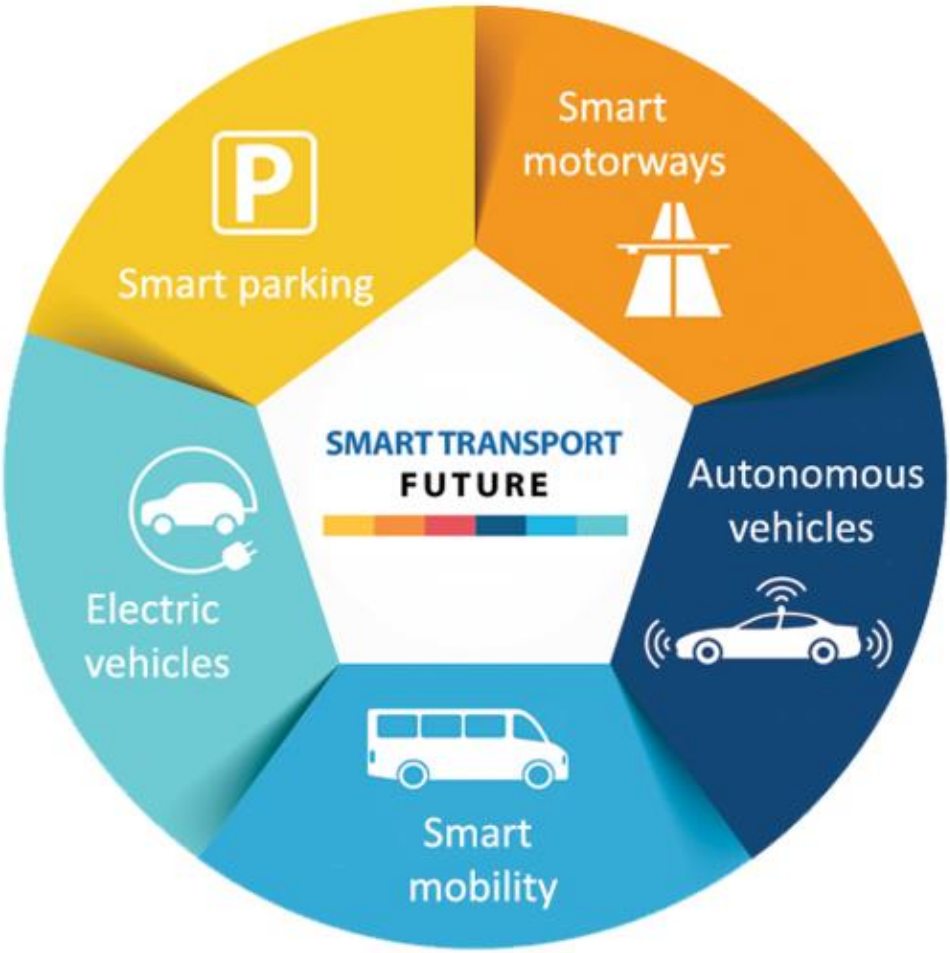
Accelerating Our Smart Transport Future



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About the NRMA

Better road and transport infrastructure has been a core focus ever since the NRMA first came into being in 1920 when our founders lobbied for improvements to the condition of Parramatta Road in Sydney. Today the NRMA continues working with government, advocating for more road funding to improve safety and for solutions to ever increasing traffic congestion. By working together with all levels of government to improve not only road infrastructure but also public transport infrastructure we can give motorists a real choice about how they get around. The NRMA believes that efficient roads, public transport and better facilities for cyclists and pedestrians work hand in hand to solve the many transport problems that we face each day.

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Contents

A Smart Transport Future

Technology is rapidly transforming every aspect of our daily lives. From the way we commute to the way we communicate, new and disruptive technologies have significantly altered our social and economic landscape, and have opened up endless opportunities for positive and momentous change across all sectors of the Australian economy.

Broadband, smart phones and social media, technology will lay the foundation of our future economic growth, creating an innovation ecosystem that encourages and nurtures new and imaginative solutions to complex challenges such as traffic congestion and infrastructure capacity constraints.

To solve the infrastructure and mobility challenges of the future, governments need to move beyond a business as usual approach. Simply building new infrastructure and throwing money at ad hoc projects will not of themselves solve congestion, improve travel times or future proof our infrastructure and transport services.

The NRMA's *Smart Transport Future,* an internally produced document, identifies and examines the challenges that NSW and the ACT face over the next 15 years. These challenges include population growth in our cities at the expense of rural and regional areas, the corresponding impact of congestion on our roads and the economy, an ageing population and diminishing public resources – all factors that may limit the ability of government to invest in new road and transport infrastructure projects and adequately maintain the current road network.

To this end, the paper examines how smart technology can keep NSW and the ACT moving. The paper uses real world examples to demonstrate how global cities are successfully adopting smart transport technologies to prepare for the future. It also provides recommendations to government about how similar technologies and solutions could be implemented in NSW and the ACT to meet our future transport challenges today.

NRMA's recommendations contained within the paper encourages government to promote and adopt smart technologies across a range of areas, including autonomous vehicles, smart parking, managed motorways, mobility and electric vehicles. NRMA hopes that these recommendations will encourage the NSW and ACT Governments to continue to be proactive and adopt innovative solutions to solve our future transport challenges.

Given technology is rapidly evolving every day, it is assumed that many smart solutions identified within the paper will eventually be superseded. It is noted that this paper is not intended to be a definitive guide to all smart transport technologies, but aims to provide a snapshot of how current technology can be adopted to pave the way for a smart transport future.

NRMA would like to acknowledge the assistance of Intel Australia in developing this paper by providing practical examples about how smart technologies are transforming mobility around the world.

Recommendations

1. That the NSW and ACT Governments undertake a review of their capabilities to deliver a smart transport future.

2. That the NSW and ACT Governments develop a strategic framework for an autonomous vehicle future that reviews regulatory barriers, develops legislative frameworks and encourages autonomous trials at locations across NSW and the ACT.

3. That the NSW and ACT Governments undertake an audit of underutilised land near commuter hubs and explore the potential for the private sector to operate commuter parking facilities through innovative solutions such as Peer to Peer parking and smart phone applications.

4. That the NSW and ACT Governments ensure that all new road infrastructure projects are fitted with smart managed motorway technologies to measure real-time information about the capacity and condition of the road network.

5. That the NSW and ACT Governments encourage a greater take up of electric vehicles by exempting electric vehicles from registration fees, investing in electric vehicle charging stations and providing priority or discounted parking.

Challenges

Urbanisation

The growth of cities and urban areas is driven by the opportunities and economic prosperity that they help to create. Cities account for the vast majority of gross domestic product around the world and are the engine rooms of economies, providing employment opportunities and increasing the quality of life and standards of living for its citizens. However, the next 15 years will see continual and unprecedented growth in cities across the globe, with an estimated 60 per cent of the world's population predicted to live in cities and urban areas by 2030[1]. This concentration of population growth in cities and urban areas is a global trend that requires thoughtful and responsible solutions from policy makers to ensure that rapid urban growth does not negatively impact on the ability of cities to remain economically competitive and environmentally sustainable into the future.

Australian cities, and Sydney in particular, are not immune from the challenges presented by the global trend of increased urbanisation. More than 75 per cent of Australians currently live in the country's 20 largest cities[2], and over 66 per cent of Australians currently live in a capital city[3]. This figure is expected to grow to around 70 per cent by 2031[4]. As noted in Table 1 below, the NSW population is expected to grow from 7.7 million people in 2016 to 9.2 million in 2031. This represents an increase of 1.5 million people or 20 per cent over a 15 year period. Similarly, the ACT will experience population growth of 23 per cent over the same period, growing from 405,000 in 2016 to around 500,000 by 2031.

Table 1 – NSW & ACT projected population growth (2016 to 2031)

(Source: Bureau of Transport Statistics, Household Travel Survey: 2012/13; ACT Government)

Projected Population Growth (2016 to 2031)					
	2016	**2021**	**2026**	**2031**	**%**
NSW	7,708,850	8,230,400	8,739,950	9,228,350	**20%**
ACT	405,447	437,032	469,015	499,463	**23%**

The projected population growth in NSW and the ACT over the next 15 years will place substantial pressure on existing road and public transport infrastructure assets, many of which are at or nearing capacity. Existing infrastructure assets within urban areas are particularly vulnerable to increases in population with the NSW Government estimating that by 2031 more than 27.5 million journeys and 1.6 million freight and commercial trips will occur in Sydney each weekday.

[1] United Nations, Department of Economic and Social Affairs, Population Division (2014), *World Urbanization Prospects: The 2014 Revision, Highlights.*

[2] Department of Infrastructure and Regional Development, Bureau of Infrastructure, Transport and Regional Economics 2014, *Trends: Infrastructure and Transport to 2030*, Commonwealth of Australia.

[3] Australian Bureau of Statistics 2016, *Australian Demographic Statistics: June 2015,* Commonwealth of Australia.

[4] Infrastructure Australia 2015, *Australian Infrastructure Audit,* Commonwealth of Australia.

Consistent with global trends in urbanisation, most of the projected population growth in NSW will occur within the Sydney metropolitan region. As indicated by Figure 1 and Table 2 below, Sydney's population is expected to grow from 4.6 million people in 2016 to around 5.8 million by 2031. These projections also indicate that the Sydney metropolitan region will account for 64 per cent of NSW's total population. This figure is expected to increase to 74 per cent by 2061[5].

Figure 1 – NSW projected population growth by region (2016 to 2031)

(Source: Bureau of Transport Statistics, Household Travel Survey: 2012/13)

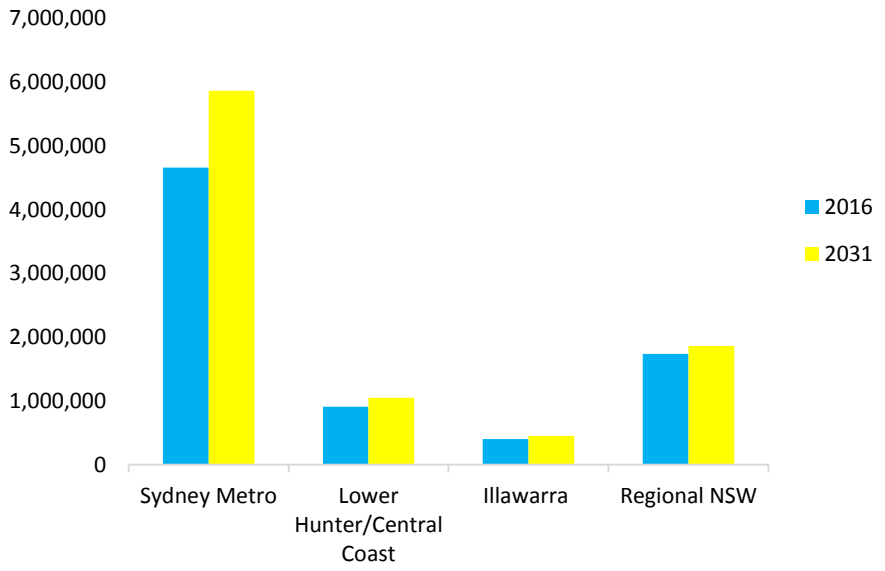


Table 2 below further indicates that urbanisation within the Sydney metropolitan region will come at the expense of rural and regional areas of NSW. Projections indicate that the population of Regional NSW as a total percentage of the NSW population will decrease from 23 per cent to around 20 per cent by 2031. This has implications not only for infrastructure capacity and congestion in Sydney, but also on the future economic viability of Regional NSW.

Table 2 – NSW Project Population (%) by Region (2016 to 2031)

(Source: Bureau of Transport Statistics, Household Travel Survey: 2012/13)

NSW Projected Population (% by region)		
	2016	**2031**
Sydney Metro	60%	64%
Lower Hunter/Central Coast	12%	11%
Illawarra	5%	5%
Regional NSW	23%	20%

[5] Australian Bureau of Statistics 2013, *Population Projects, Australia, 2012 (base) to 2101,* Commonwealth of Australia.

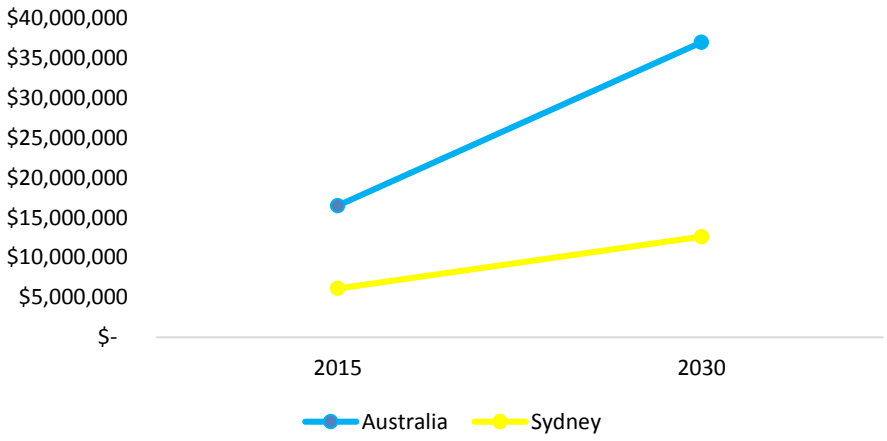
With the inevitable movement towards urbanisation, policy makers at all levels of government need to consider new approaches to appropriately build, maintain and manage our road and transport networks and infrastructure. This in itself is a significant challenge. While major infrastructure projects are important in securing cities in NSW and the ACT's future transport needs, successful and sustainable cities require new and innovative approaches to address the challenges associated with urbanisation.

Traffic Congestion

Congestion on NSW and ACT roads is the most significant transport problem facing policy makers. It is estimated that the avoidable cost of congestion will total $53 billion per year by 2030 without substantial investment from government. Congestion is not only frustrating for motorists and commuters, it places a huge burden on the Australian economy by increasing travel times, constraining productivity and increasing the costs associated with doing business. Congestion also negatively impacts on the environment by contributing to higher levels of pollution through intensified vehicle emissions.

The cost of congestion on the Australian and NSW economies is only expected to worsen over the next 15 years in line with projected population growth. Figure 2 highlights that congestion cost the Australian economy $16.5 billion in 2015, with this cost expected to increase to $37 billion by 2030[6]. In Sydney, the cost of congestion is predicted to increase from $6.1 billion in 2015 to more than $12.6 billion in 2030[7]. Canberra is also expected to feel the economic pain associated with congestion, with the avoidable cost of congestion rising from $200 million in 2015 to $400 million in 2030.

Figure 2 – Projected cost of congestion by 2030 (Australia and Sydney)
(Source: Bureau of Infrastructure, Transport and Regional Economics)



[6] Department of Infrastructure and Regional Development, Bureau of Infrastructure, Transport and Regional Economics 2015, *Traffic and congestion cost trends for Australian capital cities*, Commonwealth of Australia.
[7] Department of Infrastructure and Regional Development, Bureau of Infrastructure, Transport and Regional Economics 2015, *Traffic and congestion cost trends for Australian capital cities*, Commonwealth of Australia.

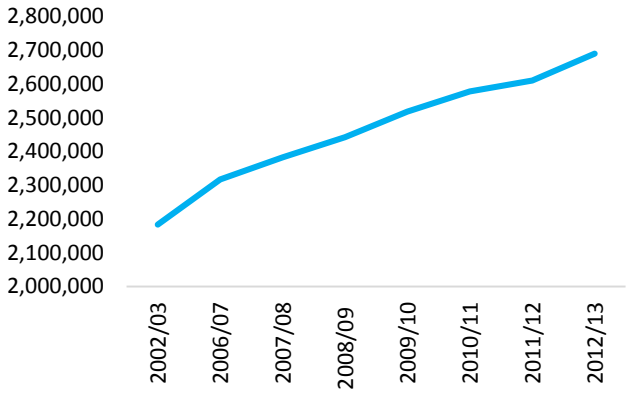
Congestion in Sydney has led to increased travel times for motorists. Between 2002/03 and 2012/13, the duration of the average car trip in Sydney, the Hunter, Central Coast and Illawarra regions increased by approximately 5.3 per cent. Over the same period, the average number of vehicle kilometres travelled per person has decreased by 2.1 per cent, suggesting that motorists across NSW are taking longer to travel about the same distance[8]. The TomTom 2014 Travel Index further highlights the problem of congestion in Sydney, with travel times increasing 35 per cent as a direct result of road congestion. This ranks Sydney as the 21st most congested city in the world, ahead of Paris, Shanghai, Singapore and New York City[9].

Congestion also increases the cost of doing business. NRMA's 2015 Business Motoring Survey found that 75 per cent of Western Sydney businesses believed that congestion had worsened over a 12 month period. 40 per cent of businesses also stated that their staff spent an additional 10 to 20 minutes longer in traffic over the same period. The economic cost of congestion to business is also substantial, with 35 per cent of businesses estimating that increased congestion adds up to $5,000 to the cost of doing business due to increased fuel costs, slowdowns in productivity and decreases in staff punctuality[10].

Vehicle Ownership

With the population of NSW and Sydney expected to grow substantially over the next 15 years, it is likely that there will be a corresponding increase in the number of vehicles on our roads, at least in the short to medium term. As highlighted by Figure 3, the number of private vehicles owned in Sydney also increased by 23 per cent between 2002/03 and 2012/13, rising from 2.1 million to 2.6 million – almost double the rate of population growth[11].

Figure 3 – Private vehicles owned in NSW (2002/03 to 2012/13)
(Source: Bureau of Transport Statistics, Household Travel Survey: 2012/13)

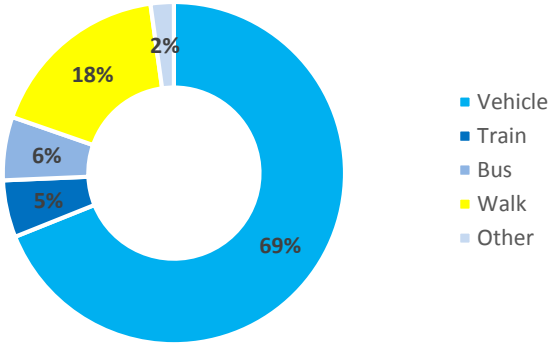


[8] Transport for NSW, Bureau of Transport Statistics 2014, *Household Travel Survey Report: Sydney 2012/13,* NSW Government.
[9] TomTom 2014, *The TomTom Travel Index,* available at: <https://www.tomtom.com/en_au/trafficindex/#/>.
[10] The National Roads & Motorists' Association 2015, *NRMA 2015 Business Wise Congestion Survey.*
[11] Transport for NSW, Bureau of Transport Statistics 2014, *Household Travel Survey Report: Sydney 2012/13,* NSW Government.

In recent times there has been a major effort by the NSW Government and a number of local councils to discourage the use of private vehicles in favour of public or active transport alternatives, particularly for trips to and from the Sydney CBD. Sixty-nine per cent of all trips taken in Greater Sydney are made by a driver or passenger of a motor vehicle. Although there has been a substantial increase in the number of trips made by public transport in recent years, driving remains the main method and the most convenient mode of transport for a large majority of the population to get to work, to go shopping or to engage in social and sporting activities.

Figure 4 – Weekday trips by mode in NSW

(Source: Bureau of Transport Statistics, Household Travel Survey: 2012/13)



Any increase in car ownership and usage will place further demand on our existing road networks. While increased investment in road and transport infrastructure projects will go some way to alleviating traffic jams, in the future governments will not be able to simply rely on building their way out of congestion. Future population growth in urban areas may result in infrastructure projects reaching peak capacity shortly after completion. Governments will therefore need to embed technology solutions into all new infrastructure projects to better manage congestion and to maximise efficiencies in the road and transport networks.

Transit Oriented Developments (TODs)

To combat the increase in car ownership across Sydney, the NSW Government has signalled through the release of its Draft Metropolitan Strategy a strong intention to favour Transit Oriented Developments (TODs). TODs are high density communities based within walking distance of public transport hubs and aim to encourage housing growth in designated centres across Sydney. The NSW Government hopes that TODs will "assist in reducing car dependence and to make walking, cycling and public transport more viable for residents[12]". The removal of parking facilities for residents is a key strategy to reduce private car use around future high density developments. While this policy might go some way to reduce congestion within urban areas, it will place greater demand on public transport services. It is likely that TODs will be required to rely on future technologies and the sharing economy to ensure the mobility of its residents, resulting in increased demand for ride-sharing services and on-demand public transport options.

[12] Department of Planning and Environment 2013, *North West Rail Link Corridor Strategy,* NSW Government.

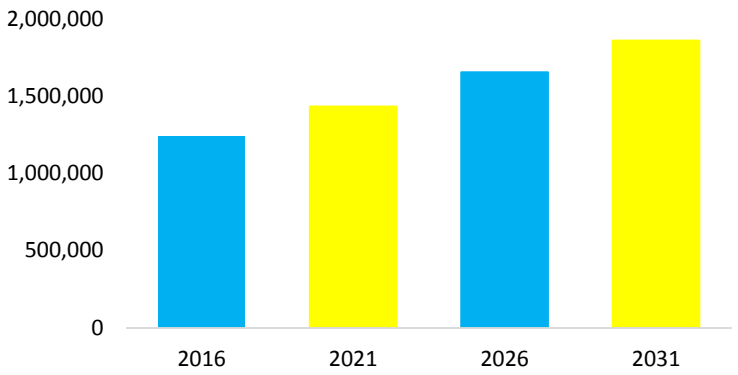
Ageing Population

Australia's population is ageing with the number and the total percentage of older Australians increasing over time. Cities and regions across NSW and the ACT also face the challenge of managing an ageing population, particularly in relation to the appropriateness and accessibility of future transport infrastructure and services to cater for the mobility needs of older Australians.

Between 2016 and 2031, the number of people living in NSW over the age of 65 will increase from 1.2 million to 1.8 million, making up 20 per cent of the NSW population. The largest numerical increase in the number of people 65 years and over is set to occur within the Sydney metropolitan, region with approximately 400,000 more people over this age residing in the area by 2031[13].

Figure 5 – Number of people in NSW aged over 65 (2016 to 2031)

(Source: NSW Department of Planning & Environment, 2014 NSW Population Projections)



While the largest numerical increase in the amount of people aged 65 years and over is to occur in Sydney, which is generally well serviced by accessible public transport options, the greater proportion of growth within this age group will occur in Regional NSW.

As noted in Table 3 below, the proportion of residents aged over 65 in the Lower Hunter will increase from 19 per cent to 24 per cent between 2016 and 2031. Similarly, the Illawarra will experience an increase of 5 per cent over the same period. Significantly, the greatest percentage increase in residents aged over 65 will occur in Regional NSW, with 27 per cent of all residents aged over 65 by 2031.

Table 3 – Percentage of population over 65 (by region)

(Source: NSW Department of Planning & Environment, 2014 NSW Population Projections)

% of population over 65+ (by region)		
	2016	**2031**
Sydney Metro	14%	17%
Lower Hunter/Central Coast	19%	24%
Illawarra	20%	25%
Regional NSW	21%	27%

[13] Australian Bureau of Statistics 2014, *Australian Demographic Statistics,* Commonwealth of Australia.

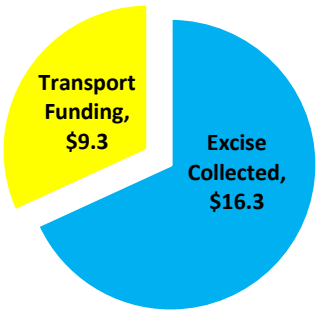
The increase in the percentage of people aged over 65 in Regional NSW presents numerous challenges for government. In many parts of Regional NSW public transport options are limited, with many older residents heavily reliant on the use of private vehicles to access essential public services such as hospitals given the distance between home and regional centres. To address the transport needs of older Australians, particularly in regional and rural areas, policy makers must consider new and smart technologies to increase personal mobility. Failure to do so has the potential to restrict the movements and freedoms of older Australians into the future by limiting access to services, and ultimately negatively impacting on the cost of living and quality of life of older Australians.

Government Funding of Major Infrastructure Projects

As our population increases greater demand will be placed on the existing capacity of road and public transport networks. This will in turn require greater government investment in major projects to build new or upgrade existing infrastructure assets. This poses a number of challenges due to declining government revenue and the need to prioritise investment in competing segments of the economy such as health and education.

As noted by Figure 6, it is estimated that the Australian Government will collect around $16.3 billion in 2016/17 from motorists through the fuel excise. This figure will increase biannually with the reintroduction of fuel excise indexation[14]. At present, $9.3 billion of the $16.3 billion will be invested back into transport infrastructure in 2016/17. This is equivalent to a return of approximately 22.5 cents (or 57 per cent) of the 39.5 cents per litre fuel excise paid.

Figure 6 – Transport Funding Revenue vs Fuel Excise Expenditure 2016/17
(Source: Australian Government Budget Papers, 2016/17)



Revenue collected from motorists through the fuel excise makes up a substantial portion of Australian Government spending on transport infrastructure projects. However, this revenue base may experience decline beyond the forward estimates should motorists opt for electric or hybrid vehicles into the future. This could negatively impact on government revenue and ultimately on the amount of expenditure allocated to new road and transport infrastructure projects, forcing governments to be more agile and innovative in delivering future infrastructure projects.

[14] The Treasury 2016, *Budget Measures: Budget Paper No. 2,* Commonwealth of Australia.

Preparing for the future

To meet the significant challenges identified above, governments must become more agile and nimble in adopting new and disruptive technologies to future-proof our road and transport infrastructure. This means moving beyond a business-as-usual approach.

Simply building new infrastructure and investing in *ad hoc* infrastructure projects, while important and welcomed, will not of themselves solve future road and transports problems associated with increased population growth, an ageing population, greater vehicle usage or declining government revenue streams.

Innovation agenda

In addition to investment in major road and transport infrastructure projects, NRMA acknowledges that the NSW and ACT Governments have been proactive in encouraging innovation in the road and transport sectors. Both governments have led the way in legalising ride share and point-to-point services and the ACT Government has recently commenced an innovative smart parking trial.

The NSW Government has pushed its innovation agenda by appointing a Minister for Innovation and Better Regulation, leading to the creation of an open data portal and moving towards the provision of real time fuel price information for motorists. NRMA also supports the far-sighted decision made by the NSW Government to establish a Smart Innovation Centre to support and promote the development of emerging road and transport technologies.

Barriers to innovation

While it is encouraging that the NSW and ACT Governments are pushing innovation agendas, there is danger of a disconnect between vision at the leadership level and the implementation of this vision at a delivery level. This point was recently made by the NSW Transport Minister at the *Future Transport Summit* held in April 2016.

As an example, it is noted that the NSW Government has recently committed to managed motorway technologies on the M4 but for many years, government agencies were reluctant to implement and embed proven managed motorway technology in new road infrastructure projects.

This ultimately set NSW back in terms of preparedness for a smart technology future and means that managed motorway technologies will need to be retrofitted into existing road infrastructure assets. These scenarios can no longer afford to be repeated. It is essential that governments review their capabilities to deliver a smart transport future.

Autonomous Vehicles

Of all the transport-related technological advances set to reshape our transport future, the potential of autonomous vehicles to boost the Australian economy and reimagine mobility is unmatched. Autonomous vehicles in conjunction with smart infrastructure and Intelligent Transport Systems (ITS) are likely to create a new paradigm for personal mobility and to facilitate and accelerate economic growth into the future.

Autonomous vehicles are no longer a fantastical element associated with science fiction movies, with car manufacturers and technology companies anticipating that fully autonomous vehicles will become available for purchase by 2020. It has been estimated by McKinsey that by 2025, fully autonomous vehicles will make up 1 or 2 per cent of light vehicles on the road network. It is assumed that the number of partially autonomous vehicles on the roads could number 12 to 15 per cent[15]. It is also estimated that autonomous vehicles could contribute around $235 billion a year to the global economy by 2025, through reduced traffic accidents, fuel consumption and carbon emissions[16]. This will have major policy and regulatory implications that all levels of government will need to grapple with in a timely and agile manner.

Figure 7 illustrates the potential economic, social and environmental benefits of autonomous vehicles which are explained in further detail below.

Figure 7 – Potential benefits of autonomous vehicles
(Source: World Economic Forum)

[15] McKinsey & Company 2015, *The Internet of things: Mapping the value beyond the hype.*
[16] McKinsey & Company 2015, *The Internet of things: Mapping the value beyond the hype.*

Improved Road Safety

Perhaps the greatest possibility associated with the adoption of autonomous vehicles relates to the impact that they may have on improving road safety for motorists by essentially eliminating human error from decisions made behind the wheel. It is estimated that more than 90 per cent of car accidents in the United States can be attributed to human error, contributing substantial economic and societal costs[17]. McKinsey assessments suggest that fully autonomous vehicles could eliminate 90 per cent of motor vehicle accidents, with partially autonomous vehicles eliminating around 40 per cent of accidents[18]. In the NSW context, the hypothetical elimination of 90 per cent of accidents that occurred between 2008 and 2013 on regional local roads is equivalent to around 1,330 less fatalities and 90,300 less injuries over a six year period. In addition, the total economic cost of fatalities and injuries on local roads over the same period would have reduced by $13.5 billion[19].

Fully Autonomous Vehicles	•90 per cent reduction in road fatalities and injuries.
Partially Autonomous Vehicles	•40 per cent reduction in road fatalities and injuries.

Reduced Congestion

It has been suggested that autonomous cars will have a positive impact on congestion and travel by increasing the capacity of road networks as autonomous vehicles would have the ability to travel closer together at increased speeds as a result of connected technologies and vehicle to vehicle communication[20]. By communicating with the external environment and other vehicles during a journey, autonomous vehicles can better utilise road space which in turn will result in better journey times and reduced congestion. Taking away the human factor from behind the wheel may also contribute to greater travel efficiencies and throughput as a result of a reduction in avoidable accidents occurring on the road network.

Parking Efficiencies

Technology can play a vital role in eliminating the current parking crisis faced by cities. The potential impact of technology on parking is discussed in further detail below. However, it is anticipated that fully autonomous cars could in the longer term help to reduce the need for parking spaces around CBD locations and commuter hubs such as train stations. It is possible that in the future fully autonomous vehicles will be able to drop off passengers and then proceed to remote parking locations outside of the CBD until required to make a pick up, effectively eliminating or reducing the need for publicly available on or off street parking facilities.

[17] Accenture 2014, *The new road to the future: Realising the benefits of autonomous vehicles in Australia.*
[18] McKinsey & Company 2014, *A road map to the future for the auto industry.*
[19] The National Roads & Motorists' Association, *Local Road Funding Report 2015.*
[20] McKinsey & Company 2014, *A road map to the future for the auto industry.*

Reduced Pollution

Autonomous vehicles may also have a significant impact on the reduction of fuel emissions into the future. Research conducted by the World Economic Forum suggests that consumers anticipate that autonomous vehicles will be either hybrid or electric, with 37 per cent of consumers preferring a hybrid option and 29 per cent favouring electric autonomous vehicles[21]. New technologies associated with autonomous vehicles may also lead to greater fuel efficiencies and a reduction in fuel consumption due to changes in driver patterns and behaviours, providing environmental relief in the form of less pollution from vehicle emissions.

Greater Mobility

The impact of autonomous vehicles, both private and public, is discussed elsewhere in this discussion paper. At a high level, autonomous vehicles will potentially make mobility easier to access for many, providing greater social inclusion for children, older people, those suffering from disability and others who previously were unable to operate a vehicle. Not only will this increase equality and mobility in urban areas, but equally it will go some way to addressing the transport needs of those living in Regional NSW where current public transport options are limited or non-existent.

Autonomous Vehicle Trials

A World Economic Forum survey recently found that 48 per cent of global cities expect the commercialisation of fully autonomous vehicles within the next 10 years, with another 40 per cent of cities predicting that they will be fully operational before 2025[22]. To prepare for the eventual take up of autonomous vehicles in the urban environment, many overseas and domestic jurisdictions have taken the lead and begun trialling autonomous vehicles in both controlled and uncontrolled environments, as well as undertaking reviews of potential legal and regulatory barriers that require amendment or removal to facilitate an autonomous vehicle future.

Case Study - United Kingdom Autonomous Vehicle Trials

In 2015, the United Kingdom Government provided $19 million to fund four autonomous vehicle trials across Britain located in Greenwich, Bristol, Milton Keynes and Coventry. These cities were selected following a 'driverless cars' competition that invited UK cities to partner with business and research organisations to undertake local autonomous vehicle trials[23]. This investment is significant, as the UK Government positions predicts that the autonomous vehicle industry will be worth more than $900 billion by 2025. The trials being undertaken in the UK have been actively facilitated by government, by the provision of funding to support trials of autonomous vehicles on public roads, and by developing a comprehensive strategy to offer a welcoming regulatory framework that aims to encourage and facilitate the testing and production of autonomous vehicles by cities and vehicle manufacturers.

[21] World Economic Forum 2015, *Self-driving vehicles in an Urban Context.*
[22] World Economic Forum 2015, *Self-driving vehicles in an Urban Context.*
[23] Department for Transport 2015, *The Pathway to Driverless Cars: Summary report and action plan.*

Image 1 – Autonomous vehicle pod currently being trialled in Milton Keynes

(Source: The Telegraph 2015, First self-driving 'pod' unleased on Britain's streets)

Milton Keynes Council is one of the UK cities currently trialling autonomous vehicles. The 'pod' (pictured above), a partially autonomous vehicle, is currently being tested in pedestrianised environments across the city. Milton Keynes Council believe that the 'pod' has the potential to replace costly public transport services such as buses and act as an on demand transport and mobility service that can be ordered via smartphone.

Case Study - South Australia Autonomous Vehicle Trials

Closer to home, the South Australian Government has taken the lead in facilitating the testing of autonomous vehicle technologies. In September 2015, the South Australian Government introduced laws allowing the on-road testing of autonomous vehicles, positioning the state to be at forefront of the future Australian autonomous vehicle industry[24]. In November 2015, in partnership with the South Australian Government and the Australian Driverless Vehicle Initative, Volvo successfully undertook Australia's first on-road demonstration of an autonomous vehicle. A modified driverless Volvo was able to travel on a motorway at around 70 kilometres an hour.

An Autonomous Car Future for NSW and the ACT

Autonomous vehicles present both NSW and the ACT with significant opportunities and have the potential to redefine personal mobility and public transport into the future. It is clear that in the longer term, autonomous vehicles will allow for the more efficient movement of people and goods, and lead to significant improvements in road safety and travel times. However, in order to make the most of the opportunities associated with an autonomous car future, both the NSW and ACT Governments must do more to encourage the autonomous vehicle industry by identifying and removing potential legal and regulatory barriers that may restrict future on-road trials.

Following a review of legal and regulatory barriers restricting on road trials of autonomous vehicles, the NSW and ACT Governments should follow the lead of South Australia and develop a legislative framework that provides legal clarity to support and allow autonomous vehicle trials to be undertaken in real world environments across NSW and the ACT.

[24] Department of Planning, Transport and Infrastructure 2015, *South Australia leads nation on driverless car legislation,* Government of South Australia.

A comprehensive legal framework would be a good first step in readying NSW and the ACT for an autonomous vehicle future. Additionally, such a framework would allow both NSW and the ACT to become global hubs for the research, development and integration of autonomous vehicles and smart infrastructure solutions.

To actively leverage the economic opportunities associated with the testing and development of autonomous vehicles, the NSW and ACT Governments should also consider providing financial or concessional incentives to vehicle manufacturers and leading IT companies such as Google to encourage autonomous vehicle trials across NSW and the ACT. These trials could be undertaken in Canberra, Newcastle, Wollongong, Sydney Olympic Park or Regional NSW.

Intelligent infrastructure to support autonomous vehicles

While there is huge potential for autonomous vehicles to reshape the transport and mobility landscape in the long term, governments need to ensure that that the technology and digital infrastructure required to support an autonomous vehicle future are put in place. This will require substantial investment from government in *Intelligent Transport Systems* (ITS) and *Information Communication Technology* (ICT).

In terms of physical investment in infrastructure assets, governments will need to begin to embed smart devices and ITS technologies such as data sensors into the road network to allow autonomous vehicles to communicate and interact with other vehicles as well as the surrounding environment.

In addition to embedding ITS into current and future road infrastructure assets, significant investment in the broadband and telecommunication networks such as 4G is required to support the operation of autonomous vehicles and associated ICT infrastructure. These services can only operate with the support of reliable and high speed broadband and telecommunication networks. It is therefore crucial that broadband and ICT networks are reliable and available across the nation, including in regional and rural areas.

Smart Parking

NRMA has long advocated for innovative solutions to make it easier for motorists to find available on-street and commuter parking spaces. Since 2012, NRMA has released three comprehensive reports identifying the need for additional on-street and commuter parking and providing government with recommendations to increase parking capacity across Sydney and NSW:

1. Commuter Parking Audit – 2012
2. Parking Comparison Report – 2014
3. NRMA's Parking Strategy – 2015

NRMA's *Parking Strategy* released in February 2015, called on the NSW Government to work with the private sector to make better use of technologies and disruptive solutions to increase parking capacity, particularly around key commuter and transport hubs.

NRMA notes that following the release of the *Parking Strategy,* the NSW Government has announced its intention to commence trials to lease unused government parking spaces in government buildings via smart phone applications. It is also noted that since 2012, the NSW Government has built or released an additional 2,500 commuter parking spaces for motorists across Sydney and NSW.

Globally, parking remains a significant problem. It is estimated that the global cost associated with people looking for available parking spaces is around $3.9 trillion a year[25]. CISCO has also estimated that 30 per cent of all traffic congestion in urban areas is caused by drivers looking for available parking spaces[26]. McKinsey consider that by utilising smart parking technologies, cities could reduce congestion by 10 per cent[27]. On this basis, many global cities such as Munich are utilising technology to better manage on and off street parking.

Case Study – Munich Smart Parking Trial

In Munich, Intel and Siemens are currently collaborating to deliver a Smart Parking solution that will eventually lead to the creation of a sensor and communication network for future Smart City concepts and projects. The trial combines Intel's IoT architecture with Siemens' sensors allowing for parking locations to be continuously monitored via overhead radar sensors (as highlighted by Figure 1.X below), providing real time information about available parking spaces.

The data collected from the sensors is able to be transmitted via mobile radio to a control centre, which then records the sensor data, calculates parking space availability and prepares the data for use by smart phone app operators that offer motorists with assistance in finding available parking spaces. Since commencing the trial, Intel estimates that the amount of time spent my motorists searching for available parking has been reduced by around 43 per cent[28].

[25] McKinsey & Company 2015, *The Internet of things: Mapping the value beyond the hype.*
[26] CISCO 2014, *Smart+Connected City Parking,* available at < http://blogs.cisco.com/tag/smartconnected-city-parking>.
[27] McKinsey & Company 2015, *The Internet of things: Mapping the value beyond the hype.*
[28] Intel Australia 2015, *Intelligent Transport Systems.*

Image 2 – Intel Smart Parking Trial

(Source: Intel Australia)

Parking Guidance Systems

NRMA has previously called on state and local government to install parking guidance systems, similar to those being trialled in Munich, for on-street and commuter parking facilities to make it easier for motorists to find available parking[29]. Parking guidance systems and sensors have been in use for many years, particularly in shopping centres such as Westfield and privately managed off-street parking garages and could easily be utilised for on-street and commuter parking spaces.

Parking guidance systems detect real time information about available parking spaces through a wireless magnetic detector or camera installed at each individual parking space. The data detected at each parking space is sent to a central control unit and then forwarded to variable messaging signs (VMS) that indicate to motorists how many spaces are available at a particular car park. Data about available parking spaces is also transmitted to VMS display boards in real time.

Complementing VMS display boards, LED-based indicators are located above each individual parking space and interact with the wireless magnetic detection unit and change colour between red and green to reflect the current availability of a parking space. Electronic display boards also indicate the direction of available parking spaces and is updated in real time, providing motorists with relative certainty about the location of available parking spaces.

Parking guidance systems, in conjunction with IoT, can also facilitate the collection of accurate data about recurring parking trends at particular locations, allowing policy makers to better plan for the future.

While parking guidance systems are not widely used for on-street or commuter parking spaces, there is scope for state and local government to consider implementing guidance systems at these locations to provide motorists with real time information about available parking options.

[29] The National Roads & Motorists' Association 2015, *NRMA's Parking Strategy.*

The introduction of VMS display boards outside commuter parking facilities in particular would eliminate frustration experienced by commuters who can never be certain about the availability of parking, particularly during the AM peak, where many parking facilities reach capacity before 7AM each morning.

Smart Phone Parking Applications

Parking guidance systems have the potential to connect with smart phone parking applications that provide real time information and the location of available parking spaces, allowing motorists to better plan their journey and make more informed decisions about where and when they park.

While a number of applications have been developed to provide real time information about available parking spaces, there are also opportunities to use smart phone technology to pre-book on-street or commuter parking spaces and to pay for and top-up parking remotely.

It is important to note that many local councils across NSW have adopted smart parking technologies. However NRMA is concerned that councils are using technology solely as a means to increase revenue by making easier to fine motorists who overstay in a parking space. NRMA strongly believes that councils must also use technology to help motorists, not just for their own enforcement purposes.

Peer 2 Peer (P2P) Parking Solutions

Peer to Peer (P2P) smart phone parking applications can also play a role in transforming parking through the shared economy. With the availability of parking diminishing and costs associated with parking increasing, P2P is an innovative way to increase parking capacity in urban areas and around key commuter hubs. The P2P concept connects motorists with vacant or unused residential parking spaces for short-term lease.

P2P has the potential to increase the capacity of available parking spaces around key commuter hubs at a fraction of the cost associated with building or upgrading stand-alone commuter parking facilities. Based on NSW Government data, it is estimated that the cost of providing each new commuter parking space at Sydney train stations can be as high as $123,000[30].

Given the high costs associated with building additional commuter car parking spaces, it makes economic sense for the NSW Government to actively encourage P2P as a more affordable means of providing additional parking capacity for motorists and commuters around key transport hubs and on the periphery of the CBD.

To encourage innovation and growth of a P2P industry, it is important that residents offering vacant parking spaces for short-term lease are not made financially worse off or subjected to the NSW Government Parking Space Levy or any equivalent or additional rates, fees or charges.

[30] Transport for NSW 2012, *Getting on with the job: New car parks and interchanges for commuters,* NSW Government.

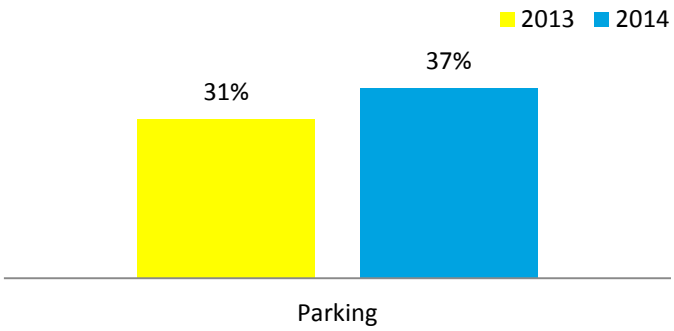
To ensure P2P solutions are viable for motorists, the NSW Government must work closely with providers of smart phone applications within the private sector to ensure that businesses seeking to use new technologies to provide additional parking capacity, at little or no cost to government, can operate and flourish in an environment free of bureaucratic red-tape.

Public Private Partnerships – Commuter Parking Facilities

The provision of safe and adequate commuter parking spaces at key transport hubs can help to reduce congestion on Sydney roads by providing motorists with options to make it easier to access public transport for all or part of their journey. However, as noted by Figure 8 below, the availability of parking at train stations is a key concern for commuters and a major impediment to mode shift.

Figure 8 – Change in commuter parking concerns between 2013 and 2014

(Source: NRMA Seeing Red on Rail Surveys – 2013 & 2014)



Given the demand for safe and accessible parking spaces at key commuter hubs, the NSW Government should consider working with the private sector to build, maintain and operate commuter parking facilities through Public Private Partnership (PPP) arrangements.

A PPP would allow an increase in commuter parking capacity across Sydney and NSW at little or no cost to government. Private sector investment in commuter parking facilities could also stimulate innovation through the use of smart technologies, providing motorists and commuters with a better customer experience. As an example, it could be possible for commuters to better plan their journey by reserving a parking space before leaving home via smart phone applications.

Smart Road Infrastructure

Information Communication Technology (ICT) and the Internet of Things (IoT) are crucial elements to tackling congestion in our cities and our regions now and into the future. With increased competition for government resources and a growing population, it is unlikely that governments of the future will be able to solve congestion issues simply by pouring more concrete and investing in large and expensive road infrastructure projects.

Future investment decisions will need to be targeted and leverage ICT and IoT solutions to provide relief from congestion in a cost-effective and intelligent way. To maximise efficiencies and to make better investment and planning decisions about managing, maintaining or upgrading our road network, governments must also make better use of ICT and IoT to collate data and real time information about the usage and condition of the road network and associated infrastructure assets.

Case Study – Managing Brazil's Traffic (Intel)

Brazil has one of the largest motorway systems in the world, with more than 200,000 kilometres of paved roads and more than 1.2 billion trips made by motorists each year. Congestion caused by a large increase in the amount of vehicles purchased in recent years has put increased pressure on Brazil's road network. To improve the safety and efficiency of the road network, Brazil is investing in technology to create more efficient and intelligent motorways.

In partnership with Intel, the Government of Brazil aims to install an RFID (Radio Frequency Identification) tag in all 90 million vehicles to monitor and manage traffic flow. Once RFID is installed, traffic departments across Brazil will be able to monitor and manage traffic, improving traffic flow, reducing accidents and collect real time information allowing decisions to be made about future investment and upgrades to the road network.

Big Data and the Internet of Things (IoT)

The above case study is just one example of how technology can be used to manage, monitor and improve traffic flow on our roads and motorways. While it is not proposed by NRMA that Australian vehicles be fitted with tracking devices, the use of ICT and IoT technologies have unlimited potential to provide government and decision makers with accurate information that can help to improve the forecasting of current and future traffic flows which can ultimately improve future investment decisions as well as increase the reliability and efficiency of the road network.

By using smart technology such as Intelligent Transport Systems (ITS) to capture up to the minute information about the condition of physical assets, decision makers will be better able to make data-driven decisions to reduce congestion and better manage traffic flow. As noted by Intel, the true value of the IoT is in producing real time data that can help government to better manage traffic congestion, amongst other things[31].

[31] Intel Australia 2015, *Submission to the House of Representatives Standing Committee on Infrastructure and Communications: Inquiry into the role of Smart ICT in infrastructure.*

This view is supported by the UK Government Office for Science who notes that real time information and big data collected from sensors can help government to monitor traffic, reduce accidents and make informed decisions about where and when to expand the road and motorway network[32].

In the NSW context, it is important for the government to make the right investment decisions to cater for and manage a growing population and a corresponding increase in congestion. The adoption of smart technology that provides real time information and data about the capacity and condition of the road network is an important element in ensuring that infrastructure assets are future proofed and appropriately maintained.

In an era of open government, real time data about road capacity, condition and travel speeds should be made readily available to the general public in a format that is readily accessible and easy to understand on a daily basis.

Adaptive Traffic Control

Infrastructure Australia (IA) has noted that ITS can triple the use of road assets and result in better management of networks. IA also notes that better traffic signal phasing and integrated corridor management are a much more cost efficient way of reducing congestion and increasing travel times than building new road capacity[33].

Better optimising technology to manage intersections and traffic lights will also be an important mechanism to improve traffic flow and reduce congestion on urban roads. McKinsey estimates that the efficient use of adaptive traffic controls can improve traffic flow at intersections by between 5 to 25 per cent[34].

It is noted that Roads and Maritime Services (RMS) currently relies on the Sydney Coordinated Adaptive Traffic System (SCATS) to manage the synchronisation of traffic signals across Sydney. However, as noted in NRMA's *Decongestion Strategy* this has a number of limitations and it has arguably been superseded by newer and more reliable technologies. One of the major limitations of SCATS is that detectors are generally placed immediately behind an intersection.

As a result, SCATS has no real way of knowing or predicting the amount of traffic waiting on each approach to an intersection. The installation of advance queue detectors using wireless technologies could better predict the amount of traffic waiting at intersections and appropriately adjust the timing of traffic lights.

[32] The Government Office for Science 2014, *The Internet of Things: making the most of the Second Digital Revolution,* United Kingdom.
[33] Infrastructure Australia 2016, *Australian Infrastructure Plan: Priorities and reforms for our nation's future,* Commonwealth of Australia.
[34] McKinsey & Company 2015, *The Internet of things: Mapping the value beyond the hype.*

Smart Motorways

Complementing smart traffic infrastructure, smart motorways also have the potential to significantly improve the efficiency of our roads and motorways by using integrated technologies to collect real time data that can be used to manage network capacity, reduce congestion and increase travel times. NRMA's data suggests that road capacity on Sydney roads could be increased by 25 per cent simply by adopting smart managed motorway technologies[35]. Better utilising technology to manage the road network and detecting and responding to traffic incidents early can significantly improve congestion and travel times.

What are managed motorways?

Managed motorways use smart transport infrastructure technologies to deliver more efficient motorways. This is achieved by using the latest technology to monitor traffic conditions, manage congestion and increase capacity on motorways by responding to traffic incidents in real time. Managed motorway technologies are varied but generally consist of variable speed limits, ramp metering to control the number of vehicles that can merge onto a motorway at any one time, VMS to provide real time information about travel times and traffic conditions, and ITS including road sensors, traffic detectors and CCTV to collect up to date data about the management and performance of the road network.

Case Study –Melbourne's Monash Freeway

Melbourne's Monash Freeway was one of the first motorways in Australia to install managed motorway technologies. The Monash Freeway uses ICT such as VMS and control systems to manage traffic flows, lane usage and travel speeds. The adoption of managed motorway technologies has delivered a 50 per cent improvement in travel times and a 50 per cent reduction in crashes on the Monash Freeway. As a result of these statistics, the Victorian Government intends to incorporate managed motorway technologies on every freeway in Melbourne within the next five years.

The ARRB Group has recommended that managed motorway technologies should be considered whenever a new urban motorway is to be built or upgraded[36]. Considering the high costs associated with building and upgrading Sydney's motorways this is a view that is supported by the NRMA as managed motorways are a cost effective way to deliver more efficient and safer motorways.

[35] The National Roads & Motorists' Association 2011, *Decongestion Strategy.*

[36] ARRB Group 2012, *Managed Motorways a matter of control: Building motorways that consistently operate near capacity during peak periods,* presentation to NRMA, 8 March 2012.

Electric Vehicles

NRMA has long been at the forefront of promoting and encouraging the use of alternative fuels and environmentally sustainable forms of transport including electric and hybrid vehicles. Encouraging greater use of electric or hybrid vehicles is a major component in addressing the cost of motoring, reducing Australia's reliance on imported fuels and encouraging greener motoring. It is highly probable that electric vehicles will form part of the long-term solution in meeting Australia's future transport and energy demands, particularly following the eventual introduction of autonomous vehicles over the next decade.

Figure 3 – NRMA Electric Vehicle
(Source: NRMA)

Case Study – Amsterdam & Electric Vehicles

The City of Amsterdam is leading the way in encouraging the take-up and usage of electric vehicles. Amsterdam currently has the highest density of charging stations in the world and as of 2014, the City of Amsterdam had installed more than 1,000 public electric vehicle charging stations. The City of Amsterdam has set itself a target of 4,000 publicly available charging stations across the city by 2018. As a result of investment in electric charging stations, it is estimated that as of December 2014, more than 4 million kilowatt hours have been charged at public charging points, equivalent to around 21 million emission-free kilometres driven by electric vehicles.

Currently electric vehicles make up a very small percentage of the total number of registered vehicles in Australia. As of 2015, the number of electric vehicles registered in Australia numbered just under 2000. While the take up of electric vehicles has been disappointing to date, it is predicted that global annual sales of electrified and hybrid vehicles will increase substantially from around 2.3 million in 2014 to over 11 million by 2022[37].

[37] McKinsey & Company 2015, *The Internet of things: Mapping the value beyond the hype.*

Autonomous vehicles may also have a significant impact on the take up of electric vehicles. Research by the World Economic Forum suggests that a majority of consumers anticipate that autonomous vehicles will be either hybrid or electric, with 37 per cent of consumers preferring a hybrid option and 29 per cent favouring electric autonomous vehicles[38].

Encouraging Electric Vehicle Ownership

Electric vehicles can help transform Australia into a low-carbon economy and reduce our reliance on imported fuels. As noted above, the full potential of electric vehicles to the Australian economy and environment has yet to be realised. NRMA has led the way in promoting the use of electric vehicles in NSW and the ACT. In 2011, NRMA in partnership with the City of Canada Bay and Origin Energy installed Sydney's first free of charge high-speed electric vehicle charging station in North Strathfield. NRMA has also installed an electric vehicle charging station that is powered by 100 per cent renewable energy in the ACT at Tuggeranong. NRMA believes that there exists a unique opportunity for the NSW and ACT Governments to lead the nation by providing real incentives to encourage motorists to take up electric vehicle ownership.

Financial Incentives

Around the world, many jurisdictions are actively encouraging people to purchase electric vehicles through the provision of generous financial and non-financial incentives. In Demark and Germany, electric vehicles are exempt from registration and road taxes, with many other European nations also offering tax credits to motorists who purchase electric vehicles[39]. The NSW and ACT Governments should consider similar schemes to exempt electric vehicles from registration fees, or alternatively consider reducing registration fees for electric vehicles.

Non-Financial Incentives

In addition to financial incentives, governments should also consider alternative means to encourage electric vehicle ownership. Oslo, Norway has developed a scheme whereby electric vehicles are able to use bus lanes during peak periods, as well as exempting electric vehicles from congestion charges and motorway tolls[40]. In London, local authorities are aiming to have one million electric vehicles registered by 2020, supported by the provision of free parking and publicly available charging stations. As noted above, the City of Amsterdam has also heavily invested in publicly available charging stations as a means to promote increased electric vehicle usage. The NSW and ACT Governments should consider adopting similar incentives, allowing electric vehicles to use bus lanes in addition to priority or discounted parking fees would go a long way in promoting electric vehicle usage. Additionally, greater investment in publicly available charging stations is required from both State and Local Government.

[38] World Economic Forum 2015, *Self-driving vehicles in an Urban Context.*
[39] International Energy Association 2013, *Electric Vehicle Landscape to 2020.*
[40] Department for Business Innovation & Skills 2013, *The Smart City Market: Opportunities for the UK*.

Alternatives to car ownership

Smart technology and digital disruption will be a major enabler to enhancing mobility for many Australians in the long term, providing significant and lasting economic, social and environmental benefits. Ride sharing, private and public autonomous vehicles as well as better integration of transport services will improve mobility and provide greater social inclusion for children, older people and those suffering from disability. Not only will this increase equality in urban areas, but equally it will go some way to addressing the transport needs of those living in Rural and Regional NSW where current public transport options are often limited or non-existent.

Ride Sharing

Flexible and on-demand ride sharing and transport services will increasingly become more important and more widely used as our urban population increases and our regional population ages. NRMA has been a strong and vocal supporter of ride sharing and point to point transport services, and welcomes the approach taken by both ACT and NSW Governments to legalise these services. As noted previously in this paper, the NSW Government has indicated that it intends to encourage high density living (TODs) around key public transport hubs across Sydney to accommodate future population growth in Sydney[41].

This policy is consistent with the recent phenomenon of a growing proportion of people choosing to live in medium and high density inner city areas, where up to three times as many households do not own a car compared with outer suburban and regional areas[42]. It is possible that this policy will lead to a further reduction in the number of vehicles owned by residents living in urban or inner-city areas. Should this trend continue, it is arguable that on demand ride share and car pool services will continue to expand at the expense of private car ownership in urban and inner-city areas. This will have future implications for mobility across NSW and the ACT.

Case Study – OECD Taxibot Study

The Organisation for Economic Cooperation and Development (OECD) has undertaken a study exploring self-driving vehicle concepts and analysing the hypothetical impacts on road and transport services in Lisbon, Portugal[43]. Taxibots are described as self-driving vehicles that can be shared by numerous passengers at once (an on-demand ride sharing service). The study found that a Taxibot system in combination with high frequency and high capacity public transport could result in 65 per cent fewer vehicles on the road during peak periods, with less people owning private vehicles and taking up membership or subscription to autonomous ride sharing services. The study also found that for small and medium sized cities, a shared fleet of autonomous vehicles could conceivably remove the need for traditional public transport services, such as buses and taxis.

[41] Department of Planning and Environment 2013, *North West Rail Link Corridor Strategy,* NSW Government.
[42] Profile ID, *City of Sydney Car Ownership,* available at <http://profile.id.com.au/sydney/carownership>.
[43] OECD International Transport Forum 2015, *Urban Mobility System Upgrade: How shared self-driving cars could change city traffic.*

The above case study conducted by the OECD further expands on the view that ride sharing will continue to grow, particularly with the introduction of on demand autonomous vehicles. The estimated 65 per cent reduction in vehicle usage that the OECD predicts will occur through a combination of autonomous vehicles and high capacity public transport is substantial and will have implications for future public transport capacity.

Connectivity between home and transport hubs

Ride sharing and autonomous vehicles also have the potential to increase connectivity between home and public transport hubs. At present, ride sharing services play an important complementary role to the public transport network by making it more viable for some commuters to catch the bus, ferry or train rather than drive their own vehicle to work. For some commuters, this may be a daily commuting option due to convenience or as a result of physical or mobility issues. Data provided by Uber confirms that a large proportion of trips made across Sydney start or finish at a train station or major bus stop[44]. Should autonomous vehicles and ride sharing services continue to expand, it will result in expanding the catchment areas for public transport services, which will encourage further urban development, reduce the total amount of kilometres driven by vehicles on our roads and increase public transport usage.

Autonomous Buses

Technology will also impact on our public transport services. Already, around the world, many metro rail systems have the capacity to operate autonomously. It is noted that the Greek city of Trikala is currently in the process of trialling autonomous bus services. The West Australian Government in partnership with the RAC has also announced that autonomous buses will be trialled on Perth roads from April 2016. NRMA believes that the NSW Government should also consider partnering with industry to conduct a local autonomous trial at Olympic Park to transport workers from public car parking facilities to the office.

Figure 4 – Greece Autonomous Bus Trial
(Source: City of Trikala)

[44] Uber 2015, Submission to IPART Draft Report – Sydney taxi fares to apply and new licences to be released from July 2015, available at:
http://www.ipart.nsw.gov.au/files/sharedassets/website/trimholdingbay/online_submission_-_uber_-_b_kitschke_-_30_jan_2015.pdf

Public Transport Real Time Information

Public transport services can also benefit through the application of new technology and IoT. According to McKinsey, IoT systems have the potential to adjust train or bus schedules in real time through the tracking of public transport data. It is estimated by McKinsey that 70 per cent of commuting time is spent waiting for a service to arrive at a stop or station and when the service actually leaves[45]. NRMA applauds the work undertaken by the NSW Government to provide accurate and real time information about public transport services across the network through smart phone applications. NRMA also notes the NSW Government's recent announcement that Moovit and Transit App are now available in NSW along with a $1.7 million commitment to build an online Open Data Hub[46]. These announcements will provide commuters with even greater information about public transport services, allowing commuters to make informed decisions about how they travel.

Smart Bus Stops

To complement current real time information applications and information boards at train stations, ferry wharves, governments should consider trialling smart and interactive bus stops. Auckland Transport is currently in the process of developing a connected bus stop. It is anticipated that digital and interactive screens at bus stops will provide commuters with real time information about journey times and allow the tracking of particular services. The interactive and connected screens could also serve as a useful mechanism for transport providers to announce disruptions or changes to scheduled services, allowing commuters to better plan their journeys. The Auckland Transport trial is scheduled to begin in August 2016.

Opal Card

With the roll out of the Opal Card completed ahead of schedule and with more than 3.2 million Opal Cards having been issued to transport customers in NSW, NRMA believes that Opal Cards should be integrated into taxis. This will reinforce the status of taxis as a mode of public transport with an integrated and secure payment systems.

[45] McKinsey & Company 2015, *The Internet of things: Mapping the value beyond the hype.*
[46] The Hon. Andrew Constance MP 2016, *popular global commuter apps now live in Sydney.*

Ownership of data and privacy

With the introduction and adoption of smart technologies in the road and transport sector, questions about personal privacy and the ownership and use of personal data need to be adequately addressed by government and technology providers. An apparent downside to the introduction of smart and disruptive technologies is the potential for personal privacy to be compromised and for data collected by government or technology providers to be used for impure or improper purposes.

To date, governments have yet to introduce policies or reach agreements with technology providers that anticipate future privacy and data ownership concerns likely to arise with the introduction of smart transport technologies. However, these concerns should not be used as a justification to delay adopting future smart technologies or legalising new and disruptive transport solutions such as autonomous vehicles.

Ownership of data

The question of who has ownership and access to the use of data created by and from the use of future smart technologies in vehicles is a particular concern for motorists. At present, data collection does not necessarily require the explicit consent of the motorist. In most instances, transparency around how data is collected, how it is accessed and who has legal ownership of the data is deficient.

Data ownership is not just a concern for the future, it is a live issue that requires government intervention now. With telematics systems installed in almost all new vehicles, manufacturers are currently receiving and accessing data from motorists about how and where they travel, vehicle performance and other diagnostic information. This data is currently controlled by manufacturers and there does not appear to be any apparent protections in place for motorists to determine who can access the data produced by their vehicle or for what purpose.

It is the view of NRMA that any data captured and stored within a vehicle's electronic systems should be made available to the owner. This means that consumers need to be fully informed about what data is being transmitted and for what purpose. Drivers should retain ownership of the data that their car produces and control how it is used for as long as they own the vehicle.

To encourage the take up and adoption of smart transport technologies such as autonomous vehicles in the future, it will be crucial to ensure that the issues of appropriate data collection, usage, protection and ownership are dealt with by government. To this end, governments should introduce legislation and appropriate guidelines to ensure that motorists own the data that is collected by smart transport technologies. Restrictions should also be placed on who is able to collect data and who that data can be shared with and for what purpose. Data should not be shared with any third party without the express consent of the motorist.

Privacy

In addition to the ownership and access to data generated by smart technologies, the personal privacy and confidentiality of the individual must be considered by government when introducing or legalising new and innovative technologies. Technology does provide an opportunity for unnecessary intrusion into the private lives of individuals. It is therefore important that appropriate safeguards are put in place to limit the types or categories of data that can be collected and accessed by government, technology providers or associated third parties through smart transport technologies without the explicit consent of motorists and commuters.

Failure to safeguard the privacy of motorists and commuters may have a negative impact on the acceptance, and consequently on the take up, of future smart transport technologies such as autonomous vehicles. Technology providers and vehicle manufacturers will also need to ensure that autonomous vehicles and smart transport infrastructure technologies are highly resistant and secure from hacking or unauthorised access to personal information and data.