Parliamentary Committees

Inquiry into Transport Technology

Report No. 41, 56th Parliament
Transport and Public Works Committee
July 2020

Transport and Public Works Committee

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Acknowledgements

The committee acknowledges the assistance provided by the Department of Transport and Main Roads.

Notes

- All Acts referred to in this report are Queensland Acts unless specified otherwise.
- All in-text references have been removed. Refer to original source for more information.

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Abbreviations

AADA	Australian Automotive Dealer Association
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ADAS	Advanced Driver Assistance Systems
ADR	Australian Design Rules
ADS	Automated driving system
ADSE	Automated Driving System Entities
AEB	Automatic electronic braking
AEMO	Australian Energy Market Operator
AIS	Accessibility and Inclusion Strategy
ALC	Australian Logistics Council
ANCAP	Australasian New Car Assessment Program
ANZDVI	Australian New Zealand Driverless Vehicle Initiative
ARG	TMR Accessibility Reference Group
ARRB	Australian Road Research Board
ATN	Accessible Transport Network
AVs	Fully automated vehicles
BCC	Brisbane City Council
BEV	Battery Electric Vehicle
CASA	Civil Aviation Safety Authority
CAV	Connected and Automated Vehicle
CAVI	Cooperative and Automated Vehicle Initiative
CBD	Central Business District
CCTV	Closed-circuit television

C-ITS	Cooperative Intelligent Transport Systems
CNG	Compressed Natural Gas
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific & Industrial Research Organisation
DC	direct current
DSAPT	Disability Standards for Accessible Public Transport Standards 2002
DSDMIP	(formerly) Department of State Development, Manufacturing, Infrastructure and Planning
DTMR/department/TMR	Department of Transport and Main Roads
e-bikes	Electric bicycles
EME2	Enrobés à Module Élevé Class 2
e-scooters	Electric scooters
ETSI	European Telecommunications Standards Institute
EU	European Union
EV	Electric Vehicle
EV Strategy	*The future is Electric: Qld's Electric Vehicle Strategy*
EVC	Electric Vehicle Council
FCEV	Fuel Cell Electric Vehicle
FTR	Flight Test Range
FY	Financial year
GDPR	EU General Data Protection Regulation
GPS	Global Positioning System
HD	High Definition
HRS	Hydrogen refuelling station
HVNL	Heavy Vehicle National Law

HVRR	Heavy Vehicle Road Reform
IALPG	International Aerospace Law & Policy Group
ICE	internal combustion engine
ICEV	internal combustion engine vehicle
ICVP	Ipswich Connected Vehicle Pilot
IP Act	*Information Privacy Act 2009*
IQRNS	Inland Queensland Roads Network Strategy
ITS Australia	Intelligent Transport Systems Australia
JSCRS	Joint Standing Committee on Road Safety of the Parliament of NSW
kW	kiloWatt
LGAQ	Local Government Association of Queensland
LiDAR	Light Detection and Ranging remote sensing method
LPG	Liquefied Petroleum Gas
LTMR	Land Transport Market Reform
LZEV	Low and Zero Emission Vehicle
MaaS/MAAS	Mobility as a Service
MTAQ	Motor Trades Association of Queensland
NACoE	National Asset Management Centre of Excellence
NatRoad	National Road Transport Association
NBN	National Broadband Network
NGR	New Generation Rollingstock
NHVR	National Heavy Vehicle Regulator
NPF	*National Policy Framework for Land Transport Technology*
NSW	New South Wales
NTC	National Transport Commission

OIC	Office of the Information Commissioner
PBS	Performance Based Standards
PHEV	Plug-in hybrid electric vehicle
PIA	Privacy Impact Assessment
PIEV	Plug-in electric vehicles
PT	Public Transport
QAI	Queensland Advocacy Incorporated
QCU	Queensland Council of Unions
QESH	Queensland's Electric Super Highway
Qld	Queensland
QLRC	Queensland Law Reform Commission
QRC	Queensland Resources Council
QRIDA	Queensland Rural Industry Development Authority
QTS	Queensland Transport Strategy
QUT	Queensland University of Technology
RACQ	Royal Automobile Club of Queensland
RCC	Redland City Council
RPAS	Remotely Piloted Aircraft Systems
RTI/RTI Act	*Right to Information Act 2009*
RTP	Regional Transport Plans
RUC	road user charging
SDRC	Southern Downs Regional Council
SEQ	South East Queensland
TAFE	Technical and Further Education Institutions
TCC	Townsville City Council

TCQ	Taxi Council of Queensland
The committee/TPWC	Transport and Public Works Committee
TIC	Transport and Infrastructure Council
TLWAC	Transport and Logistics Workforce Advisory Committee
TPW	Transport, Postal and Warehousing
TRC	Toowoomba Regional Council
UAS	Unmanned aircraft system
US/USA	United States of America
UTM	Unmanned Aerial Systems Traffic Management
VKT	vehicle kilometres travelled
Wing	Wing Aviation

Chair's foreword

This report presents a summary of the Transport and Public Works Committee's inquiry into Transport Technology.

The committee commenced the inquiry in June 2018 and this report focuses on providing a snapshot of where Queensland is currently in terms of transport technologies, as well as what will be needed in the future as transport technologies evolve and are introduced onto Australian roads and into Australian airspace.

The committee acknowledges the significant amount of work that the Department of Transport and Main Roads has already done and is undertaking in order to be ready for the introduction of these new technologies onto the road network. The committee also acknowledges that many of the issues raised require a cross-jurisdictional or national response.

The committee has made 16 recommendations which are aimed at addressing some of the gaps that have been identified by stakeholders during the course of the committee's inquiry.

On behalf of the committee, I would like to thank those individuals and organisations who made written submissions, appeared before the committee and provided additional written information during the inquiry. I also wish to thank those organisations who met with the committee when it travelled to Sydney, Canberra and Melbourne and provided information which assisted the committee greatly in its understanding of the issues. I also thank the Department of Transport and Main Roads for their assistance.

I commend the report to the House.

Shane King MP

Chair

Recommendations

The committee recommends that, in regard to electric personal mobility devices, the Queensland Government consider:

- reviewing legislation to provide for the legal operation of electric personal mobility devices that encourages use for first and last mile trips as an alternative to private car use.
- reviewing planning and design guidelines and retrofit areas to ensure safe interaction and mitigate conflict on shared infrastructure between pedestrian and traditional active transport, and electric mobility device users.
- undertaking public engagement and education about the safe operation of electric personal mobility devices and supported use cases.

The committee recommends the Queensland Government consider the potential risk for first responders using their equipment alongside an electric vehicle in future training as and when needed.

The committee recommends the Queensland Government consider:

- how it can incentivise and support local councils, property developers, carpark owners and shopping centres to install electric vehicle charging stations with a variety of chargers to meet market demand.
- the benefits and potential of providing electric vehicle charging stations in park 'n' ride facilities.
- liability concerns if a vehicle fails to charge or a fire occurs due to technical fault.

The committee recommends the Queensland Government consider how it can support infrastructure for new transport technologies in rural, remote and regional Queensland to ensure no Queenslander is disadvantaged in relation to access to electric vehicles and the infrastructure required to support them.

Whilst acknowledging that this is a national issue, the committee recommends that the Queensland Government take a leadership role in regard to the restructure of the road funding model to ensure that the matters raised by submitters during the inquiry are considered.

The committee recommends the Queensland Government undertake modelling on potential new transport models to determine the government's best use of resources and how it will manage the overall transport network impacts into the future and ensure social equity for all Queenslanders.

The committee recommends that the Queensland Government consider submitter comments regarding the best model of implementation for a mixed fleet operating on Queensland roads.

The committee recommends that the Queensland Government note submitter concerns regarding faulty manufacturing in vehicles with new transport technologies and considers them during the regulation making process.

The committee recommends the Queensland Government, working with other jurisdictions, continue to address the key concerns raised by submitters about infrastructure, including:

- the ability of automated vehicles to react to road hazards by developing interoperable connectivity, infrastructure, and traffic management systems
- the potential community investment required to install and upgrade infrastructure connectivity and network management software
- conducting trials to identify and rectify infrastructure design and maintenance issues
- working across jurisdictions to update road design and maintenance standards consistently to ensure automated vehicles operate safely and reliably.

The committee recommends the Queensland Government continue working with all Australian governments to ensure that the issue of black spots and mobile phone coverage across Australia is resolved in order to facilitate connectivity for automated vehicles.

Noting the concerns raised during the inquiry process, the committee recommends the Queensland Government address the following issues relating to protecting the privacy of individuals and reducing the risk of cyber-attacks by developing and implementing legal, policy and operational frameworks or working with the federal government to:

- prevent unauthorised privacy breaches relating to tracking and location of individuals
- ensure that any access by law enforcement and transport regulators to data produced from transport technology is subject to safeguards and transparency
- maintain clear records of who is accessing the data and for what purposes
- consider that the principles of the *Information Privacy Act 2009* are embedded in legal, policy and operational systems that involve personal information as recommended by the Office of the Information Commissioner and undertake Privacy Impact Assessments early in the policy process to manage, minimise or eliminate negative impacts of unauthorised data access
- investigate the potential for privacy breaches involving conversations in vehicles and address as needed to ensure privacy
- review the issues in relation to privacy raised by the Privacy Commissioner during the inquiry process with a view to strengthening the privacy legislation where necessary
- consider a 'privacy by design' approach as recommended by the Office of the Information Commissioner when regulating for new and emerging transport technologies.

The committee recommends that the Queensland Government consider the following, as recommended by submitters, as it continues to develop and implement its policies in relation to improving accessibility of transport now and into the future:

- ensure the adequate provision of wheelchair accessible vehicles, including methods for securing wheelchairs when a human driver is not present
- conduct a local and state government review of standing zones and parking spaces, and amend as necessary, to allow sufficient room for the safe and, if possible, automated deployment of a ramp to the rear of the AV, and otherwise safe and efficient boarding for passengers with a disability and those requiring extra time and assistance

- ensure the accessibility of smart phone applications in relation to transport and transport hubs
- ensure appropriate licencing arrangements are reviewed with the emergence of automated vehicles
- assess whether existing policy approaches and incentives in the disability sector should be adjusted or retargeted
- continue consulting with people with disabilities on transport policies early in the planning process
- invest in research, development and real-world trials that benefit the entire transport network customer base, including people with disabilities to provide a sound basis for government decision-making.

Recommendation 13 **121**

The committee recommends the Queensland Government consider a community awareness campaign, including what actions are being taken by government, to build understanding of the benefits, safe use, and automated features of connected and automated vehicle technology.

Recommendation 14 **129**

The committee recommends the Queensland Government consider planning for how a future regulatory framework around automated vehicles will operate and how state and federal governments can work cooperatively to successfully integrate these vehicles into transport networks.

Recommendation 15 **138**

In regards to training, the committee recommends that the Queensland Government liaise with peak bodies in the transport industry and workers' representatives to consider how to assist workers to retrain and upskill to meet the changing demands of the state's workforce.

Recommendation 16 **138**

The committee recommends that the Queensland Government liaise with all jurisdictions to ensure the consistency of licensing, accreditation and training of mechanics across jurisdictions, including specific training to reduce the risk of electrocution and fire associated with electric vehicles.

1 Introduction

1.1 Role of the committee

The Transport and Public Works Committee (committee) is a portfolio committee of the Legislative Assembly which commenced on 15 February 2018 under the *Parliament of Queensland Act 2001* and the Standing Rules and Orders of the Legislative Assembly.[1]

The committee's primary areas of responsibility are:

- Transport and Main Roads
- Housing, Public Works, Digital Technology and Sport.

1.2 Inquiry process

On 11 June 2018, the committee resolved to conduct an inquiry into Transport Technology.

On 19 June 2018, the committee invited stakeholders and subscribers to make written submissions on the terms of reference for the inquiry. Twenty-seven submissions were received.

The committee held seven public hearings for the inquiry. See Appendix B for a list of witnesses. The committee also met with key stakeholders between 18 and 20 November 2019 in Sydney, Canberra and Melbourne including:

- Austroads
- Electric Vehicle Council (EVC)
- Australian New Zealand Driverless Vehicle Initiative
- Sydney Metro Northwest project team
- Australian Road Research Board (ARRB)
- Civil Aviation Safety Authority (CASA)
- National Transport Commission (NTC)
- ClimateWorks Australia
- VicRoads

The submissions and transcripts of the hearings are available on the committee's webpage.

1.3 Terms of reference

In accordance with section 92(1)(d) of *Parliament of Queensland Act 2001*, the terms of reference for the inquiry are to consider in detail the challenges and opportunities which technology will bring to the transport sector in coming years including:

a) identifying trends and changes in fuel type usage in the sectors of personal transport, freight transport and public transport, such as the increasing uptake of hybrid and electric vehicles
b) examining the readiness of the transport network for increasing electrification of vehicles in coming years
c) identifying other emerging technological factors which will impact on transport networks into the future, such as driver aid technology and 'driverless car' technologies
d) examining how technology is affecting employment arrangements in the transport industry, particularly in the food delivery area

[1] *Parliament of Queensland Act 2001*, section 88 and Standing Order 194.

2 Background

2.1 Purpose of this report and key findings

The purpose of this report is to present evidence from stakeholders and submitters, responses from the Queensland Government, and recommendations from the committee to address the inquiry's terms of reference. In this report, the committee focuses on providing a snapshot of where Queensland is currently at in terms of transport technologies, as well as what will be needed in the near future as transport technologies evolve and are introduced onto Australian roads and into Australian airspace.

The committee found that battery technology for electric vehicles has come a long way since the technology was first introduced and that much work has been done to support the uptake of electric vehicles, including the introduction of the Queensland Electric Super Highway. The committee also found, however, that there is still much work to be done to ensure Australian roads are ready for automated driving, not only in urban environments, but particularly in regional, remote and rural areas. The committee keenly supports policies that will ensure that these areas are not left behind as technology advances. The committee notes that if the issues are not addressed, they may negatively impact the public's trust in, and therefore potentially the uptake of, automated vehicles.

One of the key findings for the committee was the evidence that suggests drone technology might be in use in a significant way in the near future. With this, comes the responsibility to ensure that policies and regulatory frameworks support the safety of all stakeholders and the amenity of neighbourhoods remain upper most in policy-makers minds when regulating this technology.

The committee notes the issues raised by submitters in regard to how governments will fund the construction and maintenance of the road network as new transport technologies emerge and erode traditional road funding sources. However, the committee acknowledges that the federal government is the key player in coordinating the restructure of the road funding model and encourages the Queensland Government to take a leadership role to ensure that submitter concerns raised during the inquiry process are considered.

Ensuring all Queenslanders have equitable, safe and reliable access to different modes of transport, particularly as new transport technologies evolve, is of key concern to the committee and submitters. Recommendations in this report addresses the issue of accessibility of transport for all Queenslanders.

The committee shared submitter concerns in relation to changing employment patterns as transport technologies evolve and supports their calls for the Queensland Government to take a lead role in assisting those industries impacted most severely by changing employment opportunities—now and into the future—including consideration of benchmarking skills and qualifications and supporting training to upskill workers.

Finally, stakeholders commonly expressed the view, supported by the committee, that a national and coordinated response to emerging transport technologies was required to address the challenges as outlined in this report, as well as ensure that the technology that we use in Australia is designed to suit our circumstances and conditions, particularly our vast and widely different geographic and climatic regions.

2.2 Key bodies

There are a number of various organisations and peak bodies whose responsibilities intersect with new and emerging transport technologies in Australia. Their roles and responsibilities are summarised below.

Name	Level of authority	Role	Responsibilities
Transport and Infrastructure Council[2]	Australian – operates under the Council of Australian Governments (COAG) Council System. Includes New Zealand, Involvement of Commonwealth, state and territory ministers	Deliver national reforms to improve the efficiency and productivity of Australia's infrastructure and transport systems	Responsibility for transport and infrastructure issues.
National Transport Commission[3]	Australia	Lead land transport reform in support of Australian governments to improve safety, productivity, environmental outcomes and regulatory efficiency.	Key contributor to the national reform agenda with accountability to the Transport and Infrastructure Council and its advisory body, the Transport and Infrastructure Senior Officials' Committee.
Civil Aviation Safety Authority[4]	Australian Government	Australian government body that regulates Australian aviation safety and the operation of Australian aircraft overseas. Work with the Australian Department of Infrastructure, Transport, Regional Development and Communications and Airservices Australia to provide safe aviation in Australia.	License pilots, register aircraft, oversee aviation safety, promote safety awareness, ensure Australian airspace is administered and used safety. Also responsible for drone regulation.
Austroads[5]	Peak organisation of Australasian road transport and traffic agencies.	Austroads members manage over 900,000 kilometres of roads in Australian and New Zealand. Austroads supports member organisations to deliver an improved Australasian road transport network.	Undertake leading-edge road and transport research, which underpins their input to policy development and published guidance on the design, construction and management of the road network and its associated infrastructure.

2 Transport and Infrastructure Council, https://www.transportinfrastructurecouncil.gov.au/.

3 National Transport Commission, https://www.ntc.gov.au/about-ntc.

4 Civil Aviation Safety Authority, https://www.casa.gov.au/about-us/who-we-are.

5 Austroads, https://austroads.com.au/about-austroads.

Name	Level of authority	Role	Responsibilities
Australian Road and Research Board[6]	National	National Transport Research Organisation	Source of independent expert transport knowledge, advising key decision makers on Australia's most important challenges. The ARRB works with road agencies, all levels of government, academia, and companies in the private sector.

2.3 Current policy framework

One of the key forces driving the development of transport technology policy according to the Department of Transport and Main Roads (DTMR/department) is the current 'uncertainty associated with the future—including the form, impact and implications of transport technologies'. DTMR considered the following factors are impacting, or will impact, decisions on how the future transport system is delivered:

- Newly emerging technology and sharing economy business models will impact transport markets, consumer choices, and decisions about where governments invest.
- Consumer choices about transport will determine the future need for additional infrastructure, which may be different to past trends.
- The need to develop options for the sustainable long-term funding of the transport system as traditional revenue sources for transport, including registration, licensing and fuel excise, slow when compared to population growth.[7]

2.3.1 Queensland Government's approach

DTMR has developed its 30-year Queensland Transport Strategy, which outlines Queensland's strategic approach to emerging transport technologies and ensures the department's policy, technical, infrastructure and customer service capabilities are prepared for the future. The strategy is structured around 5 high-level customer outcomes for the purpose of moving Queensland 'towards a transport industry that is cost effective, safer and more reliable, where innovation can thrive and benefits are experienced across the community'.[8] The five outcomes are:

1. Accessible, convenient transport
2. Safer journeys for all
3. Seamless, personalised journeys
4. Efficient, reliable and productive transport for people and goods
5. Sustainable, resilient and liveable communities[9]

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6 Australian Road Research Board, https://www.arrb.com.au/about-arrb.

7 Submission 4, p 3.

8 Department of Transport and Main Roads, *Queensland Transport Strategy*, https://www.tmr.qld.gov.au/QueenslandTransportStrategy.

9 Department of Transport and Main Roads, *Queensland Transport Strategy*, https://www.tmr.qld.gov.au/QueenslandTransportStrategy.

In regards to the Queensland Transport Strategy, DTMR stated:

> *Queensland is on the cusp of exciting changes in our transport system, with significant opportunities within our grasp to harness emerging technologies and services to improve the use of existing roads and transport systems. New ways of transporting people and goods, such as electric vehicles, low and zero emission vehicles, demand responsive transport, automated vehicles and drones will contribute to a safer, greener and more efficient future.*
>
> *We need to respond to these changes now, to position Queensland to make the most from new technologies and services to reduce congestion, improve reliability and achieve emissions reduction. Our future direction depends on the choices that we make for transport today.*
>
> *More people are choosing to call our state home, which is helping to grow our economy. It's expected that Queensland's population will grow from 4.8 million in 2016 to 7.1 million by 2041. In South East Queensland, the population is predicted to grow by 56.2 per cent between 2016 and 2041, over twice the rate of the rest of Queensland. This growth will have significant impacts on our transport system.*
>
> *In 2019, South East Queenslanders took about 520,000 public transport trips every day. This is anticipated to grow to about 1.6 million trips per day by 2050. As the proportion of older Queenslanders increases, there will be more urgency to ensure accessible services are available. Public and shared transport modes will play an increasingly important role, particularly demand responsive transport services and high frequency, high capacity links, such as Brisbane's Cross River Rail, to provide the access to the jobs and services of tomorrow.*
>
> *An accessible, safe and efficient transport system will be supported by the government increasingly acting as an enabler and regulator of transport and mobility, supporting new and innovative services and technologies.*
>
> *The* Queensland Transport Strategy *provides a 30-year vision for the transformation of the state's transport system that will have flexibility in responding to customer preferences, global trends and emerging technologies. It puts customers first and articulates our plan for maximising the benefits of future changes for all Queenslanders. It is aligned to the* State Infrastructure Plan and Our Future State: Advancing Queensland's Priorities.[10]

DTMR also spoke of the impact of the strategy on working towards zero-emission vehicles, stating:

> *The strategy sees the increased uptake of lower emission vehicles as a direct and effective response to reduce carbon emissions and mitigate the global impacts of warming. Today, the transport sector contributes approximately 15 per cent of Queensland's total carbon emissions. This number has been growing and is expected to continue growing, unless we transition Queensland's vehicle fleet to low- and zero-emission vehicles.*[11]

The department is cognisant of the need to ensure a 'nationally consistent and coordinated policy framework and action plan to address the challenges and opportunities associated with transport technologies'.[12] In this regard, DTMR is party to the national policy framework as outlined in 2.3.2 below.

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10 Department of Transport and Main Roads, *Queensland Transport Strategy*, p 3.

11 Public hearing transcript, Brisbane, 15 June 2020, p 2.

12 Submission 4, pp 1, 3.

2.3.2 National policy framework

The Transport and Infrastructure Council[13] (TIC) is also addressing many of the issues and challenges associated with transport technologies. The key policy framework for delivering a coordinated, national approach on transport technologies is the *National Policy Framework for Land Transport Technology*. The objective of this framework is 'to support an integrated policy approach by governments to the development and adoption of emerging transport technologies, in order to improve transport safety, efficiency, sustainability and accessibility'.[14] As noted by submitters in section 5.5.2, a coordinated and national approach to these new technologies is essential for supporting public trust and the subsequent impact to increasing the uptake of these technologies as they are introduced.

The National Policy Framework (NPF):

- *Facilitates efficient and timely uptake of transport technology to meet consumer demands and improve services;*
- *Guides consistent implementation, integration and uptake of transport technology across all jurisdictions and all land transport modes;*
- *Outlines government's role on issues such as regulation, standards and investment, to provide certainty to industry and community; and*
- *Promotes innovation and competition through support for compatible and interoperable transport technologies and open access to transport data.*[15]

The National Policy Framework is underpinned by the *National Land Transport Technology Action Plan 2020-2023* (the Action Plan) which outlines the national short to medium term priorities. These priorities focus on five key issues identified in the framework:

- safety, security and privacy
- digital and physical infrastructure
- data
- standards and interoperability
- disruption and change.[16]

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[13] The Transport and Infrastructure Council brings together Commonwealth, State, Territory and New Zealand Ministers with responsibility for transport and infrastructure issues, as well as the Australian Local Government Association. Transport and Infrastructure Council, https://www.transportinfrastructurecouncil.gov.au/.

[14] Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 'National Policy Framework for Land Transport Technology', https://www.infrastructure.gov.au/transport/land-transport-technology/national-policy-framework-Land-transport-technology.aspx.

[15] Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 'National Policy Framework for Land Transport Technology', https://www.infrastructure.gov.au/transport/land-transport-technology/national-policy-framework-Land-transport-technology.aspx.

[16] Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 'National Policy Framework for Land Transport Technology', https://www.infrastructure.gov.au/transport/land-transport-technology/national-policy-framework-Land-transport-technology.aspx.

The committee notes that these align with some of the main challenges stakeholders raised during the inquiry.

The committee also notes DTMR's advice that it 'has invested significant resources in either leading or contributing to actions under the Action Plan and is committed to an ongoing, engaged role in delivering nationally coordinated action to address the challenges and opportunities associated with transport technologies'.[17]

2.3.3 National Transport Commission

The NTC works in support of Australian governments leading land transport reform to improve safety, productivity, environmental outcomes and regulatory efficiency. The NTC is currently undertaking an autonomous vehicles program, focussing on nationally-consistent reforms 'that support innovation and safety' to allow Australians 'to access the benefits of this technology'.[18] NTC states:

> *Our reform program focuses on achieving national consistency. Our goal is end-to-end regulation to support the safe commercial deployment and operation of automated vehicles at all levels of automation in Australia.*[19]

The NTC's work in various areas including data, regulation and trials are noted in the following sections of the report: 5.4.3.4, 5.5.1 and 5.5.2.

2.3.4 Recent inquiries

Over recent years, there have been a number of inquiries at both state and federal levels of government in regard to emerging transport technologies.

Heavy vehicles

The Joint Standing Committee on Road Safety of the Parliament of New South Wales (JSCRS) reported on heavy vehicle safety and the use of technology to improve road safety in May 2018. The JSCRS made eight recommendations with the NSW Government supporting five of these and supporting in principle, or in part, the remaining three.[20]

Some of the key findings of the JSCRS report are about how connected and automated vehicle (CAV) technologies can improve the safety of the heavy vehicle fleet, noting that the evidence is still emerging from trials and pilot programs. The JSCRS also found that further research into the limitations of telematics deployment needed to be understood and overcome as a priority before any roll out proceeds. Finally, the JSCRS expressed the view that 'any roll out of CAV technologies in the heavy vehicle fleet must be undertaken according to a nationally agreed approach in order to maximise the benefits and minimise the risks of such a roll out'.[21]

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17 Submission 4, p 4.

18 National Transport Commission, *About NTC*, https://www.ntc.gov.au/about-ntc.

19 National Transport Commission, Automated Vehicles Program, https://www.ntc.gov.au/transport-reform/automated-vehicle-program.

20 Transport for NSW, *NSW Government response - Inquiry into Heavy Vehicle Safety and Use of Technology to Improve Road Safety*, November 2018, https://www.parliament.nsw.gov.au/ladocs/inquiries/2467/NSW%20Government%20response%20-%20Inquiry%20into%20Heavy%20Vehicle%20Safety%20and%20Use%20of%20Technology%20to%20Improve%20Road%20Safety.pdf.

21 Joint Standing Committee on Road Safety (Staysafe), *Heavy Vehicle Safety and Use of Technology to Improve Road Safety*, May 2018, p vi, https://www.parliament.nsw.gov.au/ladocs/inquiries/2467/Final%20Report.pdf.

Impact of emerging technologies on workers

In 2017, the Australian Senate established the Select Committee on the Future of Work and Workers to inquire into the impact of technological and other change on the future of work and workers in Australia. The Select Committee tabled its report in September 2018, making 24 recommendations to support workers through changes to technologies, including in the areas of training and education, legislative amendments, casual work, and the gig economy.[22]

2.3.5 National Freight and Supply Chain Strategy

TIC released the National Freight and Supply Chain Strategy in November 2019. This 20-year national strategy was developed by all Australian governments with input from industry and committees for the purpose of taking action in four critical areas:

- smarter and targeted infrastructure
- enable improved supply chain efficiency
- better planning, coordination and regulation
- better freight location and performance data

The goal is to increase government and industry action to lift freight system performance.[23]

According to the strategy:

> *Australia's freight task is growing and changing. The volume of freight carried is expected to grow by over 35 per cent between 2018 and 2040, an increase of 270 billion tonnes (bringing the total volume to just over 1000 billion tonne kilometres). The nature of the freight challenge is also changing in conjunction with growing population density pressures - urban freight is forecast to grow by nearly 60 per cent over 20 years to 2040. Regional and remote Australia has an important role in responding to increasing demand from Asian and other international markets, underpinning our national economic growth, and our growing urban population.*
>
> *The National Freight and Supply Chain Strategy prepares us for this future. It sets an agenda for coordinated and well-planned government and industry action across all freight modes over the next 20 years and beyond. It sets a national vision for freight systems and supply chains to contribute to a strong and prosperous Australia through achieving the following goals:*
>
> - *improved efficiency and international competitiveness*
> - *safe, secure and sustainable operations*
> - *a fit for purpose regulatory environment*
> - *innovative solutions to meet freight demand*
> - *a skilled and adaptable workforce*
> - *an informed understanding and acceptance of freight operations*

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22 Australian Senate, Select Committee on the Future of Work and Workers, *Hope is not a strategy – our shared responsibility for the future of work and workers*, September 2018, https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Future_of_Work_and_Workers/FutureofWork/Report.

23 Department of Infrastructure, Transport, Regional Development and Communications, *National Freight and Supply Chain Strategy*, https://www.infrastructure.gov.au/transport/freight/national-strategy.aspx.

These goals guide governments and industry in considering strategic priorities for freight policy, programs and investment.

The goals and priority action areas build on the work of the industry-led Inquiry into National Freight and Supply Chain Priorities and the work undertaken through earlier national strategies and current state and territory strategies for freight.[24]

[24] Transport and Infrastructure Council, *National Freight and Supply Chain Strategy*, August 2019, p 6, https://www.freightaustralia.gov.au/sites/default/files/documents/national-freight-and-supply-chain-strategy.pdf. NB: in-text references have been removed. Refer to original source for more information.

3 Trends and changes in the transport system, vehicles and fuel types

3.1 Major trends

Queensland's transport system is expected to experience significant change over the next 30 years resulting from demographic growth, movement to an increase in online shopping, shown during the recent pandemic, and the emergence of new transport technologies and trends.[25] Evidence indicates that one of the key technological shifts in regard to transport, from internal combustion engines to electrically powered vehicles, is well underway as shown in the statistics provided in section 3.2.1.

DTMR identified a number of emerging technologies relating to transport. These include, but are not limited to:

- movement of goods and services, including urban food and parcel delivery
- the demand for more trips
- on-demand transport
- low and zero emission vehicles
- cooperative and automated vehicle technology
- the use of drones for transporting goods and people
- transport access options for people with disabilities, older Queenslanders and people who may not have a driver's licence.[26]

In this regard, DTMR stated, '[e]merging technologies continue to revolutionise industry and the way that people engage with the transport system and view mobility'. The department is of the view that these technologies present both 'significant challenges and opportunities for how Queenslanders travel, and how goods and services are moved'.[27]

These new transport technologies are the result of emerging trends both locally and globally that are responding to global shifts towards making better use of resources, managing environmental impacts, and significant changes that are occurring in the global economy.[28] DTMR has called these 'megatrends' because they 'are predicted to significantly influence Queensland's transport system over the coming decades'.[29] The megatrends are summarised as follows:

- ***On the move.*** *Demand for transport has grown, with people travelling more and increasingly likely to consume goods and services purchased online. Future technological, demographic and consumer shifts will continue to drive this growth in transport demand.*
- ***Digital dividends.*** *Emerging technologies look to become increasingly capable, affordable and widespread. Automated vehicles, connected infrastructure, drones and big data analytics all have the potential to make the transport system more efficient, cheaper and more responsive to demand.*
- ***Virtually there.*** *Advances in technology are enabling more processes to be automated or completed online, transforming the way we work, shop and access services. This will impact how much, when and why people travel, and the infrastructure needed to support the transport task.*

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25 Department of Transport and Main Roads, submission 4, p 3.

26 Submission 4, p 1.

27 Submission 4, p 1.

28 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 1.

29 Submission 4, p 2.

- ***A lighter footprint.*** *Geopolitical pushes towards electric vehicles, shifts in consumer preferences and emerging shared mobility models offer significant opportunities to reduce the environmental and safety burden of transport. However, Queensland lags behind global trends in some of these areas.*
- ***Empowered consumers.*** *Transport users increasingly expect personalised, on demand services that cater to their specific needs. The evolution of more individualised transport services could encourage new models of freight distribution and pay-as-you-go charging models for transport users.*[30]

DTMR expects 'profound transformations' to Queensland's transport system over the next 30 years.[31] DTMR acknowledged that while the change in transport will be 'unprecedented', the more significant issue is the 'unknown nature of many of these changes' and the 'fundamental choices [that] will need to be made on how the future transport system is delivered'[32] including:

- *the cost of different transport modes will change significantly as automation, technology and sharing economy business models emerge, resulting in changes to transport markets, changes for consumer choice, and choices for government about where best to invest*
- *depending on what choices consumers make in this new era, the future need for additional infrastructure supply may be quite different to past trends*
- *growth in traditional revenue sources for transport (such as registration, licensing and fuel excise) are already slowing when compared to population growth and will require government to develop options for the sustainable long-term funding of the transport system.*[33]

DTMR recognises that decisions of today need to be future proofed, so they do not limit how the government can respond to transport needs in the future. For example:

- *innovation within the transport sector should be enabled to ensure that access, safety, responsiveness, efficiency and sustainability is retained and improved so that the best possible outcomes are achieved for Queensland*
- *the benefits of transport technology should be maximised for passenger and freight transport throughout rural, regional, and urban Queensland.*[34]

The committee supports the Queensland Government's focus on these matters as stakeholders have particularly highlighted their concerns about safety (section 5.4.1) and accessibility (section 5.4.5). Another key concern was that rural and regional Queensland is not left behind as technology advances (section 4.1.4).

3.2 Transition to fuel efficient vehicles

One of the key trends in relation to vehicles is the transition towards smaller, more fuel-efficient motor vehicles. This has been driven by increased market availability, improved vehicle performance, lower operating costs, changing regulatory requirements, fluctuating fuel prices and consumer preferences that are encouraging vehicle manufacturers to produce more environmentally friendly vehicles.[35]

30 Submission 4, p 2.

31 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 3.

32 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 3.

33 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 3.

34 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 3.

35 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 4.

Vehicles powered by a variety of fuel types are currently being developed and supported by the global motor industry and include electric vehicles and fuel-cell electric vehicles (powered by hydrogen).[36]

In regard to the benefits of these vehicles, DTMR advised:

> *Alternative transport fuels, such as electricity and hydrogen, will significantly lower emissions associated with negative environmental and health outcomes, improve our fuel security by reducing our dependence on foreign imports, increase the overall sustainability of our communities and create new industries and jobs.*[37]

Electric vehicles are discussed in section 3.3 and hydrogen vehicles in section 3.4.1.

3.2.1 Queensland's vehicle fleet

DTMR provided statistics on Queensland's vehicle fleet which reflect the trend towards smaller, more fuel-efficient engines as shown in table 1 below. Over the period from 30 June 2011 to 30 June 2019, registrations for smaller 4-cylinder cards have been increasing at a steady rate while larger 6-cylinder cars have been declining.

Table 1: Number of light vehicles registered at 30 June each year by the main cylinder groupings: 4, 6 and 8.

As at June	2011	2012	2013	2014	2015	2016	2017	2018	2019
1-3 cyl									31,651
Total Light Commercial and Passenger cars by cylinder size									
4 cyl	2,043,600	2,147,058	2,260,897	2,361,892	2,452,202	2,559,307	2,661,745	2,758,556	2,870,791
6 Cyl	1,008,165	990,231	970,335	943,614	913,414	888,863	861,400	834,333	802,447
8 Cyl	132,161	137,306	143,226	148,263	151,771	155,889	161,187	164,076	172,227
Increase/Decrease in Number									
4 Cyl		103,458	113,839	100,995	90,310	107,105	102,438	96,811	112,235
6 Cyl		-17,934	-19,896	-26,721	-30,200	-24,551	-27,463	-27,067	-31,886
8 Cyl		5,145	5,920	5,037	3,508	4,118	5,298	2,889	8,151
Increase/Decrease %									
4 Cyl		5.10%	5.30%	4.50%	3.80%	4.40%	4.00%	3.60%	4.1%
6 Cyl		-1.80%	-2.00%	-2.80%	-3.20%	-2.70%	-3.10%	-3.10%	-3.8%
8 Cyl		3.90%	4.30%	3.50%	2.40%	2.70%	3.40%	1.80%	5.0%

Source: Department of Transport and Main Roads, correspondence dated 14 May2020, p 5.

In terms of usage of vehicles by fuel type, DTMR advised that petrol and diesel fuelled vehicles still make up the majority of Queensland registered motor vehicles.[38] However, DTMR also advised:

> *While hybrid and fully electric vehicles still make up a small proportion of the overall fleet, it is expected that growth will increase as vehicle manufacturers move away from petrol and diesel fuelled vehicles resulting in more options being available within the Queensland market.*[39]

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36 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 4.

37 Public hearing transcript, Brisbane, 29 October 2018, p 2.

38 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 5.

39 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 5.

The Australian Automotive Dealer Association (AADA) supported DTMR's statement regarding the move away from diesel as a fuel for passenger vehicles. The AADA also noted the fuel trend away from liquefied petroleum gas (LPG) for large Australian cars.[40]

Table 2 below outlines Queensland's vehicle fleet based on different fuel types within different transport categories. As this table shows, electric vehicles are now evident in the heavy vehicle, personalised transport, and private and public transport categories. Additionally, hybrid vehicles consisting of either a petrol/electric and diesel/electric engine are also becoming more visible in the fleet.[41]

Table 2: Number of vehicles on Queensland register by fuel type as at 30 April 2020

Fuel	Buses	Campervans / Motorhomes	Cars	Conditional Vehicles	Mobile Machinery	Motorcycles	Other	Trucks	Total
Diesel	16,752	15,536	1,134,229	76,079	6,160	-	3	98,548	**1,347,307**
Diesel/electric	1	-	98	3	-	-	-	54	**156**
Diesel/gas	8	77	1,076	118	9	-	2	31	**1,321**
Electric	14	-	2,220	7,350	-	410	36,524	1	**46,519**
Gas	345	3	4,603	1,965	13	-	1	5	**6,935**
Kerosene	-	-	1	2	-	-	-	-	**3**
Petrol	3,503	3,694	2,712,127	7,551	49	214,694	219	842	**2,942,679**
Petrol/electric	-	-	28,435	1	-	-	4	-	**28,440**
Petrol/gas	389	240	19,491	1,708	36	1	59	11	**21,935**
Steam	-	-	1	-	8	-	-	1	**10**
TOTAL	**21,012**	**19,550**	**3,902,281**	**94,777**	**6,275**	**215,105**	**36,812**	**99,493**	**4,395,305**

Source: Department of Transport and Main Roads, correspondence, 14 May 2020, p 6.

Despite a general move away from diesel in passenger vehicles, heavy vehicles, which are critical to the freight task, are predominantly powered by diesel fuel (99 per cent) as 'diesel provides greater fuel economy over long distances'. Electric vehicle technology is also now visible (as of 30 April 2020) as a fuel type within the heavy vehicle transport category (0.09 per cent).[42]

3.3 Electric vehicles

An electric vehicle (EV) is defined as 'any vehicle that can be propelled by one or more electric motors, and that can be plugged in to charge'.[43] There are two main categories of EVs:

- Battery-electric vehicles (BEV) – fully electric vehicles

40 Submission 8, p 7.

41 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 6.

42 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 6.

43 Department of Transport and Main Roads, submission 4, p 6.

- Plug-in hybrid electric vehicles (PHEV) – an electric vehicle that can be plugged-in to charge and drive shorter distances on electricity, and also have a liquid fuel range extender/internal combustion engine that provides additional range for longer trips.[44]

The uptake of EVs in Australia has been slow, but between 2016 and 2017 the number of EVs purchased increased by 67 per cent.[45] The reasons why the uptake of EVs have been slow are discussed in section 3.3.3 below.

National figures show that BEV sales increased by 113 per cent between financial year (FY) 2016/17 and FY2017/18 (887 to 1889 BEV sales), and PHEV sales increased by 118 per cent (652 to 1423 PHEV), which shows an overall increase of 115 per cent in EV sales (from 1539 to 3312).[46]

In regard to Queensland, DTMR provided the following statistics for EVs registered in Queensland:

> *As at 1 April 2020, there were 3799 electric vehicles registered in Queensland comprising of 2588 BEVs and 1211 PHEVs. This total includes EVs in light passenger vehicles, buses, motorcycles and trucks. As of 1 April 2020, EVs represented 0.145 per cent of the Queensland fleet. Additionally, there were 15 full battery-electric heavy vehicles and 407 battery-electric motorcycles/mopeds registered in Queensland.*[47]

These registration figures indicate that Queensland's BEV fleet increased by over 600 per cent in the last four years from mid-2016 to 1 April 2020 (from 369 to 2588 vehicles).[48]

Based on an Energia study, DTMR submitted that EV sales could reach 28 per cent of new vehicle sales by 2026 in Australia under a moderate growth forecast.[49] Transurban provided slightly different figures, stating that the total number of EVs are expected to reach over 2.56 million or 13.2 per cent of total new Australian vehicle sales by 2036, moving to 13.63 million or 61.5 per cent of all new vehicle sales by 2050.[50]

Several other submitters also supported the view that EVs will grow in importance in the Australian vehicle fleet. The Motor Trades Association Queensland (MTAQ) stated that '[t]he major phase of the transport revolution will be driven by the broad uptake of "plug in electric vehicles" (PIEV)'[51] while Engineers Australia summarised the trend towards EVs as follows:

> *The trend for many national governments around the world is to ban the sale of passenger vehicles powered by fossil fuels progressively over the next 20 years. The future of transport appears to be electric.*[52]

Engineers Australia contended that as the cost of vehicles with new technologies, such as electric vehicles, decreases, society will move away from its current reliance on fossil fuels.[53]

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44 Department of Transport and Main Roads, submission 4, pp 6-7.

45 ClimateWorks Australia and the Electric Vehicle Council, *The State of Electric Vehicles in Australia. Second Report: Driving Momentum in Electric Mobility*, June 2018, p3. Available at: https://climateworks.com.au/sites/default/files/documents/publications/climateworks.

46 Department of Transport and Main Roads, submission 4, p 7.

47 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

48 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

49 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

50 Transurban, submission 17, p 8.

51 Submission 7, p 2.

52 Submission 25, p 5. NB: in-text reference has been removed. Refer to original submission for more information.

53 Submission 25, p 5. NB: in-text reference has been removed. Refer to original submission for more information.

DTMR supported the view that costs will play an important role in the uptake of EVs:

> *If Queenslanders continue to preference increasingly fuel-efficient vehicles, this will support growth in the take up of vehicles powered by more economical fuel sources as they become available. It is anticipated that EVs will continue to grow as a portion of Queensland's vehicle fleet as more models arrive in Queensland, when they reach cost parity with internal combustion engine vehicles, and when current models enter the second-hand market.*[54]

3.3.1 Government support for electric vehicles

MTAQ believes that EVs have the potential to restructure Australia's economy, reform the basis of national logistics, and reconfigure the economic geography of metropolitan and regional centres, as well as profoundly impact the business models of the private sector.[55]

Changing technologies, including the advent of EVs, have impacted the decisions that governments are making about future transport needs. DTMR stated that consumer choices on the types of vehicles they use will guide the department's decisions about how it will support these technologies and that, if the current preference of Queenslanders for fuel efficient vehicles continues, it 'will support growth in the take up of vehicles powered by more fuel efficient vehicles as they become available'.[56]

DTMR is cognisant of the impact of government policy intervention on the uptake of EVs:

> *EV uptake trends in Queensland, and across Australia, support findings from a recent study commissioned by the Australian Renewable Energy Agency and the Clean Energy Finance Corporation (the corporation). The corporation predicted that with moderate policy intervention, EVs could represent 49 per cent of Australian new vehicle sales by 2030, climbing to 100 per cent of sales by 2040. Even under a nil policy intervention scenario, the study predicted that EV sales would make up approximately 25 per cent of Australian new vehicle sales by 2030, largely due to: falling battery prices, increased EV model availability, and an increasing difference between electricity and petrol prices.*[57]

In response to the growing support for EVs and the need to encourage uptake, the Queensland Government launched *The Future is Electric – Queensland's Electric Vehicle Strategy* in 2017, which includes strategies to empower consumers to learn more about EVs, enable EV charging infrastructure, explore cost-effective programs to support the uptake of EVs, and envisage what future actions may be required to adjust to changes in the market.[58]

DTMR advised that the Strategy has identified 'electric vehicle tourism and the transition to EVs as an opportunity for the development of tourism in regional Queensland'. In this regard, the Queensland Government supported the opening of a 500-kilometre Tropical North Queensland Electric Vehicle Drive in November 2019, which provides charging stations for EVs at six key tourist attractions across the Cairns region.[59]

The committee notes that Queensland is the only jurisdiction to have a dedicated EV strategy to increase the uptake of EVs in Queensland.[60] The committee also notes that Queensland is home to the Queensland Electric Super Highway (QESH), as discussed in section 3.3.2.

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54 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 6.

55 Submission 7, p 2.

56 Submission 4, p 6.

57 Submission 4, p 7. NB: in-text footnotes have been removed from the quotation. Please refer to original submission for this information.

58 Submission 4, p 6.

59 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 9.

60 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 8.

3.3.2 The Queensland Electric Super Highway

The QESH was launched in October 2017 and is the world's longest electric super highway in a single state. It allows travellers to travel from Coolangatta to Cairns and from Brisbane to Toowoomba in an electric vehicle. The QESH includes 18 fast charging stations. In regard to the location of chargers, the Queensland Government advised:

> *The fast chargers have been installed in convenient, safe locations close to major highways where there are existing amenities, such as cafes, restaurants and shops. The sites have been identified to allow motorists to easily charge their electric vehicle (EV) and have a short break during their journey, allowing them to prepare for a safe onwards journey.*[61]

Additional information regarding the QESH infrastructure is included in section 4.1.

Figure 1: Queensland Electric Super Highway

Source: Queensland Government, *Queensland's Electric Super Highway*, https://www.qld.gov.au/transport/projects/electricvehicles/future/super-highway.

[61] Queensland Government, *Queensland's Electric Super Highway*, https://www.qld.gov.au/transport/projects/electricvehicles/future/super-highway.

The committee notes DTMR's advice that the Queensland Government has committed $2.5 million to Phase 2 of the QESH to fund the construction of (up to) 13 additional sites.[62]

DTMR has linked the increase in the sale of BEVs directly to the launch of the first QESH sites[63]

In regards to the positive environmental impact related to the increased uptake of EVs, DTMR advised:

> *As of 1 April 2020, the use of QESH fast chargers, powered by renewable energy, has saved between 199 and 233 tonnes of CO_2 compared to a car filling up at a service station.*[64]

3.3.3 Benefits of electric vehicles

Benefits of EV technology include transport emission reductions, low operating costs, reduced transport costs for owners/travellers, and reduced oil dependency (and therefore improved fuel security). Additionally, they are predominantly charged during low grid demand periods i.e. overnight.[65] One stakeholder, Mr Dallaston, advised that electric running costs are 60 to 90 per cent cheaper than petrol and that EVs are cheaper to maintain than internal combustion engines.[66] In addition, the electric vehicle-to-grid systems are also bi-directional, which means they can support electricity returning to the grid during peak grid demand periods, effectively 'acting as mobility battery systems'.[67]

While acknowledging that the upfront cost of buying an EV is more expensive than conventional vehicles, the EVC noted that powering an EV is much cheaper—about 70 per cent cheaper per kilometre. EVC stated '[t]hat means the average EV driver saves $1,600 on fuel costs each year'.[68]

The Royal Automobile Club of Queensland (RACQ) expressed the view that EVs 'bring a range of health and environmental benefits' but that supporting their uptake is 'complex as there are issues relating to both the public demand for electric vehicles, and infrastructure and vehicle supply'.[69] These matters are addressed in section 3.3.5.

According to Redland City Council (RCC), electrification of vehicles will be particularly beneficial to island communities, such as those that exist in the RCC local government area, as fuel is less accessible and transport costs are high, particularly for water-based transport. As part of its forward planning, RCC, where possible, is providing 'innovation-enabling infrastructure', such as charging stations, in projects to facilitate future transport innovation.[70] RCC advised:

> *This has also been a discouragement for growth on the islands, and a provocation for social disadvantage with the cost and time losses in water-based transport creating a financial challenge for individuals, for Council and for private companies transporting materials and personnel to our islands. Such vulnerable communities are a perfect example of where innovative technologies can help access economic and social opportunities.*[71]

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62 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 8.

63 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

64 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 8.

65 Brisbane City Council, submission 2, p 3.

66 Submission 19, p 3.

67 Department of Transport and Main Roads, submission 4, p 7.

68 Electric Vehicle Council, *Mythbusting*, https://electricvehiclecouncil.com.au/about-ev/myth-busting/.

69 Submission 5, p 4.

70 Submission 11, pp 3, 4.

71 Submission 11, p 4.

The committee notes the comments made by RCC about the particular benefits of EV technology to island communities where fuel costs are traditionally higher and fuel is less accessible. The committee encourages the Queensland Government to consider island communities as it moves forward with future planning for supporting the uptake of EV technology in Queensland.

3.3.4 Electric personal mobility

Another emerging transport technology is electric personal mobility devices, which includes electric bicycles (e-bikes), electric scooters (e-scooters), motorised unicycles, segways, and skateboards. RACQ stated that these personal forms of transport can contribute positively 'to the efficiency, sustainability and affordability of the transport network as alternative forms of transport to private car use, and by fulfilling first and last mile transport gaps'.[72]

RACQ made several recommendations in relation to electric personal mobility devices, including:

1. *Review legislation to provide for the legal operation of electric personal mobility devices that encourages use for first and last mile trips as an alternative to private car use.*
2. *Review planning and design guidelines and retrofit areas to ensure safe interaction and mitigate conflict on shared infrastructure between pedestrian and traditional active transport, and electric mobility device users.*
3. *Undertake public engagement and education about the safe operation of devices and supported use cases. Encourage use through provision of shared electric mobility schemes, such as e-bikes and electric scooters, around public transport nodes and middle-inner city suburbs either through government provided facilities, or industry/private support or partnerships.*[73]

The committee notes DTMR's advice that 'Queensland was the first state or territory in Australia to introduce legislation to provide for the safe use of increasingly popular personal mobility devices, such as e-scooters'.[74]

Committee comment

Given the increasing use of electric personal mobility devices in urban environments and their potential for decreasing congestion for short trips as an alternative to private car use, as well as providing options for first and last mile trips, the committee supports the RACQ's recommendations 1 and 2 as provided above. The committee particularly, though, wants to ensure the safe use of these devices given the occurrence of several accidents to date and thus also supports recommendation 3.

[72] RACQ, submission 5, p 3.

[73] Submission 5, p 1.

[74] Department of Transport and Main Roads, correspondence dated 2 July 2020, p 7.

Recommendation 1

The committee recommends that, in regard to electric personal mobility devices, the Queensland Government consider:

- reviewing legislation to provide for the legal operation of electric personal mobility devices that encourages use for first and last mile trips as an alternative to private car use.
- reviewing planning and design guidelines and retrofit areas to ensure safe interaction and mitigate conflict on shared infrastructure between pedestrian and traditional active transport, and electric mobility device users.
- undertaking public engagement and education about the safe operation of electric personal mobility devices and supported use cases.

3.3.5 Barriers to the uptake of electric vehicles

Stakeholders stated that there were a number of barriers that have the potential to hinder the uptake of EVs in Australia. These include:

- range anxiety and charging capacity of batteries
- cost and availability of EVs
- cost of running an EV and cost of batteries
- charging infrastructure (discussed in more detail in section 4.1.1)
- potential for battery fires

3.3.5.1 Range anxiety and charging capacity

Engineers Australia advised that range anxiety is often based on a lack of understanding of the technology with most EVs in Australia having a range between 100km and 500km, which is sufficient range to cover the majority of urban car trips.[75] The EVC supported this view, stating that EVs 'have enough battery range to meet the average Australian's driving needs for over a week'.[76] EVC stated:

> *Current EVs have an average battery range of 480km but the technology is advancing so rapidly that new models can drive for almost 550km on a single charge.*
>
> *The average Australian drives 38km per day so an EV owner can go for at least 10 days without a recharge. Unlike petrol cars, you can recharge at home or anywhere with access to electricity.*[77]

iMOVE Australia (iMOVE) suggested that '[i]mproved digital connectivity of vehicles can help overcome some of the barriers to EV uptake (such as range anxiety) by providing real-time information to drivers on charging options'.[78]

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75 Submission 25, pp 5, 6.

76 Electric Vehicle Council, *Mythbusting*, https://electricvehiclecouncil.com.au/about-ev/myth-busting/.

77 Electric Vehicle Council, *Mythbusting*, https://electricvehiclecouncil.com.au/about-ev/myth-busting/.

78 Submission 9, p 4.

3.3.5.2 Costs and availability of vehicles on the market, batteries and taxes

iMOVE stated that the uptake of EVs in Australia has been low because of cost and availability.[79]

Costs for users and owners of new transport technologies include investment, maintenance, replacement and updates of technology. These costs may impact the uptake of new technologies. Mr Thomas, a submitter, said that any move to new types of vehicles will happen when technology can meet demands and the cost of vehicles enable a return on investment.[80]

Another submitter, Mr Lacaze, expressed concern that any transfer of fuel taxes to electric vehicles 'would almost kill the uptake of those vehicles before it happens'.[81]

While the initial cost associated with purchasing a new vehicle was highlighted as a potential barrier to uptake, the rapidity of obsolescence of technology was also raised as a cost-related issue.[82] As one submitter stated:

> *Potential costs of updates/upgrades may not be affordable for the majority of consumers and may make otherwise functional and serviceable vehicles no longer commercially viable – This would have a very significant consumer/community cost and environmental impact of vehicles that effectively become disposable items after 3-5 years (look at recent issues with single use plastic bags and the large amount of e-waste from consumer electronic goods such as computers, televisions, mobile phones etc).*[83]

The AADA advised that, as new car dealers, its members are 'battling new vehicle prices that are higher than their equivalents powered by internal combustion engines' (ICE), as well as the 'added burdens of new vehicle tariffs and the luxury car tax, which can add about $20,000 to a car such as a Tesla S'.[84]

The AADA provided the following information in relation to the best price point for EVs for mass uptake:

> *We recently lodged a submission with the federal Senate committee, which had an inquiry into electric vehicle uptake. The price point is the No. 1 barrier, but range anxiety and associated lack of charging infrastructure are also issues. In terms of the price point, some years ago the Nissan LEAF was being sold in Australia. It is not currently being sold and it is due to be brought back in a few years. They got it to a point where it was under $40,000; it was $39,990. To my mind, that is the number you want to be at, when people are actually in a position to start buying a significant number of units.*
>
> *The cheapest electric car we have in Australia at the moment is the Renault ZOE at $47,000. That is the cheapest. To compare it to an equivalent Renault, the Clio, which is an internal combustion vehicle, is around $18,000 to $20,000. If someone compares the price of those two vehicles, the difference is $27,000, so it is tough even at that price point. They will be looking at the Renault Clio and saying that it has three times as much range and it is three times quicker to refuel even when you compare it to fast chargers. There are some perceived disadvantages. In the absence of any rebates, which they do have in international jurisdictions, it is not going to assist purchasers of those vehicles.*[85]

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79 Submission 9, p 4.

80 Submission 10, p 1.

81 Submission 16, pp 4-5.

82 Submission 20, p 16.

83 Submission 20, p 16.

84 Public hearing transcript, Brisbane, 12 November 2018, p 8. The average cost of a Tesla S is $129,000.

85 Public hearing transcript, Brisbane, 12 November 2018, p 11.

In regard to taxes, the AADA advised further:

> *Our members also note the recent introduction of a State Luxury Car Tax on vehicles over $100,000. This is a tax on a tax, as such cars are also liable to the Federal Government's Luxury Car Tax. Many of the more advanced and desirable electric vehicles are in this upper price bracket, and such a tax acts as a disincentive to the wider adoption of electric vehicles. More importantly, it works against the long-term interest of a sustainable and electrified Queensland Transport Infrastructure.*[86]

The AADA added:

> *Firstly, as new car dealers we are happy to sell any kind of new vehicle to a consumer, but to do that—specifically in the case of electric vehicles—we need the models and the stock. In Australia that has not been easy.*
>
> *…*
>
> *There are not many electric vehicles available on the Australian market. I think the Electric Vehicle Council tells us there are about 16 or 18. We recently did a study which showed that – I will get this information to you on notice – 13 out of those 18 vehicles are above the luxury car tax threshold. Then if you add to that the levy that the Queensland government announced prior to the state election last year and implemented in the budget this year, that only adds to the cost. When it comes to those vehicles, they may be luxury but there might be a point at which a prospective buyer looks at the price and decides that they would rather go with an internal combustion vehicle. In my opening statement I mentioned $20,000, which is the luxury car tax at the federal level on a Tesla S. When you put more money on top of that it simply makes cars more expensive and uncompetitive in relation to other internal combustion engine vehicles.*[87]

RACQ agreed with other submitters, noting that some of the challenges for supporting the uptake of EVs include the need for necessary infrastructure to support their operation, financial incentives to buy them over ICE vehicles, charging and range anxiety, and the cost of the vehicles themselves. RACQ expressed the view that the charging network needs continuity and consistency for the long-term uptake of EVs, which can be 'achieved through the provision of an appropriate mix of fast and slow chargers, and ensuring interoperability in charging specifications for both infrastructure and in-vehicle components'.[88] In this regard, RACQ made a number of recommendations in relation to EVs:

> *Engage with the public to impart practical electric vehicle ownership and use advice to subdue concerns regarding charging, maintenance, and running-cost concerns, and emphasise benefits.*
>
> *Engage with the Federal government on impacts of carbon targets on EV market and potential for incentive strategies to increase EV uptake while maintaining choice and minimising cost burden to all motorists.*
>
> *Evaluate options to address concerns related to upfront purchase costs and consider providing subsidies, rebates, or low-interest loans.*
>
> *…*
>
> *Engage with public transport providers and freight companies to identify opportunities to transition suitable vehicles/routes to electric or hybrid vehicles.*

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86 Submission 8, p 3.

87 Public hearing transcript, Brisbane, 12 November 2018, pp 8, 9. The committee notes subsequent advice from AADA stating that there were 16 EVs available in Australia and that 12 of them were subject to either or both federal and Queensland luxury car tax: AADA, answer to question taken on notice at public hearing, 18 November 2018, p 2.

88 Submission 5, pp 4, 5.

Lead by example and set Government fleet vehicle targets for electric vehicles.[89]

In response to the barrier of the cost of EVs, the EVC stated:

There are also lots of new mid-range EVs entering the Australian market in 2019. These include the Hyundai Ioniq ($44,990), Renault Zoe ($47,490), and Tesla Model 3 (around $55,000).

EVs are only going to become more affordable with time. According to Bloomberg, falling battery prices mean that the total ownership costs of EVs will be the same as conventional vehicles by 2021 and that upfront costs will be cheaper by 2025.

As competition, investment, and innovation increase, the costs of EVs will continue to fall while conventional vehicle prices stay the same.[90]

EVC also commented on the cost of running an EV as well as battery costs:

EVs have lower running costs than internal combustion engine vehicles (ICEVs). Fewer moving parts mean that EVs require less maintenance. With an EV you don't need to replace filters and spark plugs, change oil, or repair the transmission, head gasket or engine. In 2018, maintenance and servicing savings of an EV were estimated at $300-400AUD/year.

Contrary to a popular myth EV batteries last as long as the lifetime of your car. Battery costs are continually falling. With current forecasts: today a 40 kilowatt (kW) battery (for example like that in a Nissan Leaf) would cost around $USD 8,000 to replace, but in 2030, the same battery is expected to cost $USD 2,800. Most vehicle manufacturers offer a 10-year or 160,000km warranty on batteries.

Another massive saving from EV ownership is fuel. Battery EVs don't need any petrol or diesel and are charged with electricity. The average Australian drives 15,000km and spends around $2,160 on petrol per year ($0.14/km). An EV travelling 15,000km would cost around $600 per year ($0.04/km) in electricity costs.

If an EV user has a solar panel, charging is free![91]

Committee comment

The committee notes stakeholder concerns regarding the initial investment cost of an EV, the availability of different models on the market (for dealers and to create a competitive environment), and the State Luxury Car Tax. The committee also notes the EVC's advice that EV costs will fall over time. However, the committee supports RACQ's recommendations for the Queensland Government to engage with the public for the purpose of increasing awareness about EVs, their range capacity, charging infrastructure, running costs and other benefits.

The committee notes the work DTMR is undertaking in this area, including implementing its electric vehicle strategy that incorporates actions to investigate the electrification of light, heavy and public transport fleets, and its support of the Queensland Electric Super Highway, discussed in detail in section 3.3.2.[92] The committee supports the ongoing work of the Queensland Government to increase the uptake of EVs, including incentive strategies to increase sales and identifying opportunities for public transport providers and freight companies to transition to electric/hybrid models.

89 Submission 5, p 1.

90 Electric Vehicle Council, *Mythbusting*, https://electricvehiclecouncil.com.au/about-ev/myth-busting/.

91 Electric Vehicle Council, *Mythbusting*, https://electricvehiclecouncil.com.au/about-ev/myth-busting/.

92 Submission 4, pp 2-3.

3.3.5.3 Fire and electric vehicle batteries

There was some concern that there is a higher potential for a fire in an EV due to its battery than for a fire in traditional ICE vehicles.

Transurban highlighted potential changes to how they detect and respond to traffic incidents, particularly related to lithium battery fires and the growing number of electric vehicles:

> *For instance, lithium battery fires are expected to be high intensity and can take longer to extinguish than gasoline fires. In addition the potential release of toxic fumes may also require emergency services to wear self-contained breathing apparatus and use hoses that spray fog and special ventilation fans that push air out at a high velocity to protect bystanders downwind of the fire.*
>
> *In instances where vehicles run out of fuel, mobile charging units will likely need to be made available along with charging stations at each breakdown bay.*[93]

However, the EVC, expressed the view that:

> *Driving a vehicle with a battery is no more dangerous than driving a traditional Internal Combustion Engine vehicle.*
>
> *In fact, evidence suggests that lithium-ion batteries used in EVs are in fact as safe or even safer than conventional fuel. There are numerous studies that show that fires in EVs are no more likely or even less likely to occur than fires in ICEVs.*
>
> *In Australia, Fire and Rescue organisations do not treat EVs as any more dangerous than ICEVs.*[94]

3.3.6 Opportunities for the Queensland resources industry

The Queensland Resources Council (QRC) highlighted the economic opportunities that the advent of the EV could have for the Queensland resources industry:

> *At the strategic policy level there has been a lot of focus on where the world's supplies of lithium are and where some of the rare earths that make those components are situated. There are a lot of other common ones. They are all important. There are good opportunities for Queensland. We are highly prospective in terms of a lot of these minerals. There is a lot of interest on the ground. We have seen investment in exploration companies directly because people are wanting to diversify the global supply. Queensland is seen as a secure market based location if those commodities can be produced. There is the new frontiers aspect of commodities that we are not necessarily producing at the moment.*
>
> *As well as that, there is an enormous opportunity for the commodities we currently produce. You need about four or five times the weight of copper in an electric car compared to a fossil fuel one. That is clearly an enormous opportunity for Queensland. The weight of cars is important. We are seeing a blending from steel to aluminium—again, something Queensland has a long suit and long history of producing.*

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93 Submission 17, p 9. NB: in-text references have been removed. Refer to original submission for further information.

94 Electric Vehicle Council, *Mythbusting*, https://electricvehiclecouncil.com.au/about-ev/myth-busting/.

The electric vehicle is potentially a really important market. We are already seeing it shape investment decisions—where you are seeing car manufacturers and producers invest directly in exploration and production companies in trying to encourage the supply. That is somewhere Queensland is well placed. As well as that, in the background there is a steady year-on-year growth in demand for a lot of commodities that we produce. There is a lot of blue sky for us as a state in that global growth.[95]

The committee questioned QRC about the production of these rare earth metals and how they could be produced safely in Queensland. QRC responded:

… the metallurgy of rare earth metals is complex. It is not like mining for coal or copper. It is not visible. It is a trace element. There is a fair bit of processing required, and often it does coincide with radioactive isotopes. There is an existing framework around how that would be managed. Clearly not just the immediate neighbours but also the state as a whole are going to take an enormous interest in how that process is assessed up-front and then, if it gets approval to proceed, how it is managed. It will need to be run fairly carefully.

I think for Queensland, though, as a mature mining jurisdiction with a very good global reputation, if you are a Tesla or a BMW looking at sourcing rare earth metals, I think you would probably take a fair bit of comfort from looking at those resources being carefully produced to the highest environmental standards here in Queensland rather than somewhere else around the world.

… those operations, particularly where we have not had a history of them operating before in Queensland, will be intensely scrutinised, but I think the quality of our regulatory system is part of the appeal for customers. We are starting to see a lot of work go into blockchain technologies in terms of providence. If you have lithium, did it come out of the Democratic Republic of the Congo or did it come from a source where it has been produced with greater environmental sensitivity? Part of Queensland's opportunity lies in the rigour of our regulatory system.[96]

In terms of the use of automation currently in the resources industry and expected into the future, QRC advised:

A lot of the automation that has been taken up so far in the industry has been driven by safety. They have automated shot firing, for example, to reduce the risk of working near explosives. Rio Tinto and BHP are running driverless trains. They call them the world's biggest robot—two-kilometre-long ore bodies hurtling through the bush. What we are starting to see now are some really clever advances around automation. It is even the case with the train signalling system. They have the ability to run a more precise operation and get their timetabling down so that they get more productivity out of their trains.[97]

Committee comment

The committee notes that there is potential to explore in regards to both the use of EVs in the Queensland resources industry and for Queensland to tap into the rare earth metals market that is associated with EV batteries. In this regard, the committee encourages the Queensland Government to work with the Queensland resources industry to explore the potential of these.

[95] Public hearing transcript, Brisbane, 25 February 2019, p 4.

[96] Public hearing transcript, Brisbane, 25 February 2019, pp 6-7.

[97] Public hearing transcript, Brisbane, 25 February 2019, p 4.

3.3.7 Training for first responders

The AADA noted that the introduction of electric vehicles would require specific training of first responders given that their job may entail high-voltage components, which with an EV could pose a risk. The AADA explained:

> *One final concern relating to the introduction of EVs into wide use within Australia relates to the training and equipping of first responders (Fire, Ambulance, Police). EVs, by their very nature include significant high-voltage components that could energise the whole vehicle in the event of an accident. This puts bystanders and especially first responders at considerable risk should they not have both the training and equipment to manage such circumstances. Current EVs, such as the TESLA range, include clearly identified "first responder loops" which, when cut disables electric components throughout the vehicle.*
>
> *Thus, dealing safely with a TESLA vehicle incident requires the first responder to have specific knowledge (where to find the loop), and specific equipment (heavy duty insulated shears). It may be that mandated common approaches through the Australian Design Rules (ADRs) may be the most cost effective means of ensuring the safety of first responders attending to incidents involving EVs.*[98]

Committee comment

The committee notes the concern raised by the AADA in regard to the potential risk for first responders using their equipment alongside an EV and recommends the Queensland Government consider this in future training of first responders as and when needed.

Recommendation 2

The committee recommends the Queensland Government consider the potential risk for first responders using their equipment alongside an electric vehicle in future training as and when needed.

3.4 Other fuel sources - trends

3.4.1 Hydrogen

Hydrogen is an emerging fuel source, the most abundant element in nature, and can be used for a variety of energy needs, including transport with fuel cells that power electric motors known as Fuel Cell Electric Vehicles (FCEV).[99] DTMR elaborated on the benefits of hydrogen as a fuel source:

> *Hydrogen FCEVs offer equivalent driving range and vehicle refuelling times to current internal combustion vehicles on the market today. FCEVs could offer a zero-carbon emission solution particularly in transport operations such as heavy freight, buses and marine transport, due to hydrogen's lightness and energy density.*[100]

Dr Alan Finkel AO, Australia's Chief Scientist, has stated that hydrogen 'can be easily extracted using basic chemistry and offers jobs and investment in Australia for decades to come'.[101]

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98 Submission 8, p 9.

99 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

100 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

101 Dr Alan Finkel AO, Chief Scientist, Australian Government, Department of Industry, Science, Energy and Resources, 'Australia's hydrogen potential: A message from the Chief Scientist', 1 July 2019, https://www.industry.gov.au/news-media/australias-hydrogen-potential-a-message-from-the-chief-scientist.

However, both DTMR and Dr Finkel acknowledged the challenges associated with using hydrogen as a fuel source. DTMR stated:

> *The challenge with hydrogen is that 95 per cent of today's hydrogen is currently produced from fossil fuels through either coal gasification or steam methane reforming. Transitioning to a hydrogen economy based on fossil fuels would have no advantage in reducing CO_2 emissions.*[102]

Dr Finkel added:

> *Most of the hydrogen produced today for industry is made from fossil fuels. The process is emissions-intensive, even if the hydrogen itself is clean-burning. An alternative low-emissions pathway is required.*[103]

However, there are processes that could be used to overcome this challenge. DTMR explained:

> *… hydrogen can be produced by renewable energy sources such as solar and wind through electrolysis—a process that involves passing an electric current through water and separating the hydrogen and the oxygen. This offers an opportunity to utilise hydrogen as a way to store renewable energy.*[104]

Dr Finkel supported this view and added that Australia was in a good position to become a 'dominant supplier'. Dr Finkel stated:

> *There are two commercially viable options: splitting water molecules into hydrogen and oxygen, using electricity generated from renewable sources; or refining fossil fuels like coal and natural gas, using carbon capture and storage to mitigate the unwanted emissions.*
>
> *On either pathway, Australia is a prime contender to be a dominant supplier.*
>
> *Australia has a number of competitive advantages as a hydrogen exporter:*
>
> - *expertise and infrastructure we can leverage to develop hydrogen export energy supply chains*
> - *proximity to markets in Asia and well-established trading relationships*
> - *an abundance of renewable energy and low-cost fossil-fuel resources*[105]

Dr Finkel estimated that the growing demand for hydrogen could result in an export industry worth $1.7 billion by 2030 and 2800 jobs, most of which would be in regional areas.[106]

Engineers Australia also encouraged the Queensland Government to 'recognise the value of fostering our hydrogen energy power' and its benefits as a fuel source based on the following:

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[102] Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

[103] Dr Alan Finkel AO, Chief Scientist, Australian Government, Department of Industry, Science, Energy and Resources, 'Australia's hydrogen potential: A message from the Chief Scientist', 1 July 2019, https://www.industry.gov.au/news-media/australias-hydrogen-potential-a-message-from-the-chief-scientist.

[104] Department of Transport and Main Roads, correspondence dated 14 May 2020, p 7.

[105] Dr Alan Finkel AO, Chief Scientist, Australian Government, Department of Industry, Science, Energy and Resources, 'Australia's hydrogen potential: A message from the Chief Scientist', 1 July 2019, https://www.industry.gov.au/news-media/australias-hydrogen-potential-a-message-from-the-chief-scientist.

[106] Dr Alan Finkel AO, Chief Scientist, Australian Government, Department of Industry, Science, Energy and Resources, 'Australia's hydrogen potential: A message from the Chief Scientist', 1 July 2019, https://www.industry.gov.au/news-media/australias-hydrogen-potential-a-message-from-the-chief-scientist.

Whilst the combustion characteristics of hydrogen differ from other fuels, feedback from Engineers Australia members is that the overall associated risks are similar.

With an increased demand for zero emissions transport options, hydrogen fuel cells can provide a reasonably priced, rapid refuel and long range alternative. Furthermore, as hydrogen has the capacity to store energy and flexible load, grid resilience is increased.[107]

Engineers Australia advised that they do not see the way forward as necessarily 'an either/or in terms of electric or hydrogen: we see them as complementary measures', adding that 'the message is that diesel is dead and we are moving away from fossil fuels'.[108]

The committee notes that the COAG Energy Council established a Hydrogen Working Group in December 2018 chaired by the Chief Scientist for the purpose of developing a 'clean, innovative and competitive hydrogen industry that benefits all Australians and is a major global player by 2030'.[109] The Council released its National Hydrogen Strategy in November 2019, which outlines how Australia can 'scale up quickly as the hydrogen market grows' and includes a set of nationally coordinated actions involving governments, industry and the community.[110]

The committee also notes that the Queensland Government released *The Queensland Hydrogen Industry Strategy 2019–2024* in May 2019. DTMR elaborated on the Queensland Government's progress:

As part of the strategy, the Government established a $15 million Queensland Hydrogen Industry Development Fund to support hydrogen projects in Queensland. $1.7 million has already been announced on 27 February 2020 to be allocated to the $4.2 million gas injection facility in Gladstone. This facility will deliver renewable hydrogen into the city's gas network making Gladstone the first city to blend natural gas and hydrogen. Expressions of interest closed on 24 August 2019, with further successful applicants expected to be announced soon.

The Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) have committed to integrating five Hyundai Nexo FCEVs into Q-Fleet. The hydrogen to refuel these vehicles will be produced by BOC who are constructing a $3.1 million renewable hydrogen electrolyser at its Bulwer Island facility. This facility will have the capability of producing 2,400kg of hydrogen per month. Once produced, the hydrogen will be transported to a planned hydrogen refuelling station (HRS) located at the Queensland University of Technology Kelvin Grove campus. DSDMIP have written to departments seeking expressions of interest in taking one or more of the Nexo's in departmental fleets. The cars and refuelling infrastructure are expected to be in place by the end of 2020.

[107] Submission 25, p 6.

[108] Public hearing transcript, Brisbane, 25 March 2019, p 4.

[109] COAG Energy Council, 'Establishment of the Hydrogen Working Group of the COAG Energy Council, 19 December 2018, http://www.coagenergycouncil.gov.au/publications/national-hydrogen-strategy.

[110] Australian Government, Department of Industry, Science, Energy and Resources, *Australia's National Hydrogen Strategy*, November 2019, https://www.industry.gov.au/data-and-publications/australias-national-hydrogen-strategy.

> *Queensland supports further research into hydrogen as a renewable fuel source. On 31 May 2018, the Queensland Government announced a commitment of $750,000 to support the investigation of producing and supplying hydrogen at a competitive price to alternative energy sources such as natural gas and other sources.*[111]

DTMR also emphasised that there are 'significant opportunities for the adoption of hydrogen powered vehicles in Queensland's logistics, mining and agricultural sectors—the sectors that support our regional communities'.[112]

Committee comment

Given the advice from Australia's Chief Scientist regarding the potential benefits of hydrogen, not only as a source of clean energy but as an industry worth up to $1.7 billion by 2030 with jobs for 2800, the committee is pleased to see the Queensland Government's work in this area, including the establishment of the Queensland Hydrogen Industry Fund and its support for further research into hydrogen.

3.4.2 Biofuels

Biofuels are defined as solid, liquid or gaseous fuels produced from biomass and according to Bioenergy Australia could play a major role in Australia meeting its obligations to reduce emissions.[113] Biofuels include ethanol blended petrol, biomethane and biodiesel.[114] The benefits of bioenergy include:

- reducing greenhouse gas emissions
- better air quality
- biodegradable
- offer the potential for regional and rural economic development and employment opportunities
- supporting agricultural and food-processing industries
- cost savings
- less landfill
- energy reliability and security[115]

Bioenergy Australia stated that Australia holds an advantageous position for developing a sustainable and competitive biofuel industry, including:

- *an abundance of sunlight, flat land and a climate suitable for growing dedicated energy crops;*
- *world-class expertise in agricultural science;*

111 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 8.

112 Public hearing transcript, Brisbane, 15 June 2020, p 2.

113 Submission 6, p 2.

114 Victorian Government, Department of Environment, Land, Water and Planning, *Biofuels for transportation*, https://www.energy.vic.gov.au/renewable-energy/bioenergy/biofuels-for-transportation.

115 Victorian Government, Department of Environment, Land, Water and Planning, *Benefits of bioenergy*, https://www.energy.vic.gov.au/renewable-energy/bioenergy/benefits-of-bioenergy.

- *a strength in natural resources and infrastructure industry development;*
- *a first world economy with rule of law and low political risk.*[116]

However, Bioenergy Australia believes that Australia is 'lagging' behind in the global transition towards biofuels and that the passenger road transportation sector, aviation, shipping and long-haul heavy haulage will rely on alternate fuel sources to meet emissions reductions. Biofuels have the potential to be a viable low-carbon technology for use in these industries.[117]

It is noted that Brisbane City Council (BCC) considers that 'biodiesel is an obvious choice [for many bus fleets] as emissions benefits can be achieved quickly with no modifications' but that 'rising food demand and special storage requirements make the availability and cost effectiveness of biodiesel not guaranteed in the future'.[118]

DTMR provided the following information in regard to what the Queensland Government is doing in this space, and particularly noted the benefit of the industry to rural and regional Queensland:

> *… the Queensland government has developed a Queensland biofuels 10-year road map. A dedicated unit has been established within the Department of State Development, Manufacturing, Infrastructure and Planning that is working specifically to grow the biofuels sector and address some of those issues around the environmental consequences of fuel and also to look at opportunities for self-sufficiency from a state perspective as well as local employment.*
>
> *As you might be aware, with respect to the regional dimension of the biofuels industry, in 2016 the Queensland government was successful in attracting Southern Oil Refining to Gladstone to look at producing 400 million litres of renewable fuel each year at its Gladstone refinery. That is still in its very early days, but that has been an opportunity to look at employment in a regional context and to provide a new regional industry.*
>
> *Also flowing from that Queensland biofutures 10-year road map the Queensland government has supported a number of programs, including the Biofutures Industry Development Fund, which assists industrial biotech industries to secure financing for large scale production. There is the Biofutures Commercialisation Program, where national and international biofutures partners are sought to prototype or upscale innovative biotech research and development. There is the Biofutures Acceleration Program, which attracts and supports the development of new biorefinery projects in Queensland. Recently, there has been announced a new—it is yet to be opened—biofutures waste to bioenergy program, which is a $5 million fund to support innovative bioenergy projects.*
>
> *In terms of some of the other impacts in a regional sense, of those programs and projects that I have outlined, to date, support has been provided to Dalby Bio-Refinery, which plans to expand its existing biorefinery to produce ethanol. That could have application more broadly across the state. There is MSF Sugar's plans to develop a new biorefinery to produce ethanol and electricity at the Atherton Tablelands. There is also Renewable Developments Australia and its plans to build a biorefinery to produce ethanol and renewable energies, which is happening in the Pentland-Charters Towers region.*[119]

116 Submission 6, p 2.

117 Submission 6, pp 2, 3.

118 Submission 2, p 2.

119 Public hearing transcript, Brisbane, 29 October 2018, pp 3-4.

Committee comment

The committee notes the Queensland Government's commitment to biofuels through the development of its Queensland biofuels 10-year roadmap and its support for a number of programs, including the Biofutures Industry Development Fund. The committee notes the particular benefits of these programs and projects to regional Queensland.

3.5 Public transport - trends

BCC's submission discussed the impact of new fuel types on its bus fleet and the role of whole-of-life costs in the decision-making process for adopting alternative fuel technologies for buses. BCC emphasised that 'operational reliability cannot be compromised while trying to achieve lower fuel costs and emission targets'.[120] In regard to the major trends in Australia for bus fleets, BCC advised:

> *A variety of hybrid bus types are being introduced to government fleets around Australia but the larger scale introduction is occurring overseas. It is generally accepted that commercial viability is still to be realised due to the high purchasing cost.*
>
> *For many bus fleets, biodiesel is an obvious choice as emissions benefits can be achieved quickly with no modifications. However, rising food demand and special storage requirements make the availability and cost effectiveness of biodiesel not guaranteed in the future.*
>
> *Hydrogen fuel cell buses have zero emissions from the vehicle but the extremely high cost makes adoption of this technology unfeasible at present. It will probably be a decade of technology development before hydrogen buses can be seriously considered.*
>
> *Electric buses with on-board battery storage provide flexibility without the need for expensive infrastructure to deliver the electricity to the bus. Although the cost of charging stations makes electric buses less attractive, these stations can be used for buses on different routes passing through the same station or depot.*
>
> *The emissions benefit that Compressed Natural Gas (CNG) buses had over diesel 10 years ago is no longer present since the introduction of new emissions standards and the development of ultra-low sulphur diesel. CNG buses are approximately 10% more expensive than an equivalent diesel powered bus and the extra fuel infrastructure and regulatory compliance issues negate the fuel saving costs benefits of CNG.*[121]

In table 3 below, BCC provided a cost comparison by fuel type for operating a standard 12.5m bus.

[120] Submission 2, p 2.

[121] Submission 2, p 2.

Table 3 – Cost comparison by fuel type of a standard 12.5 metre bus unit

Fuel types	Hydrogen	Biodiesel	CNG	Hybrid	Electric on-board battery	Diesel
Advantages	No tailpipe emissions	Can be used with current diesel buses	Low carbon emissions	Low carbon emissions Numerous trials around the world	No tailpipe emissions Less noise	High energy density allowing all day operations Cost Effective Refuelling time immediate
Disadvantages	Very high purchase cost Fuel source and infrastructure still to be developed Early development stages	Fluctuating fuel cost Fuel source still to be developed commercially	High Maintenance and regulatory cost	Higher purchase cost Performance uncertainty exists	Electricity charging infrastructure has to be built Battery technology is still a hurdle Electricity generation results in extra emissions Manufacture and disposal of batteries will have an environmental impact	Emissions and pollution Non-renewable energy source Research and development ceased
Initial cost	$2,000,000/bus	$450,000/bus	$500,000/bus	$750,000/bus	$750,000/bus $150,000/bus	$450,000/bus

Source: Brisbane City Council, submission 2, p 3; Brisbane City Council, correspondence dated 24 June 2020, p 2.

BCC also provided the statistics on its bus fleet by fuel type as of 30 May 2020 as indicated in table 4 below:

Table 4 – Summary of Brisbane City Council bus fleet by fuel type as at 30 May 2020

Fuel type	Quantity	Percentage
Compressed Natural Gas (CNG)	326	27%
Diesel	896	73%
Hybrid	1	0%

Source: Brisbane City Council, correspondence dated 24 June 2020, p 2.

BCC updated the committee on new and emerging public transport technologies in Council:

> *Council currently operates a bus fleet of over 1200 buses and replaces approximately 60 buses a year. Since July 2017, Council has committed all new buses will meet Euro VI diesel emission standards or higher. Euro VI emissions standards is higher than the Australian minimum standard of Euro V, however, comes at an approximate cost of $20,000 per bus. The benefit of Euro VI emissions standard is a 66% reduction in exhaust particulates and an 80% reduction in nitric oxide compared to Euro V standards, contributing to improved air quality. New Euro VI diesel buses are replacing aged Euro III and IV CNG buses. Over the next 8-10 years, all CNG buses will be retired from Council's fleet.*[122]

[122] Brisbane City Council, correspondence dated 24 June 2020, p 2.

BCC is also finalising a tender for an electric bus with a successful tender expected to be announced in the first quarter of the 2020/21 financial year. The tender includes a solution that charges overnight at a bus depot and is capable of completing a full day service on a single charge.[123] BCC advised of the three key challenges for electric buses:

> *Balancing Range and Duration – A number of city route buses do a modest number of kilometres per day, between 180-250km. While a number of electric buses claim to travel this range on a single charge, this is achieved over a short period of time, 3-5 hours. The challenge for city route buses is combining range with running essential on bus systems such as air conditioning for 10-14 hours per day. While there are currently a limited number of electric buses that can achieve this performance, there are more solutions anticipated to be available as battery technology improves.*
>
> *Passenger Capacity – An electric bus has to balance the requirements between battery charge and passenger capacity. A standard rigid electric bus has a maximum passenger capacity between 60-65 passengers while a diesel rigid has a capacity between 75-78 passengers. To maintain the same passenger carrying capacity across a fleet, approximately 15% more electric buses are required.*
>
> *Electrical Infrastructure – When electric buses are able to effectively replace diesel buses, there is a requirement for a significant investment in electrical infrastructure to support the charging requirements. By the nature of the bus network, the majority of electric buses need to be charge concurrently overnight while back in the depot. While it is possible to manufacture and replace buses over a relatively short period of time, it could take a decade or more to upgrade the electrical grid to support this requirement.*[124]

BCC also advised:

> *Council's signature project the Metro, is a biarticulated electric vehicle. Council will be purchasing 60 of these vehicles ready for introduction to service in 2023. The Metro vehicle solution uses a different charging technology. The Metro uses flash charge at the end of each route. This is achieved through … having smaller battery packs compared to depot-based "overnight" charging solutions, which increases passenger capacity. This flash charge solution requires a recharge time of approximately 6 minutes at the end of each run. This flash, opportunity charge solution, is suitable for routes that operate point to point on a single route. For efficiency, this style solution has limited application for city route buses as buses are scheduled across multiple routes each day. This form of scheduling is the most efficient way to reduce out of service travel and limit the size of the bus fleet to meet the network requirements.*[125]

In regards to making its transport decisions, the Southern Downs Regional Council (SDRC) advised it focuses on both cost sustainability for itself and reducing costs for its ratepayers. To do this, SDRC advised it was considering changes to both its light and heavy fleet to access hybrid and electric vehicles for the purpose of lowering operating costs and passenger costs.[126]

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123 Brisbane City Council, correspondence dated 24 June 2020, p 2.

124 Brisbane City Council, correspondence dated 24 June 2020, p 2.

125 Brisbane City Council, correspondence dated 24 June 2020, pp 2-3.

126 Submission 1, p 3.

SDRC also expressed its interest in exploring pilot programs related to public transport, 'especially in assisting residents to commute between the principal population centres of the Southern Downs to the smaller villages and hamlets of the area'. SDRC explained further:

> *If social isolation or access to employment can be overcome by cost effective sustainable transport then this is an option that requires further investigation. Council believes there is a genuine opportunity to see how affordable public transport can be implemented in areas of social isolation.*[127]

SDRC has also proposed that the use of solar passenger trains on existing rail infrastructure could be explored for the purpose of improving connectivity between small towns to allow people to access medical, retail and recreational facilities.[128]

In order for people to move towards public transport, Brisbane Residents United advised that it needed to be 'affordable, clean, frequent, reliable and seamless in transition from one mode to another' and that local area movements needed to become more 'pleasant and easy, using various modes of human and electric powered transportation'. This would require town planning to consider people's movements, including pedestrian movement.[129]

To tap into the tourist dollar across the vastness of the state, Brisbane Residents United suggested that the rail network be expanded 'to create major freight and tourism corridors with fast train services cover the major routes', stating:

> *Queensland is a vast state and the distances to major attractions can be daunting to tourists who are time poor and wanting to see as much as they can on their holidays for example the Whitsundays are 1100 km and Cairns is 1682 km from Brisbane. On a train travelling at between 300 to 400 km per hour you could be at the Whitsundays in approximately 3 - 4 hrs. You could be on the Sunshine or Gold Coast in half an hour.*
>
> *This would actually make train travel a viable alternative to air travel and possibly even more convenient. This would also make certain areas accessible for commuters to city or regional centre based jobs.*
>
> *The train network should also be expanded to include regional centres such as Warwick, Stanthorpe and Boonah. These areas represent a new growth area in tourism that we call agritourism. They are also close enough to Brisbane to provide an accessible area for rest and recreation.*[130]

Brisbane Residents United also discussed the benefits to cities and regions with putting more freight on the rail network, thereby decreasing the amount of freight travelling on roads. They argued that this would decrease road funding costs.[131]

Committee comment

The committee notes the advice from BCC regarding the benefits, challenges and associated costs of using different fuel types in its public transport fleet. The committee appreciates BCC's statement that commercial viability is difficult to achieve due to high purchasing costs of vehicles and not being able to achieve economies of scale.

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127 Submission 1, p 3.

128 Submission 1, p 3.

129 Public hearing transcript, Brisbane, 25 March 2019, p 6.

130 Submission 13, p 2.

131 Submission 13, p 2.

3.6 Freight sector and heavy vehicles - trends

The National Road Transport Association (NatRoad) advised that the freight sector is heavily reliant on diesel fuel with estimates of up to 99 per cent of trucks and 50 per cent of light commercial vehicles using this type of fuel. NatRoad advised that there are current trials of dual-fuel technology in trucks that substitute diesel for LPG that show 'positive operational and environmental results with an 18-23% energy saving and a 60% reduction in particulate matter'.[132]

As the peak national body representing major and national companies participating in the freight logistics industry, the Australian Logistics Council (ALC) advised that it had formed an Electric Vehicles Working Group[133] to 'inform the national discussion around the benefits of electric freight vehicles'.[134] The ALC considered the key benefits of EVs for the freight logistics industry to be:

- the potential of EVs to reduce the carbon footprint of the industry
- EVs are quieter than conventional internal combustion engines, thereby reducing noise pollution (of particular importance for supermarket operators who are often delivering produce to their stores at night due to local government regulations)
- EVs produce fewer particulates than ICEs, leading to improved air quality.[135]

Australian logistics providers are beginning to see the advantages of electric vehicles, with many of the largest logistics providers, including Australia Post, Linfox and DHL, incorporating EVs in their delivery models.[136] The ALC provided examples of what each of these organisations is doing to increase their use of EVs. For example, Linfox is:

- trialling EVs at their facilities.
- investing in renewable energy solutions to power EVs in the future, including 500kW of solar panels installed at their warehouses to date, with plans to increase this energy generation across Australia.
- implementing EV material handling equipment at their sites and build EV requirements into their new sites.[137]

The ALC advised that participants of the Electric Vehicle Working Group agreed to increase the use of EVs for freight deliveries and noted the 'enthusiasm' of the freight logistics industry to adopt EVs as part of their business. In the short-term, the ALC expects that short distance freight would be the first to benefit from EVs.[138]

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132 Submission 3, p 3.

133 Members of the ALC Electric Vehicle Working Group include Australia Post, Coles, DHL, Infrastructure Partnerships Australia, Liberty Onesteel, Linfox, Port of Brisbane, Port of Newcastle, Qube, Sea Electric, Telstra, Toll, NSW Transport department, Woolworths.

134 Submission 23, p 4.

135 Submission 23, p 6.

136 Submission 23, p 7.

137 Submission 23, p 10.

138 Submission 23, p 11.

DTMR provided the following advice about steps taken towards fulfilling one of the priorities of the NPF Action Plan—identifying and facilitating emerging technologies that improve freight outcomes:

> *TMR is investigating applications which will provide crucial support to the movement of heavy vehicles across the network with measures to increase situational awareness of network availability in real time (major incidents and flood outage) supporting the productivity of this vital economic sector. Also by deploying improved network monitoring capability, simplified access arrangements could be implemented for the heavy vehicle industry, further supporting productivity and job creation in this sector.*
>
> *Heavy vehicles support the following supply chains, fast-moving consumer goods, sugar, fuel, mine inputs, general freight, project and construction cargo, livestock and meat, and horticultural.*[139]

3.7 Personalised transport

Submitters advised the committee that the taxi industry has been at the forefront of transitioning to new fuel technologies: for example, in the area of low emission hybrids.[140]

One submitter proposed that the legislative changes in Queensland in relation to booked hire services impacted the number of hybrid vehicles operating in personalised/on-demand passenger transport in Queensland—from 70 per cent in 2016 to 15.28 per cent in 2018.[141] The submitter explained further:

> *This clearly demonstrates that, while the historic Qld taxi fleet embraced the commercial and environmental benefits of running a fleet of fuel-efficient hybrid vehicles, the structure of the 'gig' corporation on-demand passenger transport fleet - that relies upon individual worker drivers to provide the capital and essential equipment/tools of the business, has not been able to reach the same conclusion and indeed, the perverse incentives may even be such as to deliver the opposite - eg someone wanting to drive an expensive high powered V8 vehicle or large SUV may see potential personal benefit in being able to claim tax deductions and business expenses by purchasing their desired car, and then signing on as a booked hire driver.*
>
> *Ultimately this demonstrates that the Community benefit of increased use of low emission (hybrid and electric) vehicles in high mileage passenger transport vehicles is not resolved by market forces in the 'gig' economy sector, and that achievement of the Community Benefit requires legislated mandatory requirements that all on demand passenger transport fleets (for each and every Authorised Booking Entity) must achieve a minimum level of fuel efficiency and/or a maximum level of CO_2 emissions.*[142]

[139] Department of Transport and Main Roads, correspondence dated 30 June 2020, p 14.

[140] David Thomas, submission 10, p 1.

[141] Submission 20, pp 4, 5.

[142] Submission 20, p 5.

4 Readiness of Queensland's transport network for electric vehicles

According to The Australia Institute, all stakeholders 'have a role to play in preparing the sector to make the most of the change ahead', including employers, workers and their unions, customers and shippers, governments and regulators, financiers and investors, and training and education institutions.[143]

The key factors that will determine the readiness of the network for EVs, as well as addressing the challenges and opportunities in preparing the sector, are outlined below.

4.1 Key factors determining the readiness of the network for electrification of vehicles

4.1.1 Infrastructure to support electric vehicles – personal transport

One of the key factors identified for supporting the uptake of EVs is ensuring that adequate charging infrastructure is in place.[144] This will be essential in overcoming one of the key barriers to the uptake of EVs: 'range anxiety', which is also discussed in section 3.3.5.

Engineers Australia encouraged governments to 'prioritise transport policies with a focus on sustainability, productivity and affordability and which support the global trend away from fossil fuel reliance'. As such, they recommend further investment in the deployment of infrastructure to support the electrification of the transport network, particularly where cars are parked (carparks and service stations).[145]

The Queensland Government has recognised this in its electric vehicle strategy, which includes the development of the QESH with its charging infrastructure (refer to section 3.3.2 for more information).[146]

4.1.1.1 EV charging stations

Key issues that need to be addressed relating to the provision of adequate EV charging infrastructure include the ensure an adequate number of charging stations are available for EVs, the need for a variety of chargers to be made available to suit different EV models; fire occurring due to technical fault; availability of on-street parking spaces when vehicles need to be charged for periods of time; and the potential for petrol stations to provide EV charging facilities.[147]

As DTMR highlighted, for EVs and the QESH to be viable, a network of fast EV charging stations which support the majority of EV models must be made available in Australia.[148]

DTMR advised that there are two main types of EV charging stations in Queensland:

- *alternating current (AC) chargers: 3-22 kW (20 to 130 kilometres per hour)*
- *direct current (DC) fast chargers: >50 kW (>300 kilometres per hour).*[149]

The committee notes that Queensland currently leads Australia with the highest number of DC fast-charging stations, largely because of the QESH.[150]

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143 Submission 18, p 64.

144 Transurban, submission 17, p 8.

145 Submission 25, p 5.

146 Submission 4, p 8.

147 Brisbane City Council, submission 2.

148 Submission 4, p 8.

149 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 9.

150 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 9.

DTMR provided further information about the number of EV charging stations in Queensland:

> *Between mid-2016 and mid-2018, the number of publicly accessible EV charging stations in Queensland increased by 264 per cent (from 78 to 284 charging stations). This has predominantly been in the form of AC charging stations (257 charging stations) and through the rollout of the QESH DC fast-chargers (27 fast-charging stations).*[151]

From a motor vehicle dealership point of view, the AADA advised that being able to assure their potential EV customers that there would be enough charging infrastructure to make the purchase and use of EVs viable was essential. The AADA stated:

> *… customers need to know that they are well served by a charging infrastructure that allows them to travel where they wish to go. In our view, such infrastructure needs to be, as far as possible, in place before electric vehicles gain broad mass appeal. "Range Anxiety" is the very real fear that an electric vehicle will be left stranded in the absence of available charging stations. We believe that governments have a role in facilitating the faster and wider deployment of a charging infrastructure.*[152]

For RACQ too, ensuring the charging network has continuity and consistency will be key for the long-term uptake of EVs.[153]

The EVC commented on charging infrastructure for EVs:

> *While 80 per cent of EV drivers globally charge their EV at home, there is still a need for public charging infrastructure.*
>
> *An ever-expanding network of public charging infrastructure is being installed across Australia. Private companies have been building networks along highways, and both federal and state governments are now investing too.*
>
> *Local councils are supporting local communities to make the change by installing chargers in local public areas, and it is increasingly common to see EV chargers in shopping centres.*
>
> *If you check out the charger map on our website, you will see that the number of charging points is well into the hundreds.*
>
> *Ultimately, you could charge an EV in a regular home power socket.*[154]

Both Engineers Australia and Brisbane Residents United suggested existing petrol stations could provide the perfect network for public charging stations and alleviate 'range anxiety'.[155] Brisbane Residents United explained:

> *The infrastructure investments in these sites by companies will still be able to recover costs during and after the transition to electrification of vehicles. Many of them have food venues that mean that people can have a coffee or a meal as their car is charging.*[156]

Engineers Australia also suggested that greater access to charging infrastructure in carparks would be useful given the majority of time that cars are parked.[157]

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151 Submission 4, pp 8-9. NB: in-text references have been removed. Refer to original submission for information.

152 Submission 8, p 10.

153 Submission 5, p 4.

154 Electric Vehicle Council, *Mythbusting,* https://electricvehiclecouncil.com.au/about-ev/myth-busting/.

155 Submission 25, p 5; Submission 13, p 4.

156 Submission 13, p 4.

157 Submission 25, p 5

BCC has suggested that it could play a role in encouraging the uptake of EVs by installing charging stations at council facilities. In addition, BCC indicated that it could 'provide onsite solar or grid contracts to provide renewable power'. BCC also advised that it has public EV charging in King George Square carpark and for council fleet vehicles at BCC offices.[158]

However, BCC said that while EVs will bring benefits to the community, there were challenges for providing the infrastructure support needed to encourage the uptake of EVs, including obsolete technology, liability for accidents and related insurance matters, and the impact on availability of on-street parking spaces.[159] BCC explained:

> *Council would also be taking on an additional liability if a vehicle fails to charge or a fire occurs due to a technical fault. As some forms of charging take an extended amount of time, the impacts on the availability of on-street parking spaces could be significant if on-street charging is used.*[160]

BCC expressed concern that uncertainty over the technology might result in developers being cautious about including EV charging infrastructure in new property developments:

> *As a variety of vehicles with different chargers are currently available there is a risk, as an early installer of charging infrastructure, that the stations will become obsolete in time.*[161]

RACQ recommended that the Queensland Government:

> *Develop and commit funding to an ongoing charging network investment and installation program, including provision of chargers in park 'n' ride facilities to encourage sustainable modal transfers.*[162]

Committee comment

The committee acknowledges the Queensland Government's commitment to EVs with its ongoing support to the QESH. The committee, however, notes submitters' views that the imminent installation of charging infrastructure across not only Queensland but Australia is essential to encourage the uptake of EVs and address range anxiety. The committee also notes the AADA's comment that the infrastructure needs to be in place 'before electric vehicles gain broad mass appeal'.

In this regard, the committee recommends the Queensland Government consider:

a. how it can incentivise and support local councils, property developers, carpark owners and shopping centres to install electric vehicle charging stations with a variety of chargers to meet market demand.

b. the benefits and potential of providing electric vehicle charging stations in park 'n' ride facilities.

c. liability concerns if a vehicle fails to charge or a fire occurs due to technical fault.

158 Submission 2, p 4.

159 Submission 2, p 3.

160 Submission 2, p 3.

161 Submission 2, p 3.

162 Submission 5, p 1.

Recommendation 3

The committee recommends the Queensland Government consider:

- how it can incentivise and support local councils, property developers, carpark owners and shopping centres to install electric vehicle charging stations with a variety of chargers to meet market demand.
- the benefits and potential of providing electric vehicle charging stations in park 'n' ride facilities.
- liability concerns if a vehicle fails to charge or a fire occurs due to technical fault.

4.1.2 Impact on electricity grid

One of the unknowns with the increased use of EV charging stations is the impact on local grid capacity. In this regard, DTMR advised that it will be important to closely monitor the clustering of EVs, particularly given that the majority of EV charging will most likely be carried out at home and work, so any constraints on the grid can be managed.

The AADA raised this as an issue and noted the potential impacts particularly for rural and remote regions:

> *The recent and significant growth in the production of renewable energy from widely distributed sources such as domestic rooftops and the resulting changes to traditional patterns of generation and consumption have placed significant stresses on the power distribution networks throughout the country. Such stresses are likely to become more significant as the demand for charging electric vehicles (both cars and trucks) grows, particularly in rural and remote regions.*[163]

DTMR advised that it is working 'closely with Energy Queensland and other state departments to further understand the impact of EVs on the electrical grid to ensure both transport and the energy sector are prepared for an increasing number of EVs and chargers'.[164] Based on overseas studies, DTMR stated that the 'charging of EVs can be integrated into the existing grid with minimal additional costs using demand management strategies, including time-of-use tariffs' and that '[f]urther improvements in battery technology will also decrease charging infrastructure requirements'.[165]

DTMR provided further advice in relation to its work with Energy Queensland to consider the potential impact of EVs on the electricity grid:

> *If the issue of EV charging is managed strategically, and EV owners are educated and incentivised to charge at times outside of the peak electricity demand periods, which are typically early in the evening, everybody wins. However, if EVs are typically charged during peak demand periods, EV charging will be more costly for owners and electricity demand will increase to levels that require our relevant local networks to be upgraded. That cost will ultimately be reflected in increased electricity prices for everyone.*
>
> *As a result, Energy Queensland has developed its Network Electric Vehicles Tactical Plan. By investigating and understanding the issues, and collaborating with a broad range of stakeholders who have common goals, Energy Queensland has sought to create charging arrangements that:*
>
> - *Balance affordability, convenience, environmental and other priorities for EV owners.*

[163] Submission 8, p 10.

[164] Department of Transport and Main Roads, correspondence dated 14 May 2020, p 8.

[165] Submission 4, p 9.

- *Enhance network utilisation and performance, thereby contributing to a more efficient National Electricity Market.*
- *Minimise the need for network upgrades.*
- *Facilitate additional connections of renewable energy generating systems of all capacities.*
- *Reduce greenhouse gas emissions per kilometre of road travel.*
- *Support the growing EV industry in Queensland and beyond.*
- *Reduce Queensland's and Australia's reliance on imported oil, petrol and diesel products.*
- *Ultimately place downward pressure on electricity prices.*[166]

DTMR advised that Energy Queensland's 10 EV-related tactics include:

1. *Educate EV salespeople, EV charger installers and customers about EV charging options.*
2. *Enhance the network connection process for both private and public EV charging stations.*
3. *Scope energy management opportunities presented by EVs.*
4. *Identify challenges and opportunities related to facilitating Vehicle-to-Grid (including Vehicle-to-Building) EV connections.*
5. *Implement mechanisms to identify private EV charger locations.*
6. *Develop an EV data repository.*
7. *Deploy research into EV charging behaviours, network impacts and EV owner experiences.*
8. *Deploy an EV stakeholder engagement plan.*
9. *Establish network monitoring in areas of high EV penetration.*
10. *Quantify the benefits to the network business of the customer adoption of EVs.*[167]

DTMR highlighted that energy providers see EVs as an opportunity for increasing the utilisation of the electricity grid as more homes and businesses start to use solar energy.[168]

4.1.3 Tourism opportunities and infrastructure deployment

SDRC supported further development of charging infrastructure 'to allow for the charging of electric vehicles along key transport routes' and expressed an interest in working with the Queensland Government in encouraging the uptake of EVs and the use of the QESH. SDRC's focus is on how it can best leverage economic development and tourism opportunities from this, given that its region is 'a recognised short-break destination in South East Queensland'. SDRC was of the view that it is those communities who adapt to new technology quickly that will benefit from the potential economic opportunities that may arise from this. For example, SDRC is looking at partnering with local businesses to explore the opportunity of offering customers free charging as they spend time and money in the area.[169]

166 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 10.

167 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 11.

168 Submission 4, p 9.

169 Submission 1, p 2.

SDRC provided the following advice in regard to the tourism benefits of being included as part of the super highway:

> *There are two* [high-speed chargers] *about to be installed within the CBD of Warwick as part of the superhighway. I am glad to see that we are still included as part of the superhighway. It is about trying to attract more people to shop while their vehicle is getting charged up. I note there is already a motel in Warwick that operates an electric charger for those people using electric cars up and down the highway. It would assist a great deal if there was more promotion about the superhighway going through.*[170]

SDRC also stated that 'with the impending construction of the University of Queensland solar farm and the high number of visitors to the municipality, the Southern Downs is an ideal location to trial charging stations and ancillary infrastructure for Electric Vehicles, whether they be light or heavy fleet', as well as for providing an environment for vehicle testing and driverless technology research.[171] Two charging stations were opened in Warwick in September 2019 and are equipped with three bays.[172]

Committee comment

The committee notes the contribution of the QESH towards Queensland tourism. The committee supports SDRC's view that the placement of charging infrastructure has the potential to positively impact tourism in regional Queensland. The committee notes the location of charging infrastructure along the QESH and encourages the Queensland Government to work with local government as part of consultation into Regional Transport Plans (refer to DTMR's comments in section 4.1.4) on any future plans for expanding the QESH.

4.1.4 Infrastructure in rural, remote and regional areas

Australia's vastness and concentrated population in urban centres will impact the uptake of EV technology differently in urban and rural, remote and regional locations. There are vast distances between locations across Queensland, and EV charging locations must be able to address that to overcome 'range anxiety' for regional drivers. MTAQ is of the view that Australia's urban and regional geography will play a significant role in the pattern and rate at which EV technology will be integrated into private and commercial transportation systems:

> *It is likely that metropolitan centres will have a more rapid uptake of PIEV technology and the adoption of autonomous vehicles.*
>
> *Initially metropolitan and urban centres will be favoured, because the cost of dismantling conventionally powered vehicle infrastructure e.g. internal combustion engine (ICE) serving facilities and fuel retail stations and replacing these with PIEV facilities - that is auto electrical repair shops and recharging stations - can be more effectively recovered from larger population centres. Australia's vast distances and decentralised demography means that conventional vehicles are likely to continue to play a major transportation role in rural and regional economies for a considerable time after PIEV displace ICE vehicles in metropolitan centres.*

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170 Public hearing transcript, Brisbane, 25 February 2019, p 3.

171 Submission 1, p 4.

172 Southern Downs Regional Council, *Southern Downs open to electric motor vehicle highway with new Warwick charge stations,* https://www.sdrc.qld.gov.au/council/alerts-news-notices/2019-news/2019-september/southern-downs-open-to-electric-motor-vehicle-highway-with-new-warwick-charge-stations.

> *Australia's urban and regional geography involves extended transport logistics and the new generation of batteries for electric vehicles enabling on average 500 kilometres of travel between recharging is an important consideration for stakeholders. Currently this is in the process of being upgraded to 1,000 km between recharging and will eliminate the concerns the motoring public has about the suitability of electric vehicles for Australia's long distances. This innovation can be expected to remove a major obstacle to the uptake of electric vehicles.*[173]

MTAQ called for policies that would ensure people in rural and regional locations were not denied access to EV technology based on their location and the potential issue of developing economies of scale:

> *The desirability of social equity that can be achieved by the introduction of autonomous vehicle technology should be considered. Economies of scale and business models are likely to favour the urban uptake of this technology and if the social utility of the introduction of autonomous vehicles is to be equitable, support programmes for rural and regional areas need to be considered.*[174]

Local governments also provided advice on how the uptake of EVs in regional Queensland would be impeded by both the cost of the vehicle itself and the potential lack of charging infrastructure. For example, Toowoomba Regional Council (TRC) stated:

> *I believe that in our CBD, in the city, we have quite a few electric cars now—probably 20, which is not that many really. I think the cost will be the impediment, and the ability to recharge them will be an impediment as well. I do not think there will be a great take-up in the region of our council. We have a city and 36 townships—a large region. We straddle both. My thought is that in the city, yes, there will be a certain uptake but out in the region not so much.*[175]

In regard to charging stations, Townsville City Council (TCC) added:

> *We have two high-speed chargers, one paid for by the state and one paid for by Townsville City Council. We have five other smaller chargers for the city. Two on the superhighway have minimal use. However, they are free to use to encourage people to come into the city to recharge. It is all about educating and having the opportunity to do that with the new models coming online. It is still a chicken-and-egg sort of process. It is a transitioning process. We put ourselves in that space so we can accommodate those who wish to invest in those types of vehicles.*[176]

Several stakeholders called for rural, remote and regional Queensland to be considered specifically in relation to planning for the electrification of the transport network. For example, the AADA stated:

> *Our members also make up a significant part of the economy in regional, rural and remote Australia. We think that the impact of electrification on those areas needs to be considered as fully as the impacts for highly urbanised capital cities. Similarly, the development of charging infrastructure needs to include regional and rural corridors at the same time as the urban cores.*[177]

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[173] Submission 7, p 2.

[174] Submission 7, p 7.

[175] Public hearing transcript, Brisbane, 25 February 2019, p 3.

[176] Public hearing transcript, Brisbane, 25 February 2019, p 3.

[177] Submission 8, p 3.

The AADA cautioned against using data from overseas to make planning decisions, particularly those derived from highly urbanised environments, because 'in Australia we have a much greater dichotomy between highly urbanised urban centres and rural and remote Australia'.[178] NatRoad also noted that products developed overseas are not marketed in Australia because of the cost of adapting them for Australian conditions.[179]

The AADA continued:

> *The policy responses and even the technological responses required for those two environments are quite sharply different to our mind. Consequently, when taking up those lessons they need to be put into the context that what is required in Birdsville is not necessarily required in the centre of Brisbane.*
>
> *…*
>
> *… the adoption of the infrastructure to support both electric and autonomous vehicles runs the risk that it will be very rich around urban areas and around heavy traffic freight corridors, but it will create areas of lack where both those aspects are not present. You could be entrenching disadvantage both in infrastructure and economic opportunity if that is not addressed from a policy perspective before the problem manifests itself.*[180]

AgForce also sought reassurance that any advances in technology would be carefully considered 'to ensure positive outcomes for all regions', not just cities or traffic corridors:

> *For instance, access to recharge points, repair and mechanical services, GPS accuracy and unmarked/unpaved surfaces all present challenges that will need to be addressed for applicability in rural areas.*[181]

DTMR has recognised that any benefits of transport technology need to be maximised for passenger and freight transport throughout rural, regional and urban Queensland.[182] In this regard, DTMR provided the following information in regard to its planning for rural and regional Queensland as part of its regional transport plan (RTP) process:

> *On the issues more generally about how these opportunities are going to be experienced and how we are considering the options and benefits that transport technologies provide regional areas, you might be aware that, currently, the Department of Transport and Main Roads is developing a series of regional transport plans. These transport plans have involved a high degree of consultation, engagement and partnership at that local level—so local governments working hand in glove with state agencies, including the Department of Transport and Main Roads.*
>
> *We are looking at developing a series of RTPs that cover the Far North, North-West, Northern and Central-West. The Mackay-Isaac-Whitsunday RTP has already been released. It was released last year as a draft consultation document. That can give you a little bit of a flavour of what these regional transport plans look like. There is also the Fitzroy, South-West, Darling Downs and SEQ, which will cover the north coast, metropolitan and south coast.*

178 Public hearing transcript, Brisbane, 12 November 2018, p 12.

179 Submission 3, p 4.

180 Public hearing transcript, Brisbane, 12 November 2018, p 12.

181 Submission 14, p 6.

182 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 3.

These documents are not just about the here and now in terms of what the transport system looks like, but they are an opportunity to look into the future as well. How are these new technologies going to provide opportunities for these regional areas on a very specific case-by-case basis? What is happening in the region? What are the region's characteristics? What are the social issues? What are the economic issues? What are the environmental issues and how do we tailor a future-looking transport system that actually meets that local community's needs? That is really the work that is being progressed through the RTPs.[183]

Committee comment

Ensuring adequate charging infrastructure is in place and supported across the road network is a significant challenge for governments. The committee notes that the challenges increase in a country like Australia with vast distances between population centres. Submitters pointed to the fact that the infrastructure needs to be in place now to support uptake of new transport technologies and that the public needs to be educated about the vehicles as well as the charging infrastructure that supports them.

Of key concern to the committee, as highlighted in several sections of this report, is that social equity in terms of the availability and accessibility of transport options is achieved for all Queenslanders regardless of where they live and drive.

Recommendation 4

The committee recommends the Queensland Government consider how it can support infrastructure for new transport technologies in rural, remote and regional Queensland to ensure no Queenslander is disadvantaged in relation to access to electric vehicles and the infrastructure required to support them.

4.1.5 Road funding model

This section is relevant to both electrification of the transport network and other emerging transport technologies, such as CAVs.

Submitters discussed the structural changes to the road funding model that are arising from emerging transport technologies and that will continue to impact the national economy—at an increasing rate—due to declining tax revenue.[184] DTMR put it bluntly, stating that '[r]oad revenues will be impacted with the increasing uptake of CAVs and EVs'.[185] DTMR continued:

Currently, all levels of government receive revenue from road and other transport users which contributes to the provision of transport infrastructure. For example, local governments collect revenues from parking infringements, whereas state and territory governments are responsible for licensing, registration and traffic infringements and the Commonwealth receives revenue from fuel excise.

Fuel tax revenue, which accounts for 45 per cent of road related revenues, is continuing to decline due to improvements in fuel efficiency of light vehicles, changes in travel preferences and the introduction of EVs. Other road related revenue such as registration and licensing remain the only significant source of growth but are highly likely to be impacted in the future with the adoption of CAVs.[186]

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183 Public hearing transcript, Brisbane, 29 October 2018, p 4.

184 Brisbane Residents United, submission 13; Transurban, submission 17; Department of Transport and Main Roads, submission 4; Brisbane City Council, submission 2; National Road Transport Authority, submission 3.

185 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 15.

186 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 15.

Transurban also reported that fuel efficient vehicles and the advent of the EV is currently eroding the century-old fuel excise road funding system and that the road funding model required imminent reform. Transurban explained:

> *Australia needs to reform its road funding model to provide a fair and sustainable system that is built on a principle of those who benefit, pay. This will allow us to invest and use the infrastructure more efficiently and provide a revenue stream that is aligned with actual road use.*
>
> *For many years, the need for road funding reform has been gaining momentum. Nationally significant bodies such as Infrastructure Australia, the Productivity Commission, Bureau of Infrastructure, Transport and Regional Economies, the Australian Automotive Association and Infrastructure Partnerships Australia as well as the Henry Tax Review and Harper Review all advocated for change. These groups have highlighted Australia's demographic changes, stretched government budgets, declining fuel excise and the inequity of the current system as worthy triggers for reform.*
>
> *While this groundswell provides impetus for change, without understanding Australians' views and behaviour towards road pricing systems, reform will always remain theoretical.*[187]

RACQ noted the following in its submission in relation to the long-term funding for the construction, operation and maintenance of the road network as EVs reduce government revenue from the fuel excise:

> *Infrastructure Australia has recommended the government replace current funding models with Road User Charging (RUC) models sooner rather than later to avoid retrospective policy and charging changes for non-fuel vehicle owners, and to manage future infrastructure funding as the fleet transitions to non-fuel based technologies, and fuel excise consequently declines.*[188]

Local governments also expressed concern about how they would fund their roads as vehicle ownership becomes more electric and efficient. BCC acknowledged that reducing parking due to the increased use of shared transport will mean reduced revenue for local government.

TRC also expressed concern about how it would fund its roads, given that council was responsible for a significant portion of the road network but received little funding, stating:

> *There is also road user charging. As the road owner, local government … owns 70-something per cent of our roads and we are at the bottom of the funding pile now. The more electric vehicles we have, the less funding of roads comes back to us from the federal government. If we are totally electric, we will have no guaranteed source of funding in local government. We need to be looking at this as a whole. I agree with the member for Callide: in the country it will not be possible for everyone to be using electric vehicles.*[189]

And:

> *That is really looking at how you can move from a pure excise model to a road user charging model that can also bring funding back into the network, whether it be the federal, state or local government network, with the local government having 75 to 80 per cent of the road network across Australia. Whatever changes there are in any model, obviously local government needs to give its fair share of investment.*[190]

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187 Submission 17, p 9.

188 Submission 5, p 5.

189 Public hearing transcript, Brisbane, 25 February 2019, p 7.

190 Public hearing transcript, Brisbane, 25 February 2019, p 3.

Mr Dallaston made the following comments in regard to replacing the traditional fuel excise tax:

> *Petroleum fuels in Australia are currently taxed at 41.2c per litre, plus 10% GST. As electric vehicles do not require petrol, a replacement tax for the fuel excise has often been mooted, most commonly in the form of a tax on vehicle kilometres travelled (VKT tax or Road User Charge). Fuel excise has historically had a Pigovian effect, driving the popularity of more fuel-efficient vehicles and imposing a cost on unnecessary vehicle use. It has also often been seen as unfair, disadvantaging drivers in rural areas who must use more fuel to cover longer distances.*
>
> *A flat federal VKT tax, directly replacing the fuel excise, would not address this disadvantage; but a variable VKT tax would. A higher VKT rate for urban areas would effectively be a congestion charge, discouraging vehicle use in the inner city, while subsidising rural users who drive as a matter of necessity rather than convenience.*[191]

Transurban recommended that 'governments should prepare to transition to an alternative funding model/s to support road infrastructure'.[192] Transurban continued:

> *A significant first step is under way with the Federal Government's Heavy Vehicle Road Reform (HVRR). The HVRR aims to establish a transparent, fair and efficient charging system that invests revenue into road infrastructure to meet user needs. The HVRR is only the first step in reform and we recommend the following should also be considered:*
>
> 1. *Government progress medium-term planning toward a light vehicle road-user charging scheme in line with the forecast growth in electric vehicle uptake.*
> 2. *Road-user charging frameworks are also designed to meet other transport objectives such as improving travel times and road utilisation.*[193]

RACQ recommended that the Queensland Government:

> *Engage with the Federal Government to progress transport infrastructure and operational funding models including Road User Charging proactively for non-fuel based vehicles to retain sustainable provision of high-quality and affordable transport for community members as the fuel excise revenue decreases.*[194]

From the heavy vehicle perspective, NatRoad discussed 'mass distance location charging':

> *There was a regulatory impact statement issued by the department about moving to a pay-as-you-go system that has those characteristics rather than the current system, which relies on a mix of excise tax and registration fees. The user pays idea must completely displace what we have now in order to be efficient.*
>
> *The regulatory impact statement unfortunately had a few lacuna or omissions. There was no real investigation of what a community service obligation would look like. There was no real investigation of how you treat toll roads. We do not think you should pay a mass-distance charge and at the same time pay a toll—you are paying twice. There was also no discussion in that regulatory impact statement about local government individual charging. There are more omissions at this time than there are matters of substance that we can agree on. It is certainly ultimately the model we would like to move towards but we think in the meantime there should be an independent price regulator that is established federally that can bring together all of the arguments, fill in those gaps that we just talked about and have a role in establishing a mass-distance charging price that can be done fairly taking into account road tolling, taking into*

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191 Submission 19, p 3.

192 Submission 17, p 10.

193 Submission 17, p 10.

194 Submission 5, p 1.

account landside port charges and other matters that will require a great deal of investigation. What does the community service obligation look like? Once we pay tax how much of a road does that buy? Those are questions that need to be thoroughly and thoughtfully investigated rather than having the system introduced with the objectives that it has without that detail preceding the system's introduction. We think it is some time away. It is an objective which we thoroughly support, but the devil is in the detail.[195]

DTMR provided the following information on progress in the area of road funding:

Current and future changes in the transport sector and in technology will require all levels of government to reconsider how transport users are charged for their use and how these charges are linked to investments in the network, so that funding remains equitable and sustainable into the future.

There have been numerous independent calls for a move towards cost reflective road user charging in recent years, including the Productivity Commission Inquiry into Public Infrastructure in 2014, the Competition Policy (Harper) Review of 2015 and Infrastructure Australia in 2016.

Given this interest in cost reflective road user charging, at the end of 2015 the Council of Australian Governments (COAG) asked the Transport and Infrastructure Council to lead efforts to improve the efficiency of road services by accelerating heavy vehicle road reform and investigating high-level benefits, costs and options to introduce cost reflective road pricing for all vehicles.

To progress this agenda a Land Transport Market Reform (LTMR) Steering Committee (the Committee) has been established with officer-level representatives across the federal, state and territory governments, the Australian Local Government Association and the National Transport Commission. Queensland is actively engaged in this work including relevant committees and working groups.[196]

Committee comment

The committee notes that a number of submitters share the view that the emergence of new transport technologies, particularly EVs, will significantly impact how governments fund the construction, operation and maintenance of the road network. Submitters called for governments to take action now on addressing the road funding model in Australia. The committee notes the work already being done in this area, including by the LTMR Steering Committee.

While the committee also acknowledges that the federal government is the key player in coordinating the restructure of the road funding model, the committee encourages the Queensland Government to take a leadership role to ensure that the matters raised in this section of the report, including the view that road user charging for non-fuel based vehicles is a viable alternative to the current fuel excise model, are considered and acted upon now.

[195] Public hearing transcript, Brisbane, 29 January 2019, pp 5-6.

[196] Department of Transport and Main Roads, correspondence dated 14 May 2020, pp 15-16.

Recommendation 5

Whilst acknowledging that this is a national issue, the committee recommends that the Queensland Government take a leadership role in regard to the restructure of the road funding model to ensure that the matters raised by submitters during the inquiry are considered.

4.2 Readiness of the network for changes to the heavy vehicle and freight sector

4.2.1 Charging infrastructure for heavy vehicles

NatRoad reported several barriers to the adoption of alternatively fuelled vehicles, particularly the lack of infrastructure for EVs for long-haul vehicles and the amount of time required for recharging. Barriers include lower energy density, higher price, reduced driving range (or payload penalty), lower thermal efficiency, and limited availability of fuel or refuelling facilities.[197]

DTMR was also of the view that the freight sector may face unique challenges in that long-haul heavy vehicles will require fast-charging infrastructure, which may be different for personal transport vehicles operating in urban environments. DTMR advised:

> *Heavy vehicles, such as buses and trucks used for freight, may have different charging profiles to passenger vehicles depending on their typical route length and operating times. Overnight AC charging is likely to be sufficient to provide enough charge to facilitate typical daily routes for short-haul and urban electric heavy vehicles. Long-haul heavy vehicles are likely to be more dependent on fast-charging infrastructure, at least initially, in combination with internal combustion engine and fuel cell range-extenders.*[198]

NatRoad stated that infrastructure planning was essential to accommodate any shift to alternatively fuelled vehicles and that the infrastructure should reflect the needs of the road freight industry.[199] NatRoad highlighted the importance of planning for the needs of the freight industry:

> *The extent to which those infrastructure plans accommodate a move by light vehicle manufacturers to electric or hybrid vehicles is a separate question to the adoption of electric or other alternative fuelled vehicles by the freight industry. The freight industry is likely to be a late adopter of alternatively fuelled vehicles.*[200]

The National Heavy Vehicle Regulator (NHVR) also highlighted the following in terms of barriers for all types of alternatively fuelled heavy vehicles:

> *Fuel distribution is always going to be the big question. If you move to anything where you are required to fill up a tank on a vehicle, a line haul run between Brisbane and Melbourne, you need somewhere in between to potentially fill that vehicle up unless you are going to put sufficient fuel tanks on that vehicle to fuel you from end to end. If you do take your full journey's worth of fuel so that you can fuel up at your own depots at either end you then cop weight penalties as well. Access to refuelling points is going to be the big part. Having reviewed previous hearings transcripts, it is the same with electric vehicles. Whilst Queensland has the electric vehicle super highway up the east coast of Queensland, being able to get that out into the regional areas potentially may be something that holds back the electric vehicle side of it as well.*[201]

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197 Submission 3, p 3; See article by Heid et al, 'What's sparking electric vehicle adoption in the truck industry', (2017) https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/whats-sparking-electric-vehicle-adoption-in-the-truck-industry.

198 Submission 4, p 9.

199 Submission 3, p 3, 4.

200 Submission 3, p 4.

201 Public hearing transcript, Brisbane, 29 January 2019, p 5.

NatRoad supported this view:

> *The studies into energy use in Australia clearly show that diesel enjoys a virtual monopoly in fuelling heavy freight vehicles and there are economic or operational compromises for others, including the driving range issue or a reduction in the load that you can carry, lower thermal efficiency and limited availability of fuel or fuelling facilities. The lack of refuelling facilities is also one matter that will hinder Australia in the rollout of electric light vehicles at the same speed as in Europe, because those refuelling centres are absolutely integral to the rollout of electric vehicles. Most heavy electric vehicles are still only prototypes.*[202]

The committee notes the comments of the ALC in section 3.6 that the Australian freight industry is keen to electrify its fleet. To improve the readiness of the heavy vehicle transport network for the expected increase in EVs over the coming years, the ALC recommended:

1. The Queensland Government seek to provide low interest finance to companies in order to install electric vehicle charging stations.

   Further policies the Queensland Government could seek to implement could involve providing incentives for freight operators to install charging equipment at their distribution centres and warehouse facilities. These incentives could include, for example, a low interest loan and rebates on electricity used to power the vehicle.[203]

2. The Queensland Government work to develop City Deals with the Commonwealth Government that further develop charging infrastructure and encourage planning regimes favourable to electric vehicle use.

   ALC believes that the Commonwealth Government City Deals can be used to encourage fund recipients to plan for the future use of electric freight vehicles, notably with regard to recharging infrastructure. City Deals may also be used to incentivise the provision of electric vehicle only loading facilities in metropolitan areas, allow electric vehicles to utilise bus lanes and/or transit lanes and to establish adequate recycling facilities for used electric vehicle batteries.[204]

RACQ also recommended:

> *Engage with public transport providers and freight companies to identify opportunities to transition suitable vehicles/routes to electric or hybrid vehicles.*[205]

In response to these suggestions, particularly about government providing incentives for freight operators to install charging equipment at their distribution centres and warehouse facilities, the department advised the following:

> *The Queensland Government has determined that Queensland should play an active role promoting Low and Zero Emission Vehicle (LZEV) charging and refuelling stations through the release of* The Future is Electric: Queensland's Electric Vehicle Strategy *(EV Strategy).*
>
> *The strategic intent of the EV Strategy, Queensland Freight Strategy, and other policies in development, such as the Department of Transport and Main Roads' Zero Net Emissions Roadmap, is to inform more detailed planning and policy development including future considerations around LZEVs and supporting infrastructure on key transport routes including freight networks.*

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202 Public hearing transcript, Brisbane, 29 January 2019, p 5.

203 Submission 23, p 12.

204 Submission 23, p 12.

205 Submission 5, p 1.

The department is committed to working with industry, including the consideration of low interest finance and rebates, to realise the long-term goals of reduced emissions and decreased transport costs, and their adoption of alternate fuel sources as they become economically viable.[206]

Committee comment

The committee notes stakeholder comments in relation to the particular needs of the heavy vehicle industry and freight sector, including the provision of charging infrastructure for long-haul journeys, particularly in regional areas. The committee is pleased to see the Queensland Government's commitment to working with industry and encourages the government to continue to identify opportunities to support the electrification of Australia's heavy vehicle fleet to ensure that the adoption of electrification by this sector is not delayed due to inadequate infrastructure.

[206] Department of Transport and Main Roads, correspondence dated 30 June 2020, p 1.

5 Challenges and opportunities impacting future transport networks in Queensland

5.1 Introduction

Engineers Australia summarised the future of the transport network as 'automated, electric, connected, shared' and that it requires a 'focus on sustainability, productivity and affordability'.[207] They also stated that this technology was already available but remained 'unattainable to the masses due to price and the under-development of the automated public vehicle transport network'.[208] BCC also stated that automated vehicles will have a price premium over the next few decades compared to conventional vehicles, which would suggest a focus on commercial and fleet-based ownership at least initially.[209]

Further challenges are addressed in section 5.4 below.

DTMR considered that, '[a]longside economic growth and demographic change, emerging technologies and trends are likely to cause a profound transformation to Queensland's transport system'.[210]

The technologies most likely to impact transport networks into the future include increasing automation (EVs, automated vehicles and drone technology), increasingly connected/cooperative systems (and associated issues relating to technology, data privacy and data access), and changes to service delivery models and trends (moving towards shared mobility, personalised transport and the sharing economy).[211]

DTMR stated that 'technology is driving innovation, opportunity and transformation' and that '[n]ew emerging technologies and shared transport services have the potential to profoundly benefit Queensland's transport system and its customers'.[212] However, DTMR also reported that these developments present challenges that will 'test the ability of government to effectively respond to change and satisfy customer needs and expectations, now and into the future'.[213] DTMR summarised those challenges as follows:

> *… technology can disrupt and adversely impact existing systems. Significant changes in transport technology and service models could potentially result in increased travel demand, more road congestion, declining government revenues, rising costs and employment impacts.*[214]

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207 Submission 25, p 4.

208 Submission 25, p 7.

209 Submission 2, p 4.

210 Public hearing transcript, Brisbane, 29 October 2018, p 2.

211 Submission 4, p 10; Department of Transport and Main Roads, public hearing transcript, Brisbane, 29 October 2018, p 2.

212 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 10.

213 Submission 4, p 10.

214 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 10.

Other submitters also addressed how emerging transport technologies would cause 'disruption'. For example, the Taxi Council of Queensland (TCQ) stated that 'the introduction of autonomous vehicles will likely constitute the most significant disruption to prevailing operational and business paradigms that stakeholders within the personalised transport sector will have ever experienced'.[215] The MTAQ considered that its industry was 'about to face its greatest level of disruption since the inception of the motor car itself'.[216] MTAQ continued:

> *We will see a huge shift from combustion engines to electric vehicles. Additionally, autonomous vehicle technology and the use of artificial intelligence will underpin the future of the automotive value chain, changing our entire industry.*[217]

RACQ summarised that this transport disruption would be about the shift from motoring to a broader mobility paradigm and that the focus should be on identifying and evaluating how transport technologies can be integrated into the Queensland transport network.[218]

MTAQ emphasised the important role that governments would play in managing this disruption:

> *There will be significant disruptions that will need to be managed by all governments by developing enabling statutory frameworks to facilitate and regulate the implementation and operation of electric powered and autonomously operated vehicles.*[219]

iMOVE discussed the opportunities that new and emerging technologies and the access to data would provide but noted that the national 'mobility task' and 'freight task' were growing much faster than the capacity of the current transport network. Unless this 'mismatch' was resolved, according to iMOVE, a 'serious decline in national and state productivity' could occur.[220]

To assist with these challenges, the committee notes the TIC's *National Policy Framework for Land Transport Technology* (the NPF) and its purpose in providing a national policy approach to developing and adopting emerging transport technologies.[221] One of the seven policy principles of the NPF is to provide guidance to Queensland and other jurisdictions to manage disruption, encourage innovation and respond to emerging transport technology.[222] In regard to the NPF and its accompanying action plan, DTMR advised:

> *It is underpinned by an extensive program of policy, regulatory and technical work involving a range of national transport bodies including the National Transport Commission (NTC) and Austroads, in partnership with Commonwealth and state and territory jurisdictions. Many industry organisations have partnered with agencies to deliver project-level NPF activities. Several of Queensland's flagship projects to trial new transport technologies are being delivered as part of the NPF Action Plan.*[223]

Section 5.5 below provides more commentary on how governments are managing the issues that arise from these new technologies, as well as suggestions for addressing the issues.

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215 Submission 27, pp 1-2.

216 Public hearing transcript, Brisbane, 12 November 2018, p 8.

217 Public hearing transcript, Brisbane, 12 November 2018, p 8.

218 Public hearing transcript, Brisbane, 11 February 2019, p 2.

219 Submission 7, p 1.

220 Submission 9, p 1.

221 Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 'National Policy Framework for Land Transport Technology', https://www.infrastructure.gov.au/transport/land-transport-technology/national-policy-framework-Land-transport-technology.aspx.

222 Submission 4, p 10.

223 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 11.

This chapter identifies emerging and new transport technologies, including CAVs (EVs and electric mobility devices are discussed in section 3.3) and drones; and emerging and new transport business models, which include Mobility as a Service (MaaS), demand responsive transport, vehicle/asset sharing or subscription schemes, and ridesharing. The challenges for the implementation of both the technologies and the business models are also addressed in this chapter.

5.2 Emerging and new transport technologies

5.2.1 Connected and automated vehicles

There are five levels of automation in terms of vehicles. These are outlined below:

> *Levels 1 and 2 vehicles – sometimes known as 'partially automated' vehicles – are those with a limited automated features that may assist the driver with speed or steering control, for example, lane-keep assist or adaptive cruise control.*
>
> *Level 3 vehicles – sometimes known as 'conditionally automated' vehicles – not only manage speed and steering control, but is also responsible for monitoring the road environment, requiring the human driver to perform a 'fallback' role.*
>
> *Level 4 vehicles – sometimes known as 'highly automated' vehicles – are capable of operating in some driving modes without a human ready to take control. These driving modes may be limited by factors such as speed, weather conditions, or access to high quality digital mapping.*
>
> *Level 5 vehicles – sometimes known as 'fully automated' vehicles – are capable of operating in all driving modes and are truly 'driverless'.*[224]

Today's vehicles may have some automation, but are generally at a level 2 that requires 'eyes and hands on'. Highly and fully automated vehicles (AVs) are not currently for sale in Australia or for public road use. DTMR advised that it is 'working towards levels 3 or "conditional automation" vehicles where the vehicle can drive itself some of the time and level 4 "high automation" where the vehicle will work autonomously but the driver can take back control'. DTMR described level 5 as 'full automation' where the driver is never required to take action as the vehicle drives itself at all times.[225]

DTMR provided more information in relation to the characteristics of different levels of automation in vehicles:

> *Automated vehicle:*
>
> - *operates in isolation to others*
> - *uses sensors to see where other vehicles are*
> - *uses radar, camera, lidar and ultrasonic sensors*
> - *limited detection range.*
>
> *Connected vehicle:*
>
> - *communicates with nearby vehicles and infrastructure*
> - *sees around corners*
> - *knows what other connected vehicles are doing*

[224] Australian Government, Department of Infrastructure, Transport, Cities and Regional Development, Factsheet, p 2, https://www.infrastructure.gov.au/transport/land-transport-technology/files/FAQ-connected_and_automated_vehicles.pdf.

[225] Department of Transport and Main Roads, *Cooperative and Automated Vehicle Initiative CAVI,* https://www.tmr.qld.gov.au/About-us/News-and-media/News-and-media-frequently-asked-questions/Cooperative-and-Automated-Vehicle-Initiative-CAVI.

- *operates in cooperation with others.*

Connected automated vehicle (CAV):

- *uses both automated and cooperative vehicle capabilities*
- *vehicle senses/receives message, ie. safety hazard*
- *vehicle automatically performs corrective task.*[226]

DTMR provided the following definition of 'connected vehicles':

> *'Connected vehicles' is the term used to describe vehicles with a direct communications link (usually through wireless Internet connectivity) to other vehicles, roadside infrastructure (like traffic signals and signs) and/or service providers and devices. It covers passenger vehicle, buses and heavy vehicle satellite-based communication systems as well as Cooperative Intelligent Transport Systems (C-ITS) technologies, and digital short-range communications systems.*[227]

DTMR clarified the difference between connected vehicles and automated vehicles as follows:

> *The difference between automated vehicles and connected vehicles is that connected vehicles exchange messages with other vehicles and also with our roadside infrastructure. They use a form of wi-fi communication that enables information to be exchanged that is generally related to safety critical situations, and that information is relayed 10 times a second. It gives advice about how the driver can keep safe and alert about changes in traffic conditions. This technology is not currently available routinely in vehicles in Australia. It has been rolled out progressively in Japan, Korea and 17 countries in Europe. There is a C-Roads pilot occurring in Europe at the moment and over 20 states in the United States are also trialling this technology.*
>
> *It does not take away the control of the vehicle from the driver. It provides information for them to take an action generally related to a safety action, so it is normally related to a hazardous situation that might occur. We have a number of applications that we are looking at piloting here in Queensland in Ipswich in our pilot. Those warnings could include slow or stopped vehicles ahead, congestion ahead, vehicle/pedestrian conflicts where the pedestrian might not be entirely visible and red-light warnings et cetera.*[228]

RACQ expressed its support for the NTC's reforms (as identified in sections 2.3.3 and 5.1 above) that are focussed on ensuring AVs can operate safely and legally on Australian roads in the coming years. However, RACQ was of the view that these 'vehicles pose several risks to the long-term operation of the transport network if not integrated into a supportive transport system' with several matters needing to be addressed to achieve optimal use, including allaying public concerns about the technology to increase public trust and the uptake of technology; connectivity; and maintenance of infrastructure and road design.[229] These matters are discussed in more detail in section 5.4.2 below.

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[226] Department of Transport and Main Roads, *Cooperative and Automated Vehicle Initiative CAVI*, https://www.tmr.qld.gov.au/About-us/News-and-media/News-and-media-frequently-asked-questions/Cooperative-and-Automated-Vehicle-Initiative-CAVI. NB: LIdAR is 'Light Detection and Ranging technology.

[227] Department of Transport and Main Roads, correspondence dated 14 May 2020, p 12.

[228] Public hearing transcript, Brisbane, 29 October 2018, p 5.

[229] Submission 5, p 4.

DTMR is currently delivering the Cooperative and Automated Vehicle Initiative (CAVI) 'to help prepare for the arrival of new vehicle technologies with safety, mobility and environmental benefits on Queensland roads'.[230] DTMR explained further:

> *CAVI will lay the technical foundations for the next generation of smart transport infrastructure. This will focus on:*
>
> - *developing policy to support positive outcomes*
> - *supporting regulation, legislation, licensing, possible certification and testing*
> - *managing infrastructure, data and system integration*
> - *conducting pilot projects and feasibility studies.*[231]

The CAVI project timeframe is 2017 to 2021.[232]

In terms of the timeframe to advance to levels 3, 4 and 5, DTMR advised that it depended on how the technology evolves but that '[i]t is early days'. DTMR continued:

> *The level 3 vehicles may appear on the market in the next few years. Most people are seeing level 5 vehicles as being at least a decade or longer away except for in particular circumstances where you might have a cordoned off area, a highly controlled environment, where the vehicle is not conflicting with other users.*[233]

The committee notes that DTMR is considering the broader planning issues, such as behavioural issues around what could happen in a future scenario where AVs are the main method of road based transport, including ownership models, likelihood of people being more willing to spend time in AVs than they do now travelling in vehicles, as well as around design, security, safety, congestion and parking matters.[234]

5.2.1.1 Connected and automated heavy vehicles

According to DTMR, the heavy vehicle industry would be an 'early adopter' of automated technologies, including the application of truck platooning, 'where multiple automated (or semi-automated) vehicles are connected to a lead vehicle through wireless vehicle-to-vehicle communication'. The benefit of this technology is that vehicles can travel more closely together 'experiencing reduced wind resistance, leading to reduced fuel consumption and emissions'. DTMR cited testing of cooperative truck platooning in Japan, stating that in addition to reduced driver costs, truck platooning also demonstrated an average reduction in fuel consumption of between eight per cent and 15 per cent depending on the gap between vehicles, with 'benefits to both the leading and trailing trucks'. DTMR noted that truck platooning is likely to be restricted to multi-lane freeway standard roads, which 'will have limited application on South East Queensland motorways'. The department also indicated that the interaction between different vehicles, including with platooning heavy vehicles, is 'yet to be properly understood'.[235]

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230 Department of Main Roads, *Cooperative and Automated Vehicle Initiative,* https://www.qld.gov.au/transport/projects/cavi/cavi-project.

231 Department of Main Roads, *Cooperative and Automated Vehicle Initiative,* https://www.qld.gov.au/transport/projects/cavi/cavi-project.

232 Department of Main Roads, *Cooperative and Automated Vehicle Initiative,* https://www.qld.gov.au/transport/projects/cavi/cavi-project.

233 Public hearing transcript, Brisbane, 29 October 2018, p 6.

234 Public hearing transcript, Brisbane, 29 October 2018, p 7.

235 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 12.

The NHVR agreed that the freight industry would be early adopters and in fact was already adopting new technologies:

> *The heavy vehicle industry is a commercial industry responsible for delivering the national road freight task. Being a commercially focused industry, operators of heavy vehicles are often looking for new and innovative ways to deliver the freight task more effectively, more efficiently and in the safest manner possible. Because of this, operators are already adopting technology that allows them to do this.*[236]

The NHVR highlighted the safety benefits that technology based solutions have delivered in the past, and will continue to deliver into the future:

> *While there is much interest, and rightly so, at looking to the future to ensure that our community is ready for innovation such as autonomous vehicles and the safety and mobility benefits that they will provide, it is also important we do not forget that vehicle technology can deliver, and is delivering, safety and productivity improvements today.*
>
> *Historically, a number of technology based solutions have been introduced to the vehicle fleet to improve the safety of vehicles. Supplementary restraint systems such as airbags and seatbelt pretensioners are something we are all well aware of as they are in our everyday cars. Additionally, technology driven improvements to vehicle combinations have emerged through the performance based standards, or PBS, scheme. These have seen notable changes in how we deliver the freight task. One such example is the innovative A-double combination that was born right here in Queensland and which is now delivering freight improvements across the country. Here in Queensland it has changed the way we deliver freight between Toowoomba and the Port of Brisbane*.[237]

The NHVR provided the following information on current technologies that are being used by the heavy vehicle industry and their benefit of reducing road trauma:

> *Looking forward, there are a number of emerging technologies that are becoming available now or are under development and have the ability to reduce the number and severity of road crashes—systems such as stability control, which will become mandatory for a number of heavy vehicles starting from July this year through to 2021; autonomous emergency breaking; blind spot detection systems and the like. These technology based systems, while not replacing the role of a driver in a heavy vehicle, are available and are capable of assisting those drivers in being safer and have an important role to play in reducing road trauma.*[238]

However, NatRoad was of the opposite view to DTMR and NHVR and believed that Australia would be a late adopter of alternatively fuelled heavy vehicles as '[m]any products or innovative models developed overseas are not marketed in Australia because of the cost of adaptation for local conditions (heat, dust, larger mass requirements, and road conditions in particular)'.[239] In this regard, the committee notes submitter comments about the need for technology to be developed for Australian conditions.

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[236] Public hearing transcript, Brisbane, 29 January 2019, p 1.

[237] Public hearing transcript, Brisbane, 29 January 2019, pp 1, 2.

[238] Public hearing transcript, Brisbane, 29 January 2019, p 2.

[239] Submission 3, p 4.

5.2.1.2 Benefits of connected and automated vehicles

Stakeholders have identified the following benefits of AVs and CAVs and their driver aid technology, with DTMR stating that the benefits of connected vehicles are likely to be wider than those delivered by autonomous vehicles.[240] Society is already experiencing some of the benefits of CAVs, including improved safety through automatic emergency braking, lane keeping assistance and automated/assisted parking. The future expected benefits of CAVs include:

- improving mobility and access for mobility-challenged members of the community
- improving infrastructure use and capacity of roads (platooning allows smaller headways, higher speeds, and more efficient use of existing lanes), thereby potentially reducing congestion
- changing ownership models (shift away from private vehicle ownership to shared mobility, potentially increasing ridesharing/high occupancy vehicles and the ability to provide transport to areas that are currently underserviced)
- decreasing transport costs (removing/avoiding driver related costs)
- reducing vehicle emissions (promoting alternatives to the single occupant private vehicle travel mode)
- providing timely traveller information, infotainment and remote diagnostics, as well as maintenance and software upgrades.[241]

iMOVE summarised the benefits to be gained from emerging transport technologies, as safer transport, congestion reduction, transport equity, access for regional communities, and more liveable of cities.[242] In addition, according to iMOVE, the use of increased transport and mobility opportunities offer Queensland the opportunity to increase business development and employment and attract investment.[243]

Transurban supported this view, stating that new transport technologies will bring opportunities for more efficient and safer mobility, reductions in greenhouse gas emissions, and large-scale transport service integration.[244] Transurban also stated that it expects vehicle connectivity between vehicles to reduce congestion by 'ensuring vehicles are well coordinated with synchronised traffic flows'.[245]

Queensland Advocacy Incorporated (QAI) supported the view that AVs have the potential to provide mobility to groups such as people with a disability, as well as older people and children who currently have difficulty accessing transport services. This could have a positive flow-on effect on labour force participation for people with a disability. It would also enable older people who no longer drive to continue to visit the doctor, shop, and participate in activities.[246] BCC supported this view, stating that '[t]he most obvious benefit of AVs is the increase in safety, however, there will also be significantly improved mobility for seniors, non-drivers and people with disability'.[247]

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240 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 12.

241 iMOVE, submission 9, p 3; Transurban, submission 17, p 11; David Dallaston, submission 19, p 3; Taxi Council Queensland, submission 27, p 2; Department of Transport and Main Roads, correspondence dated 14 May 2020, p 12.

242 Submission 9, p 1.

243 Submission 9, p 1.

244 Submission 17, p 6.

245 Submission 17, p 15.

246 Submission 21, p 5.

247 Submission 2, p 5.

According to BCC, AVs could also play a significant role in fulfilling the 'last mile' task in public transport 'where demand cannot justify the provision of bus and rail services'.[248]

One of the most significant benefits of CAVs could be increased safety for road users. For Intelligent Transport Systems Australia (ITS Australia), safety should be the foundation on which CAVs are developed. ITS Australia considered CAV technology to be a pathway to safer, more efficient and sustainable transport and, as such, supported the early and widespread adoption of advance driver aid technologies, including lane keeping, blind spot warning, adaptive cruise control, and automatic braking.[249]

ITS Australia also advised that new transport technologies could provide significant benefit to rural and regional drivers, particularly relating to safety:

> *I think we face a real crisis in our rural areas with regard to road safety and the incidences in our rural areas. There is an absolute opportunity for transport technology to play a role in improving safety in our rural and remote areas. This is not about a solution that is just for the wealthy city folk. This is about a solution that can really enhance safety for rural and regional people.*
>
> *We have vehicle technology that can help monitor driver alertness and to make sure that drivers are reminded to stay alert and awake. We have lane-keep assist technology that can help on long drives to keep drivers safe. We also have connected vehicle technology that can assist particularly at rail-crossing intersections in remote and rural areas as well as in city areas. Safety is an absolute imperative. I think we can bring great benefits into the bush with this technology.*[250]

RCC also highlighted the benefits of AV technology for island communities, including the opportunity to have AVs deployed to water-based transport such as barges and ferries, which 'in the future may provide economical and efficient transport options for island based communities such as the Redlands Coast islands'.[251]

In this regard, the committee notes Queensland's first full on-road trial of an autonomous vehicle on Karragarra Island in Moreton Bay that uses an automated EasyMile shuttle vehicle. The trial commenced on December 2019 and concluded in March 2020. RACQ provided the committee with the following outcomes and learnings from the trial:

> *Shuttle operations:*
>
> - *The Shuttle travelled 1,444 km with 854 passengers, and a perfect safety record.*
> - *Unnecessary emergency stops were relatively common and posed a risk of falls for standing passengers and the safety chaperone.*
> - *Emergency stops were caused by environmental obstacles such as:*
>   - *Vehicles passing too close to the shuttle (on-coming or during overtaking)*
>   - *Grass growing into the roadway*
>   - *Non-fixed Items close to the roads' edge such as roadworks signage or rubbish bins placed out for collection.*

248 Submission 2, p 5.

249 Submission 22, p 1.

250 Public hearing transcript, Brisbane, 25 March 2019, p 2.

251 Submission 11, p 4.

User behaviour and perceptions:

- *Those using the shuttle were predominantly older (50% aged over 51 years) and were non-residents (86%).*
- *Journey purpose was to explore the island (43%) and experience the shuttle (93%).*
- *The majority of users agreed or strongly agreed that the shuttle was useful, easy to use, enjoyable to use, safe, and trustworthy.*[252]

The committee notes DTMR's advice that, based on research and trials of vehicle technology, it is becoming 'increasingly apparent that automated vehicles will require connected vehicle technologies to realise their full range of benefits'.[253]

Stakeholders raised a number of challenges associated with CAVs. These are addressed in section 5.4 below.

5.2.2 Autonomous aircraft

Autonomous aircraft are also an emerging transport technology. The term 'drone' is used to describe a variety of remotely operated and/or autonomous vehicles. DTMR is expecting drones to grow into a significant industry over the coming decades and advised that Queensland accounts for 30 per cent of the Australian drone industry.[254] Given this growth, DTMR advised the following in regards to planning for this emerging technology:

> *Queensland has the largest sector with respect to investigating drone opportunities and it is certainly something that we are monitoring. We are engaging with industry. Queensland is the only state in Australia to have a drone strategy, so from a whole-of-government perspective there is a lot of effort being put into this area looking at issues around privacy, for example, looking at issues around safety, working with CASA.*[255]

DTMR explained its use of aerial drones called Remotely Piloted Aircraft Systems (RPAS) as follows:

> *Drones are being used extensively by TMR to support and enhance technical activities such as geographic survey, asset management, structural inspections, road corridor surveys, traffic monitoring, disaster response and aerial photography/videography.*
>
> *Complementary technologies, including artificial intelligence, machine learning and video analytics are capitalising on the different perspectives that drone cameras can offer and make data analysis faster. Live-streaming from drones is enabling subject matter experts to remotely participate in assessments, facilitate faster decisions, ensure accurate data is collected and minimise site-based risks.*[256]

DTMR expanded on the Queensland Government's use of drones:

> *The department uses drones for asset inspections. They are incredibly useful to remotely monitor our bridges. We use robotic trucks to go into small culverts that we would not be able to get a person into. We can look at towers that are otherwise inaccessible or accessible only with a large amount of cost. We have also been looking at traffic management, an eye in the sky and what it is telling us. That is as far as our actual use of drones goes. It is more an extension of a hobby dronist, just off-the-shelf drones with high-quality gear added. Other departments are using*

252 RACQ, correspondence dated 28 May 2020, pp 1-2.

253 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 12.

254 Submission 4, p12; public hearing transcript, Brisbane, 29 October 2018, p 10.

255 Public hearing transcript, Brisbane, 29 October 2018, p 10.

256 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 12.

them as well for checking out things on the Barrier Reef, biological and ecological process mapping and things like that.[257]

Drones are also being developed to perform traditional transport functions, such as detecting freight and passenger movement and 'to enhance maintenance and operations on the state's road, rail and maritime system'.[258]

DTMR has also commissioned modelling studies to test how automated vehicles, including drones, and other emerging technologies may affect the transport system and preliminary findings include:

… that drones have the potential to help positive health outcomes in remote communities by reducing the cost and delay to transport test samples, equipment and medication; that drone transport services are not likely to relieve congestion on Queensland's land transport network; that the scale of drone transport services would likely be limited by aviation regulation and infrastructure use cases, and the need to balance safety considerations, and the risk with those as well; and that the noise and environmental impacts of drones are currently poorly understood.[259]

DTMR advised that there is considerable debate about how much drones will be used to move passengers and goods in the future and the extent of their impact on road transport networks to reduce congestion and greenhouse gas emissions and improve road safety. DTMR expects that in the short to medium term, drones will be used for 'small parcel and last mile freight delivery' rather than for mainstream passenger transport.[260] DTMR also acknowledged that it could look into how drones could be used for delivering medical supplies between Brisbane and regional locations in Queensland.[261] However, DTMR advised that this technology was still years away:

Dennis has talked about technology issues with regard to sensors for autonomous vehicles on the road. Andrew has talked about regulatory issues with regard to the same and that they are deemed safe. All of those things apply to drones as well as the actual technology. What we have found is that we get a lot of hype in the media with regard to how advanced the technology actually is. In my view, if I see it advertised that there is a successful trial, it is probably still about five years away. I am not going to hold my breath for drones that are used for passenger relay. I think that the primary issue at the moment is payload. They are being used to distribute emergency parcels and things like that. They are very light and they can carry very light things at the moment.

When we are talking about an actual person, we are talking about someone who is prepared to put their whole life in the hands of the technology that is required for an autonomous vehicle with the limitations of the development of all the sensors, radars, LiDARs et cetera. Then we need a legislative regime and the investigation of that to make sure they are not going to fall from the sky onto pedestrians, for example. We need to be really assured that they are going to stay up there, that they know what they are doing and that they are going to land in the right place. We still have some distance to go on that. I think we will see them delivering light parcels before we see them in a commercial perspective. Australia Post and Amazon have spoken about it. I think about two years ago we saw that Amazon was going to do that in Australia. I do not know whether we have seen a parcel delivered yet. It is usually a little bit further away than what they say.[262]

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257 Public hearing transcript, Brisbane, 29 October 2018, p 9.

258 Department of Transport and Main Roads, submission 4, p 3.

259 Public hearing transcript, Brisbane, 15 June 2020, p 3.

260 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 13.

261 Public hearing transcript, Brisbane, 15 June 2020, p 2.

262 Public hearing transcript, Brisbane, 29 October 2018, p 10.

However, QRC pointed to how quickly drone technology is being implemented and used for a variety of functions:

> *The other really quickly growing space is around drones and remote sensing—for example, the ability to manage your rehabilitation and check your infrastructure remotely. The volume of information that came out of Townsville and the north-west with the flooding event recently was extraordinary. It was almost real-time. You could fly those lines with drones and have a much better sense. You did not have to wait until the water receded and it was safe for engineers to drive in and have a look. The speed and the volume of information that is coming in from some of those technologies is really shaking up the way the whole industry operates.*[263]

An example of the commercial use of drones in Queensland includes Wing Aviation (Wing) operating in Logan, Brisbane since 2019:

> *Wing delivers small consumable products to customers from coffee and tea through to small hardware supplies.*[264]

In terms of drone use for passenger transport, the committee is aware of work being done in this area including Uber Elevate. It is explained as follows:

> *In 2023, Uber plans to give riders the option of an affordable share flight. Uber is working closely with federal and local policymakers to develop an aerial offering that's safe, quiet, and environmentally conscious, and that extends the reach of existing transportation options.*[265]

It is also reported that Melbourne will be the pilot site for Uber air taxi.[266]

In regard to supporting the drone industry, the Queensland Government announced that it was investing $14.5 million in the establishment of a commercial drone flight testing facility at Cloncurry Airport with construction commencing in June 2020 and the Flight Test Range (FTR) due to be operational by late 2020. The government advised further:

> *The FTR will initially seek a flight range of 25 kilometres and up to 6000 feet (above ground level). It is anticipated that the flight airspace will be incrementally/gradually expanded subject to users' requirements and in consultation and with approval of air safety regulators.*
>
> *It is expected Boeing Defence Australia will be the first user of the facility, to undertake the final testing and demonstration flights of the advanced autonomy platform developed under a related program supported through Advance Queensland funding.*
>
> *Market development activities including engaging with a number of UAS developers as potential users of the facility is well underway. Potential users have requested confidentiality until they have made commercial commitments to sign up to the use of facilities.*
>
> *In the coming years, another key user group of the FTR will be the autonomous aerial systems development partners with the Defence Cooperative Research Centre for Trusted Autonomous Systems (headquartered in Brisbane).*
>
> *The facility will also be available to support Queensland government agencies, universities and research organisations to support research, innovation and development of UAS technology and their application in defence, government service delivery and commercial/civilian sectors.*

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263 Public hearing transcript, Brisbane, 25 February 2019, p 4.

264 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 13.

265 Uber Elevate, https://www.uber.com/au/en/elevate/uberair/.

266 Australian Aviation, 'Uber Air Taxis Heading to Melbourne', June 12, 2019, https://australianaviation.com.au/2019/06/uber-air-taxis-heading-to-melbourne/.

> *Users will pay a fee for the use of FTR facility and services provided by the FTR operator. Fees will depend on the nature and complexity of the test operation and will be set with the department's approval. The FTR operator will be paid a management fee for its services.*
>
> *The success and ongoing market opportunities of the UAS FTR will be assessed towards the end of the initial operating period and options for the facility's future will be put forward for the government's consideration.*[267]

Stakeholders stated that regulating the drone industry was vital and that this required the involvement of all levels of government. DTMR acknowledged that regulating drone use is 'quite a challenge for us', but that CASA has primary responsibility for the flight element of drone use.[268] In this regard, CASA has developed rules regarding drones, as well as registration.[269]

DTMR confirmed that it has a regulatory role to play when drones interact with traffic and on road corridors. For example, there are offences around collisions with vehicles that DTMR is responsible for administering. DTMR advised that it is considering the impacts of this type of interaction, as well as the use of land based drones. Australia Post, for example, has been given approval to trial land-based drones.[270]

DTMR advised that the Queensland Government launched its Queensland Drones Strategy in 2018 to promote the development of the Queensland drone industry. Under the strategy, DTMR is responsible for 'monitoring and evaluating other jurisdictions' use and testing of new drone applications and technology'.[271]

The International Aerospace Law & Policy Group (IALPG), a specialist law practice focussed on aviation and space law, discussed the opportunities that autonomous aircraft could bring to the transport sector and its contribution to making Australian cities more 'liveable', including:

- reducing the pressure on the traditional road transport systems
- reducing passenger commutes
- increasing delivery efficiencies.[272]

The IALPG argued that it would not take long to implement a fully integrated urban air mobility network. Furthermore, IALPG advised that it will address and posit solutions to international legal issues arising as a result of 'newly emerging unmanned (pilotless) aircraft technologies, systems, and applications (explicitly including unmanned aerial taxis, carriage of cargo, and related liability concerns)'.[273]

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267 Department of Transport and Main Roads, answer to question taken on notice on 15 June 2020, 23 June 2020.

268 Public hearing transcript, Brisbane, 29 October 2018, p 9.

269 Australian Government, Civil Aviation Safety Authority, 'Drones – The rules', https://www.casa.gov.au/drones/rules.

270 Public hearing transcript, Brisbane, 29 October 2018, p 9.

271 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 20.

272 Submission 24, p 2.

273 Submission 24, p 2.

The IALPG cautioned against thinking of RPAS as purely aviation technology and separate from other forms of transport infrastructure:

> *RPAS and other autonomous aircraft systems will be integrated into the existing infrastructure of our cities and transport networks far greater than traditional aviation has been. Hence, the need for a complete rethink about transport and a move away from a reliance on roads. Governments should be wary not to invest too heavily in road networks to meet the supposed needs of the coming decades.*
>
> *…*
>
> *Further, in our opinion there must be cross pollination between regular road transport regulators and air safety regulators going forward so emerging technologies can take their rightful place in the evolution of transport in Australia rather than a continued conceptual segregation. Australia, and Queensland particularly, should embrace the challenges and freedoms a clean slate with transport might permit.*
>
> *As cited by the recent Commonwealth's Senate Rural and Regional Affairs and Transport References Committee's Report into the "Current and future regulatory requirements that impact on the safe commercial and recreational use of Remotely Pilots Aircraft Systems (RPAS), Unmanned Aerial Systems (UAS) and associated systems" we argued for (and the Committee recognised a need for) a clear whole of government approach to creating a vision and policy framework for RPAS. This must allow each relevant portfolio at Commonwealth, state and territory levels input to ensure their drivers for such change form part of the motivation and plans for such a mindset change.*
>
> *The entire traffic system as a whole in Australia should start now looking above the ground just as UAE and Singapore are doing, as a realistic option for the future as an economical and cleaner future way of bringing the country closer to the urban and the people of Australia closer to each other as never before.*[274]

On the other side of the argument that drones have the potential to create more 'liveable' cities, BCC expressed concerned about the adverse impact on communities from using drone technology for home deliveries:

> *The increase in online shopping is prompting parcel delivery organisations to look at a wide variety of new delivery methods such as out-of-hours delivery robots. While this will be of benefit to consumers, these delivery methods may have impacts on the amenity of neighbourhoods.*[275]

DTMR advised that Airservices Australia has responsibility, as the agency for Air Traffic Management, for aircraft noise, including drone noise. The committee also notes DTMR's advice that the Australian Government's Department of Infrastructure, Transport, Regional Development and Communications is 'currently conducting a review to determine the appropriate scope and breadth of future noise regulation in relation to drones'.[276]

The Privacy Commissioner raised privacy-related considerations in relation to drone technology:

> *It is complex, because some agencies like local and state departments are actively using drones for monitoring infrastructure and the police have a fleet. Local government has one for hire to smaller local governments through the LGAQ. We do regulate the data flows, privacy and right to access, so RTI applies to that and the Public Records Act and law enforcement access. To date there are gaps. I think the Premier's department did a strategy on drones and that has been*

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274 Submission 24, pp 2, 3. NB: in-text reference has been removed. Refer to original submission for more information.

275 Submission 2, p 5.

276 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 13.

publicly released. They are looking at privacy in that context. There are wider public nuisance questions beyond just information privacy involved with drones. The safety aspect is regulated by CASA. When the private sector uses them, if they have a $3 million turnover then the federal jurisdiction kicks in. Right now the biggest gap is small business which is under that threshold as well as the individual use of drones.

…

Frankly, you can now buy a very sophisticated kit for under a few thousand dollars that has privacy as well as safety issues that perhaps need to be further addressed. I think CASA has extra funding for regulating the space, but the next step is using them for delivery purposes or more commercial purposes. That should fall within the Commonwealth jurisdiction. I know there is one local government that has regulated and forced registration of a certain size of drone, because one of the problems is identifying who is operating it before you even look at the information flows. There are certainly filming and audio recording possibilities. I believe that some drones have the opposite of noise cancellation so that you could pick up conversations as well. Geospatial, visual and recording all converge there, and there could be personal information.[277]

In relation to the illegal use of drone technology over public gatherings and critical infrastructure, the Privacy Commissioner advised:

I believe the CASA regulations already prohibit that. For example, the Commonwealth Games security arrangements had technology to detect possible incursions of the airspace by drones and interference with some of the aviation around certain infrastructure. I am not totally privy to that. I was not involved in the security operations. There are certainly regulations around critical infrastructure and public spaces to try and stop that. Whether they are adequate is probably a question that is live. I believe that in correctional facilities they use things like blocking technology to stop drones ever flying around correctional facilities. There are technological solutions and, if you like, drone 'guns' that shoot radio frequencies to knock them out of the sky. There are some law enforcement areas that have used birds—eagles or something like that—to take them down. They could be more heavily regulated. I think risk assessments are done by law enforcement agencies and they do have technological solutions for some aspects. Again, whether they are totally adequate is another question. I believe for filming purposes people sometimes bend the rules, and because that individual use is not regulated there may be some gaps.[278]

The committee notes that the Queensland Law Reform Commission (QLRC) released its report, 'Review of Queensland's laws relating to civil surveillance and the protection of privacy in the context of current and emerging technologies' in February 2020. The QLRC report was tabled by the Attorney-General and Minister for Justice in June 2020. The purpose of the report was to consider and recommend whether Queensland should consider legislation to appropriately protect the privacy of individuals in the context of civil surveillance technologies. The report includes a draft Bill which recommends new criminal offences and penalties of up to three years jail, or an $8000 fine, relating to surveillance technology.[279]

[277] Public hearing transcript, Brisbane, 12 November 2018, p 6.

[278] Public hearing transcript, Brisbane, 12 November 2018, p 6.

[279] Queensland Law Reform Commission, Report No 77, 'Review of Queensland's laws relating to civil surveillance and the protection of privacy in the context of current and emerging technologies', February 2020, pp i, 16.

Committee comment

While the committee understands that passenger-carrying drones may still be a number of years away from operation, drones are already in use and serving a variety of purposes in Australia. The committee notes that submitters raised significant concerns in relation to drone technology, including the need for a strong regulatory framework on the use of drones to ensure safety, amenability and privacy, and the committee shared these concerns. The committee acknowledges that CASA has responsibility for drone safety and much of drone regulation and Airservices Australia is responsible for drone noise. From the committee's discussions with CASA, it is confident that CASA is working diligently to ensure appropriate regulations are put in place to protect Australian airspace for commercial drone usage.

However, the committee notes that privacy and the matter of surveillance is a state-based issue. Given this, the committee is pleased to note that the Queensland Government has a drone strategy to address issues relating to drone technology. The committee is also encouraged to see the work of the QLRC and its report into surveillance technology which recommends the introduction of new legislation to address concerns, and the Queensland Government's commitment in this regard.

The committee supports a coordinated approach with state and federal governments working together to develop a strong regulatory framework and address all issues relating to drone technology as raised by submitters during this inquiry process. The committee is of the view that this work should be completed as soon as possible and supports the Queensland Government's continued work in this area. In this regard, the committee encourages the Queensland Government to liaise with its federal counterpart to address the matters raised by submitters relating to drone technology that fall within federal jurisdiction.

5.3 Emerging and new transport operational and business models

The introduction of new transport technology, such as EVs, AVs, CAVs, electric mobility devices and drones, will drive changes to transport operational and business models and community behaviour, including creating potential shifts towards ridesharing, demand responsive transport, mobility as a service, vehicle/asset sharing or subscription schemes, and a decrease in patronage of public transport.[280]

These emerging and new transport models and behaviours are discussed in more detail below.

5.3.1 Mobility as a Service and demand responsive transport

DTMR explains MaaS as follows:

> *MaaS embodies a shift away from personally owned modes of transportation and towards aggregated mobility solutions that are consumed as a service. Aggregation looks at bringing together infrastructure, services, technology and information to suit the travel and lifestyle needs of the individual.*
>
> *…*
>
> *MaaS opportunities exist across the whole network. Not only in the South East, but also for regional and remote Queensland. Public transport is an important part of MaaS, however it also describes the whole ecosystem from public transport, to ride-share and bike share, to flexible payment options with subscription and bundled services, to personalised journey planning with an integrated planning, booking and payment platform.*[281]

[280] RACQ, submission 5, p 9; iMOVE, submission 9, p 1.

[281] Department of Transport and Main Roads, correspondence dated 14 May 2020, p 11.

Stakeholders have listed the benefits of MaaS as providing:

- personalised mobility solutions and improved customer choices
- reduced travel costs
- improved liveability and accessibility of cities
- improved sustainability with efficient use of infrastructure and assets
- more opportunities for utilisation of transport
- improved services based on demand and preferences
- ability to provide transport to areas which are currently underserviced (not close to good public transport options)
- strengthened public private relationships
- improved social and environmental outcomes.[282]

Based on recent research, iMOVE stated that 'there is a strong appetite for these services [MaaS and on-demand transport], particularly to those that offer flexibility and convenience through real-time and customised information, and integrated payment systems…'.[283]

ITS Australia advised that MaaS has the potential to provide significant benefits to regional communities:

> *When we look more generally at some public transport solutions around mobility as a service, I think there is a great opportunity in our rural centres to really enhance transport solutions with a layer of connectivity that can help to improve transport accessibility more in regional centres rather than in remote rural areas. In regional centres we can provide a layer of connectivity that can help rural people to access transport and get to jobs and get to the community services that they need.*[284]

Brisbane Residents United stated that '[d]riverless cars are going to revolutionise our public transport system by making it possible for the first time to pick up and deliver small groups of people who are going to close but not the same destination'.[285] They explained further:

> *With the use of computer technology a group of local people will be able to order a car that for example picks four of them up from within a local area within a few minutes and delivers them to four different destinations within the local area. This would lead to many expected and unexpected outcomes. For example public transport would become very responsive to people's needs; if you were transporting a large item you could order a vehicle that allowed you to transport that item easily; elderly people could remain in their homes for longer as they just used this transport to move around their local area; people would get to meet more local people and interact with them.*
>
> *This form of transport would link with longer distance transport options at local transport hubs. It would actually cut down on the amount of local traffic and on the amount of traffic generally as there would be far fewer vehicles on the road.*[286]

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[282] Department of Transport and Main Roads, submission 4, p 11; iMOVE, submission 9, p 2; Intelligent Transport Systems Australia, submission 22, p 1; Engineers Australia, submission 25, p 7.

[283] Submission 9, p 3.

[284] Public hearing transcript, Brisbane, 25 March 2019, p 2.

[285] Submission 13, p 5.

[286] Submission 13, p 5.

QAI expressed the view that the MaaS business model 'seeks to reduce barriers between different transport modes by providing consumers with easy and flexible access to the widest possible range of services'.[287] QAI stated that the model:

> *… could provide an incentive for travelers to move away from private vehicle ownership and make increased use of automated vehicles and public transport as part of a new, flexible approach to travel.*[288]

One submitter discussed the benefits of demand responsive transport:

> *An emerging technological factor, the nature and extent of which is still evolving, is the rapid uptake and Qld government legalisation of 'app'-based bookings for non-taxi on-demand passenger transport services. This has had a significant impact on passenger transport networks, on transport services for people with a disability, and on the community as a whole. The extent of this impact has not yet been fully developed or realised. However, both the long-term history of taxi regulation and evidence from overseas can provide useful insight, warnings, and guidance as to the way forward that will deliver benefits to the entire community – including benefits for those working in the industry, people with disabilities, and the general public – some of whom may not even use the services offered.*[289]

According to Engineers Australia, MaaS is 'largely driven by commercial imperatives which may or may not align with government strategic transport and land use goals'. In this regard, Engineers Australia advocated for government prioritisation of a regulatory environment to support a healthy market for MaaS services to emerge.[290] Refer to section 5.5.2 in regard to suggestions and comments from stakeholders about creating a supportive regulatory environment.

Engineers Australia also considered the role of government should move from one of service provider to 'more of an enabler' in terms of providing information to users of the transport network. Engineers Australia anticipated that users will choose the 'quickest and cheapest paths by various modes' in their particular circumstances. Engineers Australia also considered the government's role is to ensure social equity:

> *What we are concerned about when we look at MaaS being delivered, as you can see with other technologies that come on board the idea of a service provider having control of that framework—which could slant the commercial focus towards the richest pickings. Whilst we see role of government as an enabler, it is also to ensure social equity because it is to ensure we get that balance. We would encourage the government to keep moving forward.*
>
> *The Queensland Department of Main Roads is already working down this path. It is trying to understand how it will deliver mobility as a service in the future. They see that it will change how they do business. The government certainly has a role in ensuring we get an equity of balance in the right model for Queensland.*[291]

[287] Submission 21, p 6.

[288] Submission 21, p 6.

[289] Submission 20, p 6.

[290] Submission 25, p 7.

[291] Public hearing transcript, Brisbane, 25 March 2019, p 4.

The committee notes DTMR's advice that it is 'actively exploring viability of Mobility as a Service in Queensland' and 'currently running a demand responsive transport trial in partnership with Yellow Cabs in Logan'.[292] The demand responsive trial involves:

- registering and booking a trip in advance
- finding people in the area who want to travel around the same time
- picking up in a location near all the homes
- paying a standard low fare no matter how far is travelled
- dropping the passenger off a chosen destination in time for the bus or appointment.[293]

Yellow Cabs advised that at the end of the trial 'TransLink will see whether this form of transport can be rolled out across other locations'.[294]

The committee is also pleased to note DTMR's advice that it 'established the Mobility as a Service Program Management Office to develop governance, assess Queensland's future readiness, engage with customers, industry, government and academia, and explore proofs of concept to gather learnings'. DTMR also advised that, '[a]lthough the concept of MaaS is mature, deployments in Australia are generally at a proof of concept stage with jurisdictions sharing learnings and insights'.[295]

5.3.2 Shared mobility: vehicle ownership, asset sharing, and subscription schemes

According to DTMR, the introduction of CAVs in Australia is expected to change the structure of traditional vehicle ownership to one of increased shared mobility. Car sharing and ride sharing as service delivery models and ownership are expected to experience growth. Each are defined below:

- *car sharing - where people rent a vehicle for a short period, often only a few hours. This model differs from traditional car rental where the car is hired for one day or longer. It is useful for people not wanting to own a car or those with only occasional need for a car. Car sharing offers the opportunity to reduce the number of cars in use, particularly in urban areas, and is primarily focused in higher density areas where people can walk to and from the vehicle when they need it*
- *ride sharing - where shared rides are pre-booked via a smartphone, such as Uber, Lyft, Via and Haxi. Some ride sharing models also allow users to split the cost of a fare with other passengers in the vehicle*[296]

RACQ discussed what the shift from owning a vehicle to accessing one as needed, including using vehicle subscription services, would look like:

> *What we are seeing overseas is a shift towards effectively spotifying your vehicle. It is a shift from ownership to access. It is access that becomes more critically important. When you look at the running costs of vehicles, a lot of the time, particularly in more densely populated systems overseas—for example, in Europe—that have good quality transport, it does not make financial sense to own a vehicle. However, you might want to access one for a weekend trip and so on.*

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292 Submission 4, p 2.

293 Yellow Cabs, *DRT – Demand Responsive Transport*, https://www.yellowcab.com.au/drt-demand-responsive-transport/.

294 Yellow Cabs, *DRT – Demand Responsive Transport*, https://www.yellowcab.com.au/drt-demand-responsive-transport/.

295 Department of Transport and Main Roads, correspondence dated 30 June2020, p 14.

296 Department of Transport and Main Roads, submission 4, p 11.

> *We are seeing vehicle subscription services pop up in the US. There are also a couple of them that are being operated in Australia now where people subscribe. If you want a small vehicle to get around the city, you would subscribe to that. If you want to hand that back and get what my boss would have—a Mustang—to cruise down the coast on the weekend, that option is available to you. The spotification or the vehicle subscription relies on access as opposed to ownership. I see that as being the biggest change in going forward around how we deal with vehicles.*[297]

Transurban stated that this move away from car ownership and towards new shared models of mobility 'is reflected in the declining proportion of young people who hold a driver's licence'.[298] While acknowledging that people in urban and suburban areas might be better off economically from accessing a vehicle when they need one rather than owning one, Transurban stated that it is unclear how ridesharing/carpooling will impact the net vehicle kilometres travelled.[299]

According to RACQ, '[t]hese models can play a role in reaching strategic transport goals, but may also hinder them or create inefficiencies if not strategically managed'.[300] In this regard, RACQ called on the government to collaborate with industry to identify the options to flexibly manage the impacts of these models in a constructive way by and:

> *Evaluat*[e] *a range of policy and regulatory options to encourage emerging transport models and businesses, while flexibly managing their overall network impacts and contributing to shared strategic objectives for the transport network.*[301]

Committee comment

The committee acknowledges the views of submitters that new transport technologies may see the emergence of alternative transport models, particularly a model that shifts from personal vehicle ownership to models that support increased shared mobility. The committee also acknowledges that reduced vehicle ownership would have an impact on different industries in terms of employment, the growth of particular occupations, and the bottom line for many organisations that support the car industry, and supports RACQ's suggestion for government to liaise with industry to identify viable transport models and the network effects of each as transport technology evolves.

The committee understands the work that the Queensland Government has done in preparing Queensland's transport system for the future as part of its Queensland Transport Strategy. The committee also acknowledges that the strategy 'was prepared following comprehensive environmental sounding'.[302]

However, the committee encourage the Queensland Government to consider submitter comments about the potential impacts of future transport models and how they can be supported to ensure social equity for all Queenslanders. In this regard, the committee recommends the Queensland Government undertake modelling on potential new transport models to determine the government's best use of resources and how it will manage the overall transport network impacts into the future.

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297 Public hearing transcript, Brisbane, 11 February 2019, p 5.

298 Submission 17, p 15.

299 Submission 17, p 15.

300 Submission 5, p 8.

301 Submission 5, p 9.

302 Department of Transport and Main Roads, public hearing transcript, Brisbane, 15 June 2020, p 2.

Recommendation 6

The committee recommends the Queensland Government undertake modelling on potential new transport models to determine the government's best use of resources and how it will manage the overall transport network impacts into the future and ensure social equity for all Queenslanders.

5.4 Challenges hindering uptake of CAVs

Despite the benefits of CAVs outlined in section 5.2.1.2 above, stakeholders identified a number of challenges that would need to be addressed with the emergence of CAVs to ensure their ongoing safety and sustainable uptake, including:

- address safety issues to overcome consumer and community resistance from a lack of trust in, and knowledge about, the technology[303]
- deliver enhanced road and transport infrastructure to achieve optimal vehicle operation and connectivity[304]
- ensure secure data systems and privacy protections[305]
- ensure reliability and accessibility of information systems and data[306]
- provide equitable access to transport options[307]
- prevent or mitigate large scale job losses as driving roles across the transport sector become redundant[308]
- address concerns for legal and insurance liabilities if something goes wrong[309]
- overcome delays in introducing the transport technologies on Australia roads due to government policy settings[310]
- address concerns related to new transport technologies having a price premium over the next few decades compared to conventional vehicles, which may present an obstacle to personal vehicle ownership[311]

These issues are discussed in more detail below.

303 Taxi Council of Queensland, submission 27, pp 2-3; RACQ, submission 5, p 5; iMOVE Australia, submission 9, p 2.

304 RACQ, submission 5, p 6.

305 Taxi Council of Queensland, submission 27, pp 2-3.

306 Transurban, submission 17, p 16; Brisbane City Council, submission 2, p 4.

307 See, for example, submission 13.

308 Taxi Council of Queensland, submission 27, pp 2-3.

309 Taxi Council of Queensland, submission 27, pp 2-3.

310 Taxi Council of Queensland, submission 27, pp 2-3.

311 Brisbane City Council, submission 2, p 4.

5.4.1 Safety, public trust and models of implementation

Ensuring the safety of drivers, passengers, and the general public during and after the transition to new and emerging transport technologies was of significant concern to submitters. For example, the Queensland Council of Unions (QCU) expressed 'grave concerns' for public safety in regard to driverless vehicles, particularly with the technology's use in heavy vehicles. QCU stated that a 'substantial investment in equipment and infrastructure' would be needed before the public could be confident in the use of this technology.[312] RACQ expressed the view that the technology poses risks and that the lack of public trust in AV technology, as shown in research it had conducted, was a barrier to the uptake of new transport technologies.[313] RACQ added:

> *When we research our members, only about a third actually trust autonomous technology at the moment. There is a significant public trust and awareness issue out there, and it is important that we take our members and Queenslanders on the journey. We need to be able to demonstrate their safety in those environments—the different use cases. It is not about just running a trial down at some closed network in Brisbane. It is about going out to those communities and expanding the demonstrations of safety and getting people to understand that they could safely be used in their vehicles in particular circumstances.*[314]

ITS Australia supported the suggestion that further consideration be given to 'getting more drivers into vehicles with technologies that make roads safer for all users.[315]

BCC stated that there were technological challenges to achieving safe operation of new transport models on all road environments.[316] BCC indicated that local and state governments needed to start planning 'as it becomes clear what the implications will be for our community and transport network'.[317]

DTMR acknowledged that a lack of understanding and trust in new transport technologies represented a 'roadblock' to their adoption and advised that it was working towards addressing that challenge, stating:

> *Transport technologies have the potential to bring significant opportunities for Queenslanders, by improving the safety, accessibility, efficiency and sustainability of our transport network. Also, we need to keep abreast of developments in the world. It is critical that as a transport industry we research, plan and test these technologies to ensure that they achieve their intended purpose; transport technologies must be deployed in a manner that contributes to the Department of Transport and Main Roads vision for a single integrated transport network accessible to everyone.*
>
> *Importantly, we cannot rely on the development of these technologies alone to transform our transport system. Achieving the benefits of transport technologies requires the widespread understanding and adoption of these technologies by Queenslanders. At a community level, we know that a lack of trust in technology, and difficulty understanding the benefits offered by these new technologies is a potential roadblock in achieving the benefits of transport technologies. As a transport sector, community consultation and engagement has been a historic gap, and is a critical step towards changing behaviour and addressing these concerns.*

312 Submission 15, p 2.

313 Submission 5, p 5.

314 Public hearing transcript, Brisbane, 11 February 2019, p 7.

315 Submission 22, p 2.

316 Submission 2, p 4.

317 Submission 2, p 4.

> *The department published its Queensland Transport Strategy (QTS) in February 2020. The QTS outlines our 30-year vision for the transition of the state's transport system, highlighting the opportunities and benefits that can be achieved through the adoption of current and emerging technologies – by the community and industry.*
>
> *As part of the development of the QTS, the department conducted community consultation to provide the opportunity for every Queenslander to have their say on the changes happening in the transport system. The community consultation period ran from March to June 2019. As part of this, more than 1900 visitors submitted 322 ideas, comments and likes to the dedicated online consultation forum. Thirty-seven formal stakeholder submissions were also received during the consultation period. Feedback indicated that there is community acceptance that change is occurring and that this should be best designed to meet the needs of the community.*
>
> *Over the next 30 years, the transport system will continue to evolve as advancements in transport technology changes how Queenslanders move, how goods are moved, and what services our customers are expecting. As we adopt these technologies, we know that gaps will continue to emerge and the department will be required to be agile in how it responds.*[318]

In regard to safety, ITS Australia highlighted that two of the long-term goals of this new technology are to achieve zero fatalities and fewer serious injuries. This could be achieved through the use of cooperative systems communicating between vehicles, infrastructure, and other users and 'must be pursued'.[319]

For QAI, '[w]hatever new 'Artificial Intelligence is created for transport purposes, it must be guided by Principles that firstly "do no harm" and secondly "enhance humanity"'.[320]

However, the key safety issue stakeholders raised was the transition period when a mix of vehicles with a wide range of automation (vehicles controlled purely by humans to highly automated and driverless vehicles) would be operating on the road simultaneously. According to RACQ, this period had the potential to 'negatively impact the network in the form of reduced efficiency and safety outcomes'.[321]

DTMR advised that regardless of the deployment model adopted for AVs, 'it is inevitable that AVs will operate in a mixed fleet environment for a long period of time'.[322]

The transition period from non-driverless vehicles to driverless vehicles was also raised by Engineers Australia who reported that the research currently underway 'predicts that human-operated vehicles will remain part of our transport systems up to 2050' as '[t]he cost of network upgrades to support a mixed fleet is a major obstruction to automated driverless technology ubiquity'.[323] BCC was also of the view that but that 'significant adoption' was likely to occur after 2040.[324]

iMOVE called for a 'handover' process during the transitional period to 'driverless' vehicles to ensure safety and reduce uncertainty and risk.[325]

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318 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 28.

319 Submission 22, p 5.

320 Submission 21, p 7.

321 Submission 5, p 5.

322 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 2.

323 Engineers Australia, submission 25, p 7.

324 Submission 2, p 4.

325 Submission 9, p 2.

Engineers Australia expressed concern about the risks associated with a 'mixed fleet' and proposed that separating them initially might be the way forward:

> *A mixed fleet presents several risks and opportunities in future transport networks. The length of time to transition to fully autonomous cars may present disruptions from emerging adjacent markets such as autonomous aerial passenger carrying vehicles. If it is too difficult and slow to mix driverless and non-driverless cars, then it may be simpler to make driverless vehicles airborne and physically separate them. In this scenario the land based networks may become less congested but will require significant advancements in airspace management through research in Unmanned Aerial Systems (UAS) Traffic Management (UTM).*[326]

Another submitter, Mr Lacaze, supported this view, advocating for separation between vehicles with and without drivers, stating that the 'greatest efficiencies and safety derive from separated and devoted corridors' rather than shared zones and multi-modal corridor usage.[327]

The priority, according to Engineers Australia, would be to migrate to driverless vehicles in 'closed systems such as rail networks … particularly given the role of expanded mass transit systems in the major cities'. Engineers Australia provided the examples of Copenhagen, Dubai, Seoul and Vancouver that already operate fully autonomous trains on closed systems.[328] The committee notes the Sydney Metro is Australia's first fully automated driverless metro rail system with over 13 metro stations. It opened in May 2019.[329]

TCQ sought the proactive management of 'the transition phase from wholly human driven vehicles to wholly driverless vehicles … to avoid adverse market distortions and minimise unintended social dishevel'.[330] In this regard, TCQ highlighted the importance of government policy prioritising safety during this phase:

> *In TCQ's view, there will be a real and necessary role for Government interventions that prioritise and protect safety, as well as promote level playing field conditions for new and existing market competitors.*[331]

TCQ stated the government's focus should be on safety, security and sustainability when it comes to the deployment of AV for mobility service delivery.[332] To ensure this, TCQ stated:

- *Technical standards for AVs must be harmonised and interoperable across all Australian jurisdictions.*
- *AV technologies must be proven safe through open and publicly reported, exhaustive trials replicating a comprehensive range of all conceivable real world conditions, before progressing to commercial release.*
- *During the transition phase, trials should involve professional personalised transport sector taxi operators.*[333]

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326 Submission 25, p 7.

327 Submission 16, p 6.

328 Submission 25, p 7.

329 New South Wales Government, *Sydney Metro*, https://www.transport.nsw.gov.au/sydney-metro.

330 Submission 27, p 2.

331 Submission 27, p 2.

332 Submission 27, p 3.

333 Submission 27, p 3.

In relation to the heavy vehicle sector, the NHVR shared the following priorities and associated recommendations to address safety concerns:

> *Develop a co-design approach with industry to better utilise technology (including telematics) information to improve safety and efficiency*
>
> - *Recommendation 2.1: Develop a national co-regulatory best-practice model for technology (including telematics) with industry based on performance standards.*
>
> *Better recognising vehicles with increased safety and productivity performance outcomes*
>
> - *Recommendation 3.1: Increase access to the freight network for Performance Based Standards vehicles.*[334]

Although RACQ acknowledged the potential for all types of use of AVs (private/personal ownership, fleet, public transport, freight) appearing on the network concurrently to have negative network impacts, it supported the view that trials and the 'right policy and regulatory settings' could overcome these:[335]

> *It is likely that a mix of all the above models will appear on the network concurrently as the technology continues to develop and is trialled under various conditions. … This would ideally be a high proportion of automated public transport and freight use, supported by moderate to low fleet vehicle use in lower density areas, and only limited use of private/personal automated vehicles. Setting up the public transport system early so it is ready to integrate these vehicles quickly and effectively will capture the discussed benefits when the technology is ready and cost-effective and will prevent future delays which would increase private vehicle use and create broad negative outcomes for the transport network and urban form.*[336]

In this regard, RACQ recommended:

- *Trial emerging and hybrid business models in collaboration with industry to identify viable use cases for transport technologies and network effects.*[337]

Trials are discussed in more detail in section 5.5.1.

DTMR advised that 'a range of preparations are occurring across the Department of Transport and Main Roads to support the safe operation of AVs in a mixed fleet environment' and that it is 'taking a lead role in national regulatory reforms which aim to create an end-to-end regulatory framework to support the deployment of AVs in Australia'.[338] DTMR stated that the regulatory framework needs to be 'technology and deployment model agnostic and support the safe operation of AVS on Australian roads in a mixed fleet environment'.[339]

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334 Submission 26, p 2.

335 Submission 5, p 8.

336 Submission 5, p 8.

337 Submission 5, p 9.

338 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 2.

339 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 2.

DTMR advised further:

> *Australian vehicle fleets are entering a period of significant change due to the emergence of automated, connected and electric vehicles and new models of vehicle ownership and use. Austroads recently completed a report entitled "Future vehicles 2030". Based on a moderate uptake of new technology, this report estimates two per cent of vehicles will have highly automated driving features in 2030; 35 per cent will have automatic electronic braking (AEB) and some active safety features, 30 per cent will have AEB only, and the remainder will have no advanced features. Unlike the very low estimates of automation, it is anticipated that 35 per cent of all vehicles will be connected.*
>
> *Connected vehicle technologies can be used to enhance the safety of the driving task and mixed fleet interactions between human driven and automated vehicles. Under a connected vehicle environment, vehicles can talk to one and other, and infrastructure, which in turn improves the safety of these interactions. Most cars imported into Australia align with European standards, and as such, the Federal Chamber of Automotive Industries' members have advised Austroads to align with European connected vehicle standards. Further to this, Australasian New Car Assessment Program's five-star vehicle rating is aligning with Euro New Car Assessment Programme (NCAP), and Euro NCAP will require connected vehicle technologies by 2025 for a five-star vehicle rating. Alignment with international standards ensures that Australia will not be left behind; ensures national consistency; maximises small and medium business entry to these emerging markets; and reduces costs to consumers.*[340]

The final safety/trust issue relates to the process for dealing with faulty products. One submitter noted that it requires consumers to 'trust that items will perform according to promises made by the manufacturer' and for reliable mechanisms to be in place 'to ensure that faulty products do not remain on the road posing a risk of harm to members of the community'.[341] According to the submitter, this would require:

> *… reliable mechanisms to deal with foreign corporations that manufactured faulty products and then enter Administration or file for bankruptcy leaving faulty products remaining on the road posing a risk of harm to members of the community.*[342]

In regard to this and the issue of liability, DTMR advised:

> *The Queensland Government understands the importance of safety of all transport infrastructure and is committed to maintaining the safety of all Queenslanders.*
>
> *It is recommended all electric vehicle (EV) equipment is installed by a licensed and qualified electrician. Installation of EV charging infrastructure must comply with all relevant local, state, and national standards and regulations. Liability would be assessed on a case-by-case basis.*[343]

ITS Australia suggested that performance based regulation with safety systems that are validated by manufacturers is essential to strengthen the safety of the sector.[344]

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340 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 3.

341 Submission 20, p 16.

342 Submission 20, p 16.

343 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 24.

344 Submission 22, p 5.

In regard to safety, DTMR advised:

> *The proposed regulatory approach will place a range of responsibilities and safety obligations on Automated Driving System Entities (ADSEs), who are the entities that bring AVs to market and are responsible for their safe operation on roads. ADSEs will be required to certify AVs against agreed safety assurance criteria as part of first-supply regulation, under development by the Australian Government. This will include certifying the design and on-road competency of AVs to operate in a mixed fleet environment and safely interact with other road users, including human driven vehicles, motorcyclists, cyclists and pedestrians.*
>
> *Once an AV is approved for the Australian market, ADSEs will have ongoing obligations to maintain the safety of AVs under their control. This will include ensuring AVs operate in a safe and predictable manner and in accordance with relevant road rules. This is no different to the introduction of any new model of vehicle.*[345]

Committee comment

Safety is a key issue when it comes to enhancing public trust in new transport technology, as well ensuring new technologies are integrated into the transport network in a safe and sustainable manner. The committee supports the views of RACQ and ITS Australia that the public must be taken on the journey of increased transport automation as technology advances and that trials should be conducted in a variety of locations and communities to encourage drivers into vehicles with new technologies.

The committee notes the Queensland Government's acknowledgement that traditionally a lack of trust in, and understanding of, new technology and its benefits can present a potential roadblock in achieving the benefits of transport technologies, and the committee is pleased to see the government's work in this regard, particularly in relation to its consultation as part of the development of the 30-year Queensland Transport Strategy.

The committee also acknowledges the concerns of Engineers Australia that the cost of network upgrades to support a mixed fleet may be an obstacle to implementing driverless technology across the state and supports BCC's statement that governments need to start planning for this now. (The issue of infrastructure is discussed in more detail in section 5.4.2).

Submitters also commented on preferred models of implementation in regard to the introduction of automated vehicles on Australian roads, most notably about separating a mixed fleet of non-driverless and driverless vehicles to ensure safety. The committee understands that research is being done in this regard and notes the department's advice that it is undertaking a range of preparations to support the safe operation of AVs in a mixed fleet environment. The committee also notes the department's advice that connected vehicle technology in Australian will need to align with international standards.

However, the committee recommends that the Queensland Government consider submitter comments regarding the best model of implementation for a mixed fleet operating on Queensland roads.

Recommendation 7

The committee recommends that the Queensland Government consider submitter comments regarding the best model of implementation for a mixed fleet operating on Queensland roads.

[345] Department of Transport and Main Roads, correspondence dated 30 June 2020, p 2.

The committee also notes submitter concerns regarding faulty manufacturing and who bears liability and responsibility for repairs and costs, including when fatalities occur. The committee also notes DTMR's advice that liability will be assessed on a case-by-case basis.

The committee recommends that the Queensland Government note submitter concerns regarding faulty manufacturing in vehicles with new transport technologies and considers them during the regulation making process.

Recommendation 8

The committee recommends that the Queensland Government note submitter concerns regarding faulty manufacturing in vehicles with new transport technologies and considers them during the regulation making process.

5.4.2 Infrastructure for optimal vehicle operation and connectivity

Ensuring that infrastructure for optimal vehicle operation was in place, including adequate connectivity, was raised as a key challenge for the consistent uptake of connected and automated vehicle technology. NatRoad expressed the concerning view that 'the pace of technology has outstripped the concomitant investment in infrastructure to accommodate adoption of emerging technology'.[346] NatRoad continued:

> *For example, while automated heavy vehicles have the potential to deliver improvements in safety, we have doubts about the ability of Australia's current infrastructure to support high levels of automation. For example, Lane Keeping Assist systems have the greatest potential for preventing deaths and serious injury but are unlikely to function on roads without highly visible lane markings (poorly maintained or unsealed roads).*[347]

In its report on the infrastructure changes needed to support automated vehicles on rural and metropolitan highways and freeways, Austroads advised that while it was 'still uncertain what *standards* of infrastructure can support CAV operation, there is much stronger consensus on what *types* of infrastructure are required'. Austroads continued:

> *For* active safety system*s that intervene but do not continuously control the vehicle, there is a major focus on the two types of infrastructure most relevant to interpretation of the road by on-board sensors:*
>
> - *line marking, including line types, line quality, curve radius*
> - *traffic signs – position as well as types.*
>
> *For* automated driving *that continuously controls the vehicle, the requirements include those above, and also include:*
>
> - *availability of high-definition mapping*
> - *availability of continuous data connectivity, particularly cellular networks.*
>
> *Both design and quality of infrastructure are important for achieving readiness for safe operation of CAVs.*[348]

346 Submission 3, p 4.

347 Submission 3, pp 4-5. NB: in-text references have been removed. Refer to original source for more information.

348 Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, 2019, p ii.

Austroads found:

- There is a reasonable but not universal level of readiness for active safety systems, but it depends on regularly maintaining the infrastructure to keep it in reasonable condition.[349]
- It is more challenging to achieve readiness for *automated driving*, and fewer roads are fully suitable. Austroads advised:

  In an automating driving *mode, the ADS is in sustained or continuous control, so the vehicle always needs to know a safe and appropriate way to act. This requires roads and weather conditions that are fully suitable for CAV operation.*

  Currently, few roads are fully suitable over extended distances for automated driving*, due to temporary conditions such as roadworks, local degradation of line marking, mobile data coverage blackspots and at-grade intersections on dual carriageways. Some CAVs may be capable of* automated driv*ing on roads on which other AVs are not, depending on their level of technology.*

  Achieving readiness for automated driving *will require a combination of smarter vehicles, changes to infrastructure and improved infrastructure operations and maintenance practices. As a result, this report includes recommendations to progress readiness for CAVs through a structured, incremental approach.*[350]
- Austroads also found that some action can be taken now to improve readiness, but much learning still lies ahead. Austroads recommended a combination of:
  - making changes to infrastructure where there is enough evidence of benefits
  - focused and collaborative exercises to further develop understanding of readiness
  - acting on other opportunities that arise from the operation of CAVs[351]

DTMR advised that it has been working with the Commonwealth on a key priority from the Action Plan—evaluating deployment models and associated costs and benefits of C-ITS vehicle technologies, stating:

In 2016, TMR prepared a benefit-cost assessment assuming the commercial penetration of European compliant connected vehicles and the government roll-out of connected infrastructure within South-East Queensland. In a connected vehicle environment, safety warnings are provided to a driver, such as red-light running warning; and hazard messages, for example a broken-down vehicle, are provided by the vehicle to the traffic management centre. Assuming a moderate penetration of connected vehicles over 30 years, the benefits are $3.5 for every $1 spent. The benefits are likely to be greater, as they do not capture other use-cases – mobility, productivity, emissions - nor the benefits when operating in a mixed human and automated driving environment where older and newer vehicles can talk to one and other. TMR's report will contribute toward Priority 4.1 – benefit cost assessment for connected vehicles – which will be revisited with a national lens. Further, TMR has also drafted with the Federal Department of Infrastructure and Communications a project proposal to explore the policy considerations and

[349] Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, 2019, p ii.

[350] Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, 2019, p iii.

[351] Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, 2019, p iii.

cost benefit analysis for national deployment of connected vehicles. With the involvement of other jurisdictions, it is expected that this project will go to market for delivery shortly.[352]

RACQ agreed that much work needed to be done in relation to infrastructure readiness for AV/CAV technology. In this regard, RACQ identified the three challenges for governments in relation to the infrastructure and the level of connectivity required for AV technology that, if not addressed, could create negative operational outcomes for the transport network in the future. These are listed as 1 to 3 below.

1. Lack of vehicle-to-vehicle and vehicle-to-infrastructure connectivity

RACQ stated:

Automated vehicles interacting with other vehicles and infrastructure using only automated vehicle technology (including LiDar, sensors, cameras, machine learning and artificial intelligence) will still be somewhat reactive in nature to sudden movements or changes to road conditions and will likely be programmed to operate in a risk averse manner when unable to interpret the situation. This, at a minimum, could create operational inefficiencies like large headways. More concerning is trial evidence that is showing automated systems may either not react to road hazards (such as stopped cars ahead) or react in an unpredictable or inappropriate way. In order to combat this and improve operational outcomes, vehicles require interoperable connectivity, and infrastructure and traffic management systems must be installed or retrofitted with connectivity hardware and fleet/network management software.[353]

DTMR identified the lack of connectivity between vehicles as a significant challenge to the adoption of the technology:

There are also some complex technical challenges to overcome for AVs to operate in a mixed road user environment (with other vehicles, cyclists, pedestrians, buses and so on) and many of the core technologies such as sensors have limitations. There is a growing consensus that to overcome these inadequacies such as not being able to see around corners or outside the range of the sensors there will be a requirement for increased connectivity between vehicles with our users and infrastructure.[354]

BCC also raised vehicle connectivity as a challenge and highlighted the uncertainty for governments in terms of planning and design due to the lack of information from vehicle manufacturers of what is required, stating:

AVs may require line markings and signage to be maintained to a higher standard and with a greater consistency across jurisdictions. Data needs to be exchanged between vehicle infrastructure to standard protocols. However, there is no information from the vehicle manufacturing industry to guide governments towards development of new standards. Road authorities are therefore unsure of the scope of future upgrade programs which will ensure other infrastructure is brought up to new standards in a reasonable timeframe.[355]

352 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 14.

353 Submission 5, p 6.

354 Department of Transport and Main Roads, correspondence dated 2 July 2020, p 4.

355 Submission 2, p 4.

DTMR agreed that there is a lack of information and agreed standards and advised that much of these details are still emerging. Through the CAVI, the Queensland Government 'is exploring the digital and physical infrastructure requirements of connected and automated vehicles' with seven projects currently underway.[356] DTMR provided further advice in regards to developing standards for vehicle manufacturers:

> *The European connected vehicle standards have been implemented within CAVI's Ipswich Connected Vehicle Pilot (ICVP) – the largest connected vehicle pilot in Australia.*
>
> *The Department of Transport and Main Roads (TMR) entered into an agreement with vehicle manufacturer Lexus Australia in late 2018, making Lexus the first vehicle manufacturer to announce the testing of European compliant connected vehicle technology in Australia. The Department also entered into an agreement with VEDECOM in mid-2018, a research group led by Renault, to build and test a highly automated vehicle. Earlier this year, CAVI released a report that found that the use of cameras alone is insufficient for an automated vehicle's detection and categorisation of signs and lines, even with expected advancements in camera technology. However, the accuracy is significantly improved with a pre-defined High Definition map. The next stage of this study will be to explore what governments' role will be in the generation and maintenance of this map – especially where there are new roads, or roadworks. The initiative is ongoing through to 2023.*
>
> *Work undertaken recently by Transurban emphasised the need to ensure road signs and lines are of high quality. TMR participates in the Austroads, Future Vehicles and Technology Task Force. This task force has undertaken several research projects to understand the physical infrastructure requirements that support Advanced Driver Assistance Systems (ADAS) and Automated Vehicle covering pavement marking and regulatory fixed and variable signage.*
>
> *This research includes consultation with vehicle manufacturers and monitoring of international standardisation. Investigations are currently preliminary and have not moved to standardisation.*[357]

In terms of the bandwidth required to ensure connectivity of the network, DTMR confirmed that the required bandwidth has 'been secured for the whole of the country, so it is available for all states'.[358]

In regard to connectivity, RACQ recommended that the Queensland government:

> *Engage with manufacturers and the Federal government to ensure automated vehicles have vehicle-to-vehicle and vehicle-to-infrastructure connectivity capability and commit investment to install and upgrade infrastructure connectivity and network management software from both State and Local governments.*[359]

2. Road design and maintenance issues

NatRoad was sceptical about the readiness of the network to support the 'imminent increased use of technology (which would include utilisation of electric heavy vehicles) because of the poor state of Australian roads'.[360]

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356 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 4.

357 Department of Transport and Main Roads, correspondence dated 30 June 2020, pp 4-5.

358 Public hearing transcript, Brisbane, 29 October 2018, p 8.

359 Submission 5, p 2.

360 Submission 3, p 4.

RACQ stated:

> *Testing and incidents have occurred both internationally and* [in] *Australia which have produced insights into how automated vehicles operate on roads which currently meet relatively high safety standards, but create poor operational outcomes in automated vehicles. For example, Transurban's trials in Victoria found the colour and proximity of line markings could 'confuse' the automated driving system, or cause vehicles to behave in an undesired way, such as leaving the motorway due to following off-ramp edge lines when they were supposed to remain on the motorway. A similar programming/sensing issue caused a fatal Tesla incident in the USA when an edge line was worn away and the vehicle followed a nearby off-ramp line and collided with a concrete lane divider. The Victorian trials also found issues with low level automated vehicles' inability to read signs of varying type and location, or reading and reacting to the wrong signs, European picture based, rather than text based, signs are reportedly more easily read.*[361]

As the peak rural group representing the majority of beef, sheep, wool and grain producers in Queensland, AgForce stated that 'Queensland's wealth-producing centers are vastly spread across the state', and thus focussed on the issue of maintenance and road infrastructure:

> *The majority of infrastructure that will be used in the next 50 years has already been built, therefore investment in maintenance activities is paramount. While new infrastructure to suit future needs would be ideal, it is neither cost effective or likely to occur. Given that context, maintaining the current network must form a significant part of any future strategy.*[362]

AgForce was concerned that a lack of maintenance data along with an established evaluation framework 'limits a jurisdiction's ability to effectively prioritise and strategically allocate resources'.[363] AgForce explained:

> *It is critical that these assets* [road and rail infrastructure] *are ready for the vehicles of the present day and maintained to a standard to ensure the readiness for future demands.*[364]

In this regard, AgForce recommended:

> *Establishment of a consistent benchmark to assess Queensland road network performance that consider future load and vehicle requirements, rather than just current usage.*[365]

According to AgForce, an efficient transport network is essential for its members due to the strong relationship between transport costs and the production costs of farming. In this regard, AgForce recommended:

> *Regional transport projects (maintenance and investment) should include supply chain modelling in the cost-benefit analysis evaluation. This could be achieved through the adoption of CSIRO TRANsit modelling.*[366]

DTMR outlined what infrastructure changes relating to design would be required to support CAV technology:

> *In terms of how it might transform our transport system, firstly, the technology and the digital and the road infrastructure needs to support these vehicles in a lot of cases. For connected vehicles that means that a lot of the roadside infrastructure that we have for our intelligent transport systems would need to be upgraded to be able to communicate the information we*

361 Submission 5, p 6.

362 Submission 14, p 4.

363 Submission 14, p 4.

364 Public hearing transcript, Brisbane, 29 January 2019, p 2.

365 Submission 14, p 4.

366 Submission 14, p 6.

know now into the vehicles. That means roadside beacons would be put in place. We have a lot of locations where we have roadside equipment, so it would mean upgrading that type of digital infrastructure. Highly accurate positioning information is required to support these technologies. That is not an issue for Queensland specifically. That is an issue nationally. The federal government announced last year—and have funded—a space based augmentation system, which gives you highly accurate positioning down to a centimetre level. That technology will evolve over the next few years and will have its challenges, particularly across the sort of topography and the vastness of a state like Queensland. There are certainly some challenges ahead in terms of our rural and regional areas.

There is also the issue of communications and how that will occur between the vehicles and roadside infrastructure. That communications has been allocated by the Australian Communications and Media Authority. It is a bandwidth called 5.9 gigahertz. Queensland was instrumental in securing that bandwidth for these purposes. There are other technology options. We will need to understand how industry adopts and deploys those technologies.

There are a number of other platform issues in terms of technology platforms that are required for the connected vehicles, but for automated vehicles that is largely going to be driven by the auto manufacturers. The auto manufacturers will develop those technologies using largely sensors, so they have lasers, cameras and radar. Those sensors all have limitations. Most people in the industry understand now that overcoming those limitations of those sensors will require a connectedness as well because you cannot see beyond the line of sight of those sensors whereas the connected vehicle communications that I talked about before can see around corners and exchange messaging up to 300 metres. It has that situational awareness beyond what the vehicle does.

In terms of our own infrastructure to support that, most impacts are expected to be in terms of line marking and signing. These vehicles do use those various sensors to try to understand the road environment. It is very complex, so they need to get fairly consistent line marking and signage, particularly around speed limits and line marking. We know that large parts of our network do not have line marking at all and a large part of our network does not have sealed pavement, either. In those situations we are yet to see how industry responds to deal with those challenges. They will be largely with industry and we will be assisting where we can in those trials and understanding the information that they need to glean from our network.[367]

DTMR also stated that while certain aspects of the technology would need to be adapted for Australian conditions, the AV technology would be developed offshore. DTMR explained further:

There are certainly aspects of the technology that need to be adapted for our conditions, but, essentially, the technology will be developed offshore, particularly with automated vehicles. We need to understand those developments and what needs to adjust in our local context. Similarly for connected vehicles, there are some well-established European standards that I mentioned before that are now in deployment in Europe. Australia's vehicle fleet is 95 per cent delivered to the European specifications, so it is certainly our view that we should be following the European standards when it comes to connected vehicle technology. This is further reinforced by the Australasian New Car Assessment Program, which is aligned to the European ANCAP program. They have connected vehicle technologies on their road map for 2025.

In terms of the specific technologies, I can go into that detail but there are some specific technologies that Australia needs to address, one of them being space based augmentation systems, which give you high-precision positioning. As you can understand with connected vehicles, you need to know down to a few centimetres the exact position of that vehicle. That is

[367] Public hearing transcript, Brisbane, 29 October 2018, pp 6-7.

something that is unique to Australia. That work is happening under the federal government at the moment through a series of trials, and we are looking at that very closely.

Those types of technology issues are ones that we are taking a particular interest in. Another one is the Security Credential Management System, which is really important in terms of protecting the integrity of the data being exchanged between vehicles. That issues, basically, certificates that anonymised. They are kept on a vaulted location where those certificates are issued from. That ensures that those messages can be trusted. As you can imagine, messages between vehicles that might be at risk of having a collision need to be highly trusted. It is those types of aspects that we are looking at very closely through our Ipswich Connected Vehicle Pilot. We have just worked through all of those issues. Later this year, post COVID, we should be in a position to go live and test those in the field with members of the public.[368]

BCC stated that 'AVs may require line markings and signage to be maintained to a higher standard and with a greater consistency across jurisdictions'.[369]

In this regard, the committee notes the work of the ARRB, the national transport research organisation, which was commissioned by Austroads to undertake research into how ready Australian and New Zealand freeways and highways are for active safety systems and automated driving. The audit included more than eight million individual line segments and over 8000 signs on a 25,000km sample of the road network which represents less than two per cent of the total network.[370] The report audited key quality elements of infrastructure for connected and automated vehicles, including line marking, traffic signs, availability of high-definition mapping, and data connectivity.[371]

The audit found that 'most freeways and highways of Australia and New Zealand can for the most part currently support ADAS operation such as lane-keeping assistance, on roads with good quality lines, higher traffic volumes and good cellular availability'.[372] In regard to line markings, the ARRB advised:

The presence of left and right lane line markings is critical for lane positioning, and there are significant proportions of the road network without edge lines. Increasing the use of edge lines and dividing lines (lane lines and centre lines) will provide a clear immediate benefit for both automated driving and human drivers.

Research suggests that line markings also need to have good contrast with the surrounding pavement for accurate detection. This may be addressed with line maintenance and materials, wider lines (to improve contrast) and consideration for background luminance (of pavement materials), although in many cases contrast and reflectivity are subject to the current lighting conditions.[373]

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368 Public hearing transcript, Brisbane, 15 June 2020, p 6.

369 Submission 2, p 4.

370 Australian Road and Research Board, *Roads that cars can read - are we CAV ready?*, https://www.arrb.com.au/latest-research/roads-that-cars-can-read-are-we-cav-ready.

371 Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, 2019, p ii.

372 Australian Road and Research Board, *Roads that cars can read - are we CAV ready?*, https://www.arrb.com.au/latest-research/roads-that-cars-can-read-are-we-cav-ready.

373 Australian Road and Research Board, *Roads that cars can read - are we CAV ready?*, https://www.arrb.com.au/latest-research/roads-that-cars-can-read-are-we-cav-ready.

In regard to speed limit signs, the audit found:

> *… that speed limit signs can be reliably detected and read using automated methods and in real-time provided they were in the correct position.*[374]

In regard to cellular infrastructure, the audit found:

> *The audit found that cellular infrastructure availability and diversity is generally adequate and not likely to be a limiting factor for CAV operation on major highways where uninterrupted connection is not required.*[375]

Other findings include:

> *The project investigated high-definition (HD) map coverage to support future CAV operation, and found that HD maps are not currently available from any of the mapping providers within Australia and New Zealand. Many providers indicated that these may be ready within the next few years and will significantly enhance the suitability of the network for CAV operation.*[376]

The committee notes the findings in relation to fully automated driving readiness:

> *Fully automated driving readiness will be challenging to achieve, even with advances in CAV technologies and accurate HD maps. Roadworks, temporary lanes, missing lines and lane closures are significant problems for automated vehicle operation. The incidence rate of these conditions is significant.*
>
> *The real-world performance of ADAS and CAV systems is likely to be further diminished in poor lighting, traffic and weather conditions. The audit was based on best-case conditions for automated driving, in ideal conditions and away from intersections and built-up areas.*
>
> *More work needs to be undertaken to assess the suitability of road infrastructure, and specialised and advanced real-time equivalent technologies are best suited for this purpose. The audit found that the performance of this equipment was high, outperforming the post-processed system, and its operation is likely to be consistent with current market and near-market CAV vision system technologies.*[377]

In regard to infrastructure design and maintenance issues, RACQ recommended that the Queensland government:

- *Conduct trials on Queensland roads to identify and rectify infrastructure design and maintenance issues. Engage with the Federal government and other States and territories to update road design and maintenance standards to ensure automated vehicles can operate safely and reliably.*
- *Engage with the Federal government and other States and territories to update road signage, design and maintenance standards to ensure automated vehicles can operate safely and reliably.*

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[374] Australian Road and Research Board, *Roads that cars can read - are we CAV ready?*, https://www.arrb.com.au/latest-research/roads-that-cars-can-read-are-we-cav-ready.

[375] Australian Road and Research Board, *Roads that cars can read - are we CAV ready?*, https://www.arrb.com.au/latest-research/roads-that-cars-can-read-are-we-cav-ready.

[376] Australian Road and Research Board, *Roads that cars can read - are we CAV ready?*, https://www.arrb.com.au/latest-research/roads-that-cars-can-read-are-we-cav-ready.

[377] Australian Road and Research Board, *Roads that cars can read - are we CAV ready?*, https://www.arrb.com.au/latest-research/roads-that-cars-can-read-are-we-cav-ready.

- *Review departmental and procured maintenance policies and procedures to create a more efficient maintenance identification and rectification process, including a priority classification for automated vehicle critical operational elements such as line markings and signage.*[378]

The committee notes that Austroads has recommended the following in relation to management of roads in Australia:

> *Use supplements to update technical standards before updating the Austroads' Guide to Traffic Management and Guide to Road Design*
>
> *Austroads' guides are a critical reference for the design and management of roads in Australia and New Zealand. There is currently not enough information on the detailed requirements of CAVs to update the Guide to Traffic Management or the Guide to Road Design. In the meantime, supplements could be provided to account for the lack of knowledge and continued high rate of change in the requirements of ADS.*
>
> *The priority areas for updated technical guidance are line marking and road signs. Any supplements covering these areas should reflect the learnings of this and other Austroads projects as well as lessons learnt from international practice.*
>
> *Invest in edge lines as a no regrets improvement to infrastructure*
>
> *The need for line marking to delineate both sides of the lane of travel is an area where there is clear detail on what is needed for both active safety systems and automated driving. Edge lines also benefit human drivers, making this a no regrets improvement to infrastructure.*
>
> *Explore opportunities to use new data sources for asset management*
>
> *To use the data being collected by sensing systems on vehicles for asset management purposes:*
>
> - *Austroads should facilitate the exchange of information between member road operators for pilot and trial projects they have undertaken*
> - *Austroads should lead or support a collaborative co-creation process to bring together customers and suppliers to better understand each other's opportunities and challenges – this process would adopt a shared learning and problem-solving approach involving road operators (as customers) and vendors such as automotive manufacturers, equipment manufacturers, data aggregators and data processors.*[379]

3. Urban form/interaction with external environment

RACQ raised a concern about how AVs will interact with their external environment and the importance of road design for this, stating:

> *The Victorian trials similarly found automated vehicles were confused or disrupted by an engineering/art installation designed to reduce noise pollution in a tunnel. Similarly, the design of roads where vehicles interact with humans, either pedestrians or active transport users, will likely require consideration and retrofitting so that interactions ensure both safety and efficiency. For example, a current trend in planning is to design vehicle/pedestrian shared zones. If an automated vehicle is programmed to always stop for humans entering in front, these vehicles*

[378] Submission 5, p 2.

[379] Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, pp iv.

could be taken advantage of by pedestrians and will constantly stop and create congestion/efficiency issues.[380]

DTMR advised that it had been conducting trials in controlled environments, acknowledging that this has meant little interaction with pedestrians and other traffic:

In terms of initial deployment, we have seen that the pilots so far have occurred in highly controlled environments. Generally speaking, other road users are excluded from the trial area. That is obviously not necessarily a sustainable, long-term solution where the vehicles have to share the infrastructure with other road users. There is a lot of testing occurring in that area.

…

First is the trials that have been going on in our state and other jurisdictions. … They have been in environments where they are not interacting with pedestrians or other traffic while the technology is still in its early days. We are willing to make sure that all safety aspects are considered in those early trials. We have done four of those in different locations across the state with a particular company called EasyMile. We are currently working with local governments in South-East Queensland who are looking to trial that further in different locations… Again, safety is the highest consideration there.[381]

Transurban also raised the issue that any infrastructure upgrades 'generally require long lead times and come at significant cost'. Transurban continued:

As a country we urgently need to understand if we have to retrofit sections of Australia's almost eight million square kilometres of local and arterial roads and motorways, which would benefit from CAV-ready technology and infrastructure.[382]

In this regard, Austroads also recommended that work should continue towards readiness ratings for roads, stating:

A readiness assessment framework is achievable, provided there is a focus on the best advice possible and continuous development of the readiness assessment. Assessment could begin with a simple checklist which identified specific items to be addressed to improve the readiness of the assessed road.[383]

DTMR highlighted the uncertainty around the amount of infrastructure investment that will be required as CAVs are introduced and other emerging technologies start being used:

The introduction of CAVs and other emerging technologies is likely to have significant impacts on transport infrastructure, land use and the urban environment more broadly. However, it is not yet clear what level of government support will be required to facilitate the adoption of CAVs. At a minimum, it is likely that some level of investment will be required in C-ITS, including infrastructure that communicates with vehicles.

The eventual adoption of CAVs will drive a significant change in transport demand and therefore the nature of future investment in the network. TMR is currently investigating potential future scenarios and how best to respond.[384]

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380 Submission 5, p 6.

381 Public hearing transcript, Brisbane, 29 October 2018, p 8.

382 Submission 17, p 11.

383 Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, pp iv.

384 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 15.

Committee comment

The committee notes the work and findings of Austroads in regard to the readiness of Australia's roads for automated vehicles, particularly that more is required to achieve readiness for automated driving in Australia. The committee also notes Austroads's statement that while there is uncertainty around what standards of infrastructure will support automated vehicle operation, there is more consensus around the types of infrastructure required to support automated vehicles, including line marking, traffic signs, mapping, and continuous data connectivity.

The committee acknowledges the concerns of submitters raised during the inquiry regarding the infrastructure readiness of Queensland's roads for automated vehicles.

Recommendation 9

The committee recommends the Queensland Government, working with other jurisdictions, continue to address the key concerns raised by submitters about infrastructure, including:

- the ability of automated vehicles to react to road hazards by developing interoperable connectivity, infrastructure, and traffic management systems
- the potential community investment required to install and upgrade infrastructure connectivity and network management software
- conducting trials to identify and rectify infrastructure design and maintenance issues
- working across jurisdictions to update road design and maintenance standards consistently to ensure automated vehicles operate safely and reliably.

The committee notes that if these issues are not addressed, they may negatively impact the public's trust in, and therefore potentially the uptake of, automated vehicles.

5.4.2.1 Connectivity in the regions

Stakeholders also expressed concern about Australia's ability to provide connectivity across all regions. Austroads stated that mobile data connectivity would be required for all levels of CAVs.[385]

ITS Australia explained why it was important to focus on the unique challenges that Australia faces in this area:

> *I think it is really important that we consider the unique Australian context. We have challenges in this space around the geography of Australia. We need to be mindful of doing trials and doing our own work in Australia, not just relying on what happens in North America or what happens in Europe because of the unique geography that impacts on things like mobile coverage and GPS positioning. I think there are solutions that can start to fill those gaps. Just because we cannot have the benefits of this technology in all parts of Australia does not mean that maybe we should not have them in other parts as well. I think technology is a real issue.*[386]

Engineers Australia added:

> *We need to ensure that the country is adequately covered. We are all familiar with the NBN and the rollout of landline technology fibre systems for connectivity. The question then comes to low-orbiting satellites and what they can do and those opportunities. You can get connectivity in terms by using different types of mechanisms.*

[385] Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, p 10.

[386] Public hearing transcript, Brisbane, 25 March 2019, p 5.

As we all know, Australia's challenge is the tyranny of distance. We are a large country. I always use the words that we need to come up with solutions that are best fit for purpose. It is a balance of the demands, the concentration of people and the expectation of usage. By no means does that diminish the fact that it is important—in fact, it is critical—particularly in low-density areas of population that we need to have that ability.[387]

RACQ discussed how new transport technologies may be used in regional, rural and remote Queensland:

However, in Queensland it is a particular transport task and a particular network. We have I think about 180,000 kilometres of roads, 100,000 kilometres of those are unsealed, which is going to present huge challenges for the use of any kind of autonomous vehicle. That said, there are other types of technologies that are being used that actually deliver benefits to rural and remote communities. Particularly I am thinking about heavy vehicles and the use of certain tracking systems and performance based standards that are being used to actually improve the efficiency and productivity of vehicles servicing these communities, also being able to assess the impact on the network.

There is a trial that has just been announced that will enable location based charges, for example, using these technologies which will deliver a greater form of revenue to rural and remote councils to better manage their network while also enabling first and last mile access. Undoubtedly there will be challenges that will need to be overcome, and they are being worked through, but there are technologies at the moment that are delivering benefits. I think in those rural and remote communities the quantum of benefits that could be delivered are largely tied up for the road network in road safety improvements. As we see vehicles become better equipped with technology that mitigates human error, that will actually improve road safety outcomes at a greater proportion in rural and remote communities than you would see in highly urbanised lower speed communities. Being able to account for that error at higher speeds that you see on rural highways is going to deliver a safety benefit. It is a mixed bag.[388]

In its report on infrastructure changes to support automated vehicles on rural and metropolitan highways and freeways, Austroads made specific recommendations on supporting automated driving on rural highways, including:

1. Initiate development of a Concept of Operations for automated driving *on rural highways*

Based on the results of this project, rural highways are an important area of focus for Australian and New Zealand road authorities, but are not being investigated in as much detail as urban motorways

A Concept of Operations provides a practical way of bringing stakeholders together and providing a problem-focussed approach to resolving issues related to automated driving *on rural highways.*

2. Work with others to undertake a pilot project on rural highways

A pilot project would be the learning by doing *result of specific case examples examined in the Concept of Operations (see previous recommendation). Moving beyond desktop exercises into the real-world environment would provide more knowledge for all involved stakeholders as an important next step in creating readiness for* automated driving.[389]

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387 Public hearing transcript, Brisbane, 25 March 2019, p 5.

388 Public hearing transcript, Brisbane, 11 February 2019, p 3.

389 Austroads, *Infrastructure Changes to Support Automated Vehicles on Rural and Metropolitan Highways and Freeways: Project Findings and Recommendations (Module 5)*, 2019, p ii.

DTMR updated the committee on its progress in supporting greater connectivity across Queensland:

> *In terms of the technologies that are required to enable autonomous vehicles—and we also include discussion around connected vehicles, because we will see connected vehicles on our network much sooner than autonomous vehicles—fully autonomous vehicles require a number of supporting technologies. They require GPS positioning systems, obviously—highly accurate positioning systems. There is also a need for a high-definition map and a type of technology that does dead reckoning or exact positioning when you are moving. In terms of the communications technology that is required to support that, it is not necessarily the case in all situations. General communications connectivity is really needed for updates to software et cetera. Having that connectivity via communications along the journey is not always a requirement.*
>
> *From our point of view, we are looking at what we need to do to prepare for the deployment of these technologies into the Queensland environment. We are trialling the Renault Zoe II vehicle that we have developed in concert with QUT and the consortium from France called Vedecom. We are looking at those technologies that need work and attention for wider deployment. It would be true to say that those technologies are very costly at this point, in terms of both technologies to support the vehicle externally and the types of devices that are required on the vehicle itself. In this context, it is unlikely to see widespread deployment of fully autonomous vehicles anytime in the near future, except for very isolated specific circumstances where those supporting technologies can be provided.*
>
> *We think that connected technologies are far more likely to be deployed in the near term. In fact, Europe is progressing with connectivity in its vehicle fleet. They have the ETSI standards—the European technology standards—that they are following in the deployment of that. We heard last November that Volkswagen is now deploying that technology in all new Golf models in the European market.*
>
> *Australia has a lot of preparatory work to do for connected vehicles, particularly from a road authority point of view. Largely, the developments to do with autonomous vehicles are the domain of the manufacturers. We are working closely to understand what we need to do to support both types of technology, but there is a larger task for us in terms of connected technology.*[390]

Committee comment

As Austroads has stated, mobile data connectivity will be required for automated vehicles. Given the 'blackspots' in mobile phone coverage, the committee highlights this as a significant challenge for governments in introducing higher levels of automated vehicles on Australian roads, particularly in locations outside of major urban environments. The committee encourages the Queensland Government to continue working with other jurisdictions to address this issue.

Recommendation 10

The committee recommends the Queensland Government continue working with all Australian governments to ensure that the issue of black spots and mobile phone coverage across Australia is resolved in order to facilitate connectivity for automated vehicles.

[390] Public hearing transcript, Brisbane, 15 June 2020, p 3.

5.4.2.2 Resilience of transport network to extreme weather events

Another infrastructure related matter raised was how to support the transport network to be resilient to the effects of climate change and extreme weather events to ensure any disruption is resolved as quickly as possible so people and freight keep moving.

AgForce was of the view that Queensland's roads are often congested and subject to disruption due to extreme weather events, which has a detrimental impact on moving freight. AgForce was of the view that the current coast route is not suited or designed for freight efficient vehicles. In this regard, AgForce recommended increased:

> *Investment and support for the Inland Queensland Roads Network Strategy (IQRNS), as a means of prioritising investment in key trade routes across inland Queensland.*[391]

DTMR stated that '[b]etter planning and design of infrastructure, early warning sensors and connective vehicle-infrastructure technologies will improve network resilience' and assist in dealing with the effects of climate change, particularly more extreme weather events, and overall contribute to sustainable communities.[392] DTMR continued:

> *Resilience enables fast recovery following a problem or interruption to resume regular operations or services. This reduces disruption to the broader transport network and allows people and freight to keep moving.*
>
> *The transport network will be able to withstand natural disasters and be safe to use as soon as practically possible after such events.*[393]

DTMR advised that it had been providing funding to the ARRB for the last five years to conduct research under the National Asset Management Centre of Excellence (NACoE) for the purpose of:

- reducing the cost of infrastructure in Queensland
- improving sustainability outcomes
- applying best practice from interstate and overseas.[394]

DTMR provided several examples of how this research has created change in infrastructure in Queensland:

> *High Modulus Asphalt (a French innovation) is now being applied on an increasing scale. Approximately 10,000 tonnes was used on the Deagan Deviation on the Gateway Upgrade Project; 50,000 tonnes was used on the Port Road project, and currently 200,000 tonnes is under construction on the Logan Enhancement Project. TMR is now assessing how to allow Enrobés à Module Élevé Class 2 (EME2) as an option for Section D of the Cooroy Curra link.*
>
> *It allows the asphalt base thickness to be reduced by about 20 per cent, while offering superior performance, sustainability and productivity. Compared to conventional asphalt bases, EME2 has higher stiffness, better durability and improved rut and fatigue resistance. With lower emissions during production, fewer non-renewable resources (aggregates) used, and fewer trucks are needed to transport the asphalt, EME2 has a lower environmental impact than conventional heavy duty pavements.*
>
> *As a direct result of NACoE research, crumbed rubber is increasingly being used in seals in several parts of Queensland's road network. TMR has amended its specification to increase the use of crumbed rubber seals. Crumbed rubber seals are believed to be more resilient in cold weather.*

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391 Submission 14, p 5.

392 Submission 4, p 13.

393 Department of Transport and Main Roads, correspondence dated 14 May 2020, pp 13-14.

394 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 14.

TMR has now trialled crumbed rubber open grade asphalt which should deliver a more durable quieter and safer surfacing, and crumbed rubber gap graded asphalt, which provides an economical solution for rehabilitating cracked pavements.[395]

5.4.3 Security of data systems and privacy protections

Another key issue stakeholders raised in regard to new and emerging transport technologies, particularly driver aid technology and driverless cars, is the vast amounts of personal information that will be generated by these technologies, stored and shared in C-ITS and the security of this information. The Office of the Information Commissioner (OIC) defines C-ITS as follows:

C-ITS involves the use of wireless communications and real-time information sharing (between vehicles and with roadside infrastructure, back-end centres and personal devices) to enable vehicle and transport applications to work together.[396]

Submitters acknowledged that data was essential for the operation of new and emerging technologies. For example, iMOVE viewed data as the 'key enabler for many of the advancements needed in our transport systems', improving the following processes:

- *Informing users to give better travel, parking and freight options with real-time, customised information.*
- *Informing operators of transport networks of ways to increase efficiency and get better utilisation of assets.*
- *Informing organisations of ways to optimise their operations (for example capitalising on spare capacity for freight movement / manage fleet) and improving their service to customers.*
- *Informing government to make better policy, and transport infrastructure investment decisions.*[397]

iMOVE also acknowledged the 'challenges of data in transport—sharing, access, securing, curating, owning, standardising, analysing, presenting as just a few examples—are not trivial' but that the 'benefits are substantial and we should ensure that we collectively drive towards maximising them, of course, balancing harmonisation and national and state interests with industry competition'.[398]

DTMR also expressed the view that improved information flow 'optimised' the potential for operation of the transport system as a whole, and specific components of the system'.[399] DTMR acknowledged that 'balancing the privacy of individuals' data against the system wide benefits of effective data sharing regimes is a significant challenge'.[400]

The OIC also acknowledged the benefits that these technologies would provide but called on policy makers to implement legal, policy and operational frameworks that 'mitigate risk of any potential privacy-incursions'.[401] This issue is addressed in Recommendation 11.

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395 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 14.

396 Submission 12, p 2.

397 Submission 9, p 3.

398 Public hearing transcript, Brisbane, 11 February 2019, p 2.

399 Submission 4, p 13.

400 Submission 4, p 13.

401 Submission 12. P 2.

5.4.3.1 Types of data

The OIC lists the types of data that can be produced in new transport technologies as follows:

- *Vehicle registration numbers which are identifiable through automatic plate number recognition systems, law enforcement cameras and safety cameras*
- *Vehicle attributes such as make and model, and vehicle manufacturer information systems including unique identifiers*
- *Accident information retrieval systems*
- *Navigation and driver assistance devices which generate and retain data on location and movements*
- *Bluetooth devices monitored by remote sensors in congestion management and traffic analysis systems*
- *Mobile devices that can generate and store a broad scope and type of data; and*
- *Electronic tags for toll roads, employee systems, rental cars etc., and electronic vehicle and driver log books.*[402]

As noted above, as 'driverless' technology advances, the volume of data it generates will continue to increase, including data that identifies an individual's personal information, real time location, in-car camera footage, audio recording, behaviour patterns, frequently attended locations, consumer preferences (favourite restaurants, music choices), and biometric information (fingerprint entry).[403]

5.4.3.2 Why privacy is important

The OIC provided the example of a domestic violence victim to show how serious privacy breaches in regard to tracking and location can be for individuals. In this regard, OIC considered any access by law enforcement agencies needed to be 'transparent and subject to rigorous oversight through a range of regulatory frameworks, including appropriate legislative constraints on access to this data'.[404]

In response to a question about the risks associated with location information being accessible and the safeguards that should be in place, the Queensland Privacy Commissioner advised:

> *It is very similar to the geospatial data that is recorded on mobile devices right now. We have regimes of access in the telecommunications arena. Most likely, these vehicles might use that or create their own systems for using geospatial satellites. The telecommunications industry does have some fairly good safeguards in place right now. The one thing that has been questioned by civil society has been access to metadata through the telecommunications network. That triangulation of either the network or wi-fi data that is accessible to law enforcement has raised concerns. Under the federal legislation the telcos are required to keep that data for two years. The car data would be similar—the geospatial data would be similar. If it is reliant on the telecommunications data it probably would be regulated by that, otherwise it might have specific legislation.*
>
> *I believe law enforcement and others could get access to that. Law enforcement itself should be subject to safeguards and transparency. Particularly from a right to information perspective, we would advocate for clear records of who is accessing the data created and for what purposes and that there is a lawful basis for accessing it. There are safeguards in the current system which I believe are reasonably adequate. From time to time there have been some misuses of those. The Federal Police have actually misused that and there has been journalist access of metadata.*

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402 Submission 12, pp 2-3.

403 Submission 12, p 3.

404 Submission 12, p 3.

The Queensland Police Service has had some unauthorised access and disclosure of personal data.

There is always some risk that cannot totally be mitigated against. There are safeguards that can be put in place. In the case of metadata, the question is: who will get access to that? In a car or a vehicle perspective most likely insurers may want to get access to locational data. The transport regulators as well as greater law enforcement may want access to it as well. There may be more access points and more data trails that are accessible. There will definitely be increased risk. That is something we need to make sure we put adequate safeguards around.[405]

The Privacy Commissioner also considered whether there was a 'middle ground' between keeping people's private information safe and being able to access the information for effective law enforcement:

That question comes up in a wider set of technology data trails. For autonomous vehicles, there will be a greater volume of data, I believe, and more volume of trails put in. In the case of the Google data that already exists on search engines, if Google is a search engine in your vehicle for finding places or some other technology is the search engine, that data trail probably exists already. Again, there are safeguards that are in place to guard against improper use of that.

Internationally the question of whether they are adequate is raging right now because some of the companies that control the data have an enormous amount of data and the ability to acquire other data through acquisitions of the monopoly of data that we speak of. Potentially, the greater threat might be companies that amass a massive amount of data. I know Google is making a play in the autonomous vehicle space as are others—and Apple. They are all playing in that. If they converge and then have a lot of systems that we are using in our everyday lives as well as our vehicles, I believe there is more risk there from monopoly power and access to data than law enforcement necessarily.

The law enforcement tends to have always had some controls and some reasonable access regime around it. I think it is still important that we have those controls and transparency about who gets access and for what purposes. That is raging in the federal context right now with the My Health account data and access to health records. The Australian public have said quite clearly, 'We're not happy with law enforcement getting access to that data without a warrant.' Whether they get access beyond, say, the telecommunications data that they have without a warrant right now—they can get the metadata without a warrant. I think the regulator should get deidentified data easily without a warrant because that helps them regulate the transport system.

Whether the law enforcement people trying to solve a crime through access to a wide network of vehicles operating get that without a warrant is a question I think the public will have to consider—and the parliaments will have to consider whether that access should be given. That is currently happening in the federal parliament with a bill called the access and assistance legislation that the federal Attorney-General has introduced to the House of Representatives. I believe there are some certain questions to be asked about whether that is appropriate access—compelling companies to break encryption. The adequacy of the controls being placed on that is a real, live question right now. That could well come up in the autonomous vehicle context as well because of the data security and the issues around the public safety.

[405] Public hearing transcript, Brisbane, 12 November 2018, p 2.

> *Most likely, the data will be encrypted and very strong safeguards will be put on the transmission to make sure that those horror movie stories do not play out where people take control of vehicles for nefarious purposes and drive them out of store windows and things like that. The security systems will have to be very robust and most likely there will be legitimate reasons for law enforcement to get behind those for certain things. Putting some adequate safeguards there will be worthwhile I think, and the public would expect that.*[406]

The OIC highlighted that the uptake of technology may be impeded if privacy protection is not upheld in this way, as it could have a detrimental effect on consumer confidence.[407]

DTMR acknowledged that balancing the privacy of individuals' data against the benefits of improved data sharing regimes was 'a significant challenge'.[408]

The OIC stated that personal information could also be used for commercial purposes in relation to marketing consumer items.[409] The AADA also noted this and shared the following from an industry perspective, which highlights what data could be accessed and used:

> *Whether passenger vehicles are merely electric, or autonomous, they will generate vast amounts of data. This includes not just the telematics used in the management and maintenance of the vehicles themselves, but also the data on who drives the vehicle, how they drive it and where to. Other data collected could be on the drivers (and their passengers) themselves, such as where they shop, where they eat, etc. All this data is immensely valuable to advertisers and others, and its availability and use raises thorny questions about privacy and consent. Manufacturers are aware of the value of this data and want control of it*.[410]

In regards to servicing a vehicle, the AADA explained why it was important for car dealers and repairers to have access to information at a reasonable price:

> *The question about access at a commercially reasonable price has to do more with the ability to service the vehicle. Both dealers and the repairers, plus the independent repairers, need to be able to access the correct information, tools and data coming from those vehicles, so that they can actually maintain and repair them as required in a commercially viable manner.*[411]

5.4.3.3 Protecting privacy from illegal access and cyber-attacks

The *Information Privacy Act 2009* (IP Act) recognises the importance of protecting the personal information of individuals. It contains a set of rules or 'privacy principles' that govern how Queensland Government agencies collect, store, use and disclose personal information.[412] These principles require:

- *That the collection of personal information is lawful and fair*
- *That the collection of personal information should be done with the knowledge of the individual*
- *That collection, use and disclosure of personal information are limited to the purpose for which the information was collected*

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406 Public hearing transcript, Brisbane, 12 November 2018, pp 2-3.

407 Submission 12, p 3.

408 Submission 4, p 13.

409 Submission 12, p 3.

410 Submission 8, p 12.

411 Public hearing transcript, Brisbane, 12 November 2018, p 13.

412 Office of the Information Commissioner (Queensland), 'Privacy legislation in Queensland', https://www.oic.qld.gov.au/about/privacy.

- *That documents containing personal information are protected from loss and unauthorised access or use*
- *That personal information is accurate.*[413]

The OIC recommended that these principles be 'embedded in legal, policy and operational systems that involve personal information'. The OIC explained further:

> *This can be aided by undertaking Privacy Impact Assessments (PIAs), which are systematic assessments of a project that identify impacts on the privacy of individuals, and set out recommendations for managing, minimising or eliminating that impact.*
>
> *PIAs should be conducted early in the policy process and should be revisited frequently as projects mature.*[414]

The OIC also raised for consideration the importance of the Right to Information Act 2009 (RTI Act) in relation to privacy and the collection of data:

> *Queensland's RTI Act also needs to be considered in this context as it provides a right of access to government held information. Vast amounts of data could be generated by these new transport technologies which Government may be required to provide access to in accordance with the legislative framework of the RTI Act.*[415]

The Privacy Commissioner was of the view that Queensland 'has one of the best regimes in the world right now' in terms of right to information and freedom of information; however, the Privacy Commissioner advised that '[o]ur information privacy legislation perhaps is not as strong'.[416] He continued:

> *I know the Attorney-General is currently looking at that and has a current review. In terms of RTI, the access to the data and access to personal information versus just the data—say, geospatial of where a car is that might not even be personal—would have to be taken into account by the regulators and the manufacturers because people do have a right to access their data. Some of that will be regulated by the federal legislation.*[417]

The Privacy Commissioner also raised for consideration the impact on protecting conversations within CAVs:

> *Currently, audio recording is regulated in Queensland by the Commonwealth Privacy Act, a different act than our own legislation. The audio recording regime and the surveillance regime that were set up are quite dated and go back to the 1970s, when a lot of this technology was simply not even contemplated let alone in existence. That legislation, I believe, will be subject to review by the Law Reform Commission. There has been a referral for workplace surveillance as well as for technological challenges in surveillance in Queensland. I believe that South Australia has passed the Surveillance Devices Act, which is the most modern in Australia and probably gives better protections in relation to private conversations where someone records the conversation without the knowledge of the other party.*

413 Submission 12, p 4.

414 Submission 12, p 4.

415 Submission 12, p 4.

416 Public hearing transcript, Brisbane, 12 November 2018, p 3.

417 Public hearing transcript, Brisbane, 12 November 2018, p 3.

> *Right now at least one party to a conversation has to be aware that it is being recorded. Theoretically, if your Tesla has an audio mic open or your Google Assistant mic is open all the time they may be breaching Queensland legislation because they are not a party to the conversation. I think it is something that we need to look at, because I do not think the law has kept up with technology. I do think there is a real risk of that occurring and that corporations are hearing conversations or recording them when possibly they should not be. At least they should disclose the fact that it is possible*.[418]

The Privacy Commissioner raised an additional matter for consideration: workplace surveillance of an employee in an employer's vehicle:

> *I believe there is another question with regard to workplace surveillance. If you are driving an employer's vehicle and they get access to all of the data streams as well, there is another question there about whether that should occur, particularly in your off time, your lunch break or something like that, where the car is still live and recording.*[419]

The Privacy Commissioner expressed the view that it was important to keep privacy laws up to date. He explained:

> *The Commonwealth legislation has recently been amended to add a mandatory data breach regime so that people are told if their data is breached and what has been done to fix the problem. We have that on a voluntary basis in this state currently, but that is something I think we should look at.*[420]

Several stakeholders called for the Queensland Government to work towards reducing the risk of cyber-attacks on AVs by ensuring data security and protecting privacy. TCQ recommended 'sophisticated encryption with ongoing monitoring and development, and mandatory public disclosure of all material breaches and failures'. TCQ also sought assurance that the ownership of data related to transport operations remain with the respective transport provider and that the 'ethical question of road safety crash avoidance systems' be resolved before progressing to commercial release.[421]

BCC also raised the issue of cybersecurity and malicious hacking and stated that all levels of government would need to agree 'on the enforcement measures to minimise impact and maintain confidence in the safety of our roads'.[422]

The Privacy Commissioner considered that a 'privacy-by-design approach would be beneficial' in the context of emerging technologies but did not expect that privacy issues would 'get in the way' of their deployment.[423] He explained:

> *The interesting thing about autonomous vehicles is it really combines a great deal of existing technology into one place and into one unit. The challenge is for social media, for example, for Google searches, the geospatial challenges, audio and video recording—all of those things in the surveillance society come to a confluence in one place in a motor vehicle. It is the much the same as is happening in the context of our homes with things like Amazon and Cortana search engines and audio and video recording in the homes. It is almost the sanctity of the vehicle which is worthwhile taking a look at to make sure we get the design right.*[424]

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418 Public hearing transcript, Brisbane, 12 November 2018, p 3.

419 Public hearing transcript, Brisbane, 12 November 2018, p 3.

420 Public hearing transcript, Brisbane, 12 November 2018, p 5.

421 Submission 27, p 3.

422 Submission 2, p 4.

423 Public hearing transcript, Brisbane, 12 November 2018, p 1.

424 Public hearing transcript, Brisbane, 12 November 2018, p 1.

The Privacy Commissioner provided more information on this approach:

> *When we say 'privacy by design', you would do privacy impact assessments for different aspects of an autonomous vehicle. The driver systems and infotainment systems all have to be looked at separately and chopped down and looked at in terms of what data is being collected, for what purpose, what is the lawful basis, what are the controls on that, what are the mitigating steps that you can put in place? For example, you would want good security in an app. You might store the data encrypted and encrypted in transmission so there is no risk of it being intercepted. You might have an audit trail on the access points. You might have a monitoring system using artificial intelligence that says, 'There was an unusual pattern of activity on that data. Let's have a look' and trigger a human flag to have access.*[425]

DTMR advised that it is taking a 'lead role in several national policy reform projects exploring the use of vehicle data in the future' and that, following a review of current privacy frameworks, found that the existing framework in Queensland 'remains appropriate for future vehicle technologies'.[426] In regard to what data will be accessed and for what purpose, DTMR stated:

> *The hallmark of the existing privacy framework is that personal and sensitive information should only be collected as needed and only used for the purpose for which it is collected, unless expressly consented to by the person to which the information related.*[427]

In situations where data relating to AVs needs to be accessed, for example to support liability investigations in the event of a safety breach or to understand the circumstances that led to a crash, DTMR advised that additional information access powers will be required.[428] DTMR advised further:

> *Where personal information is required, new legislative access powers will be needed, and these will be restricted by appropriate privacy protections to ensure information is only collected and used as necessary. Any new information collection powers would be subject to full privacy impact assessments and government consideration.*[429]

In regard to the standards associated with regulating data access from AVs, DTMR advised:

> *Within a connected vehicle environment, the Federal Chamber of Automotive Industries' members have advised Austroads to align with European connected vehicle standards. The European standards are designed with privacy in mind, as well as the constraints of the EU General Data Protection Regulation (GDPR). This Regulation is considered one of the more stringent privacy regulations world-wide. When these standards are in use, connected vehicles hide their identity, and only provide information within a limited range. While the standards enable the technical operation of a connected system under the GDPR, they do not restrict manufacturers or technology developers from collecting or generating their own bespoke location information data sets that could contain or derive personal information.*
>
> *The department is also building its experience in the European standards and the handling of connected and automated vehicle data through the Cooperative and Automated Vehicle Initiative.*
>
> *Automated Vehicle developments are still emerging, and do not yet have a common set of standards to guide outcomes.*[430]

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425 Public hearing transcript, Brisbane, 12 November 2018, p 5.

426 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 6.

427 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 6.

428 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 6.

429 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 6.

430 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 6.

5.4.3.4 National Transport Commission – regulating government access to automated vehicle data

In August 2019, the NTC released a policy paper, *Regulating government access to C-ITS and automated vehicle data*. The NTC reported that stakeholders acknowledge the benefits of information generated by vehicle technology in informing and enhancing government decision making in the following four categories:

- law enforcement
- automated vehicle safety
- traffic management and road safety as part of network operations
- infrastructure and network planning as part of strategic planning.[431]

The NTC reported:

> *Stakeholders also noted the importance of balancing potential improved government decision making and public benefits with sufficient privacy protections for C-ITS and automated vehicle users. There is a risk that broad collection and use by government of this information will be a barrier to the take-up of C-ITS and automated vehicle technology in Australia.*[432]

The NTC identified three categories of new privacy challenges of C-ITS and automated vehicle technology:

> ▪ *Category 1: new data captured by automated vehicle technology.*
>
> *In-cabin cameras and biometric, biological or health sensors are the most likely automated vehicle technologies to create new privacy challenges. Such technologies are either not contained in current vehicles or are limited in use.*
>
> ▪ *Category 2: C-ITS technology may allow for more widespread direct collection of location data by government.*
>
> *The type of data generated by C-ITS technology (speed, location and direction) is broadly similar to data generated by technology contained in current vehicles. However, C-ITS technology still presents new privacy challenges because of how widespread the direct collection of this data by government may be in the future. The risk is therefore not linked to the type of data, but rather the method and potential volume of collection.*
>
> ▪ *Category 3: C-ITS and automated vehicle technology will generate a greater breadth and depth of data.*
>
> *This introduces new privacy challenges because more data is generated and stored, and there is an increased opportunity for data linking by government.*[433]

The NTC considered that C-ITS and automated vehicle technology 'will most likely generate personal information and sensitive information, especially when held by road agencies and law enforcement agencies' and that these agencies would likely 'have access to a wide range of data, and the technical capacity to analyse that data, which could aid identifiability'.[434]

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431 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 3.

432 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 3.

433 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 3.

434 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 3.

Importantly, the NTC considered that the privacy challenges associated with the collection of this information may not be sufficiently addressed under Australia's information access framework for the following reasons:[435]

- *Surveillance device laws are unlikely to place practical restrictions on government collection of personal information.*
- *While privacy principles do not authorise the collection of personal information, they do not restrict (because they allow/permit) direct collection of personal information by government agencies if the information 'is necessary for one or more of its functions or activities'. This facilitates government's increased ability to directly collect C-ITS personal information.*
- *Law enforcement collection, use and disclosure of C-ITS and automated vehicle data may result in increased opportunities for surveillance.*
- *Road transport laws in some jurisdictions contain provisions to facilitate data sharing between road agencies and police.*
- *Requirements to destroy or de-identify personal information may not in practice greatly reduce the amount of personal information held by government. Government may therefore continue to use and disclose the greater breadth and depth of personal information generated by C-ITS and automated vehicle technology once it is collected.*
- *There is inconsistency in the current information access frameworks for government agencies across states and territories.*[436]

The NTC considered several options in relation to both automated vehicle technologies and C-ITS but agreed on the following option:

> *… agree broad principles on limiting government collection, use and disclosure of automated vehicle data and C-ITS data to specific parties and purposes (reform option)*[437]

NTC explained why it considered this the preferred approach:

> *Because option 2 agrees broad design principles, we consider it best addresses the identified challenges while ensuring that governments can appropriately use data from future vehicle technology to benefit the community. These principles will help guide further development of the regulatory framework for C-ITS and automated vehicle technologies while providing a sufficient degree of flexibility as the technology develops.*[438]

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435 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 3, https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Policy%20Paper%20-%20Regulating%20government%20access%20to%20C-ITS%20and%20automated%20vehicle%20data.pdf.

436 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 4, https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Policy%20Paper%20-%20Regulating%20government%20access%20to%20C-ITS%20and%20automated%20vehicle%20data.pdf. NB: in-text reference has been removed. Refer to original document for further information.

437 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, pp 4, 5, https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Policy%20Paper%20-%20Regulating%20government%20access%20to%20C-ITS%20and%20automated%20vehicle%20data.pdf.

438 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 5, https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Policy%20Paper%20-%20Regulating%20government%20access%20to%20C-ITS%20and%20automated%20vehicle%20data.pdf.

In this regard, the NTC has developed principles for government access to C-ITS and automated vehicle data. As for its next steps, the NTC advised that these designs principles will guide:

- *the NTC's development of laws to regulate government access to automated vehicle data. This work will specifically relate to proposals for compliance and enforcement mechanisms for automated vehicle regulation, which will flow from current work on in-service safety of automated vehicles. This work is due to begin at the end of 2019.*
- *Austroads' development of the National Intelligent Transport Systems Architecture Framework.*[439]

The NTC is also working with transport and infrastructure ministers across Australia 'to lead a new piece of work on government access and use of C-ITS and automated vehicle data, including for network efficiency and investment purposes'.[440]

DTMR advised that it is working on the issues, including contributing to the NTC's work. DTMR further advised:

> *… we believe that the current privacy frameworks we have in place here in Queensland, broadly speaking, serve us well in terms of the future of automated vehicles and data privacy. Those same principles would be expected to be applied within that national regulatory framework. We would expect a full privacy impact assessment as part of the development of those regulations and the national regulator.*[441]

Committee comment

The committee notes the work of both the Queensland Government and the NTC on the issue of privacy relating to automated vehicle technology and the generation, storage, and use of the data that they produce, particularly by government. The committee is aware that the NTC has developed principles for government access to C-ITS and automated vehicle data and that these principles will guide the development of laws to regulate government access to AV data.

The committee notes DTMR's advice that any new information collection powers would be subject to full privacy impact assessments and government consideration.

While the committee acknowledges the inevitability that automated vehicles will produce greater volumes of data, the committee supports the view of the Queensland Privacy Commissioner that keeping people's private information safe by safeguarding it from unauthorised access and cyber-attacks is essential for not only the benefit and safety of individuals but also to ensure that the uptake of the technology is not impeded by a lack of trust in the security of individual's personal information. The committee considers that the issues relating to the potential shortfalls in Queensland's privacy legislation, raised by the Privacy Commissioner, should be reviewed with a view to strengthening this legislation where appropriate.

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439 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 6, https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Policy%20Paper%20-%20Regulating%20government%20access%20to%20C-ITS%20and%20automated%20vehicle%20data.pdf.

440 National Transport Commission, *Regulating government access to C-ITS and automated vehicle data*, policy paper, p 6, https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Policy%20Paper%20-%20Regulating%20government%20access%20to%20C-ITS%20and%20automated%20vehicle%20data.pdf.

441 Public hearing transcript, Brisbane, 15 June 2020, p 5.

While noting the department's advice regarding stringent European standards that could be used as a model for regulatory standards in Australia, the committee recommends the Queensland Government consider concerns raised during the inquiry process in relation to privacy.

Recommendation 11

Noting the concerns raised during the inquiry process, the committee recommends the Queensland Government address the following issues relating to protecting the privacy of individuals and reducing the risk of cyber-attacks by developing and implementing legal, policy and operational frameworks or working with the federal government to:

- prevent unauthorised privacy breaches relating to tracking and location of individuals
- ensure that any access by law enforcement and transport regulators to data produced from transport technology is subject to safeguards and transparency
- maintain clear records of who is accessing the data and for what purposes
- consider that the principles of the *Information Privacy Act 2009* are embedded in legal, policy and operational systems that involve personal information as recommended by the Office of the Information Commissioner and undertake Privacy Impact Assessments early in the policy process to manage, minimise or eliminate negative impacts of unauthorised data access
- investigate the potential for privacy breaches involving conversations in vehicles and address as needed to ensure privacy
- review the issues in relation to privacy raised by the Privacy Commissioner during the inquiry process with a view to strengthening the privacy legislation where necessary
- consider a 'privacy by design' approach as recommended by the Office of the Information Commissioner when regulating for new and emerging transport technologies.

5.4.4 Reliability and accessibility of information systems and data

Although submitters called for safeguards against unauthorised access to data produced from new transport technologies, they were also aware that the data could be shared in legitimate ways for a number of reasons, including to improve safety in vehicles. Other transport data could also be shared for the purpose of facilitated a more integrated transport network. For example, Transurban highlighted the importance of governments providing access to reliable transport data to the private sector because '[u]ltimately transport networks will become integrated with users moving seamlessly between different modes of transport'.[442] Transurban continued:

> *As technology develops and customer expectations of mobility services change, it will be critical for governments to facilitate innovation, especially by the private sector, by providing timely access to relevant public data sets.*
>
> *As it stands, Australia's infrastructure data is fragmented. It assumes that travellers/commuters have already predetermined their time and mode of travel, and will source information regarding their trip accordingly. There are no data sets currently available that combine public transport options with traffic conditions and other services, which would provide travellers with a range of options.*[443]

442 Submission 17, p 16.

443 Submission 17, p 15.

Transurban summarised by saying that a 'national framework for public data sharing and accessibility is essential'.[444] The committee notes that TIC has endorsed design principles for government access to C-ITS and automated vehicle data, which will guide the NTC's development of laws to regulate government access to AV data for compliance and enforcement purposes.[445] This is discussed in more detail in section 5.4.3.4.

The AADA also raised the matter of accessibility from an industry point of view:

> *Much like other data used in the maintenance and repair work that our members conduct for their customers, we believe that it is not so much a question of who owns the data, but that it be made accessible to our members at reasonable costs so that both we and the independent repair industry can support all our customers effectively.*[446]

For the NHVR, a key priority that would address safety would be to 'utilise data and technology to deliver positive business and safety improvements for the heavy vehicle industry'. In this regard, the NHVR recommended that:

a. increased data sharing across government be encouraged to enable delivery of a truly integrated national 'one stop shop'

b. the use of technology be recognised by providing a supportive regulatory framework to encourage its adoption and deliver improved safety and efficiency outcomes.[447]

iMOVE also suggested a national platform that enables increasing amounts of data to be made open, with agreed terms, 'could help enable technology development for the benefit of all'.[448]

While DTMR acknowledged that some data would also be useful in helping governments to deliver safety outcomes. DTMR stated:

> *… some of that deidentified data would also be of particular use to government in terms of better informing how our transport system develops insofar as demand on the transport system is concerned and safety performance on the network in particular. It is a balance between the role of the regulator that is being established and the obligations on the automated vehicle provider, but equally there is some data of general interest, clearly protecting the privacy of individuals, that would be potentially very useful in terms of delivering further safety outcomes for the government.*[449]

In Queensland, DTMR is working with the iMOVE Cooperative Research Centre, a consortium of 44 industry, government, and research partners to improve Australia's transport systems over a 10-year period. The goal is to improve mobility of people and freight through better use of data. DTMR has also developed a Data and Business Analytics Strategy that sets the vision 'for transforming the way decisions are made by putting data and business analytics at their centre'.[450] DTMR explained:

> *A dedicated project is supported by a senior leaders advisory group and wider TMR collaboration through technical working groups and a Community of Practice.*

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444 Submission 17, p 15.

445 National Transport Commission, *Regulating government access to C-ITS and AV data*, https://www.ntc.gov.au/transport-reform/ntc-projects/regulating-government-access-c-its-and-av-data.

446 Submission 8, p 12.

447 Submission 26, p 2.

448 Submission 9, p 4.

449 Public hearing transcript, Brisbane, 15 June 2020, p 5.

450 Submission 4, p 13.

With over 250 datasets published on the Queensland Government Open Data portal, TMR is the third most published agency in Queensland Government and is committed to continuing to mature its Open Data practices.[451]

To 'ensure that the future of mobility is fair for consumers', Transurban recommended:

1. *Introducing an assurance framework for transport network companies (e.g. Uber) to ensure fair and transparent charging for customers (e.g. charging tolls at the gazetted toll price).*
2. *Government provide public access to data from various modes of transportation and ancillary services in a single place so that mobility as a service providers can easily access the data. Relevant data includes information relating to on-street and off-street parking, live public transport data, fuel pricing and charging station availability.*

This will allow easy integration with software for cost, route and travel mode comparison. It will also facilitate innovation in the sector and ultimately provide choice to customers by creating a variety of service options and open platforms for payment solutions.[452]

DTMR advised that, as part of its work with the NTC, it has 'repeatedly advocated for a broad and future-focussed approach' to government access and use of vehicle data. DTMR continued:

Data generated by future vehicles, that are increasingly connected and automated, will create significant opportunities for governments to improve the delivery of services and optimise mobility for all transport users. To unlock this public value, collaborative partnerships between governments and industry will be necessary. The department is currently working with the NTC and all other Australian governments (federal, state and territory) to establish the right policy settings to achieve this including anonymising any personal data.

As a first step, the department is advocating for the development of a strategic and future focused vehicle data exchange framework in Australia. Such a framework would create a forum for industry and governments to exchange vehicle data on a range of terms and controls (legislative, non-commercial and commercial). This is a nuanced view that acknowledges that aggregated vehicle data has significant commercial value and government access should be balanced to ensure positive outcomes for consumers, industry and the general community.[453]

In regard to the role of government in this regard, DTMR advised:

… that governments have a critical enablement role to play in deriving public value for vehicle data. The department has advocated for all Australian governments to focus on:

- *Considering infrastructure needs (physical and digital) as well as not establishing unnecessary regulatory barriers.*
- *Building capability to use aggregated vehicle data to deliver the intended public value, including enabling technologies, processes and governance.*
- *Identifying data sets and insights that could be shared or exchanged with industry and/or consumers within a data sharing framework.*[454]

[451] Submission 4, p 13.

[452] Submission 17, p 16.

[453] Department of Transport and Main Roads, correspondence dated 30 June 2020, p 8.

[454] Department of Transport and Main Roads, correspondence dated 30 June 2020, p 8.

Committee comment

The committee acknowledges the importance of access to data to support a seamless integration for users as they move between different modes of transport and that the key to this is reliable, accessible, and timely public data sets.

In this regard, the committee notes the Queensland Government's work with iMOVE to better use data to improve the mobility of people and its commitment to 'continuing to mature its Open Data Practices'. The committee also notes the work that the NTC and TIC are doing in this regard as part of its national policy framework for land transport technology, including focusing on promoting innovation and competition through support for compatible and interoperable transport technologies and open access to transport data.[455]

The committee notes the department's advice that additional information access powers relating to AVs would be required through new legislation and that these powers would be subject to full privacy impact assessments and government consideration.[456]

Finally, the committee is encouraged by DTMR's advice that is it 'advocating for the development of a strategic and future focused vehicle data exchange framework in Australia'[457] and supports its continuing work with all other Australian governments in this regard.

5.4.5 Accessibility

Stakeholders also highlighted the importance of planning for accessibility as new transport technologies and models emerge.

QAI advised that almost one in five Australians as of 2015 reported living with a disability, or roughly 18.3 per cent of the population. QAI noted that around half of Australia's older population have a disability.[458]

QAI stated that the government's focus for new and emerging technologies should be on ways that would increase accessibility for people with a disability:

> *When the private provision of necessities like transport are not available to people who cannot afford them, or when they are not accessible, government must step-in. Government's first priority should be to meet the needs of travellers for an accessible, equitable, safe, efficient and convenient transport system.*[459]

QAI provided the example of on-demand passenger vehicles denying passengers a ride because their wheelchair, even folded, would not fit into the car. QAI argued that this meant many people with disabilities are and would be prevented from participating in ride-sharing. Mr Thomas, a submitter, also expressed the view that mobility challenged travellers were disadvantaged by the growth of rideshare:

> *Sadly the explosive uncontrolled growth in rideshare numbers has abandoned our disabled brothers & sisters. Rideshare don't offer wheelchair accessible vehicles which is in violation of human rights.*

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455 Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 'National Policy Framework for Land Transport Technology', https://www.infrastructure.gov.au/transport/land-transport-technology/national-policy-framework-Land-transport-technology.aspx.

456 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 6.

457 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 8.

458 Public hearing transcript, Brisbane, 1 April 2019, p 4.

459 Submission 21, p 4.

> *The rideshare business model being discriminatory & all pervasive is reliant on oversupply whilst externalizing all its costs & responsibilities. Its model relies on driver wages theft to give an illusion of value.*[460]

Along similar lines, one submitter also called for a mandated 20 per cent of the 'entire Personalised Transport vehicle fleet of each Authorised Booking Entity to be Wheelchair Accessible and fully compliant with the required Australian Standards'.[461] Inclusion Moves also stated the following in regard to this:

> *We see that rideshare simply does not have the coverage of wheelchair accessible vehicles to be classed as an inclusive mode of transport. The technology behind the app can be extremely important for people in the hearing impaired community, for example, who no longer have to make a phone call to a taxi booking company because they can use a well-designed app. There are great positives that we can take from those kinds of industries, but we must ensure that the fundamental mode behind them is inclusive. We cannot use technology to cover up poor practices.*[462]

In a second example, QAI highlighted that a lack of consultation with people with a disability resulted in access paths and bathroom access on new generation rollingstock trains being narrower than the minimum widths set out in the Disability Standards for Accessible Public Transport that were established in 2002.[463] QAI continued:

> *The new trains are designed to last at least 35 years in service, until the early 2050s. Unlike other Queensland suburban trains, the new trains have no guard station in the middle, adjacent to the accessible boarding point on the platform. As a stop-gap measure, Queensland Railways has hired staff to attend people who want boarding assistance. This saga could have been avoided if people with disability had been consulted from the beginning.*[464]

QAI expanded on this point during the public hearing:

> *Another important point that relates to that is that even when transport is compliant with disability standards it still may not be ideal for people with disabilities. One of the purposes of introducing the NGR was to eliminate guards on urban rail. What appears to be the case is that we need guards more than ever to assist people with disability on those trains. We know that we have an ageing population and that more and more of us as we get older are going to need the assistance of actual people not technology on public transport.*[465]

The committee notes that the Sydney Metro is 'a fully accessible railway' with all metro stations having lifts and level access between platforms and trains for people in wheelchairs, scooters, walking frames and with prams and strollers'. This means 'no "step" into carriage'. Sydney Metro also includes around 100 CCTV cameras at stations and 38 on every train, all of which are monitored by a central control centre 'to ensure safety across the network'.[466]

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460 Submission 10, p 2.

461 Submission 20, p 44.

462 Public hearing transcript, Brisbane, 1 April 2019, p 5.

463 Submission 21, p 4.

464 Submission 21, p 5.

465 Public hearing transcript, Brisbane, 1 April 2019, p 4.

466 New South Wales Government, *Accessible metro travel*, https://transportnsw.info/travel-info/using-public-transport/accessible-travel/accessible-metro-travel.

Assistance for people with vision or hearing impairment includes the following:

> *All metro stations have tactile flooring in lift areas and on platforms, and signs with Braille. Audio announcements, hearing loop services and interactive help points also provide accessible service information. Indicator lighting lets you know when platform screen doors are opening and closing.*[467]

Inclusion Moves highlighted the importance of accounting for the first and last mile of a journey for people with disability and noted that AVs could help with this:

> *If we look at autonomous vehicles, for example, they have the potential to be great for what they call in the transport industry the first and last mile. The first and last mile is a crucial issue where, if you cannot get to a transport hub, no matter how accessible that transport hub is you will not be able to begin your journey.*[468]

Inclusion Moves also emphasised the importance of individual service for people with disability:

> *The disability sector will always tell you that the individual service that you receive from a point-to-point transport company like a taxi company is absolutely vital, and it is to a large extent because of that good co-design of training that has been developed between the disabled community and the taxi community over a number of years. It is absolutely a part of that. For people with disability, going that extra mile can be the absolute difference between having that equitable result where they are able to be an included member of society and not being able to leave their house, not being able to get to medical appointments, not being able to do their own shopping.*
>
> *All of those social outcomes that are missed add up to a cost that needs to be catered for through another funding stream. If a person with disability cannot get out to do their own shopping, that means there is a cost that is transferred onto another funding body. When we are looking at decisions around transport we must not just look at things in the silo mentality of 'a maxi taxi costs more.' A maxi taxi may cost more, but it will absolutely save more in the long run if you were to take a broader view of the enabling factors that come with that as well.*[469]

QAI linked this point-to-point service with the low workplace participation rates of people with disability:

> *One of the reasons that the workplace participation of people with disabilities is so low relatively speaking—I think it is about 50 per cent versus 80 per cent—is that transport simply is not accessible. Often that is because there is nobody to assist people onto the transport and off the transport.*[470]

In regard to supporting a point-to-point transport network, DTMR advised:

> *The Department of Transport and Main Roads (TMR) has a vision of creating a* single integrated transport network accessible to everyone*. In line with this vision, the Accessible Transport Network (ATN) team was established to guide TMR to be a world leader in seamless journeys for all public transport users and the delivery of accessible services. The ATN is focussed upon:*
>
> - *Leading the review and modernisation of the Disability Standards for Accessible Public Transport Standards 2002 (DSAPT) via the National Accessible Transport Taskforce*

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467 New South Wales Government, *Accessible metro travel*, https://transportnsw.info/travel-info/using-public-transport/accessible-travel/accessible-metro-travel.

468 Public hearing transcript, Brisbane, 1 April 2019, p 4.

469 Public hearing transcript, Brisbane, 1 April 2019, p 6.

470 Public hearing transcript, Brisbane, 1 April 2019, p 6.

- *Providing consistent technical design advice across TMR on the planning, design and implementation of transport products, services, information and infrastructure. As an example – Cross River Rail Authority*
- *Co-designing and publishing the TMR Accessibility and Inclusion Strategy (AIS) (due mid-year).*

The AIS articulates TMR's commitment to be a leader in the provision of accessible and inclusive Transport products, services, information and infrastructure and workplaces and work practices. TMR will develop short, medium and long term Accessible and Inclusion Action Plans that will meet the principles of the AIS.

The ATN team is also leading cultural change throughout TMR focussed on building capability and awareness around the importance of accessible and inclusive co-design and customer engagement. This aligns strongly with five of the 24 recommendations (14, 17, 18, 19 and 20) outlined in the New Generation Rollingstock (NGR) Train Commission of Inquiry which highlighted the need for early engagement with the disability sector during the design, procurement and delivery of major public transport infrastructure.[471]

QAI stated that a review of licencing requirements would be required with the advent of AV technology as people who currently either do not hold a licence or have a restricted licence may qualify for a licence of a vehicle with a higher level of automation.[472]

QAI called for the government to strike a balance between encouraging the take up of new technology while also ensuring adequate and equitable access for all, including addressing the following:

- *Ensuring the adequate provision of wheelchair accessible vehicles, including methods for securing wheelchairs when a human driver is not present.*
- *Local and state government reviewing and amending standing zones and parking spaces to allow sufficient room for the safe and, if possible, automated deployment of a ramp to the rear of the AV, and otherwise safe and efficient boarding for passengers with a disability*
- *Ensuring the accessibility of smart phone applications, which will be an essential tool for accessing automated transport. The Uber App, for example, is not currently accessible to people with vision impairments.*
- *Ensure appropriate licencing arrangements, and*
- *Assess whether existing policy approaches and incentives in the disability sector should be adjusted or retargeted.*[473]

QAI highlighted the importance of consultation, research and trials and recommended:

- that the government consult from the beginning of its planning process with people with disabilities.
- that the government invest in research, development and real-world trials that benefit the entire transport network customer base, including people with disabilities to provide a sound basis for government decision-making.

471 Department of Transport and Main Roads, correspondence dated 2 July 2020, p 1.

472 Submission 21, p 6.

473 Submission 21, p 6.

- that ride-hailing services be required to make wheelchair-accessible service a growing part of their operations.[474]

MTAQ also raised for consideration the need to ensure new technologies are accessible for older generations:

> *A challenge for governments, community organisations and industries over the longer term is likely to be the implementation of programmes to assist older generations to digest new technological challenges and adjust to the benefits conferred by emerging transport choices which include accessing or owning autonomous vehicles. For the nation's seniors, driver aid technology and 'driverless car' technologies have the potential to liberate – reduce reliance on families and carers for outings or appointments. Again, similar to electronic devices it will be the take up of autonomous vehicles by the younger cohorts that will influence older generations to utilise the emerging choices and transport modes to their advantage.*[475]

Inclusion Moves also suggested virtual reality apps to help people with a disability participate in new transport technology opportunities:

> *There are lots of ways that we can use technology, however, to ensure that people with disability are able to be included in society. Virtual reality, for example, is an area that we absolutely should be looking into when it comes to app design. A person with a disability would be able to see their train station before they arrive and know what their journey will look like from their front door to where they hop onto a bus, train or any other kind of public transport. There is massive potential for technology to be used in a positive way.*
>
> *We saw it introduced a little bit with the transport app for the Gold Coast Commonwealth Games. For the Commonwealth Games there was an app that showed the gradient you were going to be using. For a wheelchair user, a gradient is one of the most important things when you are trying to figure out whether you are going to be able to get to a particular place, how long that is going to take and how much effort you are going to need to put in. Using open data sources that are available through some of our larger local and state governments to develop that capability within apps is incredibly important and a potential enabler for people with disability to be much more included in society than what they currently are.*[476]

In response to Inclusion Moves suggestion regarding the development of virtual reality apps, DTMR advised:

> *The Queensland Government is committed to seeking opportunities to improve the lives of people with disabilities, the use of virtual technology is one of many opportunities to improve the customer experience for all.*
>
> *An example of this was delivered in the New Generational Rollingstock rectification project in 2019 where virtual reality technology was used to see the toilet layout in 3D, it allowed the opportunity to view and touch the configuration. Virtual reality is being considered as part of many projects, however is again limited to use by people who can use the technology – for example those who are blind or have hand/arm impairments will need equal opportunity to provide feedback.*
>
> *A holistic approach to problem-solving needs to be taken, to ensure the solution includes the ability to communicate to customers in their preferred format (Part 27 of the Disability Standards for Accessible Public Transport). Virtual reality apps may be part of the solution; however it is critical to consider all customer needs as a suite of the potential solution.*

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474 Submission 21, p 3.

475 Submission 7, p 6.

476 Public hearing transcript, Brisbane, 1 April 2019, p 5.

As an example, a deaf person finds smartphones extremely liberating as it allows them to send receive information directly via text. However, there will be many people due to the nature of their impairment that will not be able to use this technology and will therefore be excluded. Queensland Government are always considerate toward the balance of needs and requirements to suit customers.

The Department of Transport and Main Roads (TMR) will ensure early consultation and engagement with people with disabilities to ensure co-design and participation is undertaken in the delivery of relevant transport services, products, information and infrastructure. This commitment will be published in the TMR Access TMR Accessibility and Inclusion Strategy (AIS) in July 2020.

TMR also remains focused on working with the sector to identify and implement innovative new technology solutions. The TransLink Digital Futures Program provides an embedded approach to investigation, experimentation and prototyping with new technologies in close collaboration with customers and stakeholders. Within this program, TransLink will be undertaking several Proof of Concepts to trial solutions that utilise virtual reality or augmented reality to allow our customers, especially those with an impairment, to have better access to public transport through new technologies such as digital hailing systems for buses and improved wayfinding. In addition, TransLink will also continue to look at virtual and augmented reality within the Smart Ticketing Project and identify potential opportunities to provide better outcomes for customers.[477]

Inclusion Moves also suggested real-time advice regarding service outages, particularly for lifts at railway and bus stations:

At the moment Queensland Rail shows any of their lift outages as information only on their service outages. They do not get allotted with a medium or a high-risk, yet for a person with a disability that is absolutely, as you say, a deal breaker for them to be able to know. We need to move to a tech space where a person with a disability knows before they leave their house what their whole of journey is going to look like—that includes outages, that includes maintenance that is being carried out on lifts. We see a number of lifts tend to go out in wet weather. People with a disability tend to just take that as a given and that is not a space that people with a disability should be in. People with a disability should be able to have the ability to move around in wet weather and get wet just the same as an able-bodied person. People with a disability, because of the complaint based nature of the Disability Discrimination Act, having to make a complaint against something every time is an extremely onerous task which means that a person with a disability will tend to think, well, can I be bothered making that complaint today or do I just accept that my outcomes are going to be less favourable than an able-bodied person's and that is certainly not the community that I want to be living in and that certainly should not be the community that the Queensland government should be aiming for.[478]

DTMR advised that it has 'co-designed an Accessibility and Inclusion Strategy (AIS) with our customers, employees and partners with varying levels of lived experience of disability' for the purpose of providing accessible and inclusive transport products, services, information, infrastructure, workplaces and work practices.[479]

[477] Department of Transport and Main Roads, correspondence dated 30 June 2020, pp 19-20.

[478] Public hearing transcript, Brisbane, 1 April 2019, p 7.

[479] Department of Transport and Main Roads, correspondence dated 30 June 2020, p 15.

In relation to developing action plans and legislation, DTMR advised further:

> *The AIS is due to be published mid-July. The Accessible Transport Network (ATN) will then develop short, medium and long term Accessible and Inclusion Action Plans that will meet the principles of the AIS.*
>
> *TMR in partnership with the Commonwealth Department of Infrastructure are leading the modernisation of the Disability Standards for Accessible Public Transport (2002). This will result in new DSAPT legislation which will significantly address the technical issues raised above.*[480]

In addition, the department advised that it had appointed a general manager attached to the director-general's office 'who is specifically looking in a dedicated way to accessibility issues and how we can do better in that space'. The general manager's role is to develop 'an accessible transport network' by 'looking at engaging broadly across the sector and with other levels of government and the community to ensure that we are wholly mindful of accessibility issues in all of the work that we do'.[481]

In regards to accessibility of the taxi fleet and rideshare, the department advised that 'there have been a lot of learnings from the technology disruption experience' and that they were 'taking those on board with respect to accessibility in particular'. DTMR further advised:

> *In terms of the reforms relating to the personalised transport industry, there were four key objectives in a policy sense. They were focused on strengthening safety standards, providing passengers with greater choice and flexibility, driving innovation and improving passenger service standards by reducing red tape, and ensuring accountability and clearly defined obligations. The reforms were conducted in three stages and the third stage is around comprehensive monitoring and evaluation and the department has been developing a framework in that respect. That framework is about ensuring the reforms strike the right balance and continue to deliver personalised transport services to the community. It is also about ensuring that any further changes that might be necessary are adopted initially and effectively. That is the point we are at at the moment in terms of the department—that is, reflecting on the learnings of that and those learnings could certainly be adopted more broadly across the department.*[482]

DTMR also advised the committee that it had taken specific action in regard to supporting an accessible personalised transport fleet in Queensland, stating:

> *TransLink has also taken steps to ensure Queensland's wheelchair accessible taxi fleet is renewed through a four-year, $21 million grant funding scheme. The scheme is assisting the taxi industry to replace aging wheelchair accessible taxis by offering 50 per cent funding, up to a maximum of $45,000, for the cost of a new wheelchair accessible taxi. This will support the modernisation of Queensland's wheelchair accessible taxi fleet to ensure continuity of service to people who use wheelchairs or mobility devices. The funding must be used under one of the following criteria:*
>
> - *Replace a wheelchair accessible taxi which is 8 years or older at the time of application,*
> - *Replace a wheelchair accessible taxi which is between 6 and 8 years old which has completed 800,000km or more and requires repairs estimated by a certified maintenance repairer to exceed $10,000 (plus GST) at the time of application,*
> - *Replace a wheelchair accessible taxi of any age which has been written off by an approved accredited insurance advisor, or*

480 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 15.

481 Public hearing transcript, Brisbane, 29 October 2018, p 4.

482 Public hearing transcript, Brisbane, 29 October 2018, p 4.

- *Replace a conventional taxi vehicle with a new wheelchair accessible taxi in specified areas.*

Applications for funding under this grant scheme opened on 13 December 2019. The scheme is being administered by the Queensland Rural Industry Development Authority (QRIDA) …[483]

In regard to QAI's suggestion that government consult from the beginning with people with disabilities during the planning process for transport projects, DTMR advised:

The Department of Transport and Main Roads (TMR) engages with the TMR Accessibility Reference Group (ARG) on an ongoing basis as part of its commitment to improving the accessibility of the passenger transport network for customers with disability.

The ARG meets quarterly and comprises representatives from the disability sector, industry, local government and TMR. Key projects the group were consulted on over the past 12 months include

• Next Generation Rollingstock Project;

• Southern Moreton Bay Islands ferry terminal upgrades;

• Pet Dogs on Ferries Trial;

• Smart Ticketing;

• DSAPT Modernisation;

• Brisbane Metro;

• Gold Coast Light Rail;

• Disability Parking Permit Scheme.

In addition to engagement through the ARG, targeted consultation also occurred with advocacy groups on various infrastructure related and other projects to ensure needs of customers with a disability are considered, some of these include:

• Cross River Rail

• Queen Street Bus Station Lift

• TMR Accessibility and Inclusion Strategy

• TMR Digital Wallet

A key focus of the New Generation Rollingstock Train Commission of Inquiry final report (the Forde Inquiry), centred on the need to consult the disability sector early in the development of projects. Implementation of the 24 recommendations made in the Forde Inquiry are the responsibility of a number of Queensland government agencies including the TMR, Queensland Treasury, the Department of the Premier and Cabinet, the Department of Housing and Public Works and Citytrain Response Unit.

Recommendation 17, 18 and 19 make specific reference to consultation with the disability sector and are outlined below:

Recommendation 17: The Commission recommends that the Queensland Government implements processes to ensure genuine, early consultation is undertaken with the disability sector regarding the procurement of public transport infrastructure.

Recommendation 18: The Commission recommends that a stakeholder consultation plan detailing how consultation will be undertaken with the disability sector be developed at the

[483] Department of Transport and Main Roads, correspondence dated 30 June 2020, pp 15-16.

commencement of all major public transport procurement projects. The stakeholder consultation plan should be provided to the project steering committee or equivalent governance body.

Recommendation 19: The Commission recommends that consultation with the disability sector about the design of public transport infrastructure (undertaken before, during or after procurement) be structured around the obligations of the disability legislation and functional requirements.

In response to these recommendations, TMR has updated its Project Assessment Framework and project management templates to ensure early consultation is undertaken. This was completed by 31 July 2019.

As at 27 April 2020, 23 of the 24 recommendations were considered complete. The final recommendation sits with TMR and involves the updating of the Public Transport Infrastructure Manual which is on track for completion by September 2020.[484]

5.4.5.1 Demand for parking

Several submitters highlighted the impact of new transport technologies on the demand for parking and kerbside allocation. QAI noted:

As use of AVs increases, demand for parking likely will decrease, but demand for curbside standing zones will increase and curbside arrangements will need to be reassigned. Brisbane taxi users are already familiar with the challenges faced by taxi and in particular, ride-share drivers when looking for a place to pick-up or drop-off passengers around the CBD. These challenges are more acute when the passenger is a person with a mobility impairment who may move more slowly, or rely on a third party to assist with getting in or out of the vehicle.[485]

BCC made the following observations:

- *Kerbside allocation may need to change overtime as parking needs reduce and demand increases for pick-up/drop-off zones. As a significant amount of the increase may come from people with limited mobility, these drop-off zones will need to have a high level of accessibility.*
- *Reduced parking needs would lead to a corresponding parking revenue reduction for local governments. Commercial parking operators will need to adapt to these changes to stay viable. Overall reduced demand for parking could also provide areas for redevelopment.*[486]

Committee comment

Ensuring all Queenslanders have equitable, safe and reliable access to different modes of transport, particularly as new transport technologies evolve, is of key concern to the committee. The committee notes submitter comments on accessibility and the impact that having access to transport can have on a person, including those with disability and older Queenslanders, participating in society. The committee is pleased to note DTMR's appointment of a general manager whose role it is to develop an accessible transport network and its advice regarding consultation with people with disabilities on policies.

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484 Department of Transport and Main Roads, correspondence dated 30 June 2020, pp 17-18.

485 Submission 21, p 7.

486 Submission 2, p 4.

The committee also acknowledges the concerns of submitters regarding future demand for parking and pick-up/drop-off zones with the advent of automated vehicles, noting the importance of accessibility in these zones for people with disability or those requiring extra time and assistance to get into or out of a vehicle.

The committee understands that much work is being done in this area; however, the committee makes the following recommendation.

Recommendation 12

The committee recommends that the Queensland Government consider the following, as recommended by submitters, as it continues to develop and implement its policies in relation to improving accessibility of transport now and into the future:

- ensure the adequate provision of wheelchair accessible vehicles, including methods for securing wheelchairs when a human driver is not present
- conduct a local and state government review of standing zones and parking spaces, and amend as necessary, to allow sufficient room for the safe and, if possible, automated deployment of a ramp to the rear of the AV, and otherwise safe and efficient boarding for passengers with a disability and those requiring extra time and assistance
- ensure the accessibility of smart phone applications in relation to transport and transport hubs
- ensure appropriate licencing arrangements are reviewed with the emergence of automated vehicles
- assess whether existing policy approaches and incentives in the disability sector should be adjusted or retargeted
- continue consulting with people with disabilities on transport policies early in the planning process
- invest in research, development and real-world trials that benefit the entire transport network customer base, including people with disabilities to provide a sound basis for government decision-making.

5.4.6 Congestion

Stakeholders expressed concern that new transport technologies might contribute to an increase in urban road congestion. For example, iMOVE predicted that the convenience of using automated vehicles over other forms of transport could lead to 'a surge in single occupant vehicle trips, or even zero occupant trips (by full automated vehicles) on our roads', which would increase congestion.[487]

DTMR stated '[i]t is possible that new vehicle technology will result in higher demands on the road network, as CAVs can operate without a driver, passengers, or with disabled or underage passengers' and that '[t]his increased accessibility could place an increase in the volume of trips (transport demand) made on the road'.[488]

[487] Submission 9, p 2.

[488] Submission 4, p 14.

BCC also expressed the view that shorter headways due to AV technology may create additional road capacity by providing greater convenience, access and lower costs, but the 'advent of "zero occupancy vehicle", which will emerge with AVs repositioning around road networks and changing demand patterns across networks, will be a major challenge for congestion management'. In addition, BCC shared DTMR's view that the total number of kilometres being travelled may increase with improved mobility for current non-drivers. BCC quotes an estimated 14 per cent more vehicle kilometres travelled.[489]

Mr Dallaston shared a similar view, stating that 'improved efficiency is not all good news' because 'decreased headway, cooperative merging, higher speeds and faster acceleration will fit more cars into less space, effectively adding additional lane space to every road in the state'.[490] Mr Dallaston continued:

> *Without further intervention, this will result in more traffic, more urban sprawl, and more car dependency.*[491]

Mr Dallaston also argued that MaaS would likely only 'reduce traffic congestion as a symptom of better urban design'.[492]

Another submitter considered that demand responsive transport had already increased the number of cars on Queensland roads, stating that there were at least 16,000+ cars doing the work previously done by approximately 2500 cars previously in Queensland.[493] The submitter also stated that booked-hire transport, such as Uber, is taking people off public transport and into private cars, as well as away from walking and cycling, which contributes to congestion. The submitter noted that passenger transport vehicles are less efficient due to the 'significant number of "dead" kilometres (without passengers)'.[494]

Mr Thomas shared these views:

> *Society is suffering the consequences of massive traffic congestion due to the large numbers (rideshare quoted at 15,000 in Brisbane?). 15,000 cars is 150kms of bumper to bumper traffic.*
>
> *These large numbers whilst having a devastating impact on Taxis are now having an even greater impact on our public transit systems.*[495]

QAI was concerned about the impact of AVs on public transport:

> *It is possible that automated vehicles could compete for trips with existing public transport services, especially because of increased convenience, comfort and privacy. Early modelling (based on data from the Netherlands) suggests that the costs of using shared automated vehicles could be lower than owning a traditional vehicle. These costs may be commensurate investment, and increase congestion on the road network. However, modelling by the International Transport Forum demonstrates that the best outcomes are achieved when automated vehicles are effectively integrated into existing public transport networks.*

489 Submission 2, p 4.

490 Submission 19, p 3, 4.

491 Submission 19, p 3.

492 Submission 19, p 4.

493 Submission 20, pp 7-8.

494 Submission 20, pp 7-8.

495 Submission 10, p 1.

Over time, it may be necessary for government policy to encourage and to provide an incentive for the efficient integration of public transport and automated vehicles, including, for example, drop-off zones for automated vehicles at rail stations, but this need will be determined by real world experience.

Although future road transport demand is difficult to predict, the use of 'zero occupancy vehicles' for goods delivery and as couriers may lead to increased demand and traffic congestion. This may necessitate regulation and rationing, that prioritizes personal transportation needs over the needs of commerce.[496]

RACQ also noted that AVs have the potential to provide access to people who may not be able currently to drive their own vehicle and thereby increase the number of vehicles on the road. Improving public transport would potentially shift people into decreasing the use of their vehicles:

If we see an uptake of autonomous vehicles in the public transport sector which may improve the efficiency of that sector then we might see a transfer from people driving their own vehicles to using more PT. However, autonomous vehicles have the potential to open up the transport network to a number of people who currently might not be able to drive—people with a disability, people with a medical condition, people who for various reasons cannot currently operate a vehicle. Unless we undertake work to ensure that we have good quality public transport that is contestable with people wanting to drive, we could have a situation where autonomous vehicles are exacerbating congestion. It is important that we look holistically at the transport system to ensure we are pulling the right policy levers to achieve the outcome while we are increasing our confidence about the safety of autonomous vehicles on our roads.[497]

Mr Lacaze stated that increasing access to autonomous light vehicles was not the solution to transporting large numbers of people:

The notion that light vehicles can play a major role in transporting large numbers of people has been roundly discredited in medium to large cities, and continues to be demonstrated as an ongoing economic drain rather than stimulus as community resources are applied to ever more extravagant additional 'congestion busting' road projects.

The notion that autonomous light vehicles are 'the solution' relies on either untried assumptions or unpopular behaviors that remain beyond demonstrable.[498]

Mr Dallaston argued that AVs could contribute to congestion particularly in inner-city areas:

Automated vehicles … could consequently lead to a large increase in inner-city traffic congestion. A passenger in an automated vehicle can sleep, read, eat, or otherwise occupy their time while stuck in traffic; an unoccupied driverless car is, of course, completely indifferent to traffic conditions. AV can drop their passengers off at their destination without parking, and either return to base, park in the nearest unmetered suburban street, or simply drive around the block until needed, if the cost of doing so is less than the cost of parking.

Congestion charging – transferring the current high cost of inner city parking from parking to driving – will help, but is unlikely to counter the extreme convenience that AV will offer city commuters.[499]

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496 Submission 21, pp 6-7. NB: in-text references have been removed. Refer to original submission for more information.

497 Public hearing transcript, Brisbane, 11 February 2019, p 5.

498 Submission 16, p 7.

499 Submission 19, p 4.

However, Mr Dallaston stated that increased efficiency does provide an opportunity to decrease the public space devoted to vehicle traffic without disadvantaging existing road users:

> *Reclaimed lane space in existing corridors can be repurposed to improve local walkability and provide dedicated transit links at a fraction of the cost of building separated busways or rail lines.*[500]

In this regard, Mr Dallaston suggested that '[t]he only real solution may be pedestrianising central Brisbane and other high congestion centres, removing access to cars completely'.[501]

To reduce congestion, Mr Dallaston made a number of recommendations: firstly, a moratorium on suburban road construction and widening:

> *While roadworks are often politically spun as 'congestion busting', the reality is increasing space for cars induces demand and enables urban sprawl. The money saved on these projects can instead be put towards public and active transport reform. Where congestion remains a localised issue, alternative policies (particularly closing or limiting access, and improving public and active transport links in the area) should be discussed and prioritised over new road construction.*[502]

Secondly, Mr Dallaston recommended that retail car parking be taxed:

> *While common elsewhere, Queensland does not tax retail car parking, which has enabled the proliferation of congestion-causing car-oriented megashopping-centres like Westfield Chermside. Taxing car parking spaces would both deter future over-construction of car parking, and provide a revenue stream to enhance local public and active transport.*[503]

BCC favoured governments taking a strong role:

- *Governments will need to take a strong leadership role to ensure adoption of AVs occurs in such a way that the benefits are maximised... Shared fleets and shared mobility may be one way to mitigate against this.*[504]

And that one of the keys might be the 'shared economy':

- *Federal and state governments will need to take a strong policy role to ensure that AVs contribute positively to the transport task in Brisbane through a lower total number of vehicle kilometres travelled. Key policy initiatives could include the encouragement of the shared economy, technological innovation and reforms in road pricing.*[505]

DTMR acknowledged that 'effective transport policies' would have to be 'implemented in the future to encourage increased levels of shared-use CAVs, and their integration with public transport services, to ensure benefits are maximised'. DTMR expected the following benefits if this was achieved:

> *It would be expected that when there are high levels of shared-use and where CAVs are used to complement high-capacity public transport services, there would be significant benefits in terms of network cost, utilisation and optimisation.*[506]

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500 Submission 19, p 4.

501 Submission 19, p 4.

502 Submission 19, p 5.

503 Submission 19, p 5.

504 Submission 2, p 4.

505 Submission 2, p 5.

506 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 15.

DTMR added:

> *… without appropriate management and planning, this may also substitute some of the demand for public and active transport. This may result in increased levels of congestion. However, if well managed AV technology may increase the capacity of the Department of Transport and Main Roads' road network.*
>
> - Shared vehicles and trips – *to overcome the potential for increased road congestion, the role of vehicle and ride sharing will play an important role in our future transport system, resulting in a need to change current travel behaviour. Scenario modelling indicates that a transition to a shared automated fleet may reduce household expenditure on transport.*
> - Connected and Automated Vehicles *provide safer transport outcomes than non-connected AVs. However, for this to be achieved, there needs to be sufficient diffusion to other connected vehicles and infrastructure in Queensland.*
> - Integration of mobility modes – *to support the potential benefits of AVs, governments must seek to encourage the uptake of integrated Mobility-as-a-Service offerings that encourage multi-seat journeys with high capacity public transport.*[507]

Committee comment

The committee acknowledges concerns that the introduction of automated vehicles could increase the number of kilometres travelled and therefore increase congestion on the road network. Several submitters noted that the best outcomes for automated vehicles are expected when they are effectively integrated into public transport networks and when shared-use is supported. The committee notes that DTMR has acknowledged the importance of this in its transport policies and supports the department's ongoing work and consideration of how shared-use CAVS will complement high-capacity public transport services into the future.

5.5 Role of government

To ensure a smooth, sustainable, safe, and equitable transition to new transport technologies, submitters were generally in agreement that governments needed to be deeply engaged with delivering policy leadership, supporting innovation, conducting trials, investing in research, and developing a strong regulatory environment. For example, according to ITS Australia, it is vital that the government take a strong role 'to ensure that the deployment of these technologies is guided to improve the quality of life for citizens' and that strong regulatory oversight would support public confidence as well as collaboration across the industry and community.[508]

5.5.1 Supporting pilots and trials

Submitters advocated for strong government support for pilot programs and trials of new transport technologies. ITS Australia stated:

> *To that end we are strongly supportive of existing and emerging pilots and trials underway and proposed both in Queensland and around the country, building a collaborative and transparent understanding of the challenges and opportunities these technologies offer, and ensuring that public safety is always the key consideration.*[509]

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507 Department of Transport and Main Roads, correspondence dated 2 July 2020, p 3.

508 Submission 22, p 2.

509 Submission 22, p 2.

From a heavy vehicle perspective, the ALC recommended that the Queensland Government 'actively fund electric freight vehicle trials', stating:

> *To achieve this, the Queensland Government could look to engage with the Commonwealth Government's* Smart Cities and Suburbs Program*. For example, this program has previously provided $5 million to the* Smart Move Newcastle Project*. Amongst other things, this project will pilot an electric vehicle hub on the outskirts of Newcastle. As part of this hub, electric vehicle chargers will be provided.*[510]

BCC stated that trials and earlier commercial adoption in the US and Europe will provide Australia with valuable information on planning and an adoption approach.[511]

Several submitters also provided suggestions on how the introduction of new technologies could be trialled and implemented. For example, SDRC proposed Warwick as a pilot site for larger scale electric powered freight transport to demonstrate new technologies:

> *The Southern Downs is well located on the crossroads of the New England and Cunningham Highways; it is two hours from Brisbane and one hour from Toowoomba Wellcamp Airport. There is an existing support industry for transport and logistics in the region.*[512]

RACQ also commented on the need for strong regulation based on sound decisions made about the best method for introducing new transport technologies into the network stating:

> *The right policy and regulatory settings introduced at critical technology and market points will aim to adjust the current modal share to create a balance of use models which maximises network efficiency, personal mobility, and broader social and economic outcomes.*[513]

In regard to trials, RACQ commented:

> *Ensuring the automated technology trial permitting system is flexible and enables proactive incremental scaling of successful trials will be critical to achieving an AV-ready transport network in line with market deployment. Once trials have met required safety criteria, having an incremental scaling of the permitting system will enable operators to continue testing without delays and administrative burden caused by repeated reapplication to the regulator for repermitting for similar or incrementally scaled trials.*[514]

In regard to these matters, RACQ recommended that the government:

- *Identify and investigate automated vehicle permitting and trial barriers including registered public transport operator costs for automated public transport trials and permit scaling flexibility, and identify alternative solutions to remove barriers and encourage industry investment and network preparedness.*
- *Conduct trials of automated vehicles in various public transport use cases and alter relevant contracts, policies and legislation to ensure the public transport network is 'AV ready' and responsive to technology changes.*
- *Evaluate and implement short, medium, and long-term policy settings which over time will encourage passengers to use public transport and shared fleet operational models.*
- *Undertake automated freight trials along safe and high-volume freight routes in partnership with industry.*

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[510] Submission 23, p 12. NB: in-text references have been removed. Refer to original document for information.

[511] Submission 2, p 5.

[512] Submission 1, p 3.

[513] Submission 5, p 8.

[514] Submission 5, p 8.

…

- *Engage with the public early and regularly to let community members experience the technology and benefits, and inform them of vehicle abilities, limitations, and how to ride/operate and interact with them legally and safely.*[515]

Transurban supported the recommendation to conduct road trials now 'to ensure road infrastructure is ready for the arrival of CAVs'. Transurban also supported the recommendation that the Queensland Government, together with industry, '[c]onduct a community awareness campaign to build understanding of their safe use and automated features' and ensure Queenslanders are prepared for the introduction of CAV technology.[516]

DTMR advised that it is facilitating trials to advance AV deployment by using road use permits. In regard to supporting organisations undertaking trials, DTMR advised that it had 'developed a framework and suite of application tools based on the national AV trial guidelines, developed by the NTC'.[517] DTMR advised further:

> *The department works with prospective trialling entities to ensure trial objectives are clear and proposals will ensure safe outcomes. Through its experience with trials, the department is developing technical expertise which it uses to inform national regulatory reforms, understand future infrastructure requirements and plan for future passenger service models.*[518]

DTMR provided information about current trials and future ones planned in this space:

> *Cooperative and highly automated vehicles*
>
> *The car industry is in a heavy research and development phase, where most manufacturers are working toward a highly automated vehicle (level 4), and a driverless vehicle (level 5). While still in their research and development phase, it is difficult for the car industry to provide decisive information about their infrastructure requirements or when vehicles may be commercially available. Many have indicated that they are trying to build the vehicles to use existing infrastructure.*
>
> *A contract between TMR, Queensland University of Technology (QUT) and the iMOVE CRC to look at the readiness of Queensland's infrastructure assets for CAVs (today and into the future), was signed in June 2018. A further contract between TMR, QUT and the CRC, to test and demonstrate a level 4 cooperative and automated vehicle across a number of safety scenarios, has also been reached.*
>
> *The contracts are part of the Cooperative and Automated Vehicle Initiative (CAVI) project. CAVI is a nationally significant, Queensland-led project designed to help TMR prepare for, and accelerate, the emergence of advanced vehicle technologies with safety, mobility and environmental benefits onto Queensland roads. CAVI is being delivered as part of the NPF Action Plan.*
>
> *Cooperative vehicle pilot*
>
> *Cooperative Intelligent Transport Systems allow road users and roadside infrastructure (such as traffic signals and signs) to communicate real-time information to other road users. A range of applications utilising wireless communications are emerging for vehicle-to-vehicle and vehicle-to-infrastructure communication. These applications typically provide the driver (who remains in control of the vehicle) with safety warnings. It is estimated that connectivity between vehicles*

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515 Submission 5, p 2.

516 Submission 17, p 7.

517 Department of Transport and Main Roads, correspondence dated 2 July 2020, p 7.

518 Department of Transport and Main Roads, correspondence dated 2 July 2020, p 7.

and infrastructure alone could reduce crashes by over 20 per cent and when combined with automation even higher reductions and as much as 90 per cent.

A connected vehicle pilot was announced jointly by TMR with the Motor Accident Insurance Commission and Ipswich City Council in November 2016. Pilot will include a public on-road test in Ipswich involving around 500 fleet and public participants. The pilot will enhance Queensland readiness, grow industry partnerships, demonstrate the benefits and build public confidence in the technology.

Automated vehicle (AV) trials

TMR has established an AV Trial Permit Framework to enable trials of automated vehicles. The framework builds on the National AV Trial Guidelines, previously developed by the NTC.

TMR has issued several permits to trial AVs in Queensland. A permit is required if a trial involves a vehicle that does not comply with Australian Design Rules or if road rules need to be exempted.

Notable AV trials to be conducted in Queensland include the Redlands Coast Smart Mobility Trial, using an EasyMile EZ10 shuttle vehicle on Karragarra Island in Moreton Bay, and the Co-operative and Highly Automated Driving Study, using a modified Renault Zoe Intens hatchback along several Queensland routes. Both of these trials have been conducted along open road environments, mixing with live traffic.

TMR will continue to work with organisations wishing to trial AV technologies in Queensland to ensure all trials are conducted safely and contribute to the department and State's knowledge of this emerging technology.[519]

DTMR highlighted the opportunity that connected and automated vehicles will have to improve the safety of Queensland's transport system and advised that they are 'engaging with industry, academia and the community to explore and resolve concerns about the technology through researching and testing'.[520]

In relation to addressing concerns about providing Queenslanders with an opportunity to gain insight into cooperative and highly automated driving, DTMR advised:

Transport and Main Roads is piloting a custom-made vehicle—a Renault Zoe, imported directly from France—to provide Queenslanders with an exclusive insight into cooperative and highly automated driving. Transport and Main Roads is delivering the Ipswich Connected Vehicle Pilot, which will have up to 500 vehicles retrofitted with devices that 'talk' to roadside infrastructure and road operations systems to share relevant safety related warnings to drivers.[521]

The committee also notes information from Austroads that details where connected and automated vehicle trials are taking place in Australia and New Zealand. According to Austroads, its Future Vehicles & Technology Program is supporting its member organisations 'to deliver an improved road transport network that leverages the benefits of emerging technologies whilst minimising some of the risks inevitably faced during a period of such rapid change'.[522] In Queensland, the trials include:

- a driverless shuttle bus trial
- the CAVI (as mentioned by DTMR above)
- Ipswich Connected Vehicle Pilot (as mentioned by DTMR above)

519 Department of Transport and Main Roads, correspondence dated 14 May 2020, pp 16-17.

520 Public hearing transcript, Brisbane, 15 June 2020, p 2.

521 Public hearing transcript, Brisbane, 15 June 2020, p 2.

522 Austroads, *Trials*, https://austroads.com.au/drivers-and-vehicles/future-vehicles-and-technology/trials.

- Vulnerable Road User pilot
- Connected and Highly Automated Driving Pilot
- RACQ Smart Shuttle[523]

Committee comment

The committee notes the concerns raised in this section about the infrastructure-readiness of Australian roads for automated vehicles and the role that pilots and trials play. The committee notes the trials already underway in Queensland to progress this technology and that DTMR is working with other jurisdictions on the NPF Action Plan as indicated by the work the department is undertaking on the CAVI project.

The committee supports the views of submitters that trials are essential for understanding the challenges and gaps that need to be addressed before integrating these vehicles into the Australian transport fleet. The committee notes RACQ's comments about incremental scaling of the results of successful trials to achieve an AV-ready transport network.

The committee also supports the view that the community needs to develop greater awareness of the technology and is pleased to see the Queensland Government's piloting of a custom-made vehicle to provide Queenslanders with an opportunity to explore cooperative and highly automated driving. However, the committee believes more opportunities should be made available in various locations and that a community awareness campaign be developed and released to build understanding of the benefits, safe use, and automated features of connected and automated vehicle technology.

Recommendation 13

The committee recommends the Queensland Government consider a community awareness campaign, including what actions are being taken by government, to build understanding of the benefits, safe use, and automated features of connected and automated vehicle technology.

5.5.2 Regulatory framework

Submitters made a number of comments and recommendations in regard to developing the regulatory framework for new and emerging transport technologies. For ITS Australia, it is essential that government play a key role 'in working with the private sector to facilitate deployment and remove unnecessary regulatory barriers' to enhance the uptake of these new technologies.[524]

RACQ was of the view that 'a flexible yet firm approach to regulation and penalties for low level automated vehicles' needed to be taken 'to ensure safety and quality is maximised'.[525]

MTAQ summarised its view that the foundation of regulation should be to achieve a balance between enabling new technologies to develop and ensuring the cost is not too great for regions that may be at a disadvantage:

> *The challenge for governments will be to develop and manage frameworks that both enable the adoption of the most advanced formats of vehicle technology while at the same time ensuring these statutory structures have the competence to support ICE vehicles in those regions where the economic, commercial and social cost of the transition do not justify a change from conventionally powered transportation in the near to medium terms.*[526]

523 Austroads, *Trials*, https://austroads.com.au/drivers-and-vehicles/future-vehicles-and-technology/trials.

524 Submission 22, p 2.

525 Submission 5, p 2.

526 Submission 7, p 2.

Several submitters advocated for the speedy introduction of legislation. For example, RCC was of the view that Queensland was lagging behind many other Australian states that 'have already developed or are in the process of developing legislation to guide how their states progress and deal with this emerging technology'.[527] Transurban called for regulation that would support more trials in this area, stating that it was imperative to keep pace with rapidly changing technology 'by creating a regulatory environment in which such trials can be implemented with ease and continue to conduct trials of the latest technology'.[528] Engineers Australia shared a similar view, encouraging the government to 'continue supporting trials through fuel efficiency targets and a regulatory environment conducive to greater EV uptake for businesses and individuals'.[529]

MTAQ was blunt in its assessment that the current regulatory environment was not conducive to conducting trials into new transport technologies:

> *Right now we need to commit to legitimate trials. We talk about and read about announcements of trials in different councils. The reality is the legislation does not permit that, so there is lots of talk and absolutely no action in that space. I am working with technology companies from overseas that are looking to try and launch this technology. We get a tokenistic commitment at the moment on the basis that the legislation does not support the decision-makers in and around using that autonomous vehicle technology. It is a real barrier. We are working with the Redlands shire and the Ipswich City Council at the moment. We have been given approval to do it, yet the legislation does not permit us to do it on public road access.*
>
> *…*
>
> *If we look at Springfield, for example, we are working with a small shuttle provider that is fully autonomous. Whilst they are developing and building the infrastructure you embed the technology that best supports it. These vehicles can operate without supporting technology. Because of the latest investment by Queensland and federal governments to the roads out there Ipswich's infrastructure is best suited to trial that technology, but we cannot get anywhere near the roads at this stage. The places we are talking about are university campuses and shopping centres where you have constant routes. This technology will be brilliant. If you talk about keeping people off the road and using transport, it is that first and last mile that we need to address. If you have that type of transport to complement existing public transport you will see much better use.*[530]

Engineers Australia also considered that the government should prioritise policies that would support greater uptake of EVs 'in line with global trends away from fossil fuel reliance' and sought reassurance that the government recognise 'the value of fostering development of other technologies, such as hydrogen energy power.[531]

Engineers Australia stated:

> *As the domestic market grows, EV manufacturers will provide more options for Australian consumers.*
>
> *Some progressive governments overseas have already taken steps to ban the manufacture and sale of internal combustion engines. Whilst unrealistic for the short term, the ultimate goal can be achieved if long term planning decisions are taken now.*

527 Submission 11, p 4.

528 Submission 17, p 7.

529 Submission 25, p 6.

530 Public hearing transcript, Brisbane, 12 November 2018, p 10.

531 Submission 25, p 4.

> *Recent research conducted for the City of Melbourne demonstrated that due to the carbon intensity of electricity production in certain Australian states, operating an electric vehicle in Australia can sometimes be dirtier than many of the most popular petrol cars. In order to fully realise the benefits associated with the electrification of our transport networks, focus upon emissions reductions for the entire electricity network must occur concurrently.*
>
> *The government must work to reduce commercial barriers for business in order to drive the uptake of electric vehicles. Further investment needs to focus on application of renewable energy source to reduce emission levels.*[532]

Submitters advocated for strong and coordinated strategies and frameworks to support new transport technologies. Transurban stated:

> *Urban policy decisions made today will shape the evolution of mobility and transport usage over the coming decades and must consider new technologies as well as existing policies and systems that underpin transport networks and services in Australia.*[533]

In this regard, ITS Australia recommended cross-border collaboration through bodies such as COAG and those committees that report to it.[534] The ALC also supported the view that all Australian governments work collaboratively 'to ensure a consistent and reliable source of energy to power electric vehicles', stating further:

> *As part of the National Energy Market, the Queensland Government must work collaboratively to provide a reliable, secure and affordable source of electricity. In our submission to the Senate Select Committee on Electric Vehicles, ALC stated: One factor that may limit the uptake of electric vehicles in the freight logistics industry is a lack of confidence by industry in having a guaranteed and reliable source of electricity. From September 2016 to February 2017, South Australia experienced three large black-outs. Load shedding by the Australian Energy Market Operator (AEMO) over the 2016-17 Australian summer also forced temporary black-outs.*
>
> *Freight and logistics companies wish to invest in electric vehicles. However, companies will only do so if they have confidence that they have access to a reliable and affordable source of electricity.*[535]

iMOVE also supported the need for a 'national and coordinated approach', noting that some national frameworks were in place 'but their effectiveness depends on a willingness amongst stakeholders to collaborate, share and learn from each other'.[536] In this regard, iMOVE recommended a 'collaborative, multi-party R&D' approach as:

> *… an effective means of addressing complex problems, such as those typically encountered in the transport industry. This approach ensures that there is access to the right range and depth of perspectives and expertise for the issue in hand. It also contributes to the expanding critical mass of 'ITS' (Intelligent Transport Systems) skills in Australia, creates new networks and alliances and generates further opportunities.*[537]

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532 Submission 25, p 4.

533 Submission 17, p 6.

534 Submission 22, p 2.

535 Submission 23, p 12. NB: in-text references have been removed. Refer to original document for information.

536 Submission 9, p 1.

537 Submission 9, p 3.

The issue of standardisation on a national level in terms of the technology that will be added to CAVs was also raised. Transurban advised that it is a challenge for industry. Transurban stated this could be addressed by regulation and that Transurban's role would be to keep pace with the technology changes and regulatory framework and provide feedback and findings on how it is operating to the decision-making bodies.[538]

The ALC also suggested that the Queensland Government consider changes to the ADRs 'to accommodate the unique size and shape of light commercial electric vehicles', stating further:

> *The Australian Design Rules are intended to provide a set of national standards for vehicle safety in Australia. While the Australian Design Rules play a vital role in ensuring vehicle safety, ALC members have found it difficult to ensure their electric vehicles conform to their requirements. The Queensland Government should support a review of the Australian Design Rules, noting the unique size and shape of light commercial electric vehicles.*[539]

The committee notes that changes to ADRs fall under federal jurisdiction and that the NTC is addressing these. Refer to section 5.4.3.4 for more information.

MTAQ also called for a strong statutory framework around the food delivery industry, particularly in relation to employment (the impacts of which are discussed in more detail in chapter 6):

> *It is a way that we as consumers have come to expect to use things. Our key point there is that we need an enabling regulatory framework around this. There are concerns publicly about the way in which people are employed in that space at the moment on the basis of applications, whether they are an employee a contractor, and the right wages being attached to that are a challenge to try and regulate. It is not our industry. What we want to do is create a regulatory framework that takes into account the workforce but enables business to do what it needs to do in an efficient way. That type of transportation delivery is essential to the future of Queensland and Australia's economy.*[540]

MTAQ also suggested that the statutory framework should address 'short distance' transportation logistics (food delivery and general retail deliveries), which according to the MTAQ, 'are all likely to experience transportation disputes that will need statutory framework for an effective resolution'.[541] In response to this, DTMR advised:

> *While there are currently no plans to actively regulate short distance delivery services, the department will continue to monitor developments in this space and respond as necessary.*[542]

In addition to the above comments and in regards to what specific matters needed to be considered when developing a regulatory framework for new and emerging technologies (apart of those already noted above), submitters advised the regulatory environment should:

- ensure manufacturers are held accountable for promises they make about their products to enhance public trust.[543]
- require reliable mechanisms to ensure that faulty products do not remain on the road posing a risk of harm to members of the community.[544]

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538 Public hearing transcript, Brisbane, 11 February 2019, p 4.

539 Submission 23, p 12. NB: in-text references have been removed. Refer to original document for information.

540 Public hearing transcript, Brisbane, 12 November 2018, p 10.

541 Submission 7, p 7.

542 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 21.

543 Submission 20, p 16.

544 Submission 20, p 16.

- require reliable mechanisms to deal with foreign corporations that manufactured faulty products and then enter Administration or file for bankruptcy leaving faulty products.[545]
- address accountability overall and provide clear guidelines about who holds the ultimate responsibility when something goes wrong.[546] For example, who is liable if there is an electrical fire while a vehicle is charging in local government charging infrastructure?
- address issues and public risks associated with immature semi-autonomous vehicle features.[547]
- in regard to personal mobility devices which may pose safety risks to other vulnerable network users due to their ability to travel at increased speeds compared to cycling and walking, mitigate safety risks through a mix of planning and design, regulation, and legislative responses.[548]
- support the emergence of mobility as a service.[549]
- ensure appropriate licencing arrangements as higher levels of automated driving are introduced.[550]

In regard to working towards a regulatory framework that provides for mechanisms to deal with faulty products and foreign corporations that may enter administration, DTMR advised:

> *Under current regulatory arrangements, unsafe vehicles are subject to recall under Australian Consumer Law. The Australian Government's Australian Competition and Consumer Commission (ACCC) is responsible for managing the recall process, which can be either voluntary or compulsory.*
>
> *Recall processes place obligations on the vehicle manufacturer and are able to support the rectification of unsafe vehicles even after a component manufacturer has become insolvent. For example, the current compulsory Takata airbag recall requires vehicle manufacturers to replace defective airbags, despite the airbag supplier filing for bankruptcy in 2017.*
>
> *State and territory road agencies and other federal departments also play an important role in supporting the ACCC and manufacturers to remove unsafe vehicles from the road. For example, in support of the compulsory Takata airbag recall, state and territory road agencies have agreed to cancel the registration of high-risk vehicles, where vehicle owners have not sought to have their vehicles repaired in a timely manner.*
>
> *In Queensland, this process is managed by the Department of Transport and Main Roads and all reasonable attempts are made to contact vehicle owners before cancelling registrations. This process is working well with the registration of all high-risk Takata vehicles cancelled and unable to be used on Queensland roads until repairs are made. Further work is underway to ensure the rest of the Takata fleet is similarly managed.*
>
> *Vehicle recall obligations will continue as an option that can be deployed in the future. However, additional regulatory arrangements are needed to support the safe operation of future vehicles, such as automated vehicles. A range of regulatory reforms are currently underway to develop these future arrangements. This will include, for example, statutory obligations on the entity that*

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545 Submission 20, p 16.

546 Submission 20, p 17.

547 Submission 20.

548 RACQ, submission 5, p 3.

549 Engineers Australia, submission 25, p 4.

550 Australian Automotive Dealers Association, submission 8, p 8; Queensland Advocacy Incorporated, submission 21, p 6.

> *brings an automated vehicle to market, known as the Automated Driving System Entity (ADSE), and their executive officers, both Australian and overseas, to ensure the vehicle's safe operation.*
>
> *In addition, ADSEs will be required to have an Australian corporate presence and demonstrate ongoing minimum financial requirements to ensure they are capable of detecting and responding to emerging safety issues. Processes will also be needed to ensure these statutory obligations are transferrable in the event an ADSE becomes insolvent and where a willing and capable replacement is identified.*[551]

In regard to strategy, specifically for heavy vehicles, NatRoad submitted that the first step in planning for new transport technologies is to 'get the Strategy right'. In this regard, NatRoad indicated its support for a 'move to cost-reflective road pricing, which if properly designed, would support great network efficiency through reduced congestion, greater access and better funding of road maintenance.'[552] NatRoad continued:

> *Optimally, expansion of road network capacity linked to market demand and pre-determined routes for heavy vehicles rather than reliance on an outmoded permit system will be part and parcel of the Strategy's application.*[553]

NatRoad submitted that the government played an important role in correcting 'any identified market failures… when examining the introduction of automated vehicles' and that those interventions should:

- *be consistently adopted by all states and territories;*
- *operate less prescriptively than current HVNL rules;*
- *be principles-based and technology-neutral;*
- *support road safety outcomes;*
- *support innovation;*
- *be updated and kept relevant as the capability of automated vehicles develops; have regard to all levels of driving automation;*
- *assist road transport agencies when considering the consequences of granting exemptions from traffic laws; and*
- *not affect current rules for drivers of non-automated vehicles.*[554]

As part of regulatory reform, NatRoad also sought incentives from government to increase the uptake of safety technology in heavy vehicles.[555]

As a regulator of the heavy vehicle industry, the NHVR advised that its role is 'to provide a regulatory environment that allows the industry to deliver the freight task in the most efficient way but while ensuring the safety of the industry and the general public'.[556]

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551 Department of Transport and Main Roads, correspondence dated 30 June 2020, pp 22-23.

552 Submission 3, p 3.

553 Submission 3, p 4.

554 Submission 3, p 5.

555 Public hearing transcript, Brisbane, 29 January 2019, p 3.

556 Public hearing transcript, Brisbane, 29 January 2019, p 1.

The NHVR emphasised its data based approach to developing regulation:

> *The first is the regulator's data based approach. To be an effective regulator, it is essential to have a solid understanding of our industry, who the industry is made up of, what they are moving, where they are moving it, when they are moving it and what they are moving it on. Through the development of the regulator's safety and compliance regulatory platform, we will connect a number of custom, state based and national datasets to provide a comprehensive overview of the heavy vehicle industry. This data will enable the regulator to make more informed policy decisions such as identifying areas where safety or productivity improvements could be made, and develop a strategic and coordinated national approach to address these. It will also form the basis of our service delivery functions, ensuring our roadside compliance officers have the data and tools that they need to support more effective national service delivery operations. In short, it is about using technology to regulate better.*[557]

DTMR acknowledged government's role in providing a regulatory framework for CAVs:

> *The introduction of driverless or CAVs into the Australian market will significantly change the way our roads are used and how they are managed. The challenge for governments is to provide a regulatory framework that focusses on the safety of all road users. Mechanisms that currently control road access and vehicle safety are not adequate to deal with CAVs. As such, there is a need to design a regulatory approach that does not present a barrier to innovation, vehicle importation and commercial deployment of the new technology.*
>
> *TMR is engaged in a national program of work, led by the NTC to establish a regulatory framework for CAVs. This framework will address the implications for vehicle supply to market, vehicle safety, driving laws, registration, insurance and enforcement. Australian jurisdictions have agreed that this end-to-end framework should be in place by 2020. This work is part of the NPF Action Plan.*[558]

DTMR emphasised that safety was key to the development of regulation and that the introduction of CAVs will represent a significant transition for transport:

> *The principles behind that legislative process are around a safety assurance scheme. By that I mean a number of safety principles need to be considered as far as approval for these types of vehicles are concerned to not only come into the country but be registered and deployed on the roads in the future… some of this technology is still a fair way away. There has been a lot of media around what these technologies can do, and certain companies will obviously promote their technologies. The reality of what we are seeing is that level 3 automation is still a little way away from being deployed on the roads and certainly level 4 and 5 automation is still some time away.*
>
> *What is really important to understand here is that there is likely to be a completely different framework about how we manage vehicles being imported and deployed on the roads. It is a bit of a watershed moment, if you like. It is sort of like that transition from horse and cart to motor vehicle. We are now in that phase of transitioning from motor vehicle to autonomous vehicles. That requires a fair amount of consideration about trying to get these legislative parameters right.*[559]

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557 Public hearing transcript, Brisbane, 29 January 2019, p 2.

558 Submission 4, p 15.

559 Public hearing transcript, Brisbane, 29 October 2018, pp 8-9.

In regard to the issues raised about the need for a strong regulatory framework and a national, coordinated approach to AV technology, DTMR advised that Queensland is taking a lead role in national reforms being led by the NTC in relation to end-to-end regulation for the commercial deployment of automated vehicles, one of the key priorities of the Action Plan. DTMR advised:

> *The regulation of Connected and Automated Vehicles (CAVs) must be nationally consistent and internationally aligned. This is critical as the design, testing and manufacture of CAVs will predominately occur overseas, and Queensland and Australia are small markets for vehicles on the global stage. In addition, vehicles supplied to the Australian market are sold and used across all jurisdictions and consumers have an expectation that regulatory arrangements will support this.*
>
> *Queensland, through the Department of Transport and Main Roads, plays a lead role in national reforms being led by the National Transport Commission. These reforms aim to establish an end-to-end regulatory framework to support the safe deployment of CAVs in Australia. Queensland is committed to the development of a nationally consistent regulatory framework to ensure Australia is a desirable place for commercial CAV deployment and use of CAVs across Australia is efficient and convenient for consumers.*[560]

DTMR also advised:

> *It has been agreed that there will be a single national regulatory framework for AVs to create a single and stable market for vehicle manufacturers. The NTC-led national reforms have delivered the foundations of this future regulatory framework. This includes, the need for a specialist national regulator, a new national law and a proactive outcomes-based regulatory approach supported by safety assurance criteria that will govern the safety of AVs in a consistent manner across their lifetime in Australia.*[561]

In regard to another key priority of the Action Plan—accelerating the deployment and uptake of road safety technologies and innovation, DTMR advised:

> *TMR is supporting the Commonwealth government to facilitate improvements in vehicle standards to incorporate international vehicle standards. TMR is also actively seeking to progress connected vehicle technology standards to align with the European standard and is doing so through the Ipswich Connected Vehicle Pilot.*
>
> *In deployment, these are intended to be national systems, ensuring interoperability irrespective of borders. The ICVP pilot systems are available for industry and other governments use - and is currently used by Lexus and Toyota for testing.*[562]

Committee comment

The committee notes submitters concerns regarding the regulatory framework to support new and emerging transport technologies, including suggestions to:

a) reduce commercial barriers for businesses to drive uptake of technology

b) support for innovation and trials

c) ensure safety and quality are maximised

d) ensure the cost of the technology is not too great for the regions

e) support for a national and coordinated approach to regulation

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560 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 13.

561 Department of Transport and Main Roads, correspondence dated 2 July 2020, p 7.

562 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 13.

f) national standardisation of infrastructure and vehicle standards

g) regulating responsibility for faulty products

h) regulating personal mobility devices with a focus on safety.

The committee notes TIC's work through the NPF on ensuring the consistent implementation, integration and uptake of transport technology across all jurisdictions and all land transport modes; and outlining the government's role on issues such as regulation, standards and investment to provide certainty to industry and the community.[563]

The committee is also pleased to note DTMR's advice that it is:

> *… engaged in a national program of work, led by the NTC to establish a regulatory framework for CAVs. This framework will address the implications for vehicle supply to market, vehicle safety, driving laws, registration, insurance and enforcement. Australian jurisdictions have agreed that this end-to-end framework should be in place by 2020. This work is part of the NPF Action Plan.*[564]

During its discussions with the ARRB, the committee heard that the current regulatory system is prescriptive. However, with automated vehicles there is a need for a different type of framework, which will allow flexibility to enable the technology to develop, whilst maintaining optimal safety and control mechanisms.

Recommendation 14

The committee recommends the Queensland Government consider planning for how a future regulatory framework around automated vehicles will operate and how state and federal governments can work cooperatively to successfully integrate these vehicles into transport networks.

[563] Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 'National Policy Framework for Land Transport Technology', https://www.infrastructure.gov.au/transport/land-transport-technology/national-policy-framework-Land-transport-technology.aspx.

[564] Submission 4, p 15.

6 Impact of changes in transport technology on employment

6.1 Introduction

The transport industry has experienced a number of technological changes in recent years that have impacted employment, including 'Delivery on Demand' distribution models and the emergence of the gig economy. Other major trends that are expected to impact employment over the coming years are automation, privatisation, and shared mobility.[565]

6.2 Current statistics – employment in the transport industry

DTMR provided statistics on transport, postal and warehousing (TPW) industry employment in Queensland, advising of a moderate increase of 4.2 per cent, or 5400 workers, over the decade to February 2020. DTMR notes that of the approximately 135,000 jobs within the TPW industry, road transport is the largest employer accounting for 41 per cent of total TPW employment.[566] The department provided more information on employment by occupation:

> *A number of occupations are closely associated with the transport industry and employ a significant number of Queenslanders. While there are several different occupations within the TPW industry including managers, professionals, clerical and administrative workers, the industry has a significantly higher concentration of drivers than other industries.*
>
> *The ABS collects data on several 'driver' occupations - Couriers and Postal Deliverers; Machinery Operators and Drivers; Road and Rail Drivers; Train and Tram Drivers; Road and Rail Drivers; Bus and Coach Drivers; Forklift Drivers; Delivery Drivers; Automobile Drivers; and Truck Drivers. For the purposes of this analysis, occupations within this group were aggregated into a single group called 'drivers'.*
>
> *In the year to February 2020, there were around 100,000 drivers, accounting for 3.8 per cent of total Queensland employment. Truck drivers are the largest occupation within this group, accounting for 45 per cent of drivers.*
>
> *Employment of drivers grew by around 13,000 workers, or 15 per cent, over the decade to February 2020. There was relatively modest growth in employment of drivers over the past decade, higher than growth in technicians, trade workers, and labourers, but lower than machinery operators and all other occupations.*[567]

DTMR also advised:

> *Within the group of driver occupations, increases were recorded in the past decade for all occupations except Couriers and Postal Deliverers (-5,000) and Train and Tram Drivers (-500). The largest increase was in Delivery Drivers (+5,000).*[568]

The department explained these changes for jobs as couriers, postal deliverers and forklift driver jobs as follows:

> *This may partially be explained by technological changes impacting on the industry. In recent years, the growth of online retailing, app-based delivery services for food delivery and ridesharing as well as traditional bricks-and-mortar retailers increasingly offering delivery services, has likely resulted in significant increases in employment in some industry subdivisions and occupations. Conversely, increasingly sophisticated logistics technologies may be reducing*

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565 Department of Transport and Main Roads, submission 4, p 17; Queensland Council of Unions, submission 15, p 2.

566 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 18.

567 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 18.

568 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 19.

labour requirements within parts of the industry. The transport industry and driver occupations are likely to continue to be impacted by technological change.[569]

6.3 Impact on employment and job types

Emerging transport technologies have the potential for great levels of disruption, which will be challenging in particular for the transport, freight and logistics sectors. A number of submitters commented on how this disruption is impacting, and will impact, employment and particular job types.

DTMR summarised the current context as follows:

The recent emergence of 'Delivery on Demand' distribution models has disrupted the traditional supply chain dynamic in urban areas around the world, including Australia. Service providers such as Foodora, Deliveroo and Uber-eats are establishing themselves as key players in the food delivery market. Technology enabled geolocation, ordering and payment systems are the foundation of these peer-to-peer type services.[570]

BCC advised that over time, the increasing use of EVs and AVs could result in fewer jobs in some occupations, such as drivers and mechanics.[571] RACQ concurred, stating that jobs across the transport industry could be impacted over the coming 10 to 30 years, including roles relating to driving, deliveries, mechanical repairs, public transport, freight, logistics, bookable transport, rideshare, and automotive/vehicle manufacturing and repairs.[572]

TCQ stated that the transition to new transport technologies could trigger 'large scale job losses as driving roles across the transport sector become redundant, and without commensurate numbers of new opportunities emerging in ancillary support and carer roles'.[573]

Mr Lacaze, a submitter, contended that the advent of autonomous vehicles would have 'obvious and profound' impacts on employment with 'huge numbers' of machine operators and drivers displaced.[574] Mr Lacaze explained how associated employment, for example those employees supervising AVs, might also be impacted:

Driverless shuttles which are common place in airports and theme parks clearly demonstrate the notion. Even in mining applications this is clear and perhaps more relevant.

All of these are "closed systems" where vehicles pretty much "follow the leader".

The override supervision is generally provisioned remotely via telemetry to a centralized facility. Departing to a hypothetical as to how this might look in a lower cost more "distributed system" there is little to stop this control facility being located anywhere in the world and outsourced to operators of questionable ability.

The ability for Australian authorities to control such an operation once it is allowed to occur has been shown to be almost non existent.[575]

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569 Submission 4, p 20.

570 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 17.

571 Submission 2, p 5.

572 Submission 5, p 10.

573 Submission 27, p 2.

574 Submission 16, p 10.

575 Submission 16, p 10.

Mr Lacaze also stated that, based on past experience, the uptake of technology would see prime jobs being replaced by low-paying jobs:

> *If we look at what has gone on over the last few years as well, the way those jobs have been packaged and made available to the workforce actually means there is another scorpion sting in them in that they tend to be precarious jobs. They are often contracting or sham contracting jobs. The people getting the benefits from the productivity are actually avoiding the wage risk of even the last little bits of the network that they have to run.*[576]

As the peak body representing franchised new car dealers in Australia, the AADA explained how it believed MaaS (discussed in detail in section 5.3.1) would negatively impact motor trades and related occupations, as well as drivers:

> *Further, the likely broad adoption of MAAS as the underlying principle for passenger and freight transport will result in much lower accident rates. This will impact trades and occupations that exist to keep motor vehicles on the road, such as panel beaters, and will relegate those occupations to niche roles, or make them completely obsolete.*
>
> *The consequences of MAAS for many motor trades will likely begin to manifest itself even before full automation arrives, as freight vehicles adopt 'platooning' strategies to reduce staffing imposts. In this context, the term 'platooning' refers to multiple trucks that follow one another automatically, with only the lead truck being crewed by a human driver. In the Australian context, this approach could see 'virtual road trains' where the lead truck has two drivers, thus enabling them to swap driving every few hours without delays due to mandatory rest stops.*[577]

RACQ noted that its current business model and employee role duties across its banking, insurance and assistance sections could also be impacted over coming years, including:

- *Potential for reduced demand for roadside assistance due to electric and automated vehicles being expected to have fewer mechanical issues.*
- *Possible additional education and training requirements for servicing and assistance staff to perform repairs and maintenance on electric and automated vehicles if/when required.*
- *Potentially lower demand for traffic response units (currently operated by RACQ) and insurance claims due to fewer expected crashes/breakdowns in the long term - but potentially higher demand when there is a low level automated/mixed automated and human driver fleet.*
- *Impacts to RACQ insurance products, claims, and staff training as liability for automated vehicles change for personal and business insurance requirements.*
- *Potential reduction in membership base and revenue if changing ownership trends and vehicle access models reduce demand for assistance, insurance, and loan products.*[578]

The AADA also acknowledged that its members may potentially need to upskill as technology moves towards electrification:

> *It is also important to note that when these vehicles do need repairs, they will require appropriately trained technicians as EVs pose an increased risk of electrocution and fire. In fact, the emergence of EVs will necessitate significant changes in skills and training requirements which will be needed to service and maintain an increasingly electrified fleet.*

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576 Public hearing transcript, Brisbane, 1 April 2019, p 3.

577 Submission 8, p 13.

578 Submission 5, p 9.

This is particularly concerning when you consider that the licensing/accreditation requirement for mechanics is not consistent across states and territories.[579]

And:

Our members will continue to sell, maintain and repair vehicles regardless of how they are powered. However, the skill sets required will evolve and so will our staff. Government needs to consider how to assist industry to retrain, redevelop, or redeploy the state workforce through such disruption.[580]

In this regard, DTMR advised:

The Queensland Government understands the importance of transition planning for sectors impacted by automation and digital disruption. The Department of Employment, Small Business and Training is working with industry to identify opportunities to support the workforce to adapt and respond to changes resulting from new transport technologies.[581]

RACQ also considered the need to plan for upskilling of workers as technology changed:

Roles in the infrastructure engineering, design, and construction industry will also require significant upskilling to ensure roads enable optimal automated vehicle functionality. Construction and infrastructure maintenance roles may have short-term growth due to work required for making the network suitable for AVs, but long-term decline as less infrastructure may be needed under certain use models and may require less maintenance as AV programming can minimise wear and tear caused by vehicles, especially if fleet and public transport models result in a reduction in vehicles.[582]

In this regard, RACQ recommended that the Queensland Government:

Engage with industry bodies, organisations, small business and employers which will be impacted by these technologies and identify opportunities for businesses to leverage technologies to improve efficiency and competitiveness and identify how employee roles can realign to provide complimentary value in 'soft skill' roles, which may require upskilling.[583]

QCU expressed concern about what happens when a worker is not able to upskill, stating that unemployment that follows dislocation from existing jobs and industries 'can persist for long periods and transition to another occupation is often difficult'. QCU also highlighted that income loss can be substantial and long-lasting and sought consideration of how to transition workers from current jobs to new employment.[584]

The Australia Institute stated that it was important to facilitate mobility for workers:

It is clear that some existing transportation jobs will be eliminated by new technologies, others will be significantly changed. But there will also be significant new work associated with the advent of new technologies. An obvious response to this challenge will be to assist existing workers to fill those new positions which arise in the course of technological change. This means providing notice, support, and access to training and adjustment programs, so that workers can adapt their capacities in line with the emerging opportunities. Financial support from employers and governments will be important in this regard, given the already precarious incomes of many transportation workers. A crucial challenge confronted in this effort to facilitate mobility within

579 Submission 8, p 8.

580 Submission 8, p 3.

581 Department of Transport and Main Roads, correspondence dated 30 June 2020, p 27.

582 Submission 5, p 10.

583 Submission 5, p 2.

584 Submission 15, p 2.

the sector is the advanced age and limited formal qualifications of many transportation workers. As noted above, transportation workers on average are much older, and possess fewer formal post-school credentials, than workers in other sectors. Training and adjustment programs for transportation need to take account of this reality, and tailor their offerings to fit the needs of older workers with less formal qualifications. Many older workers will be keen to learn new skills and fill new positions; but at the same time, the challenges of this adjustment will simply be beyond the personal capacities of some older workers, who will instead need to be supported in transitions to early retirement.[585]

The Australia Institute stated that the key step to facilitating mobility in the workforce would be to establish benchmarks for skills and qualifications:

New technology-intensive jobs in transportation arising from the application of new technologies will require a wide-ranging suite of new skills – including design, programming, operation, data management, and more. The more that the specific requirements and certifications associated with those skills can be formalized and regulated, the higher-quality and more stable will be the resulting jobs in these vocations. Sector stakeholders should work closely with existing bodies (such as the Australian Industry Standards body, TAFEs, and others) to specify and catalogue the requirements for these new jobs.

Transferable certifications will assist workers and employers alike in identifying and acquiring needed suites of skills, and developing a ready supply of qualified workers who can work in different firms and sub-sectors. And the sector can work with training institutions (with a likely focus on TAFEs, given their superior scope and capabilities for planning) to develop made-to-measure programs, so that those emerging recognized qualifications can be attained by new entrants and retrained employees alike. Better integration between the vocational education system, regulators, and employers across the sector would help to attain greater clarity and consistency on the skill sets, qualifications, and career paths that will define the transportation jobs of the future. Strengthening the use of high-quality apprenticeships in the industry is another critical dimension of preparing for new skills requirements.[586]

6.3.1 Gig economy

One of the key employment trends within the transport industry is the emergence of the gig economy. DTMR defines the gig economy as:

… an employment trend where organisations contract with independent workers for short term engagements. It connects customers to individual traders who have products or services to sell, hire or lease, often via an online platform or mobile app.

In recent years the gig economy has extended to the food delivery industry which relies on a variety of transport methods including cars, bicycles and motorcycles presenting challenges in road safety and regulation. International visitors, including students, who are taking up employment as delivery drivers/riders may be at greater risk due to a lack of familiarity with our road rules.[587]

Several stakeholders reported on the detrimental impact of the gig economy on employment, and workers' rights, remuneration, and employment conditions and arrangements. In summary, stakeholders identified the following impacts of the gig economy on workers:

- insecure work conditions and hours – vulnerable to exploitation
- underpaid workers who cannot earn a sufficient wage to make superannuation contributions

585 Submission 18, pp 64-65.

586 Submission 18, p 65.

587 Submission 4, p 17.

- minimal work entitlements
- few opportunities for career development[588]

QCU expressed concern about the rise of the gig economy, particularly in the personal transport and food delivery sectors, as it has a 'deleterious impact on workers in terms of employment, remuneration and workplace health and safety'.[589] QCU continued:

> *There is a considerable amount of literature that identifies the intensification of work and the growth in insecure employment across industry and throughout society. The trends in relation to food delivery are merely a reflection of those broader societal trends. The ability to use technology to obtain the lowest price from the workers who would deliver has obvious implications for incomes in this sector of the community. The gig economy in the transport sector is associated with long periods of unpaid waiting time that brings the hourly rate of the purported contractor well below the minimum hourly wage. Furthermore, those hours when work is available would ordinarily attract the payment of a penalty rate for an employee under a modern award. The start-up costs are low to enter the gig economy and it generally requires no qualification. The factors associated with the gig economy make it an obvious location for vulnerable workers, including guest workers on various forms of work visas.*
>
> *Further, the ambiguous status of drivers, who have an appearance of being independent contractors, is not only related to their hourly rate of pay. Rates of pay within the gig economy will fall below minimum rates, as mentioned above and the purported contractor will not be entitled to the protections of the National Employment Standards nor will they be protected by workers' compensation^. The net result is a shifting of obligations and risk to the worker and/or the community.*
>
> *…*
>
> *In our submission it is not so much how technology "is affecting employment arrangements in the transport industry" but rather it is "how technology is being used to adversely impact upon employment arrangements". The QCU opposes the use of independent contractors for employers to avoid their legal obligations. To dress up obvious price takers as entrepreneurs is an absurdity and workers in the gig economy should be entitled to the minimum conditions that workers elsewhere in the community are able to enjoy*.
>
> *The growing use of independent contractors contributes to the growing trend of precarious employment throughout the workforce. Precarious employment is having a deleterious effect on the working life and spending ability of a growing number of workers. This in turn is contributing to the low wage growth that is now considered to be at a crisis level in Australia.*
>
> *The QCU would urge the committee to take into consideration the impact of technology on workers within the transport industry. The impact on workers is an important but often neglected consideration.*[590]

Mr Thomas provided evidence of the impact of the gig economy on drivers where they 'no longer make a living wage'. Mr Thomas also commented'[e]mployment arrangements must take into account not only the ability of drivers to make a living wage but to do so in a safe working environment'.[591]

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588 Submission 20; QCU, submission 15; David Thomas, submission 10.

589 Submission 15, p 2.

590 Submission 15, pp 3, 4. NB: in-text reference has been removed. Refer to original submission for more information.

591 Submission 10, p 2.

Mr Lacaze also expressed concern about remuneration for employees within the gig economy:

> *It's possible, of course, that the gig-economy platforms were never designed to provide full-time work that pays the rent and feeds the kids. If they only work for occasional supplementary income, that's an excuse for a take it or leave it approach to labor. Or is it? Should a modern society tolerate jobs that come with no worker rights and no possibility of dignified survival for those who can find no other employment? And even if such jobs are allowed, should they be offered by huge tech companies that provide outsize returns to shareholders even if they don't turn a profit?*[592]

Another submitter commented on the costs of being a driver and the benefits to the 'gig' corporation of this business model:

> *However, with the emerging/'new'technology 'gig' on-demand passenger transport systems/services, the capital/vehicle costs and the costs of drivers being on-call/instantly available are borne by the workers directly. Consequently, 'gig' corporation service providers have been able to effectively 'flood the market' with unlimited vehicles and drivers at no cost to their businesses.*[593]

6.3.2 Sustainability of personalised transport sector

TCQ highlighted how changes in transport technology would impact the personalised transport sector, stating that, as automated vehicles reach level 5 full automation, drivers will no longer be required. TCQ called upon government to work together with industry to encourage new drivers to keep joining the sector until that time. TCQ stated that the 'sector will need a clear vision for the future of its human resources and how professional driving roles may be successfully promoted in the context of their foreseeable future redundancy'.[594] In terms of what can be done, TCQ stated:

- *Public and shared use of AVs, especially utilising private sector operators in the personalised transport sectors, might be put in place to promote efficient use of scarce public road and off-road (parking) space and prevent inefficient AV applications promoting otherwise avoidable congestion.*
- *As higher levels of autonomy are progressed to commercial release, the balance of liability logically shifts from human drivers to vehicle manufacturers and component technology providers. The regulatory and insurance environments must adapt in lockstep as the technology evolves in real world marketplaces to ensure personalised transport providers can operate with legal certainty in regard to their Workplace, Health and Safety obligations and liabilities for property damage and personal injury.*
- *Governments should materially support local businesses, especially small and medium-sized enterprises, to better understand and adapt to the challenges associated with AV technologies.*
- *A level and fair playing field for all personalised transport providers must be maintained so that AVs do not lead to particular market dominants being able to exercise excessive and exploitative powers to the detriment of the public good.*[595]

592 Submission 16, p 11.

593 Submission 20, p 15.

594 Submission 27, p 3.

595 Submission 27, pp 3-4.

6.3.3 Queensland Government approach to managing changes to employment

In regard to the Queensland Government's plans for managing changes to employment and job types as demands shift due to the emergence of new transport technologies, DTMR advised the following:

> *The Department of Transport and Main Roads acknowledges that the accelerating development of transport technologies and automation is changing the nature of employment across the transport sector. As a result, the department has a strategic focus on better understanding the nature and magnitude of these changes and how we (and industry) can respond, now and into the future.*
>
> *The department provides ongoing support to the Transport and Logistics Workforce Advisory Committee (TLWAC), a group of representatives from a range of transport and logistics industry associations, industry operator businesses and government, established in 2006.*
>
> *The TLWAC focuses on common issues impacting the current and future transport and logistics workforce and engages on behalf of the industry to identify and prioritise solutions for industry. The TLWAC, in partnership with the Queensland government developed the* Queensland Transport and Logistics Workforce Strategy and Action Plan 2018–2023 *to ensure a skilled, sustainable and supported workforce into the future. Nine key strategies were identified as high priority by industry, including a specific strategy dedicated to transition planning for sectors impacted by digital disruption and/or automation.*
>
> *The department engages with industry and government departments at both a state and federal level, with particular emphasis on the Department of Employment, Small Business and Training around emerging industry skills gaps, changing needs in relation to training and employment pathways, funding priorities and opportunities.*
>
> *The department, in collaboration with the TLWAC, is committed to providing ongoing support to the industry as it undergoes significant change. Industry is encouraged to actively contribute to developing and implementing solutions to ensure they have the right people with the right skills to take industry forward.*
>
> *…*
>
> *The department has also recently completed its* OneTMR Strategic Workforce Plan: Future Workplace 2020–2024 *which will guide the department's investment into workforce capabilities as it embraces the technological disruptors on the horizon. The Workforce Plan aligns to the Queensland Government's broader 10 year Human Capital Outlook, developed by Jobs Queensland.*
>
> *Jobs Queensland was established in 2015 by the Queensland Government as a statutory entity to provide independent strategic advice on future skills requirements, workforce planning and development issues and apprenticeships and traineeships. Jobs Queensland is responsible for undertaking research into future industry needs to ensure Queensland's workforce is skilled to meet the challenges ahead.*[596]

Committee comment

While the committee notes that workplace arrangements and conditions fall under federal laws, the Queensland Government is able to assist in some areas that are impacting, or will impact, on employment and employment conditions as transport technology evolves, including training and upskilling of workers in preparedness of new technologies and employment opportunities.

[596] Department of Transport and Main Roads, correspondence dated 30 June 2020, pp 25-26.

The committee notes the comments of stakeholders and their calls for the Queensland Government to take a lead role in assisting those industries impacted most severely by changing employment conditions and the emergence of new transport technologies, including automated and electric vehicles. One area would be to assist with benchmarking skills and qualifications and supporting training to upskill workers as identified by the Australia Institute.

The committee acknowledges the work the Queensland Government is doing to grow jobs in Queensland and is particularly pleased to see the development of the *Queensland Transport and Logistics Workforce Strategy and Action Plan 2018–2023*. However, the committee also notes the opportunities for employment as technology evolves and encourages the Queensland Government to investigate these opportunities further.

Recommendation 15

In regards to training, the committee recommends that the Queensland Government liaise with peak bodies in the transport industry and workers' representatives to consider how to assist workers to retrain and upskill to meet the changing demands of the state's workforce.

As the AADA also highlighted above, the need to have consistency across jurisdictions in terms of qualifications, licensing and accreditation is essential. The committee notes the example provided of licensing/accreditation of mechanics and ensuring their training covers the potential risk of electrocution and fire associated with electric vehicles.

Recommendation 16

The committee recommends that the Queensland Government liaise with all jurisdictions to ensure the consistency of licensing, accreditation and training of mechanics across jurisdictions, including specific training to reduce the risk of electrocution and fire associated with electric vehicles.

The committee also notes the concerns of submitters relating to the impacts of the emergence of the gig economy on workers' rights, working conditions and arrangements, and health and safety, and brings these concerns to the attention of the Queensland Government.

6.3.4 Employment opportunities

While RACQ expressed the view that the impact of new transport technologies on net job loss versus new role creation was still unknown, [597] ITS Australia stated that this 'disruption' would be followed by 'major growth potential in new employment opportunities through the application of technology across the life-cycle of transport projects; from planning through construction to asset management'.[598] ITS Australia highlighted the importance of gaining a better understanding of emerging employment opportunities and discussed the positive impacts that could arise from the 'disruption':

> *This technological paradigm shift is changing the way our transport networks and infrastructure are managed, developed, and maintained. Traditional roles in construction, logistics, and public transport delivery will evolve, and in speaking with a number of our member organisations we are confident these emerging technologies will offer improved employment outcomes for both this current generation and those that follow.*[599]

[597] Submission 5, p 9.

[598] Submission 22, p 2.

[599] Submission 22, p 2.

Engineers Australia supported the view that new job opportunities would be created:

> *Concentrating specifically on the technological and engineering aspects of the transport sector, it is likely that the adverse employment effects will be offset by the additional jobs emerging through the introduction of driverless vehicles.*
>
> *The types of jobs emerging as a consequence of a shift to a fully autonomous or mixed fleet are not yet comprehensively understood, but management of autonomous vehicle fleets, management of operating systems according to the Australian environment, assessing compliance to any Australian design codes, additional maintenance of autonomous systems to meet liability and insurance requirements, and an increase in verification and validation of operating databases that will require real time updates are just some of the jobs that will be created.*[600]

DTMR noted:

> *The Commonwealth Department of Infrastructure and Regional Development submission to the House of Representatives Standing Committee on Industry, Innovation, Science and Resources on the Social Impacts of Automation in Transport (February 2017) that suggests that automation will also create new business and job opportunities that could offset possible losses. This may include new roles in supplying, maintaining and operating automated vehicles, or other roles that use automated vehicles as a platform to deliver new kinds of services to the market. As with other disruptive technologies, it difficult to anticipate the opportunities that may arise with automated vehicles.*[601]

Engineers Australia also identified the benefits of ride and car sharing services to connect people and save money, as well as how this change in consumer behaviour will boost productivity:

> *Transport is a natural market for recent shifts towards collaborative consumerism and a sharing economy. Ride and car sharing services connect people with drivers and vehicles when and where they need it. Such services provide the benefits of a personal vehicle without the costs and parking constraints of individual vehicle ownership. These services deliver mobility on demand, and in the process save time and money.*
>
> *The private sector is implementing new processes to deliver food in a more competitive manner. Advances in technology have enabled fast food delivery via drive share services and even drones. This technology has resulted in changes to consumer behaviours, with many people placing greater value on saving on travel time rather than delivery cost. Home delivery services create more employment opportunities, albeit possibly on a casual basis. Small scale trials of food delivery using drones are on-going. As such the commercial viability of such processes remains debatable, not to mention the security and privacy issues associated with drone technology.*
>
> *Whilst driverless vehicles may have an adverse effect on employment in some areas of the transport industry, for example truck, taxi and delivery drivers and so on, there will also be a boost to productivity through the ability for the general population to re-prioritise their time. Where people would previously have been focussed on driving, they will instead be able to work whilst in transit.*[602]

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600 Submission 25, p 8.

601 Department of Transport and Main Roads, correspondence dated 14 May 2020, p 20. NB: in-text references have been removed. Refer to original source for more information.

602 Submission 25, p 8.

NatRoad also discussed the need for supporting more drivers to enter the heavy vehicle industry as its current workforce ages and addressing the gender imbalance. In this regard, NatRoad advised that the road freight task was expected to double by 2030 and with the average age of heavy vehicle drivers currently at 53 years, with 15 per cent of truck drivers under the age of 30, it was expected that the industry would face worker shortages as current truck drivers enter retirement over the next 10 to 15 years.[603] NatRoad also identified the need to address gender and broader community imbalances:

> *As well, women make up just three per cent of the truck driving workforce and unfortunately represent one of the greatest gender imbalances of any occupation. Initiatives to make the job more attractive to sections of the broader community, including Indigenous Australians, must add to its diversity and help address this driver shortage. This is what NatRoad is working on at the moment.*[604]

NatRoad explained its approach to improving this anticipated skills shortage:

> *We would like to see a path to a recognised trade and we would like to see use of technology integrated into that. We are working on developing, with various authorities, a path to a recognised trade. That will lift both the internal image of truck drivers and the external view that is taken of truck drivers. We are working on that at the moment. We also believe that there needs to be positive messages sent about heavy vehicle drivers, their schooling and education, and that heavy vehicles have certain characteristics. One of them relates not only to employment, it relates to the road toll and that is that the evidence that we have that has been the most complete shows a staggering statistic that on 93 per cent of occasions where there is a fatality involving a heavy vehicle it was the fault of the light driver. That statistic has not been tested more broadly, but a similar statistic a few years ago said 80 per cent. It fluctuates between those two numbers. Education about what heavy vehicles do, not viewing them as the enemy, but as integral to the economy, so education, and more structured education leading to a trade. We think that will be a very good way to deal with the issue of the skill shortage that we have.*[605]

NatRoad highlighted that trained drivers in new technologies need not fear losing their job:

> *Fear of losing jobs through technology should be replaced by a perspective that the introduction of technology will enable those who are properly trained in the heavy vehicle industry to thrive. They can do that as they master the new ways in which the heavy vehicle industry tackles the freight task, including the use of increased levels of technology. NatRoad is keen to promote new technologies as a way to attract more young people to work in the road transport industry and make heavy vehicle operation a viable career choice. We do not want it thought of as an industry that is dying on the way to automation. That is the wrong perspective to bring to bear. That is why in submissions about technology we always highlight the human cost and impact. Rather than fear the technology that will change the face of the industry, it is best to help the workforce adapt to that change and embrace the benefits technology will bring…*[606]

DTMR provided the following information in relation to the growth of potential new roles:

> *In 2018, the department worked alongside CSIRO's Data61 to produce* The Innovation Imperative*, a detailed report which modelled the potential impacts on jobs resulting from the transition towards a digitally enabled economy. This report was a key input into the Queensland Transport Strategy, which highlighted key opportunities to partner with industry to build capability and create new jobs in the transport sector. This may include new roles in maintaining and operating automated vehicles, or other roles that use automated vehicles as a platform to*

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603 Public hearing transcript, Brisbane, 29 January 2019, p 3.

604 Public hearing transcript, Brisbane, 29 January 2019, p 3.

605 Public hearing transcript, Brisbane, 29 January 2019, p 6.

606 Public hearing transcript, Brisbane, 29 January 2019, p 3.

deliver new kinds of services to the market. As with other disruptive technologies, it is difficult to anticipate the opportunities that may arise with automated vehicles. Subsequently, the Queensland Government recognises the importance of maintaining an agile approach to planning for these changes.[607] *TMR recognises that the transport industry is and will continue to be influenced by emerging trends and technologies. Some of these trends and technologies, particularly increased automation, will affect employment within the transport industry. That is why TMR is actively working towards identifying occupations that are likely to be affected, providing businesses with transition planning and exploring possible partnerships with education and training providers to ensure that adequate reskilling opportunities are available for affected employees. As these impacts are likely to be occurring in other places of the world, we have the opportunity to learn from those experiences and adapt their learnings to the Queensland circumstance and Queensland communities. We can then work with industry to put in place strategies to ensure future jobs for Queenslanders.*

The Queensland government is committed to partnering with industry and the community to grow jobs in a strong economy. New transport technologies are already growing new Queensland industries and jobs. For example, with Queensland government support, Brisbane based company Tritium has grown to be a global leader in EV technology, with EV chargers deployed in 26 countries and a workforce of 200. More broadly, as the Premier highlighted last month, Queensland is now the largest vehicle manufacturer in Australia. The Queensland government, working in partnership with industry, has enabled this transport sector to emerge as a national leader.[608]

Committee comment

The committee notes the employment opportunities identified by submitters and encourages the Queensland Government to continue to work with industry to ensure anticipated worker shortages are addressed, as well as support industry as job types transition with the advent of new transport technologies.

[607] Department of Transport and Main Roads, correspondence dated 30 June 2020, p 26.

[608] Public hearing transcript, Brisbane, 29 October 2018, p 2.

Appendix A – Submitters

Sub #	Submitter
001	Southern Downs Regional Council
002	Brisbane City Council
003	National Road Transport Association
004	Department of Transport and Main Roads
005	RACQ
006	Bioenergy Australia
007	Motor Trades Association of Queensland
008	Australian Automotive Dealer Association
009	iMOVE Australia
010	David Thomas
011	Redland City Council
012	Office of the Information Commissioner
013	Brisbane Residents United Inc
014	AgForce Queensland Farmers Limited
015	Queensland Council of Unions
016	Stephen Lacaze
017	Transurban Limited
018	Australia Institute
019	David Dallaston
020	Name Suppressed
021	Queensland Advocacy Incorporated
022	Intelligent Transport Systems Australia
023	Australian Logistics Council
024	International Aerospace Law & Policy Group

025 Engineers Australia

026 National Heavy Vehicle Regulator

027 Taxi Council of Queensland

Appendix B – Witnesses at public hearings

Public hearing on 29 October 2018

Department of Transport and Main Roads

- Mrs Julie Mitchell, Deputy Director General (Policy, Planning and Investment)
- Mr Martin Bradshaw, General Manager (TransLink)
- Mr Andrew Mahon, General Manager (Transport Regulation)
- Ms Sally Noonan, Chief Economist
- Ms Fiona Ricardo, Policy Director (Mobility as a Service)
- Ms Suzanne Rose, Executive Director (Service Policy)
- Mr Dennis Walsh, General Manager (Land Transport Safety)
- Mr Mathew Yong, Acting Manager

Public hearing on 12 November 2018

Office of the Information Commissioner

- Mr Phillip Green, Privacy Commissioner
- Ms Susan Shanley, Principal Policy Officer

Motor Trades Association of Queensland

- Mr Brett Dale, Chief Executive Officer

Australian Automotive Dealer Association

- Mr James Voortman, Executive Director, Policy and Communications
- Mr Alex Tewes, Policy Manager

Public hearing on 29 January 2019

National Road Transport Association

- Mr Richard Calver, Adviser, Compliance and Workplace Relations

National Heavy Vehicle Regulator

- Mr Peter Austin, Manager Vehicle Safety and Performance
- Mr David Carlisle, Program Director, Business Improvement & Innovation

AgForce Queensland

- Ms Amelia Shaw - Policy Officer
- Mr Zachary Whale - Grains Policy Director

Public hearing on 11 February 2019

RACQ

- Dr Rebecca Michael, Head of Public Policy

iMOVE Australia

- Mr Jeff Kasparian, Programs Director

Transurban Queensland

- Mr Christopher Poynter, General Manager, Queensland
- Mr Stephen McDonald, General Manager, Strategic Initiatives
- Mr Tony Meredith, Stakeholder Manager, Queensland
- Ms Ruth Moody, Public Affairs Manager, Queensland

Public hearing Monday 25 February 2019

Southern Downs Regional Council (via teleconference)

- Mr David Keenan, Chief Executive Officer

Moreton Bay Regional Council

- Mr Gleb Kolenbet, Principal Integrated Transport Engineer

City of Gold Coast

- Mr Alton Twine, Director, Transport & Infrastructure

Toowoomba Regional Council (via teleconference)

- Ms Carol Taylor, Deputy Mayor
- Mr Mike Brady, General Manager, Infrastructure Services Group

Queensland Resources Council

- Mr Andrew Barger, Policy Director Economics and Infrastructure
- Mr Tom Cunningham, Policy Manager Economics and Local Content

City of Townsville (via teleconference)

- Mr Michael Kaye, Traffic and Infrastructure Planning Engineer
- Mr Greg Bruce, General Manager of Sustainability and Environment
- Mr Matt Steine, Head of Digital City Strategy

Public Hearing on 25 March 2019

International Aerospace Law and Policy Group

- Mr Joseph Wheeler, Principal and Legal Practice Director

Engineers Australia

- Mr Gerard Reardon, Transport Australia Society
- Ms Sybilla Grady, Policy Advisor

Australia Institute

- Dr Jim Stanford, Economist and Director, Centre for Future Work

Intelligent Transport Systems Australia

- Ms Susan Harris, Chief Executive Officer

Brisbane Residents United

- Ms Elizabeth Handley, President, Brisbane Residents United Inc
- Ms Selina More, Management Committee, West End Community Association
- Ms Kirsten Lovejoy, Spring Hill Community

Taxi Council of Queensland

- Mr Blair Davies, Chief Executive Officer

Public hearing 1 April 2019

Individuals

- Mr Stephen Lacaze
- Mr David Thomas
- Mr David Dallaston
- In-camera witness

Queensland Advocacy Incorporated

- Mr Nicholas Collyer, Systemic Advocacy

Inclusion Moves

- Mr Geoff Trappett OAM, Director

Public hearing 15 June 2020

Department of Transport and Main Roads

- Mrs Julianne Mitchell, Deputy Director-General (Policy, Planning & Investment Division)
- Mr Dennis Walsh, Chief Engineer (Infrastructure Management & Delivery Division)
- Ms Lucinda Hoffman, General Manager (Transport Policy Branch; Policy, Planning & Investment Division)
- Ms Ishra Baksh, Executive Director (Mobility as a Service)
- Ms Suzanne Rose, Executive Director (Service Policy; TransLink Division)
- Mr Brendan Hoyle, Director (Strategic Directions; Transport Policy Branch; Policy, Planning and Investment Division)
- Ms Fiona Ricardo, Director (Economic Analysis & Research; Transport Policy Branch; Policy, Planning & Investment Division)
- Ms Amanda Hill, Manager (Policy Integration; Transport Policy Branch; Policy, Planning and Investment Division)
- Mr Russell Hoelzl, Director (Freight; Governance, Freight & Partnerships; Transport Strategy & Planning Branch; Policy, Planning & Investment Division)