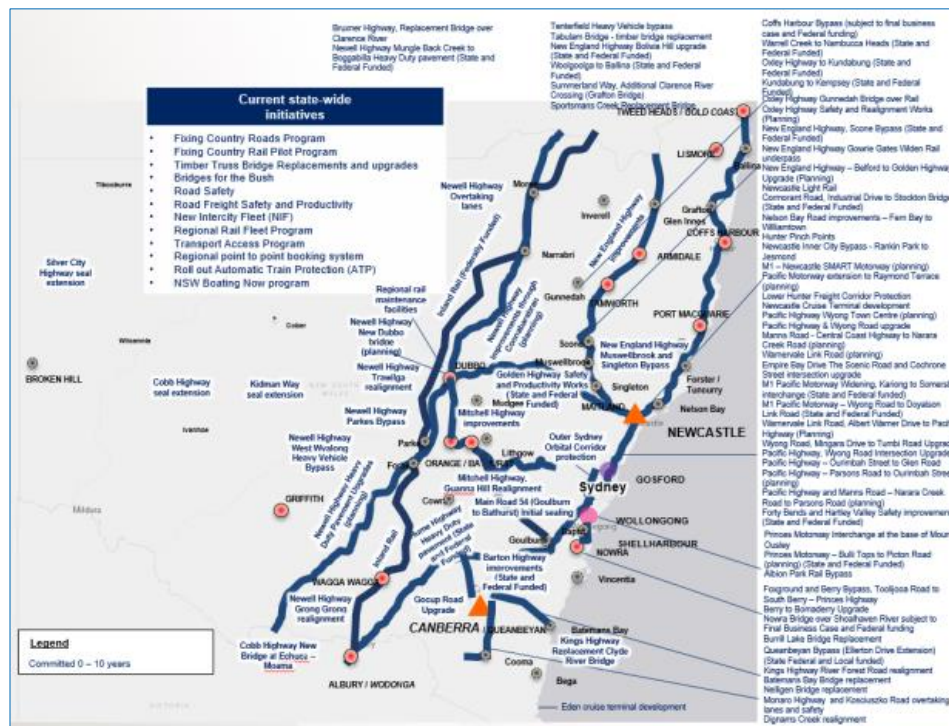


Figure 60 Committed initiatives

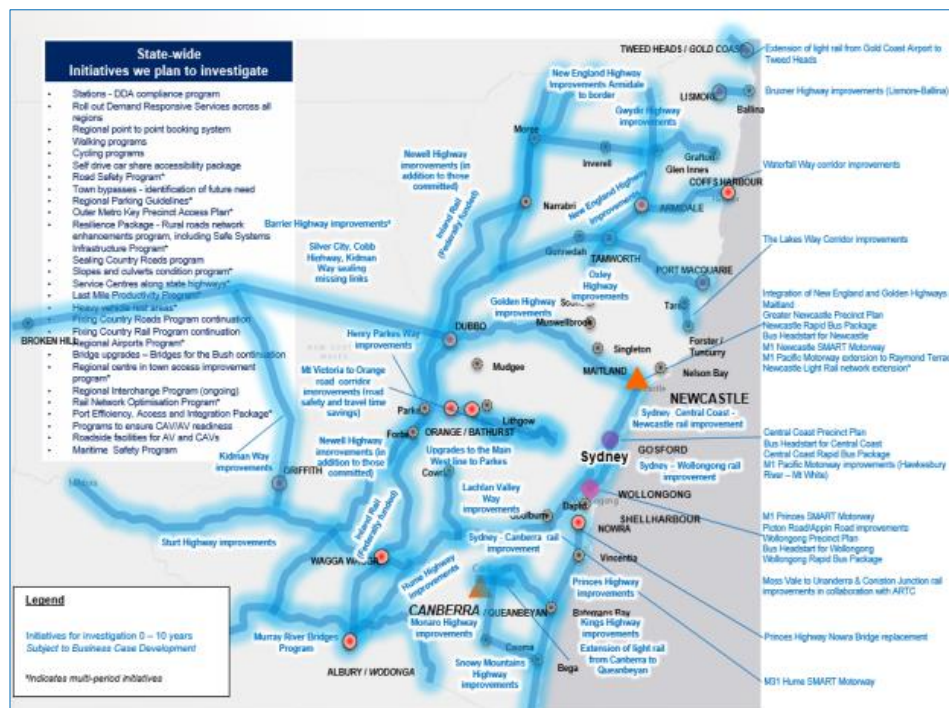


Figure 61 Initiatives for investigation (0-10 years)



Figure 62 Initiatives for investigation (10-20 years)



Figure 63 Visionary initiatives (20 years+)

The Regional NSW network – a ‘hub and spoke’ network radiating from Cities and Centres

The future regional transport network will be planned around a ‘hub and spoke’ model within a strategic framework of servicing principles allowing for local adaptation and interpretation. Servicing principles include connectivity, flexibility and efficiency, access and equity, legibility and timeliness, provision of accurate information and safety. The network will support local towns and Regional Cities and Centres and help make them better places to live, visit and do business.

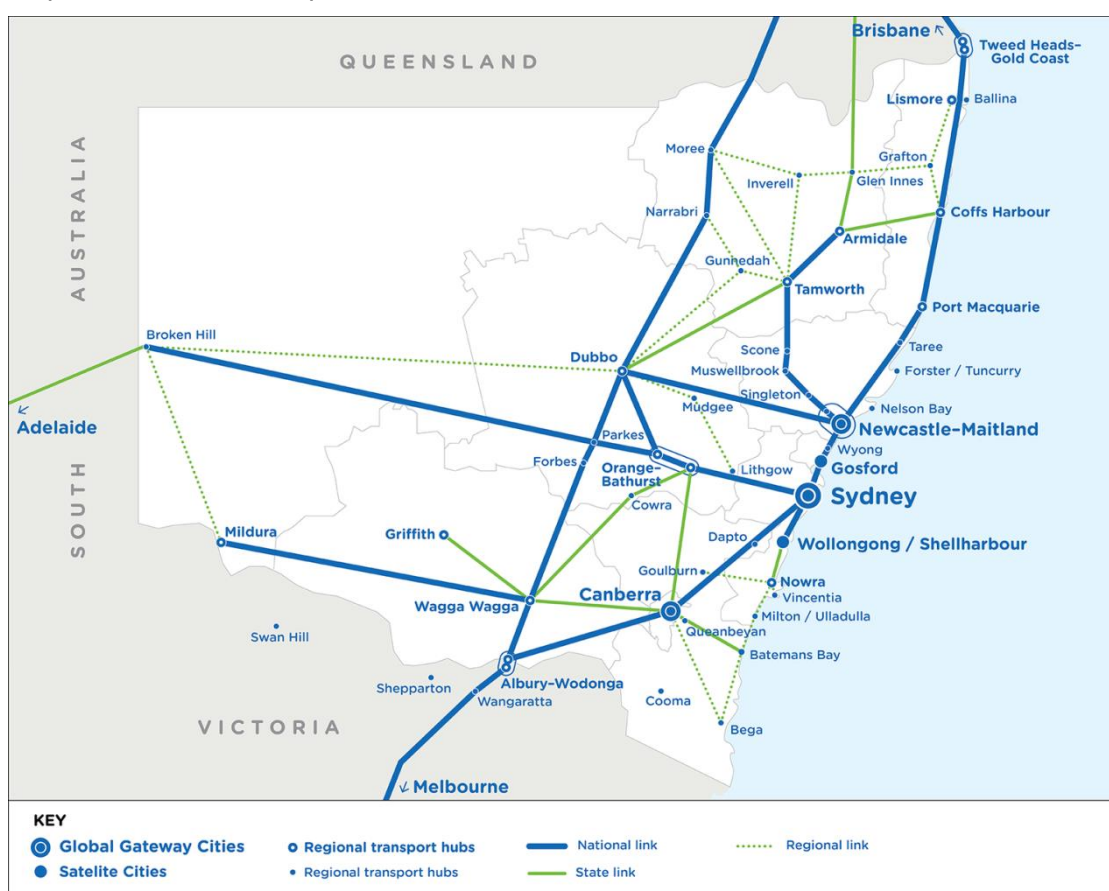


Figure 64 Regional NSW network

10. Delivering Sustainably

Achieving balanced outcomes for financial viability, environmental protection and socially responsible transport is a constant challenge. NSW cannot sustain improvements to the transport system without improving levels of cost recovery. Energy security, affordability, and climate change are also clear and present risks. Government must achieve more sustainable and equitable transport funding, and set future directions to support emissions reduction and mitigate significant weather events.

This chapter examines how we will deliver a transport system in a fiscally and environmentally sustainable manner, through:

- Moving towards sustainability
- Sustainable and equitable transport funding
- Striking the balance between user contributions and taxpayer subsidies
- A continued focus on spending efficiency
- Transport's role in working towards environmental sustainability
- Securing energy reliability and affordability
- Managing a resilient transport system

Moving towards sustainability

Decisions we make today will build a future system that is sustainable and affordable for both customers and the community

Funding our network now and in the future

Greater financial sustainability in transport will help us deliver a modern network that is affordable for both customers and taxpayers. This is essential to deliver the transport services and ongoing improvements customers expect and that connect people to work, education and social opportunities and create great places to live and work. In addition, the network has to come at a cost that the community, operators and customers can accept.

Historically, public transport in NSW recovered more than 60 per cent of its operational costs. Today, rates of recovery are less than half of this – around 29 per cent of operating costs. Declining cost recovery is occurring as transport investments are increasing. For instance, Transport for NSW is continuing to grow its asset base with over \$50 billion worth of construction planned over the next ten years on our \$119 billion network. This will mean significantly higher whole of life costs for the transport network - capital, operating, maintenance and disposal.

To achieve a financially sustainable network we will need to factor critical whole-of-life considerations into all transport decisions including the balance of investment and cost recovery; access, affordability and equity; better land use outcomes and reduced impact on the environment.

Transport's role in environmental sustainability

The transport sector, particularly private cars, contributes significantly to greenhouse gas emissions and it is important that we work with industry to achieve reductions in emissions.

Transport has a significant role in contributing to a more environmentally sustainable community by providing travel that is more efficient, productive, quieter and cleaner compared to private car use – public and active transport.

The draft Future Transport strategy aims to increase the mode share of public transport services and reduce the use of single occupant vehicles. Apart from reducing emissions through more efficient shared vehicles, this will also have positive benefits for congestion.

We are also considering how active transport can play more of a role in our everyday journeys through providing better facilities and a more extensive network of bicycle paths and safer networks for cyclists and pedestrians where they share road space with vehicles.

Public transport operating costs, revenue and recovery

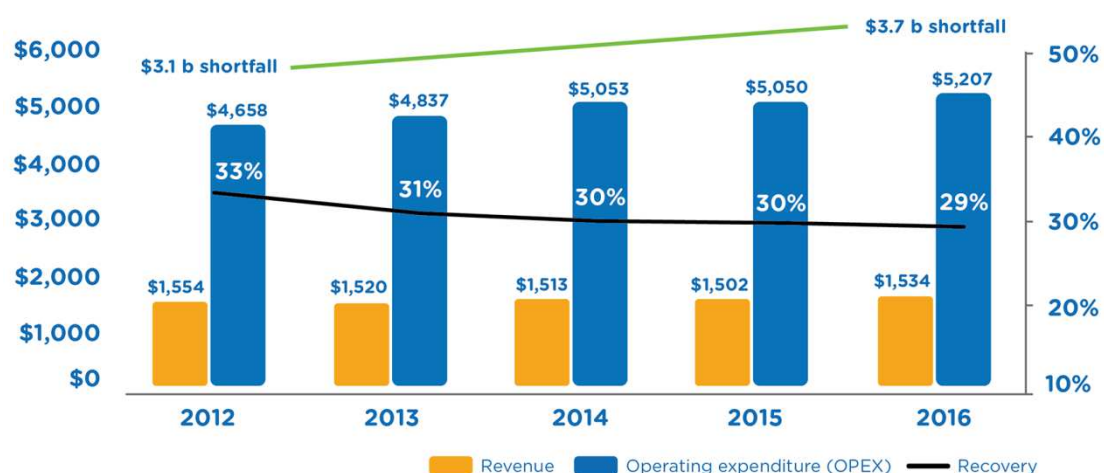


Figure 65 Public transport operating costs, revenue and recovery

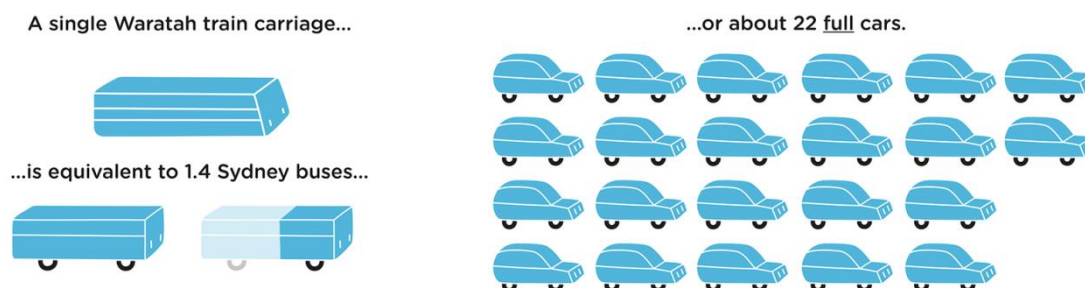


Figure 66 Efficiency of public transport

Sustainable and equitable transport funding

There has for many years been a difference between who pays for investment in the network and those who directly benefit from using the network

The cost to the community is growing

Since 2012, the level of taxpayer funding to transport has increased on average by 4.5 per cent per annum and is anticipated to reach \$5.7 billion by 2026 (\$2 billion above today's level). This is despite efficiency initiatives that have reduced operating costs by more than \$1 billion since 2011.

In the future, a slower rate of NSW and Federal Government revenue growth is expected to occur, impacting the Government's resources for service provision. This

is in part a result of the ageing population, which reduces workforce participation, lowers taxation revenue growth and contributes to increasing pressures on other sectors, particularly health.

In addition, transport operational expenses are projected to be the third largest component of the growth in the NSW Government's expenditure for services. Continued increases in funding requirements for transport will compete with the need to resource other vital services such as education and health.

Public transport operating funding from taxpayers 2006–2026 \$millions

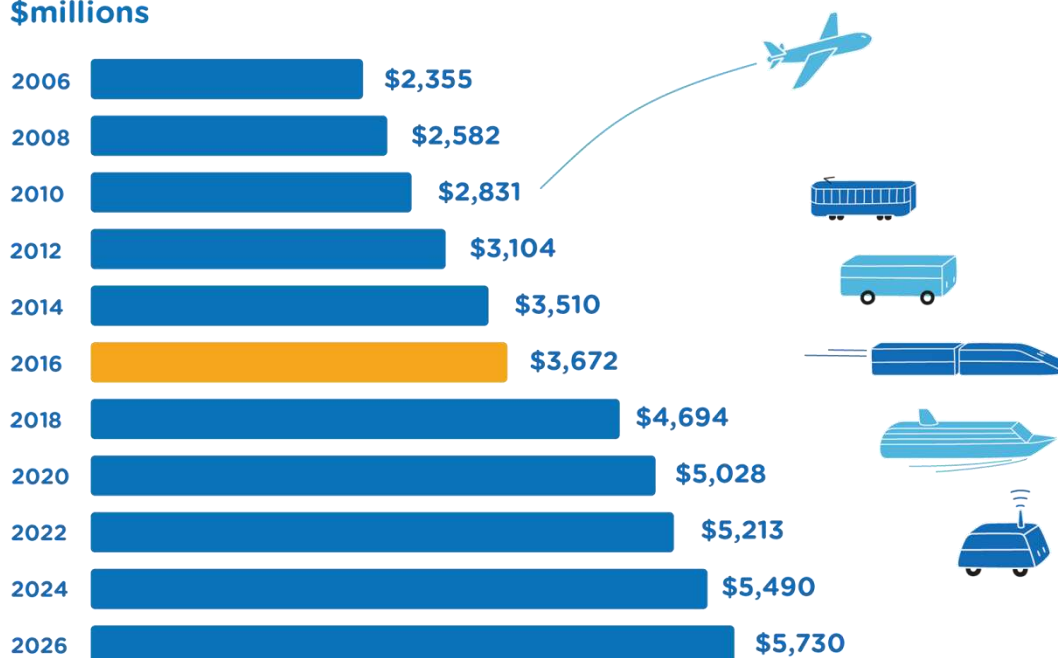


Figure 67 Taxpayer funding of public transport

Striking a fair balance on who pays

Investment in transport infrastructure and services results in benefits for the community as a whole. Improved network efficiency delivers more economic productivity for land and business owners through better access to markets and a more efficient supply chain. Direct users are also key beneficiaries through improved service levels, shorter journey times and safer systems.

Taxpayers who do not directly benefit from transport investments still contribute to the costs of the network. This is because public transport services deliver wider economic, health and environmental benefits to the community. While such benefits do justify a level of taxpayer funding, the imbalance between those who directly benefit from transport investments and those who pay for them should be considered and addressed.

Alternative sources of funding and approaches to service delivery need to be explored as part of delivering a sustainable funding model.



Figure 68 Striking the right balance when sharing costs

Striking the balance between user contribution and taxpayer subsidies

Sources of revenue for transport funding are limited and the funding available from those sources is constrained

Patronage is growing, but revenues are in long term decline

Public transport fares in NSW are regulated by the Independent Pricing and Regulatory Tribunal (IPART), which sets limits on the amount fares, can increase within a given year. The Government does not always increase fares to the amount allowed by IPART.

Fare-box revenue decreased on average by 0.3 per cent per year from 2012 to 2016, even as patronage grew 8 per cent over that period, and as services and customer satisfaction improved. The average rail revenue per passenger has declined by an average 10 per cent each year since 2012, even as capital investment has grown 13 per cent per year and delivered 90 per cent customer satisfaction and a 3.3 per cent uplift in patronage.

Cost recovery for rail has been in long term decline from around 50 per cent in the early 2000s to less than 30 per cent today. This trend is forecast to continue with recovery rates expected to be 25 per cent for rail in 2026. Other jurisdictions have set specific targets for fare-box recovery. For example, Chicago's target fare-box recovery is 50 per cent, whilst Singapore and London's target is 100 per cent. London has set a long-term price path to reach this target over the period of a decade, increasing fares by CPI plus 1 per cent each year.

The future sustainability of funding from road-based revenues may be impacted by the introduction of CAVs and a move to car-sharing. Additionally, funding from federal sources for roads may also be at risk with Commonwealth fuel excise revenue declining from \$13.5 billion in 1997-98 to \$11 billion in 2014-15.

Sydney public transport fares are relatively low compared to other jurisdictions. Fare rates in London and Munich are more than double compared to Sydney. Brisbane, Milan and Chicago are up to 20 per cent higher, depending on the distance travelled.

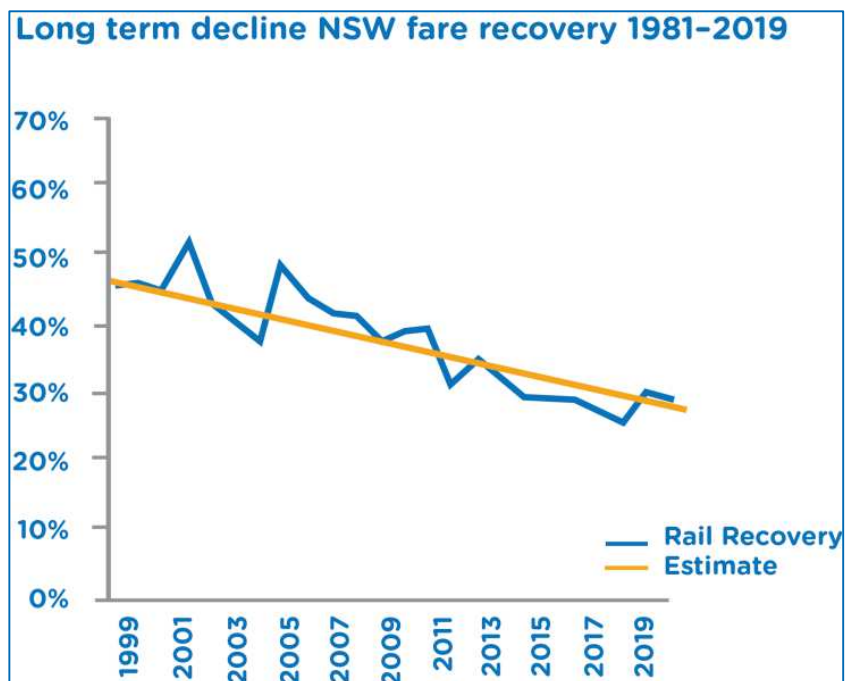


Figure 69 Long term decline in NSW fare recovery

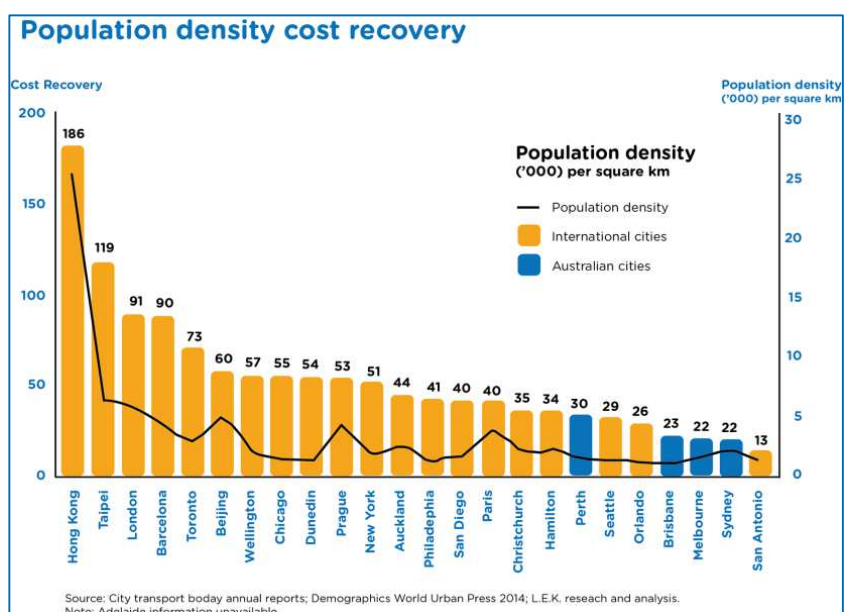


Figure 70 Population density cost recovery

Sources of other revenue are constrained

Transport for NSW has been focused on working with public transport asset managers to grow revenue from third party sources such as advertising on assets, retail leasing and customised number plates. These activities provide a useful supplement that can offset operating costs by a couple of percentage points.

As the public transport network grows, new and expanded interchanges and stations will be needed to meet demand. There are opportunities to fund this work through developments of airspace on the transport estate, and by playing a more active role in transport-led development.

While a commercial approach will be taken to leveraging these opportunities to finance costs by finding third party sources of funding, this will not materially change the nature of the long term funding challenges the transport system faces.



Figure 71 Commercial opportunities in transport interchanges, artist's impression

Future directions to investigate

NSW will establish funding arrangements for transport infrastructure and services that strike a balance between taxpayer contributions and the beneficiaries of these investments, to create a financially stable and equitable network.

- Monitor cost recovery levels and review measureable service quality and quantity improvements
- Identify balanced beneficiary models including value sharing and developer contributions aligned with improved land use planning
- Identify supplementary sources of revenue across the portfolio including commercial revenues through internal advertising and airspace use, particularly at new interchanges.

A continued focus on spending efficiency

We need greater efficiency to meet the increases in operational costs and our significant investment program

Getting the most from every dollar we spend on services and infrastructure

Operational and maintenance costs are continuing to grow as our transport network grows, and becomes safer and more efficient. As an indication, operating costs have grown at 3.4 per cent on average over the last five years, against average growth CPI in the period June 2011 – June 2016 of 1.8 per cent.

Fuel is a significant portion of the cost of operating transport services.

We are continuing to drive efficiencies across the transport cluster when it comes to operating practices. However, as service levels increase and new assets such as Sydney Metro and the new Light Rail come into service, these costs are expected to continue increasing above CPI in the short to medium term.

In addition to operational costs, we are constantly improving the network for our customers, with public transport capital investment growing at 13 per cent each year on average since 2012. A total of \$32 billion has been invested in the network over the last five years, with more than \$50 billion planned for the next ten years.

The growth in capital investment has achieved significant improvements in service quality, with Customer Satisfaction above 90 per cent (for rail) and a 3.3 per cent uplift in public transport service kilometres, with rail alone forecasting a jump of service kilometres of 18 per cent by 2018.

There are significant challenges ahead for maintaining and enhancing the transport system, including:

- Addressing the road maintenance backlog reported by the Audit Office as \$5.3 billion (June 2015)
- Upgrading existing transport infrastructure to enable new technologies that support a 'smart' network' and create a universally accessible system
- Meeting the increasing demand for services resulting from a growing and ageing population.

A growing burden on the NSW taxpayer means the transport system will need to be funded in an efficient, sustainable and equitable way, to ensure our investments provide value for money for the whole community now and for generations to come.

Future directions to investigate

NSW will need to recover more of what we spend and keep our spending efficient as we build, manage and operate the network.

- Introduce commercial approaches to asset ownership that involve a greater level of scrutiny of funding arrangements and tighter budgeting, performance and efficiency targets and cost constraints
- Improve capital investment and upgrading practices to reduce whole of life costs
- Continued transition to partnering and service commissioning models for delivery of services
- Inclusion of tangible targets and benchmarks in planning, construction, operation and maintenance contracts

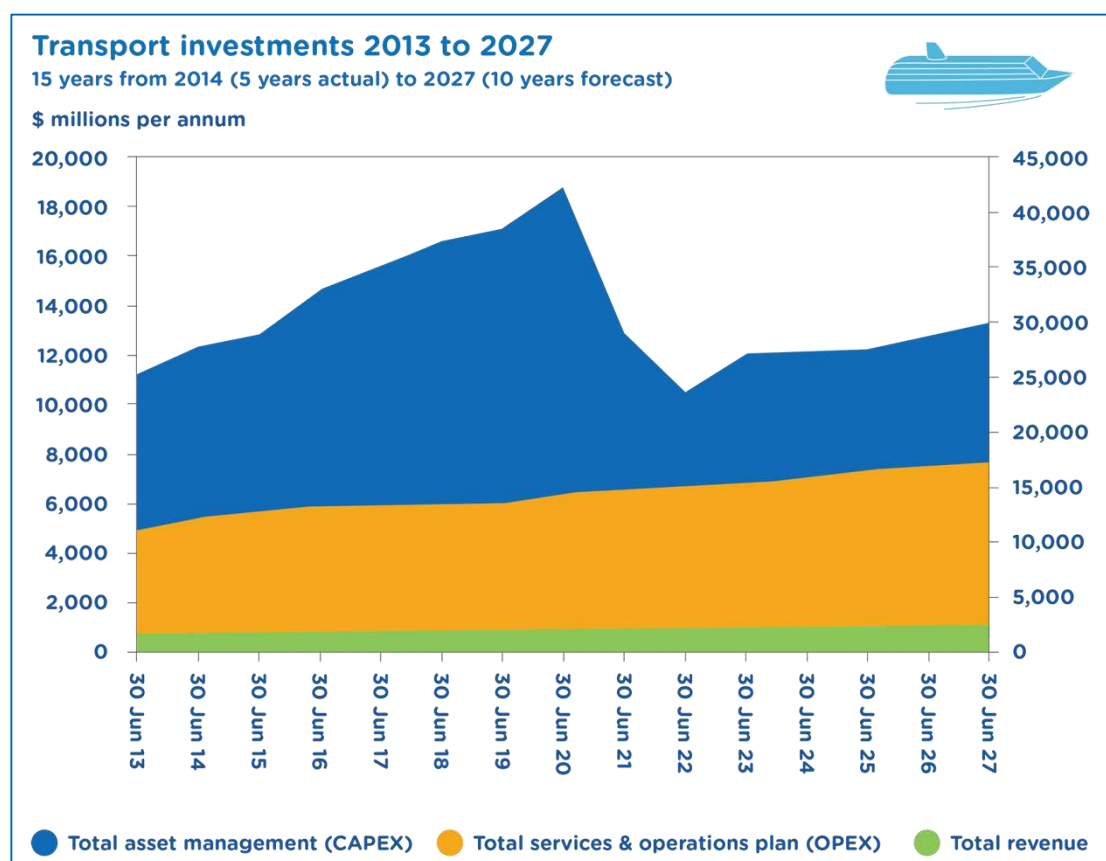


Figure 72 Commercial opportunities in transport interchanges, artist's impression

Transport's role in working towards environmental sustainability

Decisions we make today will build a future system that supports the liveability and sustainability of our communities

Public and active transport lower environmental impacts

Addressing the environmental sustainability of the transport system is essential to minimise direct and indirect impacts on the natural environment. Direct impacts include noise, waste and urban stormwater runoff. Indirect impacts include air pollution, reduced liveability of urban environments and the environmental impacts of materials used by the transport system.

To minimise the impact of the transport network, all investments across the transport cluster will improve the resilience of the network in a changing climate and support the NSW Government's aspirational target to achieve net-zero greenhouse emissions by 2050.

New technologies that deliver vehicle efficiencies are expected to reduce emissions over time. However, improving the accessibility and attractiveness of public transport has the greatest potential to reduce greenhouse gas emissions and road congestion.

There is an opportunity to consider innovative and creative ways to encourage greater use of active and public transport. This would reduce the amount of vehicle kilometres travelled (VKT) per person, which in turn would reduce the carbon intensity of each trip. Essential to this will be reducing private passenger vehicle trips, which produce ten times more GHG emissions than rail and light rail, and thirty times more GHG emissions than buses in NSW.

To encourage more people out of their cars we need to make public transport, walking and cycling more attractive options. This will include designing infrastructure that better caters to customers' needs, improving the amenity and comfort of public transport vehicles and providing fast and frequent connections to where people want to go. It will also include the provision of a safe system that allows pedestrians and cyclists to confidently travel the network.

Making public transport more accessible and attractive through improved services and infrastructure will encourage our customers to make the shift from their cars. As NSW continues to grow, the transition to mass transit will also be supported by the growth in medium- and high-density areas, which are associated with higher public transport and active transport use.

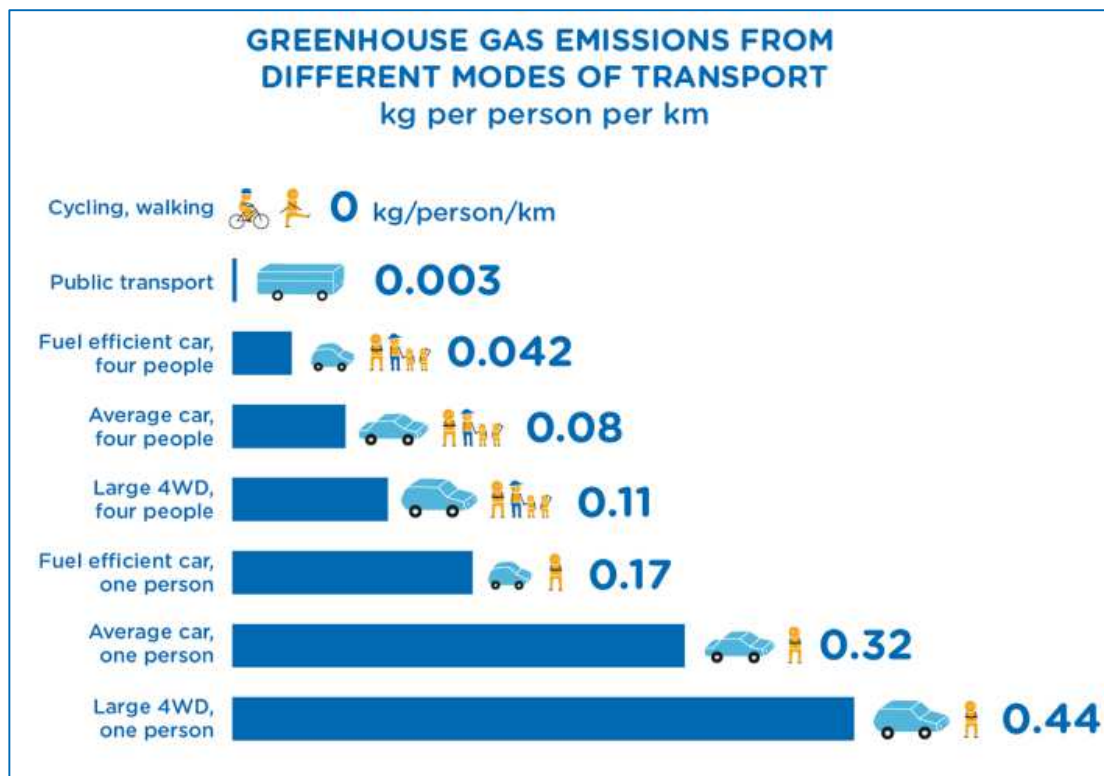


Figure 73 Energy efficiency of transport modes

Securing energy reliability and affordability

Uncertainty around energy supply and future energy costs are long term risks to the transport network

A transport sector with reduced emissions

As we build more infrastructure and increase service levels to meet demand over the next 40 years, our energy requirements will continue to grow.

Over the same time period, the NSW Government is working towards achieving a target of net-zero emissions by 2050. To meet this target, while meeting increasing energy requirements, we will need to rethink how we power transport.

Today, transport energy consumption is dominated by non-renewable coal-fired electricity and petroleum fuels, which create GHG emissions.

The transport sector is a major contributor to GHG emissions in NSW, and these emissions are growing.

Effective policies and programs are needed to provide information, tools and incentives for businesses and consumers to switch to cleaner and more fuel-efficient

vehicles, reducing emissions and generating positive health impacts due to improved air quality.

Future directions to investigate

NSW will establish a cost-effective pathway to support net-zero emissions by 2050.

- Encourage a shift from private car use to public transport
- Promote low emission vehicles
- Transition to a cost-effective, low emission energy supply, using power purchase procurement to increase renewable energy mix
- Work with industry partners on new fuel efficient vehicle technologies and transition to a low emissions passenger vehicle fleet.

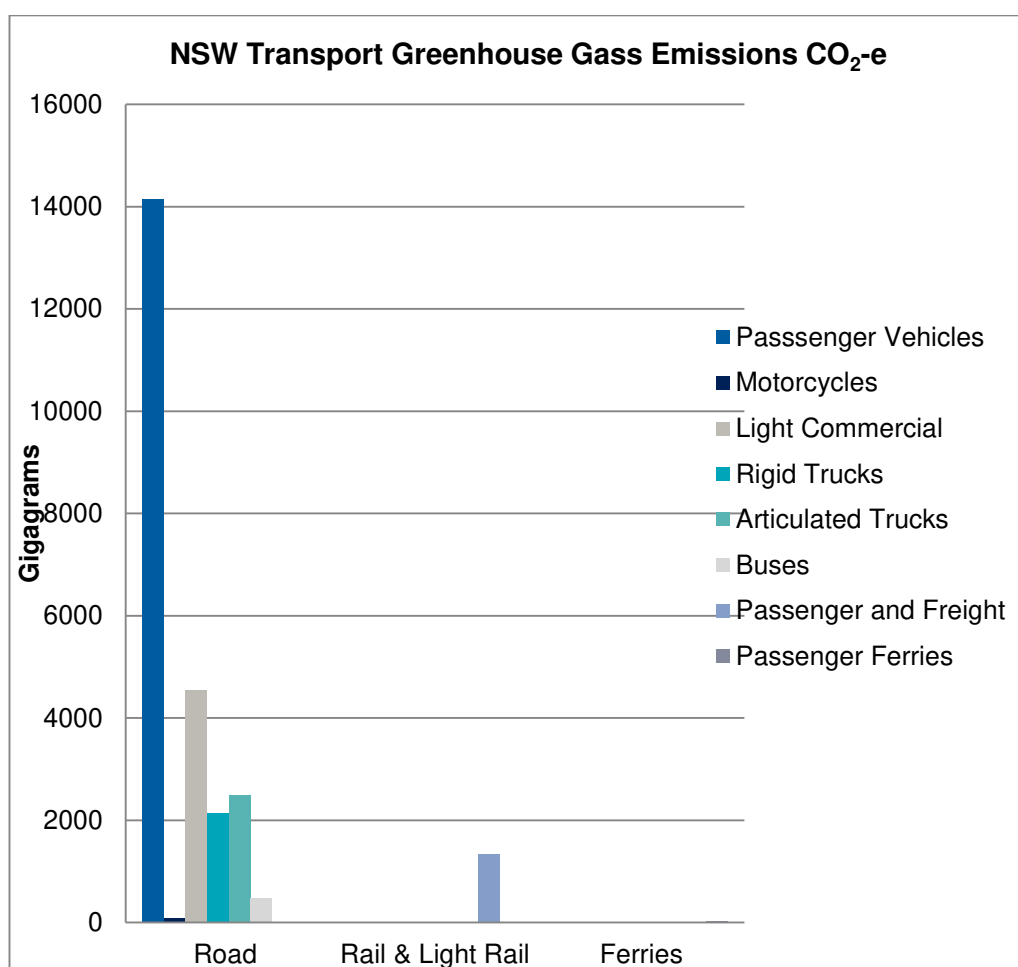


Figure 74 NSW Transport Greenhouse Gas Emissions (prepared using data from NSW Transport Facts 2015 prepared by The Centre for Transport, Energy and Environment and Pekol Traffic and Transport)

Energy Intensity NSW Passenger Transport

MJ-FFC / passenger km

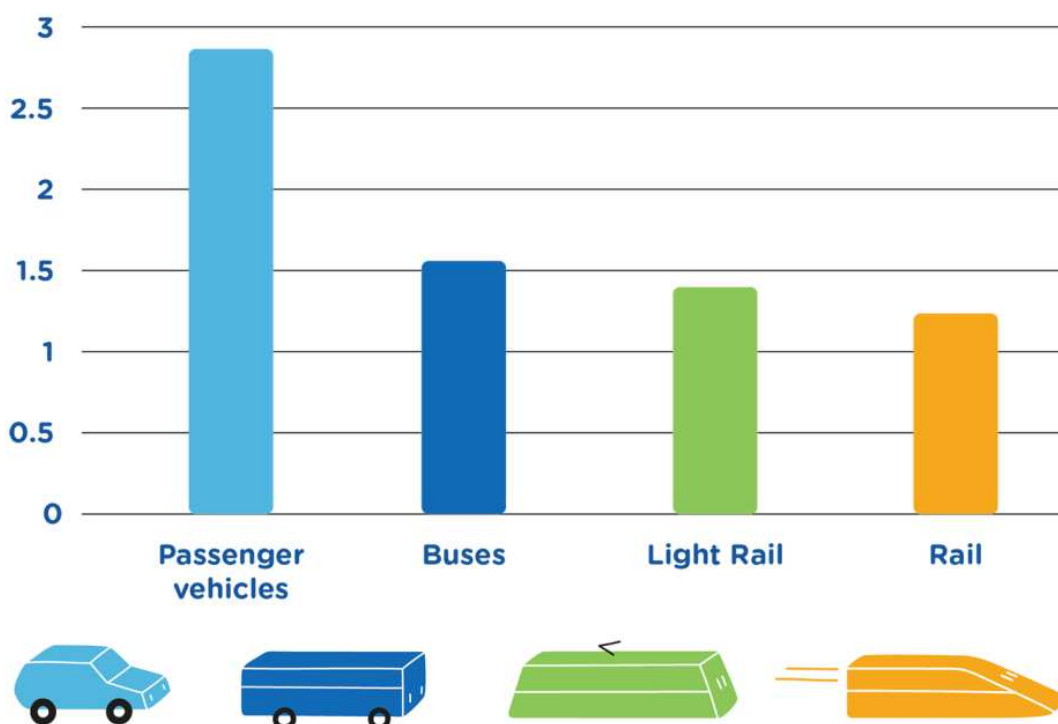


Figure 75 Energy intensity of passenger transport (prepared using data from NSW Transport Facts 2015 prepared by The Centre for Transport, Energy and Environment and Pekol Traffic and Transport)

Managing a resilient transport system

Transport assets have long economic lives and are vulnerable to the direct impacts of climate change

Preparing for extreme weather events

In June 2016, weather events along the NSW coast caused widespread rainfall, damaging winds, and flash flooding, and many roads, bridges and wharfs were significantly damaged as a result. The Insurance Council of Australia estimated costs from this event to be in excess of \$304 million.

Severe weather could increasingly impact the environment and communities in every part of the state, including transport infrastructure and services essential in moving people and goods around NSW.

To maintain a reliable transport system and meet passenger and freight needs, weather related risks to transport assets and services and interdependencies of other types of transport, energy, water and telecommunications infrastructure need to be understood and managed.

The risks to current assets and operations, and the costs and benefits of required actions will need to be fully analysed, costed and built into short, medium and long term plans.

Future directions to investigate

NSW will ensure the transport network is more resilient in an unpredictable climate and significant weather events.

- Identify and quantify the probabilities of significant weather events and other impacts on transport, to determine a risk profile for existing and planned infrastructure assets
- Identify the interdependencies amongst transport, water, energy and telecommunications infrastructure during significant weather events, to inform future asset management and emergency response
- Develop a model to illustrate the effect of extreme weather events to inform planning and asset design.

11. An Agile Planning Approach

Business as usual approaches to planning will not achieve the quality of places and communities we want in 40 years' time.

This chapter sets out our approach to planning for the places, networks and services we will need in coming decades – and how we can ensure that our plans are integrated with our vision for places, to deliver long term social and economic outcomes:

- Long term planning with flexibility
- Planning for uncertainty and change
- Innovative problem solving and delivery
- A new blueprint for developing our workforce
- Applying customer insights
- Measuring our progress

Long term planning with flexibility

Delivering our vision for the future will involve adapting our plans to changing circumstances

An agile planning framework

The need for government to be increasingly agile and responsive is the hallmark of our approach to vision-led planning. This chapter sets out some of the ways we can become more flexible in responding in a rapidly changing environment and delivering our vision for future transport.

We are already looking at ways to embed flexibility and strategic readiness into our activities:

- **Optionality** – as projects are planned, business case processes can test possible disruptive scenarios, embed flexibility into the design of infrastructure projects, and anticipate triggers for when government decision-makers should make project commitments. These may even identify where a project case may ‘pivot’ if customer needs radically or unexpectedly change over time.
- **Short term goals for long term change** – the focus would be on changes of services, policy, demand management or technology – which all have shorter lead times – to meet dynamic customer needs and to improve levels of service and convenience over time without significant capital investment.
- **Consulting outside of Government** – we can embed continuous and close consultation with industry and the technology sector to maximise our visibility over future developments. We can benefit from industry innovation and experience and facilitate trials of new products and models without widespread changes to our regulatory arrangements.
- **Committing to continuous improvement** – the Future Transport strategy and plans will be ‘living’ online documents, which allow for adjustment and incorporation of changes as needed.
- **Planning for outcomes** – transport planning will move away from individual modes and focus on delivering flexible, integrated solutions for customers and the broader community. Planning will consider whole-of-journey outcomes, including interchanges, so customers can better plan for multimodal trips. It will also look at how transport supports planning for places, precincts and corridors.

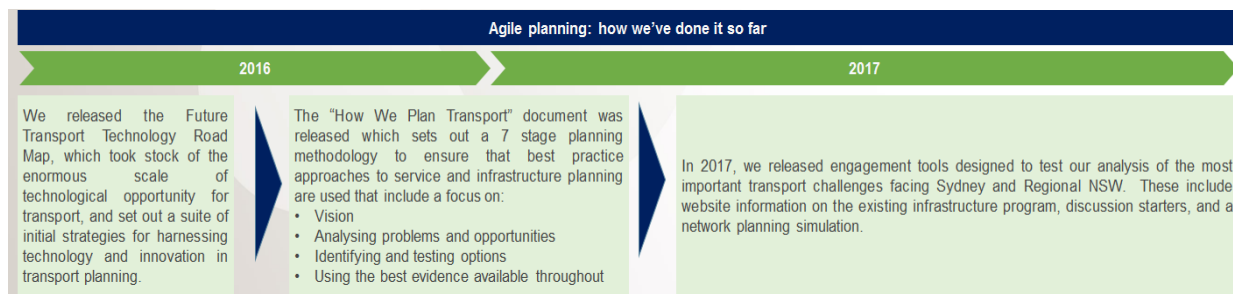


Figure 76 A new approach to transport planning

For more information see **Section 1 – Introduction**

Planning for uncertainty and change

An integrated program of options with 'triggers' to identify when major investment is needed

Using scenarios to test when new investment is needed

For any given challenge, there is a range of potential solutions. For example, when it comes to road congestion, we can build wider roads, encourage mode shift to public transport, deploy smart road infrastructure to manage congestion 'hot spots' or encourage road users to re-time discretionary travel.

Future Transport's planning framework will deliver major investments according to performance-based or need-based 'triggers', rather than rigid timeframes, and coordinate a range of solutions to meet the needs of infrastructure customers. This flips the emphasis from infrastructure provision and capital investment to more nimble responses, in the short term, that deliver more flexible solutions when there is uncertainty over how much infrastructure capacity is required.

Short term options	Long term options
Service changes, demand management, regulation and policy, and technology are quicker to deploy, and should be the 'first responders' to changing demand and customer preferences	Infrastructure construction and repurposing has longer lead times, is less flexible and is costly and should be considered as part of long-term investment prioritisation processes

Future Transport staged investments

Future Transport identifies investments and initiatives which represent 'no regret' decisions, to be delivered over the first 10 years of the plan. These include committed

and new initiatives under investigation that would maintain and improve the performance of the transport network, achieve community safety outcomes, and make sound early investments to support longer term project delivery.

Initiatives are also under investigation for the 10 to 20 year timeframe, with 'visionary' initiatives that work towards achieving the long-term vision for Greater Sydney and Regional NSW. Infrastructure proposals that involve a high level of uncertainty would be placed in a 'holding pen' to ensure continuous review.

Any investments for new infrastructure will be considered according to their ability to optimise wider network improvements, with project planning integrated under broader programs that ensure better network outcomes.

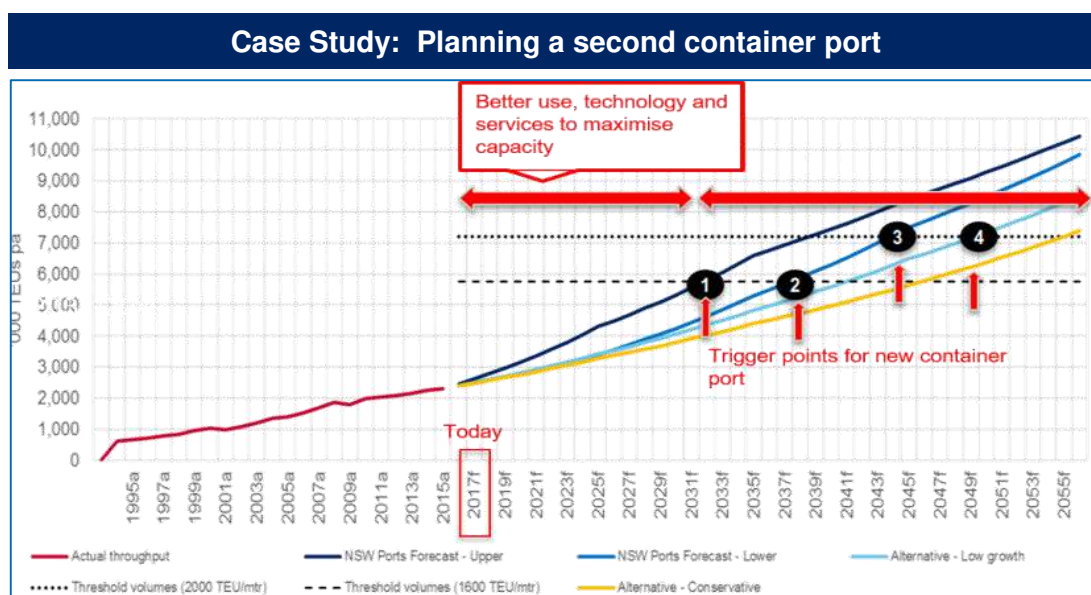


Figure 77 Trigger points for a new container port

Case Study: With the freight task forecast to double over the next 40 years, the productivity of the state's existing ports will be critical as will be planning for an overflow container port once Port Botany approaches capacity.

Under current lease arrangements, it is expected that Port Botany and Port Kembla could operate as a single port in two locations. Four scenarios were used to test different rates of trade growth and different levels of capacity at the port interface, identifying four 'triggers' for when an overflow container port would be needed. Under each scenario, it was found that Port Kembla needed to be operational by 2056.

For more information see the **Service and Infrastructure Plans for Regional NSW and Greater Sydney**

Innovative problem solving and delivery

To be a leader in transport we need continuous innovation, new ways to solve problems and deliver value, and a culture that applies learnings from other industries

Working with our customers to solve problems

The draft Future Transport Strategy and plans introduce new ways of problem solving that fit within our vision-led approach to planning, set out in 'How We Plan Transport,' released in 2016. One of the key differences in this new approach, compared to more traditional methods, is that we set a vision and objectives even before we start identifying problems. This gives us a clear picture about the outcomes we want for our customers and lets us identify obstacles to realising these outcomes.

A key feature of this approach is a high level of collaboration. From the first stages of planning we engage customers and industry, to test our understanding of the problem and harness the innovation that exists outside government to develop the best possible solutions.

Some of the ways Transport for NSW is already doing this include:

- Regulatory sand boxing, which allows pilots to be undertaken in a restricted setting, such as the pilot of a driverless shuttle bus in Sydney Olympic Park
- The call for market-led proposals for on-demand transport solutions
- The on-demand transport pilot in Tottenham
- The preschool travel trial in Condong and Tenterfield in partnership with the Department of Education
- The Open Data Hub, which to date has generated new customer apps and led to more than 1,000 registered applications, and 275 million hits
- Working with BlueChilli CityConnect on the Smart City Open Innovation Challenge
- Testing the benefits of crowdsourced solutions to key transport challenges using structured incubator and accelerator programs.

In developing solutions, we are also using a new approach based on intensively testing problems from a customer perspective – understanding what drives their preferences, and impacts their travel experiences.

This new way of thinking represents a new era in transport planning, where we emphasise the importance of learning by doing and experimentation. We will review our internal processes frequently and work towards continuously improving our skills and capabilities as we build new collaborative partnerships with the community and industry.

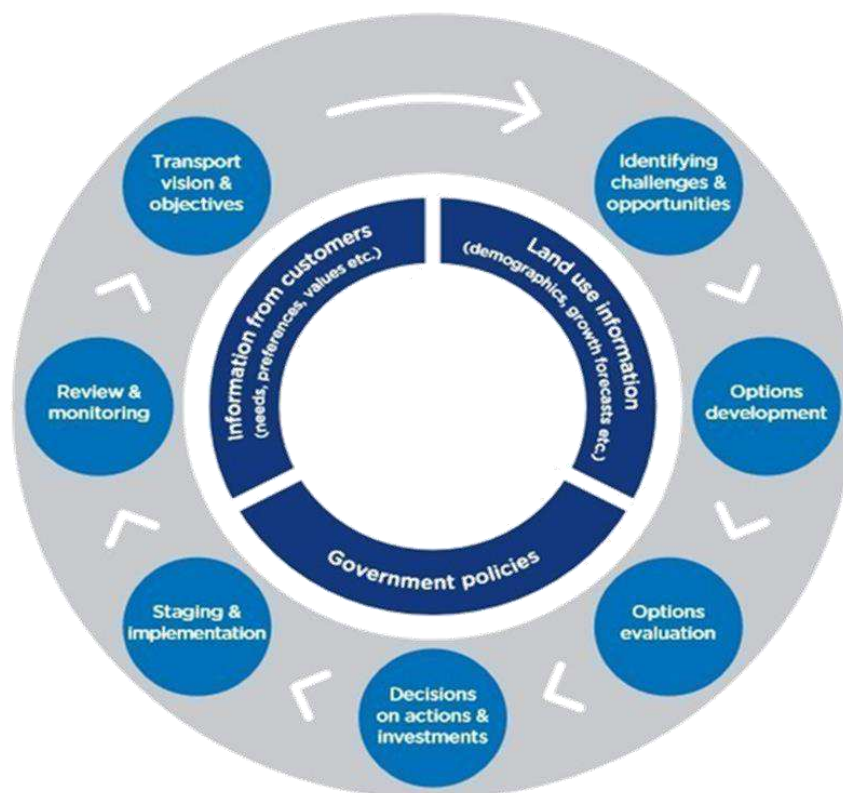


Figure 78 Problem solving and delivery

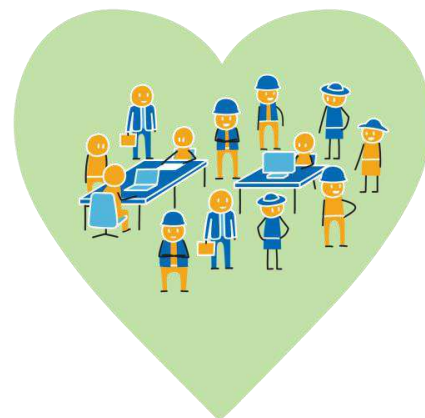
For more information see **How We Plan Transport**

A new blueprint for developing our workforce

People are at the heart of Future Transport

With global trends such as automation, the sharing economy and personalised service delivery models already reshaping the transport landscape, we will need to think differently about the role of government in enabling transport service delivery. Our workforce will need the skills and capabilities – and embody a culture – that allows us to swiftly respond to emerging opportunities and stay ahead of customer expectations.

In the years following the establishment of Transport for NSW in late 2011, the organisation's major focus was on rapidly establishing new and reformed cluster organisations, bringing previously disparate arms of transport together and using research to place the needs of customers at the centre of our attention and work.



The unprecedented focus on customer-centred delivery has led to a range of important service improvements, including integrated ticketing and customer journey information apps and has achieved levels of customer satisfaction not previously seen. It also saw the initiation of new transport projects to meet future customer needs such as Wynyard Walk, the Sydney Metro and Sydney Light Rail projects.

During this “install” phase, we have prioritised major programs to recruit and provide new and reformed cluster organisations essential in delivering improved customer service outcomes as well as driving efficiencies and improvements in the delivery of support services across the cluster. Examples include a common enterprise resource management system (Transport Equip), a unified Transport cluster scholar, cadet and graduate program, and a “Drivelt” leadership development strategy.

From 2016 the organisation prepared to transition to a significant “build” phase in its evolution, with a reformed operating model and organisation structure, to better position us to deliver a \$41.4+ billion transport infrastructure program whilst continuing to place our customers at the centre of everything we do.

The transition into this “build” phase was accompanied by recruitment of new leadership and a focus on improving the diversity of our workforce to reflect our customers. Between January 2016 and June 2017, there has been a 51 per cent increase in the number of female senior leaders employed across Transport for NSW, and a 7 per cent increase in the number of Aboriginal employees (excluding entry level talent). An Aboriginal VET Cadet program is also contributing to a more diverse pipeline of entry level talent.

We continue to listen closely to our employees through *People Matters* surveys, using the feedback to implement initiatives aimed at improving the experience they have at work over time. A positive work environment also helps our employees to deliver the best outcomes for the people of NSW every day.

Future directions to investigate

NSW will continue to support our transport workforce in delivering the transformation in services, infrastructure and regulatory frameworks needed to achieve our Future Transport vision.

- Deliver the new “People at the Heart” strategy in early 2018
- Develop an agile workplace culture that is both stable (resilient, reliable, efficient) and dynamic (fast, nimble, adaptive)
- Become more autonomous decision makers through clearly delegated authorities
- Encourage employees to foster healthy competition and innovation including in planning and regulatory practices
- Instil a strong “collaboration” culture to establish partnership structures across government and with industry and customers.



Figure 79 A successful workplace culture

12. Monitoring and Reviewing Our Progress

Improving customer outcomes with clear goals and accountability

A focus on measurable customer outcomes

Our progress towards the six outcomes that underpin the draft Future Transport Strategy and its Services and Infrastructure Plans will be monitored by a set of regularly updated performance measures. These measures align the intent of the Strategy with the Customer Service Outcomes of the Plans for each outcome area.

Measuring the performance of our transport system is not straightforward or easy. The NSW transport system is a complex one which caters to road, public transport and freight customers. Existing indicators and data cannot adequately measure all intended outcomes, but with the advent of open data and GPS technology, we can dramatically improve the evidence we have to make informed decisions, and to report on metrics that paint a more meaningful picture of how well our transport system is delivering for customers.

We will continue to develop more sophisticated measures to better understand changing patterns of movement of people and goods, particularly in rural and regional areas where many data gaps exist. We are exploring opportunities to work with telecommunications data and other emerging data sources to access near time insights on the movement of people, including information on their origin and destination, purpose, travel patterns, times and demographics.

The draft Future Transport performance targets and measures (listed opposite) provide a framework to build upon the current Transport Outcomes Framework, which reports on how our activities are contributing to wider economic, social and environmental outcomes. It will feed into the establishment of new performance 'dashboards' being developed to report on the Future Transport Technology Roadmap.

These measures are intended to:

- Cover the entire state, including all regions and modes
- Focus on the customer
- Better understand the door-to-door journey experience
- Assist in making evidence based strategic or operational decisions to improve customer experience
- Assist in delivering our long term strategic objectives.

We will undertake supporting research to further refine and develop these initial measures and align them more closely with customer expectations of an effective and integrated transport system.

Customer Outcomes - Targets and Measures

Customer Outcomes	Targets and Measures
	<p>Target: Consistently high customer satisfaction</p> <ul style="list-style-type: none"> We will report regularly on rates (%) of customer satisfaction
	<p>Target: Integrated transport and land use planning applying Movement and Place principles</p> <ul style="list-style-type: none"> We will establish a new index that reports on the % of strategic centres and transport corridors in NSW that are consistent with the principles of Movement and Place. We will establish a measure of how well transport is supporting health and wellbeing outcomes in our communities, incorporating time spent using active forms of transport.
	<p>Target: Efficient connectivity for freight and passengers</p> <ul style="list-style-type: none"> We will monitor % of population within Greater Sydney with 30 minute or less access by PT to their nearest strategic centre We will monitor % of towns and centres with day return PT services to nearest regional city We will measure travel times and speeds to monitor network efficiency
	<p>Target: A reliable network with zero trauma</p> <ul style="list-style-type: none"> We will report rates of fatality and serious injury across the road and transport network We will benchmark public transport competitiveness compared to private vehicle travel time on major metropolitan and regional corridors We will measure journey time reliability.
	<p>Target: Whole of journey accessibility</p> <ul style="list-style-type: none"> We will develop new measures of active and public transport accessibility to education, jobs and services along with regional and metro service affordability and fare parity We will monitor infrastructure and service compliance with national disability standards We will report on rates of service use and satisfaction of customers with specific needs, including by age, people with disability, people from CALD backgrounds and Aboriginal people
	<p>Target: Improved financial sustainability</p> <ul style="list-style-type: none"> We will measure the cost per service kilometre and report on levels of cost recovery for public transport and cost effectiveness of road expenditure <p>Target: Contribute to net zero emissions</p> <ul style="list-style-type: none"> We will measure energy efficiency of the vehicle fleet We will measure mode shift to active and public transport from private passenger vehicles; rail from road freight and to electric vehicles We will monitor transport-related GHG emissions and energy intensity

Figure 80 Measuring the success of Future Transport 2056