

TRANSPORT TECHNOLOGY SECTOR

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Re: Submission to the NSW Inquiry into R&D and innovation in the transport technology sector

Introduction

Thank you for the opportunity to make this submission to the Inquiry on how local research and development in the transport technology sector can deliver transport service innovations. iMOVE is the national centre for transport and mobility R&D in Australia. It was formed to identify, co-fund, and facilitate projects for its industry and government partners. Specifically, iMOVE looks to leverage data and technology to deliver new and improved transport services for passengers and freight in Australia. To date it has initiated 93 transport projects (of which 29 have been completed) and it is working with most states and territories in Australia.

Transport for NSW (TfNSW) has been a strongly engaged partner since iMOVE started in 2017. Through iMOVE, TfNSW is actively pursuing outcomes in the areas of Connected and Automated Vehicles (CAVs), Mobility as a Service (MaaS), successful place-making, Working From Home (WFH) impacts and urban freight. This totals 11 projects to date, with three already completed and others in the pipeline.

We see many emerging opportunities for using technology and data to improve the way we move both people and goods. These opportunities are best realised through collaborative projects to generate outcomes that enhance safety, accessibility, reliability, efficiency and convenience for users of the services and the broader community. This collaborative approach to achieving impact is at the heart of the iMOVE CRC operating model.

The following are areas where we believe research can contribute significant value to improving operations of our transport networks.

Person-centred journeys, including MaaS

Opportunity

The advent of accessible real-time data and the ubiquity of mobile phones has seen a proliferation in tools that enable travel. This creates opportunities for sophisticated journey planning on a much wider scale and more customised approach than was possible in the past.

Integrating data and services essentially provides options and choice. This allows people to plan their travel using a multitude of criteria, including safety, speed, cost, convenience, preferred mode (or excluded mode), facilities etc. Although MaaS is in its infancy in Australia, the potential for it to solve bigger transport related issues (congestion, environment, safety) is high and it merits ongoing investment into R&D and trialling.

Active transport is another aspect attracting attention around the world due to its potential to deliver combined benefits of congestion and emission reduction and community fitness. We expect that Active transport can play a crucial role in the delivery of travel tasks, but it is not clear yet how best to encourage community uptake.

To deliver equitable access to transport service across the community, traveller preferences (including specialised needs) should be recognised and accommodated. Once we can determine how to do this in an operationally effective way, we will be able to lift the travel experience and improve the mobility and productivity of the whole community.

What should we do?

Integration of data is key. For example, overlaying transport options with geographical or other information to deliver realistic safety ratings would increase community confidence for those using the transport network. As another example, understanding the changes to travel demand that are emerging from changing work patterns will be key to the design of network services in the future.

Other aspects that would benefit from investigation are a much better understanding of traveller choices and behaviours. Australia has some outstanding research talent dedicated to this field and we can tap into this through collaborative research. Business models to fund MaaS also require further investigation. There is a lot of complexity to be resolved around bringing together multiple public and private entities as service providers. Trust, sharing of data and appropriate distribution of the 'transport subsidy' are all aspects that require further investigation.

If we agree to encourage active transport, we need to understand what interventions give the best results. For example, what drives usage of cycleways, and how much of the movement task can be delivered by cycleways if the usage is opened to other modes (walking, e-scooters and e-bikes etc.). We need to understand what contribution active transport can make to First and Last Mile (FLM) problems, including what solutions should be established for situations where active transport is not appropriate.

What is happening?

Solid research has been taking place in Australia. Within the iMOVE portfolio this includes the recent Sydney MaaS Trial, (IAG, ITLS and iMOVE) which has delivered important insights to NSW. This is complemented by iMOVE MaaS projects in other states – Queensland having a particularly strong interest in this area - and other research around the world.

Efficient and resilient networks

Opportunity

Thanks to the development of data use and analytics, management of our transport networks is constantly improving. We can not only see what is happening in real-time, we can now start to predict what will happen in the future. At the same time recent crises have demonstrated the need for responsive adaptation to changing circumstances in order to increase the overall resilience of our transport systems.



Planning, managing, predicting and responding effectively are all enabled by better use of data, but the volume of data that has to be processed is enormous and the current level of analysis is quite modest. There is a need and opportunity to make greater use of cutting-edge data processing and analysis techniques including machine learning / AI methods. We have only just started to scratch the surface of what is possible here.

What should we do?

Technology: Emerging technology is putting ‘intelligence’ into vehicles, into traffic lights, into networks. But this is all very new. There is an urgent need to resolve how best to arrange all these enhanced capabilities. For example, how much of the dynamic processing could we and should we do at the roadside using edge computing and sensors. This could include such solutions as holding red or green according to traffic conditions.

Data: We have to resolve how to arrange the flow of data to ensure that the desired outcomes (less accidents. Less emissions, smoother, quicker, more reliable trips) can be secured.

Disruption management: Being able to respond dynamically and address disruptions in real – or near real – time is now possible. Development of the systems needed to do this effectively are already underway but would benefit from wider utilisation.

Network optimisation/prioritisation: An important complementary topic is how to prioritise vehicles on our road networks; emergency vehicles, public transport vehicles, freight vehicles. TfNSW is already active in all these areas, but there remains significant opportunity for further evolution. Network data and connectivity between vehicles and roadside infrastructure enable more nuanced approaches, but deeper investigation is needed into the best way to implement it.

What is happening?

Utilising data to better plan the movement of goods is already a topic of significant interest to iMOVE. We are conducting a number of projects in this area, including one we recently completed with TfNSW on adopting a co-modal approach to freight by using passenger trains to transport goods. This merging of networks to create a single system through data integration has significant potential to increase the productivity of our transport system and provide economic benefit. The time is ripe to exploit the learning from this project.

Working with leading ITS providers, iMOVE and Australian Departments of Transport (DoT) are also developing network management products that leverage real-time data.

We have also worked with DoTs, including TfNSW, to improve the response of the network to disruption. An example that is prominent for many jurisdictions is planning and organising bus replacements when the rail service become unavailable in both planned and unplanned scenarios. Good progress is being made on this question, but there are still numerous aspects relating to elasticity of demand that are not well understood.



Connectivity and automation

Opportunity

While the path to deployment of autonomous vehicles remains bumpy and somewhat delayed, the need to prepare for their arrival to minimise disruption and maximise benefits remains. TfNSW, as a leading DoT in this area, continues to add to the body of knowledge, and much more remains to be done.

What should we do?

Everyone expects autonomous vehicles to be safer than human driven vehicles, but that presumes that autonomous vehicles can adequately interpret the context in which they are operating. Responsibility for safer operations falls to a combination of federal government, state governments and vehicle manufacturers.

NSW will need to collaborate with the federal government to ensure that the performance specifications that vehicles are required to meet prior to vehicle release onto public roads, are suitable for NSW. In addition to the national road rules, most states utilise some bespoke local regulations and signs to manage their traffic and they need to find a way ensure that automated vehicles can follow these local rules.

Most DoTs are already cognisant of the fact that public confidence is paramount, and there is a high risk that the publicity arising from a failure would slow their introduction.

What is happening?

iMOVE has been very active in this space, including working with TfNSW on a CAV roadmap and the safe introduction of CAVs into the road network. Researchers at the University of Sydney Robotics Lab made significant progress in developing software to enable CAV's to interpret pedestrian behaviour. Connectivity and automation trials in Queensland are delivering complementary insights into the human-machine interactions and providing an evidence base for safety benefits of connectivity (V2V and V2I). iMOVE and ARRB have also recently signed a program of work to gain insights from the use of a CAV as an automated traffic 'probe'. This research hopes to identify early opportunities for CAV deployment in Australia. Research supporting policy development for use of CAV's by disabled passengers is also underway.

Integrated planning and successful places

Opportunity

We are seeing increasing interest in the effect of transport on the environment and the challenge to balance the need for place making for the local community with the need to maintain the productivity of the transport network. There is also activity occurring to better co-ordinate land and transport development initiatives. The co-development of transport corridors to support the new Western Sydney Airport is a particular example of this.

What should we do and what is happening?

While integrated land/transport planning has been a topic of interest for some time, the increasing availability of data, and capability to combine data increases the potential benefits on offer. For



example, much effort has been expended in recent years to build 'digital twins' of cities. These data sets capture a vast amount of detail about the physical environment (buildings, roads etc and fixed infrastructure (electricity distribution, street lighting, water service) but very little detail of people's movement patterns is captured. On the other hand, much work goes into identifying the pattern of travel demand but this seldom looks at the 'movement on the ground'. It requires a combination of these endeavours to optimise the performance of the transport network and respond to the needs of the communities in which they operate.

iMOVE currently has one project investigating the integration of transport and land use planning, and additional benefit would be available if this project could engage other jurisdictions.

At a more local level, a recently completed TfNSW/ iMOVE project was originally conceived to deliver insights into the use of virtual reality to better understand place making. While this project had to be adapted due to COVID, we see a lot of potential in revisiting and extending this approach, eventually enabling it to be used widely when evaluating plans for new places.

Sustainable transport / energy

Opportunity

The transport sector is indicating to iMOVE that 'sustainability' is emerging as a high priority. Many organisations are responding to the need to improve both the environmental and social sustainability of our transport systems.

Environmental sustainability

The renewed focus in the USA on climate change and reduction of carbon emissions has given courage to many stakeholders in the transport sector to start tackling the local transport emissions question. However, it is not clear yet what path should be followed. This will only be identified by further exploration of the performance and costs of the emerging technologies. Electric cars and buses, and more recently hydrogen fuel, are particularly prospective solutions.

Social sustainability

Another aspect of sustainability that is important to the transport sector is 'equity of access to mobility services' (including accommodating the disabled, and serving remote and regional communities). Social sustainability is attracting significant attention and investment as industry recognises the importance of maintaining its social licence to operate and address inequity.

What should we do

iMOVE is in the process of building a program of work to support this interest in sustainability. We would welcome TfNSW's involvement as a leader in this space. We strongly support examination and trialling of new fuel technologies. For this to happen successfully we foresee that there will be a need for parallel action on supporting infrastructure. (hydrogen refuelling, electric recharging). This ecosystem development could benefit from a roadmap approach which would also take into account the impact of clean fuels on the grid (for example).

Through the technology discussed above in 'people-centred transport', we also have an unprecedented opportunity to tackle inequity in transport access. Combining demographic,



geographic (and other) data with transport can provide planning insights and identify gaps. Presenting travel options in ways that give people more choice and control (MaaS-style interfaces and payment options) has great potential in this area, and we can build on prior learnings.

What is happening?

We are already establishing projects in low emission transport. These relate to the development of a low emissions transport strategy and investigations into a possible Hydrogen Fuel Cell Demonstration Testbed location with the aim of showcasing the viability of Hydrogen Fuel for Heavy Vehicle / Freight Operations in Australia. There are many discussions underway with state governments as they look to trial new and innovative ways to reduce emissions. We also see these conversations emerging from the private sector including from construction and ports.

iMOVE is also seeing a surge of interest in both the policy and practice of socially sustainable transport. We now have projects underway, or in formation, dealing with equity of access to mobility services and how automated buses can help disabled people. We are also looking at women's safety on public transport, and at the enhancement of 'place' values such as safety and ambience (TfNSW).

We are in discussions with Queensland about effective movement of people, including disabled people, for the 2032 Summer Olympics. We are also investigating the residual need for travel in a world where a substantial part of the community works and studies at home, as well as the likelihood of that scenario developing in a post-pandemic world.

iMOVE is committed to increasing its activity this area. Recognising that these same issues are occurring around the world, iMOVE proposes to combine results from overseas research with 'fill-in' research locally. This will enable us to chart a pragmatic path towards lower emissions and greater access to transport services for all segments of the community.

Freight

Opportunity

While most of this submission focuses on people movement, it is important not to lose sight of the fundamental role that freight plays to support the economic activity of the State and the Nation. Almost everything that we use and everything that we consume has to be transported from somewhere else. The centrality of freight to the operation of society means that inefficiency in the freight sector imposes an insidious drag on the performance of the economy.

Unfortunately, we have still very little visibility over the efficiency of the freight system in NSW, or any other jurisdiction. And yet, with the already widespread deployment of telemetry and of roadside sensing, the data that would enable us to measure and improve the performance of the freight sector probably already exists. Studies illustrate that even a relatively modest productivity gain in logistics can create large economic benefit (a 1% increase in total factor productivity in the logistics industry would yield a 2% increase in GDP nationally: ALC/Acil Allen, 2013). Using data effectively is the primary means we have at our disposal to make these improvements.



What should we do?

iMOVE has developed a program of work that aims to complement the activities of the National Freight Data Hub being established by the federal Department of Infrastructure. This is primarily through using data to increase visibility along our supply chains. This visibility in turn allows for better strategic planning and operational decision-making.

We anticipate that additional uses could be made of much 'roadside data' whose primary role is to support and inform traffic management. If the relation between freight movement and economic activity were quantified, freight movement could be used as a 'close to real time' indicator of economic activity.

Additionally, given that accelerating a heavy truck away from standstill causes high consumption of fuel and substantial emissions, the possibility exists that careful management of freight movement through the network could yield savings to operators, improved environmental outcomes, and higher state economic activity. This would not be easy to achieve but the benefits could be substantial.

What is happening?

A Department of Infrastructure and iMOVE project provided an evidence base to support the formation of freight data exchanges. This will be realised by the soon to be announced National Freight Data Hub.

As mentioned previously in this submission, integrating passenger and freight networks (such as the TfNSW co-modality project) can deliver efficiencies across the board. This was a small-scale proof of concept that shows much promise.

Elsewhere, parties are working together to improve the usage of data standards in the freight sector, and other iMOVE projects are in formation to enable freight and provenance to be tracked across the country and overseas.

Best Practice and 'Learning from others'

Research creates opportunities to scan the world for current thinking and best practice. This could provide important support for TfNSW in its aspiration to create the 'best-connected communities and freight networks in the world'.

Despite the federated nature of Australian politics there are some aspects of transport technology which require a national approach, cyber security for connected vehicles, and V2I communication protocols being two obvious examples. For many of these aspects of national interest it is likely that Australia and NSW will draw on the learnings from other countries. However, there are other aspects about which Australia needs to form a coherent approach of its own. Systematic identification and engagement with best practice would enable TfNSW to contribute leadership to national discussions on transport and mobility.

Achieving consensus from the relevant stakeholders inevitably requires a mix of unbiased research and respectful collaboration. iMOVE has strong capabilities in this area to organise and support



collaboration and collaborative research. Consequently, iMOVE proposes that development of national standards and protocols is another area where NSW could draw benefit from research and collaborative activity. Some examples of iMOVE's delivery of multi-jurisdictional collaborative research include:

- Analysis of emerging WFH patterns and its impact on transport systems.
- Universities working across borders with jurisdictions on mutually beneficial projects.
- Discussions with road authorities in support of increasing multi-jurisdictional forums in sustainability.

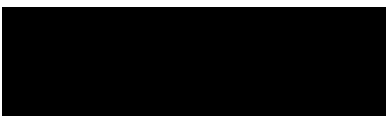
Skills

After conversations with multiple stakeholders around Australia we observe that having a suitably skilled workforce is going to be essential to maximise the benefits to transport from technology and data. With this in mind, iMOVE is undertaking a transport and mobility skills study in Australia, to which TfNSW has already contributed some insights. This will be followed by an analysis of how the skills gaps can be addressed in a bid to provide timely recommendations as new technologies become more ubiquitous.

Summary

Technology and data represent an unprecedented opportunity to deliver safer, more efficient and sustainable transport. Clearly all states and territories - in fact, all countries - are grappling with similar issues. TfNSW as a leader in this field in Australia is already contributing significantly to the knowledge and systems that benefit transport and mobility. There remains much to be done and we are keen to ensure that we maintain momentum by building on existing knowledge and project outcomes. iMOVE looks forward to continuing its role as an enabling partner of the next wave of transport innovations and improvements in NSW.

Yours faithfully

A solid black rectangular box used to redact the signature of Ian Christensen.

Ian Christensen
Managing Director
iMOVE Australia

