Victoria's State Infrastructure Strategy Update

Engineers Australia's Submission

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ENGINEERS
AUSTRALIA

Victoria's State Infrastructure Strategy Update

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About this submission

Introduction

Engineers Australia welcomes the opportunity to provide feedback to Infrastructure Victoria in response to the State Infrastructure Strategy Update. Engineers Australia broadly supports the principles and objectives defined in the Strategy and has provided responses and advice in this submission.

This submission has been developed by experienced members of Engineers Australia's Victorian Division Committee. The submission addresses several themes from Victoria's Draft Infrastructure Strategy (the Strategy).

About Engineers Australia

Engineers Australia is the peak body of the engineering profession representing the collective voice of over 115,000 individual members nationally, which includes over 26,000 members in Victoria. Constituted by Royal Charter, our mission is to advance the science and practice of engineering for the benefit of all Australians.

Overview

We note the 94 recommendations included in the draft strategy and conclude they align with the four themes Engineers Australia is responding to in this submission. These are:

- Do More with Less
- Navigating Change and Disruption
- Improving Social Equity Through Access
- Mitigating and Adapting to Climate Change

We are particularly encouraged to note the 10 objectives that have been set for the infrastructure strategy align, broadly, as follows with our 4 themes:

- Do More with Less
    - Lift productivity
    - Promote sustainable production and consumption
- Navigating Change and Disruption
    - Prepare for population change
    - Drive Victoria's changing, globally integrated economy
    - Build resilience to shocks
- Improving Social Equity Through Access
    - Foster healthy, safe and inclusive communities
    - Reduce disadvantage
    - Enable workforce participation
- Mitigating and Adapting to Climate Change
    - Protect and enhance natural environments
    - Advance climate change mitigation and adaptation

The commentary provided below is based around the four themes above. It draws on recent work completed by Engineers Australia on matters which are regarded as important in the current debate about infrastructure provision. It does not represent a response to all matters considered in the 30 year strategy.

Contact details

If you have any questions or wish to discuss the content of this submission further, please contact Engineers Australia in Victoria at vic@engineersaustralia.org.au.

1.Response and advice

1.1. What is your overall impression of the draft 30-year infrastructure strategy update?

Engineers Australia broadly supports the draft strategy. The stated objectives are consistent with our identified areas of strategic importance in Australian Infrastructure over the next 30 years. The draft recommendations include most essential considerations in the improvement and advancement of Victoria's liveability and productivity into the future, although we are eager to see more specificity in some of the recommendations, as described in the below responses. The Strategy focusses on the importance of an improved regulatory environment, a greater emphasis on whole-of-life considerations in asset management, and the circular economy, all of which will be essential to ongoing improvements to physical infrastructure.

The success of many of the recommendations contained in the draft require community education to accept a new paradigm in how we use infrastructure, and how we pay for it. This comes with several risks regarding how changes are communicated to the public, and the pace of change. Such changes are complex to implement and risk failing if bi-partisan political support is lacking.

Regulatory changes requiring large scale behavioural change and public acceptance must be carefully reviewed and tested. A human centred approach is critical to successful implementation and must be addressed in any action plans going forward. It is also vitally important to consider how we will upskill our local workforce to help deliver these recommendations.

1.2. What do you consider to be the key strengths of the draft 30-year infrastructure strategy update?

The key strengths of the infrastructure strategy update include:

- Inclusive consideration of Victoria-wide interests, ensuring both metropolitan and regional Victoria are represented.
- The focus on resilience, asset maintenance, whole-of-life considerations and managing unexpected events impacting infrastructure assets in Victoria.
- Emphasis on diversity and inclusion principles and social inclusion recommendations are commended. Victoria's experience during the pandemic years highlighted how demographics and social hierarchy can fundamentally affect how people fare when faced with extraordinary challenges.
- The focus on improving bus networks and bus usage is positive. But we wish to impress that significant public engagement and education will be essential to the success of these measures.

1.3. Do you have any general suggestions for improving the 30-year Infrastructure Strategy Update?

- Ensuring there is adequate workforce training and education will be required to support the rollout of the 30-year plan. Consideration of how stakeholder engagement and change management is addressed will be essential to the Plan's success. Analysis of Victoria's infrastructure sector training needs and required engineering capability and technical professionals in the Victorian workforce to implement the plan's recommendations is critical. It is also necessary to consider how to maximise

skills utilisation and development from within Victoria itself. This should include investing in the skills pipeline, both in regard to investing in STEM in schools and improving employment outcomes for migrant engineers in Victoria.

- The role of manufacturing and the resource sectors in Victoria's economic growth is worth further consideration. It is important to consider how skills can be repurposed and utilised in regional Victoria, such as in Latrobe Valley, as power generation moves away from this area, or support for manufacturing electric vehicles in places with a strong automotive history, such as Geelong. It would also be useful to consider exploration for and development of future metals be appropriately supported in the state.

- De-politicising the provision of infrastructure and de-coupling announcements, approvals and funding from the election cycle needs to be a priority for any successful long term infrastructure plan. The effects of "boom and bust" cycles of workload is significant. Firstly, it does not permit the providers of infrastructure enabling services, designers, planners, financiers and construction companies to establish and maintain a skilled and stable, or steadily growing, workforce. It also places strains on the suppliers of plant and materials when (a), they cannot plan for stable growth and (b), they are required to respond to peak demands which are significantly above their medium/long term capacities. Prices for all inputs to infrastructure projects are consequently increased. This influences the outturn costs for infrastructure which would be ameliorated by the availability of a steady and forecastable workflow. It therefore also reduces the number of projects that can be completed within any given funding allowance and the Victorian community consequently misses out on the provision of some facilities.

1.4. Do you have any suggestions that would assist with implementing a draft 30-year infrastructure strategy update?

The Strategy should be complemented by a comprehensive stakeholder education program and skills/training strategy for implementation in parallel with the strategy. Several of the recommendations rely on consumer behavioural change and skills such as engineering, urban planning, construction, telecommunications and biotechnology. This ambitious plan will require skills to be sourced interstate or overseas if they cannot be sourced locally. A comprehensive audit of workforce capacity in Victoria is necessary, as is a plan to engage and train the next generation, who will see this plan through to completion.

The recent state budget has also Identified that budgetary constraints In the medium term will Impact the State's ability to effect significant change in the form of new projects requiring public spending. This situation is likely to evolve and change over coming years and should be considered in implementing this plan.

Lack of certainty leads to a lack of preparedness from a resourcing point of view. For example, the current Big Build requires an unprecedented level of resourcing in the private sector. Invariably, there is a mix of local and imported capacity, and the actual mix depends on the overall pipeline and certainty of government investment in the medium to long term. Private enterprise is less likely to invest in training to develop local capacity if it considers the current building boom to do be a short-term spike. Reliable, stable long-term planning and investment allows for more sustainable local capability building and skills creation.

A skills and capability competency based inter-sectoral transfer approach would see people from different industries not going through the same level of economic growth crossover (e.g., detailed design, project management or equipment maintenance from other sectors).

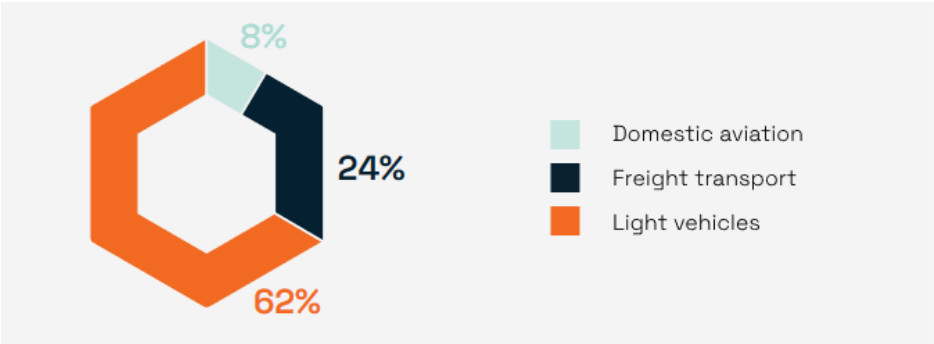
2. Doing More with Less

2.1. Energy

2.1.1. Transport

A combination of regulation and incentives should be considered in reducing emissions in Victoria. Incentives should be provided to encourage consumers to increase the uptake of more efficient vehicles.

Top three carbon emitters in the transport sector[1]



The United Nations Sustainable Development Goals (SDGs) (in particular SD13) calls for the consideration of carbon impact to be included in the lifecycle costing of mode selection and investment decisions associated with infrastructure planning. For example, over the life of the infrastructure, what is the cost of CO2 impact, congestion, and lack of disability access? The same rigour in lifecycle costing and energy and resource use should be applied to the various types of vehicles available – fossil fuel powered, hydrogen powered, battery powered and hybrid vehicles. Such lifecycle analysis should be applied at a "whole of system" level including the energy supply and storage systems and infrastructure.

Engineers Australia provided a submission to Infrastructure Victoria's consultation on reducing greenhouse gas emissions in infrastructure. It is recommended the submission is reviewed in parallel to this.

Greater investment in pedestrian and cycling infrastructure must be incorporated into major projects wherever possible. User focussed engagement and empowerment to ensure paths link up, are appropriately located and have clearly defined destinations in mind will encourage use.

Active support for e-bike and e-scooter rental schemes across cities and not just in central business districts will assist in encourage community uptake of active modes of transport.

Further discussion on Engineers Australia's position on these matters can be found in our Discussion paper on *Active Transport.*

2.1.2. Buildings

Improving energy efficiencies in existing buildings requires a focus on insulation, ventilation, purchase and installation of energy star certified products, LED lighting, and offering asset owners and operators ready calculations on return on investment for energy efficient upgrades. Options and incentives to assist existing buildings to become more sustainable across energy-water and waste include:

- Auto correctors on temperature settings for unused areas (HDVC, heating and air condition systems).
- Motion sensors for lighting.
- Revamping of sorting of waste by business and large facilities.

[1] Bell M. 'The future of transport discussion paper' *Engineers Australia* (January 2023) engineeraustralia.org.au

- Geographic clustering of greater recycling.
- Installation of waste-to-energy plants.
- Embedded electricity network virtual renewable power purchase agreements.

2.2. Water

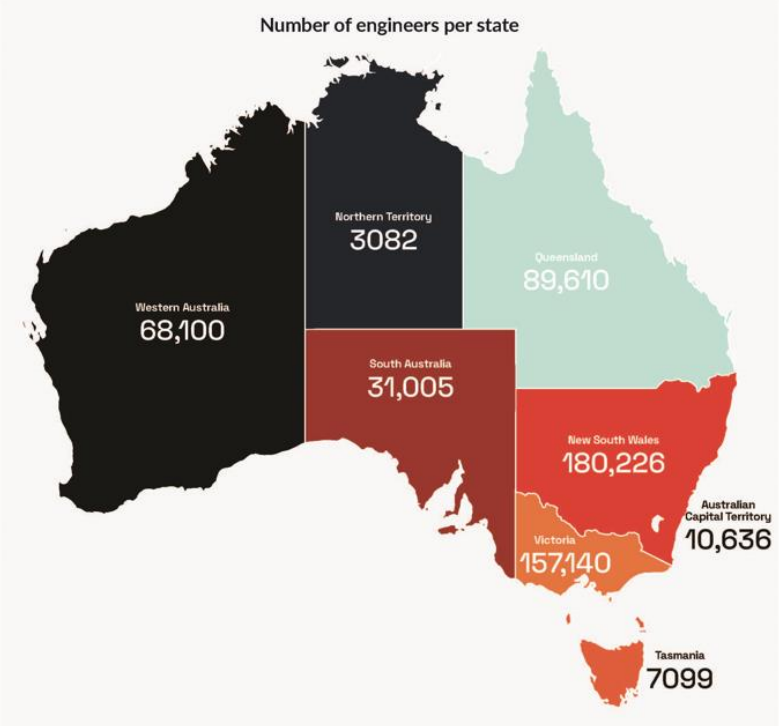
Community education must provide information as well as recommended behaviours and actions to encourage reduced water consumption. Diverse methods of dissemination should be employed, including mainstream media campaigns, social media, specific websites including fact sheets and opportunity for enquiries, community notice boards, site specific signage, targeted email campaigns and letter box drops, face to face workshops and facilitated discussions, on site and online tours of facilities and water management, access to experts to build confidence to concerned parties by providing evidence and reassurance that alternative sources are safe.

Examples from overseas, where there are schemes for significant use of recycled water, sometimes repeatedly, should be promoted and advertised to inform people of the benefits of these types of schemes.

The modelling and planning for the need for a new second desalination plant should be clearly communicated to the community given misunderstanding and criticism of the utilisation of the current Wonthaggi Desalination Plant.

2.3. Skills and the engineering workforce

As technology becomes increasing integrated into various aspects of our lives and systems become more complex and interconnected, engineers will be more sought after. It is therefore essential to address the current and future challenges in the supply of engineering skills in Australia.



Both quantitative and qualitative data indicates a shortage of engineering skills in the job market, effecting most engineering disciplines to varying degrees. These current shortages can be attributed, in part, to the increased demand for engineering skills due to high levels of government investment in

infrastructure around the country. These shortages were exacerbated during the pandemic due to travel restrictions which impacted migrations. The broader reasons for a shortage of engineering skills is multifaceted. Contributing to it is the underutilisation of migrant engineers in Australia, declining domestic commencements in engineering higher education courses, reduction in the uptake of STEM subjects at schools and diversity challenges, which sees only 16 per cent of Australia engineering graduates and 13 per cent of the Australia engineering workforce female.

Engineers Australia has undertaken a significant research project exploring the engineering skills supply and demand challenges facing Australia and recommends this is reviewed as part of this consultation. Please see *Strengthening the engineering workforce in Australia.*

2.4. A circular economy

Mandating use of recycled materials in public projects and incentivising sustainable procurement practices is encouraged.

Greater alignment with industry in funding and development of new ventures in sustainable waste collection, sorting and separation, and manufacturing will be essential for the long-term.

An integrated waste procurement strategy should include the integral upstream, midstream, and downstream processing of waste into a range of platforms and products. The products can be both intermediates and final products, and include metals, recyclable building materials, compost and feeds, composite materials, and chemicals, whereas energy includes fuels, power, and/or heat.

Reuse is a core principle of circular economies and should be prioritised similarly to recycling.

The strategy should consider incentives to use recycled materials in all areas - government, private businesses and households.

Introduction of subsidies to help businesses recycle materials should also be considered. For example, for regional areas that may have large freight costs, offering subsidies on freight when transporting material for recycling may encourage businesses to do so.

Increasing funding, innovation support and research and development of recycling facilities will encourage private investment. Private investment could also be supported through government. procurement guidelines specifically mandating certain activities in this area. It is important that ongoing improvements in waste collection ensure that the product used by recycling companies is appropriately segregated.

3. Navigating change and disruption

3.1. Changing behaviours and the challenges of the future

Recent global events, including the COVID-19 pandemic, have highlighted the crucial role a robust and adaptable transport network plays in supporting the Victorian economy. The pandemic led to a significant transformation in travel behaviour, with people staying at home and travel declining, especially in central business districts (CBDs). The demand for delivery services surged while air travel and cruise ships were severely impacted. As vaccines became available, travel patterns began to revert to pre-pandemic conditions, but public transport has still been affected due to concerns about infection in confined spaces. Additionally, recent natural disasters, such as flooding and severe storms, emphasise the need for a more sustainable and resilient transport system.

Looking ahead, factors like population growth, space limitations in expanding road capacity, infrastructure-induced demand, and natural disasters will shape the future of transport infrastructure. Victoria's population is expected to grow to between 10.1 million and 14.5 million people by 2066.[2] The Australian Bureau of Statistics further predicts Melbourne will be the largest city in Australia by the same time.[3]

Traditionally, Australia has relied on expanding road capacity as the primary means of accommodating population growth in its transportation networks. However, this approach has resulted in substantial investments in road expansion, an increase in car ownership and usage, and a rise in greenhouse gas (GHG) emissions from transportation. Moreover, the capacity of road networks has shown a peculiar phenomenon known as Braess' Paradox, where increasing the road capacity can lead to more traffic and congestion, rather than effectively addressing the issue. To effectively meet the transportation needs of a growing population, policymakers, planners, and engineers must adopt a comprehensive and long-term perspective on the network and must develop a transport system that adapts to evolving circumstances. This includes investing in space-efficient transport modes and ensuring equity and inclusion for individuals facing mobility challenges or financial limitations.

Incentivising efficient, clean, reliable and frequent public transport service should also be applied to manage the provision of transport infrastructure. There are beneficial effects on congestion, road maintenance, the requirement for parking reduced car ownership and, as a bonus, the health of the community arising from such an initiative. This should also include integrated timetable planning between modes that eases modal transfer for journeys.

Wherever possible, development should be close to existing activity centres, business districts and transport corridors. Where development occurs on or near an existing transport route, upgrade of those routes must be urgently prioritised.

One example to consider is that rapid housing development has been occurring in Cranbourne East and Clyde since the late 90s, including the Casey Fields sporting complex. Still, more than 20 years on, there is no train-station nearby, despite it having been discussed and promised since that period. The negative outcome of this is creation of a car-centric community as they have no viable transport alternative. In this example, the line extension and station are presumably waiting for sufficient demand to justify the infrastructure on a cost-benefit basis.

In such communities, the infrastructure should have been built prior, or in parallel to the initial development. The earliest residents moving into such a community should have access to good public transport and other infrastructure. This may reduce requirements for a second and limit overreliance on driving where other options are available.

Discussions on transport policy reforms, such as the Universal design for transport and Urban Transport Systems papers, are addressed in Engineers Australia's *Future of Transport discussion paper*.[4] It is recommended this paper is reviewed as part of Infrastructure Victoria's process.

3.2. Technology

Innovation and technology continue to change every aspect of society and transport is not immune. Engineers play a crucial role in creating and integrating new technologies and software to improve efficiencies and tackle challenges. Autonomous vehicles, artificial intelligence, smart technologies, new fuel sources and propulsion systems, freight and transportation management systems, mobility-as-a-service (MaaS), high speed rail, e-mobility, and drones are just some of the advancements being discussed and implemented throughout the world. These developments can have numerous benefits including increasing productivity and efficiency and reducing emissions. However, it is essential that regulations and policies relating to technology are developed to ensure unintended and unwanted consequences are

[2] 'Population Projections, Australia' *ABS* (Released 22 November 2018) https://www.abs.gov.au/statistics/people/population/population-projections-australia/latest-release#victoria
[3] ibid
[4] 'Future of Transport discussion paper' Engineers Australia (January 2023) https://www.engineersaustralia.org.au/sites/default/files/2023-01/future-transport-discussion-paper-jan-2023.pdf

minimised. It is also essential that regulation keeps up with the pace of change of new technology, permitting the efficient trialling of technology and supporting a nimble integration of new technology into our existing system (as well as supporting (and encouraging) the retirement of 'old' technology where necessary).

An example of this is micro-mobility and its ability to change the way commuters and planners approach the first mile/last-mile conundrum. While mass transit remains the most efficient way of moving large groups of people, getting to mass transit modes can be a challenge. Micro-mobility provides new options to move people, reducing the reliance on cars (and the need for parking infrastructure), while reducing GHG emissions. With the introduction of this type of mobility comes regulatory and policy challenges, particularly around safety and integration with the current transport system.

Another example is the use of flight path optimisation and management technologies which allow more aircraft to take-off and land each hour. The Sydney to Melbourne route has traditionally been rated as the second or third busiest route in the world. Technology supporting operations management can assist in squeezing extra capacity into the system and can reduce the need for additional infrastructure. Care needs to be taken to ensure safety is not compromised, or liveability and amenity for those living close by does not suffer. Innovation in software is also helping with travel demand management (TDM) by providing data-led consumer-orientated products to influence demand on transport networks by promoting other modes, times and routes. Effective use of TDM can change behaviours and reduce the impacts of congestion. This can help to maximise the efficiency of current assets and reduce the need to fund additional infrastructure (such as new lanes on the road network). TDM measures that reduce traffic are generally low cost and should always be considered prior to, or in combination with, introduction of high-cost infrastructure.

New technologies will require legislative and policy changes for their integration into the current system and to support their development and uptake. The New South Wales (NSW) Government's NSW Point to Point Transport reforms are an example of how policy needs to shift to allow improvements to the transport system, such as automation, connectivity, electrification and ridesharing, to be used and embraced. Collaboration between all levels of government is needed to provide uniformity across Australia in the take-up of new systems as well as participation from industry, suppliers and others.

Engineers Australia's *Enhancing productivity in infrastructure delivery directions paper* outlines how innovation and the use of digital infrastructure solutions (such as digital twins, building information modelling systems (BIM), digital engineering and digital asset management tools) will ensure Australia is future ready and our infrastructure can be managed efficiently, sustainably, safely and effectively.[5] Greater emphasis is needed on integrating nationally consistent digital approaches to public infrastructure planning and operations if Australia is going to be ready for the demands of the future.

3.3. Adoption

The biggest risk we see in adopting new and innovative technologies is risk aversion, fear of the new. Test programs can support confidence by proving performance but can be expensive. Incentive funding may assist in breaking down barriers as has been the case with the financial incentives for adoption of new solutions in the Level Crossing Removal Program has shown.

Another barrier is the coexistence of new and old forms, running in parallel. For example, infrastructure to support the existing fleet of petrol-based vehicles whilst supporting increased use of autonomous vehicles will be required. Rigorous consideration of what infrastructure, policy reforms and incentives will be required to phase out technology that has been superseded is critical.

Government legislation and regulation must be agile to support and integrate new technology and ensure it is rolled out within a controlled environment.

[5] Grady, S. 'Enhancing productivity in infrastructure deliver: Policy directions paper' *Engineers Australia* (March 2022) https://www.engineersaustralia.org.au/sites/default/files/resource-files/2022-04/policy-directions-paper-enhancing-productivity-infrastructure-delivery.pdf

4. Improving social equity through access

4.1. Quality of public transport

Quality of public transport is not necessarily a primary driver for everyone but is certainly a factor in most peoples' consideration of where to live and work, and is an essential part of an inclusive, equitable society and urban landscape. Access to options for easy transit to and from work, home and social events is a necessity and it is likely that locations with good links are preferred. Access to safe, reliable, clean and frequent public transport services is a hallmark of an inclusive approach to the provision of services for the entire community.

Uniform, consistent routes, turn up and go services and rapid travel which is comparable to or faster than a car journey will assist in making bus use more attractive.

It is still common in many parts of Melbourne for the first bus to be 7am or later and tending to arrive at 15-20mins intervals with unreliable arrival times, and long, complicated, indirect routes. Access to buses at earlier and later times of the day, with faster and more direct routes is encouraged. We understand that the Victorian Government is currently re-negotiating various bus contracts and wishes to include improvements to bus timings and the span of the service day. This is a positive move in this aspect of public transport provision. We would also encourage integrated timetable planning, between public transport modes, to create more seamless multi-modal journeys.

One proposed solution is for pop up bus stops for aged/disabled residents in local communities. The greatest advantage of buses is they are flexible. It should be possible, noting there may be scheduling constraints, to create pop up bus stops in places where a disabled resident, for example, lives nearby, making it easier for them to use the service.

Designing transport as a system requires consideration of equity and inclusion. The concept of universal access allows for an environment which is accessible to everyone. This takes into consideration the needs of people with disabilities and other mobility challenges (for example, people with injuries, the elderly and parents with prams) as well as financial constraints and those who face additional socioeconomic barriers. In 2018 just under 18 per cent of Australians had a disability with the prevalence of this increasing with age (over 65 years). Using the concept of universal design, environments can be created that are usable by more people. Applying universal design processes improves quality of life and independence by facilitating the broader population to achieve peak human performance, health and wellness through equitable access to all facilities and social participation.

In Australia, the Disability Discrimination Act 1992 (Cth) (the Act) and the Disability Standards for Accessible Public Transport 2002 (Transport Standards) aim to prevent discrimination against disabled people and set guidelines for transport accessibility. The Act prevents discrimination against an individual because of disability and includes when to provide services and facilities. Transport Standards provide minimum accessibility requirements for public transport. This is contrary to global best practice, which is less about complying with standards and more about adopting the concept of universal access.

Transport Australia society's Universal design for transport discussion paper outlines several benefits of adopting the concept of universal access.

The imperative to move to a more inclusive view of access is evident, although it is not without challenges. These are mainly seen in upgrading of existing infrastructure and systems, particularly older networks which were built to very different standards initially. Funding is also a challenge. Public transport systems fall to state and territory governments to design, build and operate (often with Commonwealth supported funding). Most funding is allocated to build new systems, rather than upgrade deficient existing systems. In addition, while universal design requires collaboration from all parties, particularly the users, to ensure it is fit for purpose, it also requires greater collaboration between governments particularly where

delineation of responsibility occurs. An example of this would be a local government responsible for the facilities available around a public transport hub or a principal shared path connecting two local government areas.

4.2. Infrastructure delivery

Engineers Australia's *Enhancing Productivity in Infrastructure Delivery* policy directions paper provides a number of recommendations for how best to enhance the delivery of infrastructure projects across the state. These recommendations are summarised below. It is recommended this paper is reviewed as part of this consultation.

5. Mitigating and adapting to climate change

5.1. Infrastructure resilience

Government at all levels and across all departments require a more coordinated and cohesive approach to climate change. Prioritisation of data collection and analysis is key: for example, coastal water level rise impacts (close to population centres), impact of escalating summer temperatures, and transport requirements associated with crisis/emergency management corridors. There are significant opportunities to work with research institutions to model and plan for more frequent and extreme weather events associated with climate change. Across regulations, design standards and guidelines there is not a single, consolidated source of information on design for existing and new infrastructure in response to climate change. Development of bespoke requirements / regulations is recommended.

Creating Resilient Networks

There will be a corresponding increase in design values of climatic factors such as temperature and rainfall intensity. There will also be increased frequency or severity of extreme events such as heatwaves, bushfires, flooding, sea-level rise and storm surges. These must be considered in planning, design, maintenance and operation.

Adaptation to climate change in transport infrastructure should be planned for the life of the infrastructure. If we expect a bridge or railroad to last 100 years, then it should be designed to operate safely in the climate range forecast within that 100-year timeframe. The following issues are foreseeable and should be considered in planning, design and construction of new infrastructure, and maintenance and operation of existing infrastructure:

- Allow for higher average temperatures, and a larger range of extremes in design, including thermal expansion, heat degradation, water table changes and passenger comfort.
- Maintain or improve micro-climate in urban works by planting trees for shading and providing breeze corridors to reduce the urban heat island effect and improve liveability.
- Allow for sea-level rise and storm surge increases in coastal transport links.
- Plan for a wider range of extreme events such as bushfires and floods.

5.2. Coastal erosion

Coastal erosion is a natural occurrence and cannot be prevented everywhere. A comprehensive planning framework with easily auditable decision-making accountability and transparency is required to assess whether engineering intervention is appropriate. Certainly, in areas of cultural significance, critical infrastructure, or urban necessity, coastal strengthening should be prioritised. However, there needs to

be a clear decision-making matrix for assessment of where the above conditions do not necessarily apply and where it might be appropriate to allow for coastal erosion.

5.3. Reducing emissions

5.3.1. Transport

Transport Australia society is a technical society of Engineers Australia who have developed a discussion paper on *Climate Change and Transport*, which gives practical guidance on how climate change should be considered in the transport sector.

Further commentary on Engineers Australia's position on Electric Vehicles can be found in our *EV Strategy discussion paper* submitted to the Commonwealth Department of Climate Change, Energy, the Environment and Water in October 2022. Engineers Australia is also developing a submission to the Australian Government Consultation on the Fuel Efficiency Standard which can be provided on request.

5.3.2. Gas substitution roadmap

In the context of climate change, we refer here to gas substitution. The Victorian Government has issued the Gas Substitution Roadmap which proposes a series of initiatives:

- Expanding the Victorian Energy Upgrades (VEU) scheme, with new incentives for switching to efficient electric appliances.
- Phasing out VEU incentives for fossil gas residential appliances by the end of 2023.
- Changes to the Victoria Planning Provisions in 2022 to remove the requirement for new housing developments to be connected to gas.
- Retiring Victoria's 6 Star National Construction Code variation to allow for more efficient hot water systems as part of new construction and major renovations.
- Move to a 7 Star Standard for new home construction, this standard takes account of home energy appliances and not just the thermal shell of the building, driving greater energy efficiency from the point of design.

These changes require widespread systematic and programmatic change including the engagement and education of parts of the community who are gas users. Many aspects of life that people take for granted, such as cooking, will require a significant pivot in community values and behaviour to be successful.

5.3.3. Construction

Construction of transport infrastructure involves the use of large quantities of engineered materials. These embody a large amount of energy required for their extraction, processing, placement and end-of-life disposal. Globally the construction sector is estimated to cause up to 25 per cent of industrial emissions. Production of steel, cement and asphalt are especially emission intensive. The Government should promote and prioritise ecologiQ and Recycled First policies.

All planning and asset management decisions regarding transport networks should include consideration of whole-of-life emissions. Where possible, the lowest emission option should be preferred.

Planning and design of infrastructure and services should estimate the amount of emissions for each option in construction and operation and preferably the least emitting.

Adopt a policy of no net increase in emissions in new construction. This may be achieved by means such as revegetation, renewable power and purchase of carbon offsets or other incentives.

5.3.4. Freight transport

Long distance travel by air, sea or road, especially for freight, requires the storage of large amounts of energy with the lowest weight and space requirements feasible. This is a challenge which needs to be overcome for electric vehicles to support these modes.

Aviation remains a major unsolved issue with synthetic fuel from carbon-dioxide capture being adopted in Switzerland. Biofuels, primarily biodiesel and bio-based jet fuels, play a key role in the decarbonisation of long-haul transport modes, complementing measures aimed at reducing freight demand and improving energy efficiency of operations. The International Energy Agency (IEA) estimates biofuels will provide some 40 per cent of air transport fuel and 30 per cent of bunker fuel for shipping by 2060. The IEA defines advanced biofuels as sustainable fuels produced from non-food crop feedstocks, which can deliver significant life-cycle emissions savings compared with fossil fuels, and which do not directly compete with food and feed crops for agricultural land or cause adverse sustainability impacts.

Engineers Australia is pleased to see the Commonwealth Government consulting on a National Hydrogen Strategy. This can explore avenues for Australia to utilise hydrogen across many sectors of the economy. Hydrogen could power freight transport, especially over long distances. This may become feasible when solar and wind generation provide over 100 per cent of electricity demand. Then, through electrolysis of water, hydrogen becomes a cost-effective means to store excess electricity and make it available for non-grid uses. Hydrogen is not favoured at present due to major cost differences from the need to produce and safely store hydrogen, whereas electricity is readily available.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