Volume 1

Victoria's infrastructure strategy 2021-2051

INFRASTRUCTURE VICTORIA

About us

Infrastructure Victoria is an independent advisory body with three functions:

- preparing a 30-year infrastructure strategy for Victoria, which we review and update every three to five years
- providing written advice to government on specific infrastructure matters
- publishing research on infrastructure-related issues.

Infrastructure Victoria also supports the development of sectoral infrastructure plans by government departments and agencies. The aim of Infrastructure Victoria is to take a long-term, evidence-based view of infrastructure planning and inform community discussion about infrastructure provision. Infrastructure Victoria does not directly oversee or fund infrastructure projects.

Aboriginal acknowledgment

Infrastructure Victoria acknowledges the Traditional Owners of country in Victoria and pays respect to their elders past and present, as well as Elders of other Aboriginal communities. We recognise that the state's infrastructure is built on land that has been managed by Aboriginal people for millennia.

Contents

Foreword 04

Executive summary 06

Infrastructure and Victoria's First Nations peoples 10

Objectives 12

Approach 14

Summary of recommendations 18

Smarter ways to use existing infrastructure 28

1 Confront long-term challenges 32

1.1 Navigate the energy transition 34

1.2 Respond to a changing climate 54

1.3 Embed resilience 66

1.4 Embrace technology and innovation 74

1.5 Build a circular economy for waste and recycling 90

2. Manage urban change 100

2.1 Integrate land use and Infrastructure planning 103

2.2 Create thriving urban places 110

2.3 Steer changes in travel behaviour 128

2.4 Adapt infrastructure for modern needs 142

3 Harness infrastructure for productivity and growth 150

3.1 Shape the transport network for better access 152

3.2 Improve freight efficiency for industry competitiveness 172

3.3 Align social infrastructure with better service delivery 182

3.4 Plan for growth areas 196

4 Develop regional Victoria 212

4.1 Enhance regional market access and economic growth 215

4.2 Better connect the regions 224

4.3 Foster regional Victorians' health, wellbeing and inclusion 238

Delivering infrastructure policies, reforms and projects 250

Acronyms 252

Endnotes 254

Foreword

Since Infrastructure Victoria released the state's first 30-year infrastructure strategy in 2016, the Victorian Government has allocated billions of dollars in investment for new infrastructure; first to support population growth, and then in response to Victoria's devastating bushfires and the shocks of the COVID-19 pandemic. This has produced record infrastructure investment on new transport, health, education, social housing and tourism infrastructure. Of the 137 strategy recommendations in the 2016 infrastructure strategy, over 90% have commenced or been completed.

This updated 30-year strategy charts the next stage of Victoria's infrastructure journey. It is the culmination of years of work, reflects the current environment, including the COVID-19 pandemic, and draws upon the input of thousands of Victorians. It makes recommendations to help achieve Victoria's long-term objectives including enhancing productivity, building resilience, responding to climate change, and meeting the social and economic needs of Victorians so they can build flourishing, meaningful, and prosperous lives.

This strategy aims to help Victoria address existing infrastructure pressures, emerge stronger from the COVID-19 pandemic and be prepared for the future. Our recommendations seek to better use existing infrastructure, manage demand on it, and help plan the timing and location of required and necessary new infrastructure.

We build upon the recommendations and findings from our 2016 strategy while incorporating lessons from its development, as well as other recent developments. The updated strategy includes the extensive research and modelling we have conducted since, and findings from the advice we have provided to the Victorian Government. We have reviewed our earlier recommendations, and consulted widely with the community, industries, organisations, and governments. Our draft strategy engagement program included more than 25,000 website visits, 675 participants in consultation events, and received more than 200 formal, written submissions.

Importantly, this strategy goes beyond merely listing good, evidence-based infrastructure projects. It also makes many recommendations about changing the way Victorians use and manage infrastructure to get better results. Our integrated approach shows how actions in one infrastructure sector can provide benefits in others, or reduce the need to invest in them. Smarter use and management of infrastructure, combined with selecting and progressing strategic high-performance projects can keep infrastructure affordable, meet Victorians' needs, and help achieve Victoria's broader social, economic, and environmental goals.

We thank the thousands of people who provided the feedback, advice, research, modelling and evidence upon which this strategy is built. We commend this strategy to the Victorian Parliament and look forward to the Victorian Government's response.

Jim Miller
Chair, Infrastructure Victoria

Michel Masson
CEO, Infrastructure Victoria

Photography by Peter Bennetts, Designed by ASPECT Studios

Executive summary

Much has changed in the five years since we released Victoria's first 30-year infrastructure strategy, including two significant events. Victoria endured the 2019–20 summer bushfires, which exacted heavy tolls on the people, communities, ecologies and infrastructure it affected. Victoria is also enduring and responding to the impacts of the COVID-19 pandemic. Both events showed the resilience of Victorians, and their ability to rapidly change their behaviour to support each other through challenges.

In the last five years, the Victorian Government committed to Victoria's largest infrastructure program, significantly raising investment in infrastructure. It also announced many policy changes, including release of its revised metropolitan planning strategy, *Plan Melbourne,* outlining Melbourne's planned growth trajectory to 2050, and setting a new target of net zero greenhouse gas emissions by 2050 in the *Climate Change Act 2017.*

These crises and policy decisions show that infrastructure needs, and context, can evolve rapidly, and the value of regularly reviewing and updating infrastructure plans. This strategy deliberately revises many recommendations we have made previously and adds new recommendations considering Victoria's changing circumstances. It retains a long-term view of Victoria's infrastructure needs over the next 30 years, remembering that infrastructure lasts decades, and must meet immediate and future needs.

Infrastructure is more than roads, bridges, hospitals, and schools. It underpins Victoria's economic productivity, social equity and connectedness, and ecological impact. It can help reduce social disadvantage.

This strategy focuses on Victoria's future. We take existing Victorian Government projects, decisions and commitments as our starting point, and make recommendations about future decisions to be made. We also make decisions about how to maximise the benefits of existing commitments.

This strategy has 94 recommendations spanning many types of infrastructure policies, reforms and projects, and is based on extensive evidence, research and consultation. We have grouped them thematically, assembling recommendations that work together to achieve a more prosperous, inclusive, and sustainable Victoria. For each recommendation, we have produced a strategic estimate of its potential cost range, stipulated the recommended timing for delivery, and considered funding options for major policies, reforms and projects (see Appendix C of Volume 2).

We have not prioritised some recommendations over others, and instead sought to present an integrated, interlinked, and interconnected set of recommendations to help achieve the strategy objectives. Different stakeholders can identify their own priorities, and addressing each theme requires different priority actions. We have also prepared regional summaries of the strategy, allowing each region to identify recommendations of special interest.

Combined, the recommendations have a total capital cost of approximately $100 billion over 30 years. This is our best, central estimate of the capital cost of delivering this strategy, which was a consideration in developing it. This estimate does not include other 'business as usual' Victorian Government capital expenditure for purposes unrelated to the recommendations in this strategy. Of the 94 strategy recommendations, 53 are for policy changes and reforms that help better use and manage demand on infrastructure. The remaining 41 recommendations involve Victorian Government infrastructure capital investment. The Victorian Government is ultimately responsible for prioritising infrastructure spending according to Victoria's prevailing financial position and broader fiscal policy settings.

This strategy has 94 recommendations spanning many types of infrastructure policies, reforms and projects, and based on extensive evidence, research and consultation.

Confront long-term challenges

Victoria's recent experiences underline that future events are uncertain. Long-term strategy must be adaptable and resilient, able to adeptly change and recalibrate in different circumstances, while confronting long-term challenges. A changing climate means infrastructure must be resilient to new climatic conditions, and a 2050 net zero emissions target refocuses Victoria's infrastructure needs to support transitioning away from traditional fuel sources. New, emerging technologies can radically alter infrastructure demand and give governments new tools to manage it. Global health, economic and geopolitical shocks will affect Victoria and it must keep options to respond. For instance, international trade bans on recyclable materials have disrupted Victoria's recycling and resource recovery industries, creating an opportunity to build a more circular economy.

Manage urban change

A decade of rapid population growth to 2020 has strained Victoria's infrastructure, creating congestion and shortfalls. The COVID-19 pandemic has paused population growth, providing an opportunity to ensure systems and policies are in place to better manage future population growth. This includes better integrating Victoria's land use and infrastructure planning to guide urban development in the most appropriate locations, providing the right infrastructure at the right time. Suitable and well-located areas in established parts of Melbourne and regional cities can accommodate more new homes, helping maximise use of existing infrastructure and services. Reforms can help manage transport demand to make better use of existing and new transport infrastructure by using pricing to help people make more informed choices about when and how they travel. Victoria can better maintain and adapt its existing economic, social and community infrastructure to lengthen its lifespan and keep it fit for contemporary conditions.

Harness infrastructure for productivity and growth

Managing demand and achieving maximum efficiency from existing infrastructure can improve the productivity and effectiveness of the infrastructure Victoria already has. But it will not meet all infrastructure needs for a productive and equitable state, especially as population growth returns. Victoria will require some new major transport projects, and new social and environmental infrastructure to support rapidly growing communities and reduce disadvantage. Particularly when managing fiscal constraints, governments must carefully select infrastructure projects to deliver maximum benefits to the community, considering all options, and ensuring they perform under different future scenarios. Selecting the right infrastructure at the right time can support the productivity of Victoria's economy, prepare for future needs, and ensure people can access the infrastructure and services they need for their social and economic wellbeing. The Victorian Government should conduct detailed feasibility studies and business cases before announcing new projects, to ensure their investments serve Victoria best.

Develop regional Victoria

Developing Victoria's regions is more than simply generating construction activity. Regional development encompasses economic and community development. Infrastructure can support a region's competitive strengths, help adapt to economic change, and address socioeconomic disadvantage for some of Victoria's most vulnerable communities. Building connectivity, especially between businesses and markets, can help Victoria's regions develop. Infrastructure can also help strengthen wellbeing in regional Victoria by connecting people to essential services and resources at major life stages.

Victoria's infrastructure is only one facet of the state's economic performance, social outcomes and ecological sustainability, and cannot solve every problem alone.

But combined with good governance, innovative and competitive businesses, strong public and social services, and a thriving community, infrastructure can help create a prosperous, inclusive and sustainable long-term future.

Insight

Considering multiple future scenarios

We are publishing this strategy in a period of significant uncertainty. The COVID-19 pandemic added further complexity to other trends affecting infrastructure, including technological disruption, climate change and the ageing and growth of Victoria's increasingly diverse population.

Infrastructure Victoria modelled different future scenarios to build the evidence base underpinning this strategy. Infrastructure projects are an investment for the long term, but the long-term outlook can vary markedly. Structural changes, including those induced by the COVID-19 pandemic, can significantly change people's preferences, including for travel choices and behaviour. For this strategy we modelled scenarios considering a longer-term trend of greater working from home, the effects of automated and electric vehicles, and faster or slower population growth, as part of our *Major transport program strategic assessment report.* The strategy also drew upon scenarios in our previous studies, including *Good move: fixing transport congestion*, and *Advice on automated and zero emissions vehicles infrastructure*.

Our working from home scenario found reduced demand on the transport network, helping reduce congestion, but also raised the possibility that this change in people's behaviour could result in more people living in rural areas and Melbourne's outer suburbs and new growth areas. At the same time, it could reinforce the dominance of the central city, as more jobs could be created in the centre of Melbourne.

Our automated and electric vehicle scenario similarly showed more people may move to Melbourne's outer suburbs and growth areas. But in contrast to working from home, it worsened road congestion in the medium term but improved congestion in the long term, and reduced the share of trips taken on public transport, as cars became cheaper to run and more attractive to use. It also has implications for energy use, placing extra demand on the energy infrastructure in these places.

We have also considered the impacts of government-led initiatives such as transport network pricing and upgraded road management systems. These initiatives can have a significant impact on transport system demand, capacity, and subsequently the need for new transport infrastructure.

Our different population scenarios show that the timing of infrastructure needs, such as when roads or public transport become unacceptably congested, partly depends on the rate of population growth. However, slower population growth does not solve congestion problems, it simply delays them for a few years. The spatial distribution of population growth is also something we have considered, drawing on our *Density done well* work.

Combined, these different scenarios show that while Victoria's future trajectory is not certain, some underlying trends persist. Underlying population growth is forecast to resume and drive the need for future action. The scenarios underline that actions to ease congestion and manage travel demand remain beneficial in different futures. Our recommendations, including changes to transport pricing, can be used to help address any adverse impacts.

In early 2021, we published a research report, *Transporting Melbourne's recovery*, which explored the short-term impacts of the COVID-19 pandemic. It found that increased vehicle traffic in inner Melbourne could reduce average vehicle speeds by 20% to 30%, compared with pre-COVID levels. With easing of restrictions and a transition into the recovery phase, these projections were confirmed by reality. By March 2021, traffic on Punt Road was recording travel times longer than those recorded pre-pandemic,[1] as did traffic levels in some places in the central city.[2]

We made recommendations that could be implemented quickly at relatively low cost to contribute to recovery from the COVID-19 pandemic. For instance, flexible work practices, such as earlier or later start and finish times, could help shift demand across the transport system, helping to support safer, more confident public transport travel. Cycling and walking infrastructure investment can also be a cost effective way to encourage commuters to choose active transport, while also providing health and environmental benefits. Many of these measures are also opportunities to better use existing infrastructure and would remain valuable long after the pandemic passes.

Infrastructure Victoria continues to undertake modelling and research on the potential medium and long-term effects of the COVID-19 pandemic.

Insight

An innovative way to assess major transport projects

We wanted to make sure that this strategy reflected changes since the release of our 2016 strategy. For our recommendations to match future policy and infrastructure needs, we commissioned modelling to consider the growth patterns of recent years, and the Victorian Government's commitments to modernising and expanding the transport network with new and refurbished infrastructure projects.

Our modelling makes use of new and innovative modelling techniques for the first time, allowing us to examine the effects of transport infrastructure on land use. A drawback of traditional transport modelling is that it assumes transport infrastructure causes no changes in the distribution of population and employment. This means it cannot incorporate the effects of land use change in response to new infrastructure construction.

The brand new, innovative Victorian Land Use and Transport Integration (VLUTI) model, developed by Victoria University in partnership with Infrastructure Victoria, provides a new tool to examine the land use effects of infrastructure investments. This innovative VLUTI model allows for land use and transport infrastructure to directly influence each other, causing changes in the location of people and jobs. This means we can gain insights into how infrastructure investments might shift the location of population or employment growth. This new modelling technique starts to allow us to develop more accurate estimates of the land use benefits of transport infrastructure investments

Approaches to assessing infrastructure programs have evolved over time. We commissioned modelling and economic evaluation of some of the major transport recommendations in this strategy. Our assessment framework considers many elements, with the assessment outcomes reflecting a progressive approach to major transport program assessment. We applied a multi criteria analysis, an expanded economic evaluation that considers land use changes, a broader social, environmental and economic assessment, and consideration of distributional impacts.

Our *Major transport program strategic assessment report* is available on our website. It includes detailed modelling and analysis of:

- Improving road network management systems
- Constructing an outer metropolitan ring road and rail corridor
- Reconfiguring the City Loop and northern rail corridor upgrade
- Upgrades to the western rail corridor
- Constructing Melbourne Metro Two and direct Geelong rail services
- Building a new cross-city motorway.

Using our assessment framework, modelling and sensitivity testing, we identified the conditions required for a transport program, and the complementary measures that support its benefits and mitigate against any unwanted outcomes. Our modelling showed the potential for some programs and scenarios to accelerate outward city growth, which can have environmental, ecological, economic and social impacts. Our modelling also showed induced demand could erode the future benefits of some new infrastructure programs. Integrated transport and land use planning, and transport network pricing, can help to identify and mitigate these risks and unlock greater benefits for Victorians.

Infrastructure and Victoria's First Nations peoples

Infrastructure Victoria proudly acknowledges Victoria's First Nations peoples and their ongoing resilience in preserving and practising the world's oldest living culture. We acknowledge the Traditional Owners of the lands and waters on which we live and work, and pay our respect to their Elders past, present and emerging. Aboriginal and Torres Strait Islander people and their cultures have prevailed and endured despite experiencing entrenched disadvantage, political exclusion, intergenerational trauma and ongoing institutional racism.

Victoria's Aboriginal peoples were this land's first infrastructure builders. For example, at Budj Bim in western Victoria, ancient lava flows were cultivated by Gunditjmara peoples to engineer one of the world's oldest freshwater aquaculture systems to farm and harvest Kooyang (short-finned eels) and other fish. Alongside the traditionally engineered aquaculture systems, Gunditjmara clans established villages along the Budj Bim Cultural Landscape by building clusters of stone houses.[3]

We also acknowledge that infrastructure made possible the history of colonisation and dispossession of Victoria's First Peoples. The construction of infrastructure, such as ports, roads, railways, mines and dams, allowed the Port Phillip colony to grow and expand. This infrastructure allowed colonists to reach and alter ever greater tracts of land, without the agreement of Victoria's First Peoples. The exploitation of this land for agriculture and minerals also funded and fed the expanding colony, using colonial infrastructure to transport it. Infrastructure continues being built on the traditional lands of Victoria's First Peoples today. In recognition of past wrongs, the Victorian Government has established the Yoo-rrook Justice Commission as Australia's first truth-telling process. Yoo-rrook is the Wemba Wemba / Wamba Wamba word for truth, and the Commission will investigate historical and ongoing injustices committed against Aboriginal Victorians since colonisation, across all areas of social, political and economic life. The Commission will deliver an interim report to the Victorian Government by 30 June 2022 and a final report by 30 June 2024.[4]

The Victorian Government has also committed to pursuing Treaty in partnership with Aboriginal Victorians to take the next step towards reconciliation and Aboriginal self-determination. The First Peoples' Assembly is the first democratically elected body of Aboriginal Victorians in the state's history and is working in partnership with the Victorian Government to establish the elements required to support future Treaty negotiations. While the content of a treaty or treaties is not yet known, Victoria's Treaty could include the recognition of past wrongs, acknowledgement of the unique position of Aboriginal Victorians, enhancement of existing laws and how they impact Aboriginal people in Victoria, and the transfer of decision-making power and resources so that Traditional Owners and Aboriginal Victorians can make decisions about the matters that affect their lives.[5]

The United Nations Declaration on the Rights of Indigenous Peoples enshrines Aboriginal self-determination as a human right. It describes self-determination as the ability for Indigenous people to freely determine their political status and pursue their economic, social and cultural development. It also describes self-determination as a right that relates to groups of people, not just individuals. The Victorian Government has committed to using self-determination as the guiding principle in Aboriginal affairs.[6]

In July 2020, the Coalition of Aboriginal and Torres Strait Islander Peak Organisations, the Australian Government, state and territory governments, and the Australian Local Government Association signed a new *National Agreement on Closing the*

Gap. The new agreement takes a partnership approach between governments and Aboriginal organisations, and contains 17 targets across education, employment, health and wellbeing, justice, safety, housing, land and waters, and languages. The agreement commits the parties to building formal Aboriginal and Torres Strait Islander community-controlled sectors to support Closing the Gap, including developing Sector Strengthening Plans with a stream dedicated to capital infrastructure.[7] It also states that when new funding initiatives are decided to service the broader population, a meaningful proportion is allocated to Aboriginal and Torres Strait Islander organisations.[8] The agreement requires the Victorian Government to prepare an implementation plan to progress the targets in Victoria.[9]

The Victorian Government has also developed the *Victorian Aboriginal Affairs Framework 2018–2023* to lay out Victoria's approach to Aboriginal affairs, and providing the metrics, targets and priorities to guide the state's progress. It contains 20 goals, many aligning with the Closing the Gap targets. Many of these goals and targets will require infrastructure to fulfill.

Infrastructure design and construction can exacerbate systemic injustice.[10]

The historic dispossession and incarceration of Aboriginal people on missions and reserves without reference to their connection to their Country has meant that populations are scattered and often remote from their traditional lands and heritage and family. Dispossession has resulted in disadvantage which itself creates patterns of domestic location for many Aboriginal families in poorer suburbs that are inadequately serviced with infrastructure.[11]

Infrastructure can connect Aboriginal people to their family, kin, community, and support their connection to Country, culture, spirituality, and ancestry.[12] It is critical in addressing prevailing socio economic, health and wellbeing challenges within the Victorian Aboriginal community.[13] The Victorian Government and many Aboriginal organisations have begun to outline the way forward, including in:

- *Korin Korin Balit Djak:* Aboriginal health, wellbeing and safety strategic plan 2017–2027[14]
- *Balit Murrup:* Aboriginal social and emotional wellbeing framework 2017–2027[15]
- *Dhelk Dja – Safe our way:* strong culture, strong peoples, strong families[16]
- *Marrung:* Aboriginal education plan 2016–2026[17]
- *Wungurilwil Gapgapduir:* Aboriginal children and families agreement[18]
- *Burra Lotjpa Dunguludja:* Victorian Aboriginal justice agreement – Phase 4[19]
- *Tharamba Bugheen:* Victorian Aboriginal business strategy 2017–2021[20]
- *Mana-na woorn-tyeen maar-takoort:* the Victorian Aboriginal housing and homelessness framework.[21]

Along with the Treaty process, Yoo-rrook Justice Commission, and the National Agreement on Closing the Gap, these and other frameworks, plans and reports begin to map a pathway forward to address Aboriginal disadvantage, fight racism, overcome intergenerational trauma, and meet the current and future needs of Victoria's First Nations people. In turn, they can help inform future infrastructure planning for Victoria's First Nations peoples and Aboriginal community-controlled organisations.

Objectives

Photography by Chris Matterson

These objectives specify the ultimate goals this strategy aspires to achieve. Infrastructure cannot accomplish them alone but can make a substantial contribution.

01

Prepare for population change

Victoria's infrastructure meets new and shifting demands from a growing and changing population. Change will vary and occur in different ways including changing demographics, family structures, and cultural diversity.

02

Foster healthy, safe and inclusive communities

Victorians achieve and maintain good physical and mental health. They feel safe in their homes and communities, free from harm. They maintain social connections and participate in civic, cultural and community life.

03

Reduce disadvantage

All Victorians have the resources and capabilities for a good quality of life. They have equal access to opportunities regardless of their backgrounds, attributes or locations.

04

Enable workforce participation

Victorians develop the capabilities, and have the opportunities, to engage in enough secure and meaningful work.

05

Lift productivity

Victorians can maintain a good standard of living from an economy boosted by enhanced skills, innovation, market access and efficient investment.

06

Drive Victoria's changing, globally integrated economy

Victoria remains prosperous by staying attractive for trade and investment nationally and internationally, adapting to change and capitalising on economic opportunities.

07

Promote sustainable production and consumption

Victoria manages its resources sustainably, by minimising waste and preserving natural assets for future generations.

08

Protect and enhance natural environments

Victoria protects natural environmental systems to preserve and enhance healthy, resilient and biodiverse ecosystems for future generations.

09

Advance climate change mitigation and adaptation

Victoria's community and economy adapts to the impacts of climate change and achieves the legislated target of net zero greenhouse gas emissions by 2050.

10

Build resilience to shocks

Victoria can better prevent, respond to, and recover from shocks. Victoria is less vulnerable to economic, technological, biological, ecological, and geopolitical disruptions and emergencies.

Approach

Under the *Infrastructure Victoria Act 2015,* Infrastructure Victoria must prepare an updated infrastructure strategy every three to five years.

Victoria's infrastructure strategy 2021–2051 is an update and builds on the 2016 version. We have undertaken many activities in preparing this updated strategy. For our full methodology, please refer to Appendix D in Volume 2.

Consulting on and reviewing objectives

Infrastructure Victoria surveyed the Victorian community on the strategy objectives.[22] This confirmed substantial support for the existing objectives. Our objectives also align with the directions in the United Nations' Sustainable Development Goals (SDGs). In response to the survey feedback, and in line with the SDGs, we have adjusted the language of the objectives to make them clearer. You can find the survey report at *infrastructurevictoria.com.au*.

Releasing a discussion paper

In April 2019, Infrastructure Victoria published a discussion paper, *Growing Victoria's potential*, framing some of the strategic issues confronting Victoria to inform the strategy. We have incorporated the feedback on this discussion paper in our analysis.

Consulting on the draft strategy

We released a draft strategy for consultation in December 2020. To maximise opportunities for community and stakeholder input, we developed a three-month engagement program, including 34 online forums, roundtables, and community focus groups. We received over 200 submissions. From these activities, we received over 2600 proposals for changes to the draft strategy. We have considered each of these and incorporated them as appropriate. For more information, see Appendix E of Volume 2, and *Victoria's draft infrastructure strategy public engagement findings report*.

Deliberative engagement

Infrastructure Victoria commissioned the state's largest ever online deliberative community panel, to examine how the Victorian Government should support people to adopt low or zero emissions vehicles sooner. The *Tackling transport emissions to encourage uptake of low or zero emissions vehicles sooner – community panel report* has informed the development of recommendations in this strategy.

Focusing on regional infrastructure priorities

Infrastructure Victoria has undertaken a program of work to better understand the infrastructure priorities of Victoria's regions. This included substantial data collection and workshops held in each region to produce Regional Infrastructure Needs profiles. We used two frameworks designed to assess potential recommendations that either built on comparative advantage or addressed regional disadvantage, supported by stakeholder feedback. These form the basis of many recommendations in this strategy. You can find all the related reports on our webpage about *Infrastructure priorities for the regions*.

New modelling

As part of the strategic assessment of projects, Infrastructure Victoria has commissioned new modelling incorporating population, employment, transport infrastructure, land use planning and economics, so the most up to date evidence informs our recommendations. This includes modelling of major transport projects, and examines different future scenarios. This modelling and economic assessments allowed us to prepare our *Major transport program strategic assessment report*, about the performance and viability of major transport projects.

Responding to external changes

This strategy was developed during a time of considerable change, including from the impacts of the COVID-19 pandemic. We have undertaken additional research on the short-term impacts of the pandemic on transport demand, documented in our research report *Transporting Melbourne's Recovery*. We have also modelled scenarios that consider potential longer-term effects of the pandemic, such as greater incidence working from home, documented in our *Major transport program strategic assessment report*. We have considered the potential effects of these circumstances on our recommendations.

Undertaking new research and advice

Beyond our work on regional infrastructure needs, Infrastructure Victoria undertook many research projects to gather more evidence on specific issues. We have published several research reports on transport network pricing, infrastructure provision in different development settings, metropolitan infrastructure needs, social housing outcomes, water governance, housing targets and cost reflective energy pricing, all available on our website. We have published three substantial reports on advice requested by the Victorian Government, including on future ports

capacity, automated and zero emissions vehicles, and recycling and resource recovery infrastructure. In December 2020, the Victorian Government requested advice on gas infrastructure, to be delivered in December 2021. We also undertook internal research projects on climate change, infrastructure for growth areas, density done well, integrated land use and infrastructure planning, energy transition, social and affordable housing, health infrastructure and justice and emergency services infrastructure. This strategy reflects the findings of these new research and advice projects.

Timing, costings and funding options

We have proposed a timeline and undertaken strategic costings for each recommendation, and also proposed potential funding options for recommended major policies, reforms and projects. These costings are strategic-level estimates, and often expressed as a cost range. A final costing requires more detailed work by the Victorian Government, based on implementation specifications. The detail of the timing, costing and funding options for each recommendation can be found in Appendix C of Volume 2.

Consulting experts

In many instances, Infrastructure Victoria commissioned pre-eminent experts to provide their views on developing evidence and potential recommendations for this strategy. For example, we consulted expert advisers to develop our assessment frameworks for *Infrastructure priorities for the regions* and established a Transport Advisory Panel to inform the development of transport recommendations. Our advice reports also used expert advisors to inform their findings.

Reviewing and revising 2016 recommendations

Infrastructure Victoria has reviewed all the recommendations made in the 2016 strategy. We have used updated evidence, modelling and analysis to re-examine them for inclusion in this strategy. Some of our 2016 recommendations have been implemented or substantial progress has been made, and therefore they do not reappear here. For others, the strategic context has changed, or new evidence has been produced, and the recommendations have been revised to reflect this. New evidence suggested some new actions which have formed the basis of new recommendations. We have documented progress on the 2016 recommendations and their links with this strategy (see Appendix F in Volume 2). Progress has been made in implementing most of our 2016 recommendations. Of the 137 recommendations, our review finds that 29 have been substantially completed, 98 are in progress, and 10 have not commenced.

Engaging stakeholders and the community

Beyond the three-month consultation on the draft strategy, we have extensively engaged with stakeholders throughout our evidence gathering, research and advice development phases, including with the Victorian Government, local governments, businesses, community organisations and the Victorian community. We have also engaged with multiple government and stakeholder reference groups for different strategy and research activities. We have engaged people consistently, in multiple ways, including surveys, deliberative forums, submissions processes and using digital and social media platforms.

Consulting on the draft strategy

Infrastructure Victoria released a draft of this strategy for consultation on Wednesday, 9 December 2020. We designed a comprehensive engagement program to facilitate community feedback that ran until 26 February 2021, using our own website and the Victorian Government's Engage Victoria consultation portal. During the engagement period, we recorded 18,798 visits to the Infrastructure Victoria website and 7048 visits to the Engage Victoria portal, a total of 25,846 web visitors.

We also consulted widely on the themes and recommendations through 34 community and stakeholder events during the consultation period, attended by 464 participants. This comprised:

- 192 participants at nine regional roundtables
- 142 participants at 12 industry or sectoral dialogues
- 78 participants at five workshops
- 28 participants at two local government forums
- 24 participants in six focus groups.

We also commissioned a deliberative engagement process to better understand the community's views on supporting the uptake of zero emissions vehicles, as part of this consultation program. A further 211 Victorians took part in a five-week virtual workshop series.

Victorians were encouraged to lodge a submission on the draft strategy, complete a survey, answer discussion questions, attend a focus group or otherwise contribute through the Engage Victoria website. We documented more than 2600 proposals for change, including feedback from more than 200 submissions.

Summary of recommendations

Section 01

Confront long-term challenges

1.1 Navigate the energy transition

1. Accelerate consumer purchases of zero emissions vehicles

In the next two years, publish a statewide electric vehicle charging network strategy, and produce charging infrastructure design standards and payment principles. Over the next five years, monitor and review the effectiveness of financial incentives in encouraging early zero emission vehicle purchases. Commit to no longer registering new petrol and diesel vehicles in Victoria by 2035 at the latest, through increasingly stringent vehicle registration emissions standards.

2. Transition government fleet and freight vehicles to zero emissions technologies

Within the next five years, require all new government fleet vehicles to be zero emissions vehicles where available. Incentivise uptake of zero emissions freight vehicles through reviewing restrictions on zero emissions freight movements on freight routes.

3. Augment electricity transmission for renewable energy and resilience

Support augmentation of critical electricity transmission infrastructure by 2027–28 to accommodate new renewable energy generation and improve network resilience and reliability through interconnection with other states.

4. Identify and coordinate Renewable Energy Zones

In the next year, identify Renewable Energy Zones, especially in the state's north-west, and continue to coordinate their development over the next 10 years.

5. Require 7-star energy-rated new homes by 2022, and increase afterwards

Require all new homes to achieve a minimum 7.0-star NatHERS rating (or equivalent) by 2022, increasing towards 8.0 stars (or equivalent) by 2025, either through the National Construction Code or Victorian regulations.

6. Mandate a home energy disclosure scheme

In the next five years, develop an energy efficiency disclosure scheme for home sales, to overcome information barriers and encourage energy efficiency improvements to existing homes.

7. Strengthen minimum energy efficiency standards for rented homes

In the next three years, increase minimum energy efficiency standards to reduce energy use and costs in rented homes. During the next 15 years, keep updating these standards to reflect new cost effective measures, and improve renters' ability to make home energy efficiency improvements.

8. Make Victorian Government buildings more energy efficient

Generate energy savings in existing owned and leased Victorian Government buildings through energy efficiency upgrades. Set and report against energy efficiency targets for the next five years to support delivery of energy efficiency outcomes, then review with a view to set a longer-term energy efficiency target.

9. Encourage demand management pricing to reduce peaks and optimise distributed energy

In the next 10 years, optimise use of existing electricity infrastructure by encouraging demand management pricing.

10. Confirm gas policies and pathways to reach net zero emissions and allow new gas-free homes

Within a year, respond to Infrastructure Victoria's Advice on gas infrastructure, including by considering the trajectory to transition natural gas to reach net zero emissions by 2050. This allows gas network planning changes after 2025. Adjust policies so they do not encourage or embed future residential natural gas use.

1.2 Respond to a changing climate

11. Specify climate scenarios and carbon value in assessing infrastructure

In the next year, update and expand practical instructions for government

agencies on integrating climate-related risks into infrastructure assessments. This should include high, medium and low future climate change scenarios, transitional risks and valuing emission reductions.

12. Strategically review climate consequences for infrastructure

Strategically review the climate change consequences for Victoria's infrastructure needs and priorities, beginning in November 2021 after delivering the adaptation plans under the *Climate Change Act 2017.*

13. Consider all water supply sources

Consider all water sources for supply augmentation, including identifying and addressing barriers to purified recycled drinking water within the next 10 years. When planning for future water supply, investigate all options including, but not limited to recycled water, seawater desalination, stormwater harvesting and better use of the water grid.

14. Progress integrated water cycle management

Within five years, accelerate progress toward an integrated model of water cycle management, starting by clarifying policy settings to allow the better use of stormwater and recycled water.

15. Improve decision-making for urban water investment

In the next five years, clearly allocate the roles and responsibilities for urban water systems and major supply augmentation planning.

16. Strengthen agricultural water security by modernising irrigation

In the next 30 years, contribute funding toward planning and delivery of water infrastructure and irrigation modernisation projects across Victoria.

17. Upgrade Victoria's emergency water network

In the next year, assess the condition, capacity and security of Victoria's emergency water supply point network, and upgrade or replace inadequate supply points. Clarify ongoing responsibility for monitoring, maintenance and funding to secure a resilient network.

1.3 Embed resilience

18. Invest in protection and adaptation for Victoria's coasts

In the next year, develop clear guidance on coastal adaptation planning, including thresholds, triggers, and planning guidelines to support local area decision-making. Invest in coastal protection upgrades and maintenance, including beach and dune protection and rehabilitation, and storm surge protection, over the next eight years.

19. Build back better after emergencies

In the next year, consider policy changes and funding mechanisms so high priority public infrastructure destroyed by emergencies is built to a more resilient standard or in less vulnerable locations.

20. Improve critical infrastructure information flows and embed resilience

Over the next five years, expand information sharing capabilities and embed resilience across and between critical infrastructure sectors and jurisdictions. Among mechanisms to achieve this, consider expanding the Victorian legislated definition of critical infrastructure beyond energy, water, and transport.

1.4 Embrace technology and innovation

21. Prepare for increasingly automated vehicle fleets

In the next year, begin updating transport regulations to allow automated vehicle operation on the road network. In the next 10 years, upgrade roads and communications infrastructure to help facilitate increasingly connected and automated vehicles, particularly for corporate and government fleets. Develop policy, business case and land use planning guidance to maximise the benefits of automated vehicles and mitigate their risks.

22. Facilitate integration of public transport with new mobility services

In the next five years, develop open access ticketing platforms to facilitate integration of public transport modes with new mobility services, incorporating better data sharing and collection. Remove public transport contract barriers to allow integration of existing and emerging transport modes and services.

23. Incorporate personal mobility devices in regulation

In the next two years, incorporate nationally consistent rules for personal mobility devices in Victorian legislation, update existing active transport design standards to better accommodate new devices and develop a statewide regulatory framework for shared mobility schemes.

24. Introduce new road network demand management technology

In the next five years, progressively introduce new road network demand management technologies across the state and integrate management systems for different road-based transport modes. Combine them with a road infrastructure upgrade program to optimise the benefits of technologies, such as by providing extra clearways and introducing dedicated lanes for bus routes.

25. Use innovation to deliver better models of health care

Within two years, help slow the growth in demand for hospital infrastructure by developing a comprehensive statewide health innovation strategy, supported by funding over five years to promote and progressively implement better models of health care.

26. Modernise courts through digitisation and contemporary shared facilities

In the next year, begin increasing court efficiency and help meet demand by digitising suitable court systems and procedures. Invest in new contemporary, adaptable, multi-jurisdictional court facilities during the next 10 years.

27. Improve technology and infrastructure for a responsive police service

In the next 10 years, invest in technological capacity to better support a responsive police service, and deliver infrastructure to enable a contemporary hub-and-spoke policing model, co-located with health and human services where appropriate.

1.5 Build a circular economy for waste and recycling

28. Facilitate improved recycling infrastructure for priority materials

In the next year, focus efforts to increase and upgrade waste processing infrastructure on six priority materials. Facilitate increased recovery and reprocessing capacity and capability for paper and card, plastics, and organics by 2025. Revisit funding mechanisms and align recycling infrastructure with land use settings.

29. Strengthen end markets for recycled materials

Continue to deliver market development for recycled materials by updating standards and specifications to be performance-based rather than material-based, and explicitly require the Victorian public sector to use recycled products where feasible. In the next five years, support research, development and demonstrations to build confidence and demand for recycled products.

30. Address barriers to recycling and reducing waste

In the next year, reduce recyclable material contamination by supporting greater consistency in kerbside and commercial collection and separation of glass, paper, cardboard and organic materials.
In the next year, design and implement behaviour change programs to reduce contamination, and consistently maintain further behaviour change programs in the next 30 years.

31. Minimise waste and improve residual waste infrastructure planning

In the next two years, improve infrastructure planning for managing residual waste, and further clarify the role of waste-to-energy facilities. Over the next 30 years, consistently invest in waste avoidance through behaviour change programs, pricing, regulation and other incentives.

Section 02

Manage urban change

2.1 Integrate land use and infrastructure planning

32. Produce public plans for priority infrastructure sectors

In the next five years, develop and publish long-term statewide infrastructure plans for priority infrastructure sectors for which the Victorian Government maintains substantial responsibilities, including sequencing and timelines for investment.

33. Publish Victoria's transport plan

In the next year, develop and publish Victoria's integrated transport plan. Require the transport and strategic land use plans to align with each other.

34. Review Victoria's infrastructure contribution system to cover gaps

In the next two years, complete a review of Victoria's many infrastructure contributions schemes to create a consistent and efficient system that contributes to Victorian and local government infrastructure costs. A revised infrastructure contribution system can apply more broadly, including in established suburbs, growth areas, peri-urban areas, and regional cities.

2.2 Create thriving urban places

35. Support more homes in priority established places

In the next year, identify new priority locations in established suburbs for residential intensification to better use existing infrastructure. Following this, in partnership with local government, review planning settings to allow increased housing density and establish design review advisory panels.

36. Use value-capture mechanisms to deliver very low income housing

Within the next two years, change and actively apply planning regulations to provide affordable rental housing for Victorians on very low incomes in places with good access to public transport and services, when they are re-zoned for more intensive residential use.

37. Develop an interconnected open space network

In the next three years, help create an interconnected open space network and extend the urban tree canopy, by providing direct funding, and reviewing and reforming the developer open space contribution scheme.

38. Partner with local governments to fund pedestrian infrastructure

Over the next five years, partner with local governments to fund pedestrian infrastructure network upgrades to connect people to priority places, including central Melbourne, the Monash National Employment and Innovation Cluster, other activity centres and train stations.

39. Transform cycling in Melbourne, Ballarat, Bendigo and Geelong

In the next 10 years, prioritise and significantly progress developing a continuous network of high quality, safer cycling corridors in Melbourne, Ballarat, Bendigo and Geelong, including separated cycle ways and more storage at train stations and activity centres. In the next five years, immediate priorities include connections within and between central Melbourne and surrounding suburbs, and connections to the Monash, La Trobe and Sunshine National Employment and Innovation Clusters.

40. Improve walking and cycling data to better estimate travel, health and safety impacts and benefits

In the next year, begin developing better walking and cycling information and data. In the next three years, incorporate this data and information into Victorian Government transport models for strategic and project planning, and project appraisal to guide investment decisions.

41. Reallocate road space to priority transport modes

In the next year, start delivering road space reallocation initiatives to better support and enforce priority movement through streets and places. Adopt a five-year target for delivery of more ambitious road space reallocation initiatives. Legislate for faster, simpler, and more consultative road space reallocation in government decision-making.

42. Redesign tram routes

In the next 10 years, redesign tram routes, including short shuttle routes, and reserve land for future tram depots, for more capacity in fast growing inner Melbourne areas.

43. Activate urban renewal with new tram links

In the next year, fund the northern Fishermans Bend tram connection for delivery by 2026 and complete the planning for the southern route. Within two to five years, commit to delivering a tram extension to Arden, and to the former defence site at Maribyrnong if required.

44. Plan for and fund public transport accessibility, including tram stop upgrades

Fund public transport accessibility improvements to infrastructure and services, including for priority tram and bus stops, to make substantial progress toward the legislated 2032 accessibility targets.

2.3 Steer changes in travel behaviour

45. Adopt permanent off-peak discounts for public transport fares

Permanently adopt discounted off-peak fares for metropolitan public transport and discontinue ticket types that do not offer discounts for off-peak travel.

46. Reduce bus and tram fares

In the next year, reduce bus and tram fares, while maintaining an integrated ticketing system, to encourage people to make greater use of cost-effective public transport services that can be quickly expanded.

47. Remove the free tram zone

In the next year, remove the free tram zone to improve equity, enhance the performance of the tram network and provide better safety and transport access for those most in need.

48. Appoint an independent transport pricing adviser

In the next year, appoint an independent body to advise on and monitor transport prices over the next 30 years.

49. Reduce inner Melbourne congestion by further reforming parking pricing

Within the next two years, review the Melbourne Congestion Levy on parking to increase its value, expand the properties it applies to, and cover a wider area. In the next five years, consider extending the levy to on-street parking and supporting a trial of demand-responsive pricing for inner Melbourne on-street parking.

50. Price parking at major public transport hubs

In the next five years, charge parking fees at major public transport hubs, followed by all train stations and park-and-rides, to help encourage people to travel there using public and active transport, and to make parking spaces available for public transport users who need them most.

51. Incorporate congestion pricing for all new metropolitan freeways

Apply congestion-based peak and off-peak tolling to all new metropolitan freeways, including the North East Link, to better manage traffic flow and impacts on nearby local roads.

52. Trial full-scale congestion pricing in inner Melbourne

In the next five years, trial full-scale congestion pricing in inner Melbourne to reduce congestion on inner city roads.

53. Phase out fixed road user charges and introduce user pays charging

Replace fixed road user charges with variable distance-based and congestion charges over the next 10 years, by gradually expanding and reforming the existing electric vehicle charge. Ensure user pays charging reflects the relative costs of road use, encouraging people to adopt beneficial travel behaviour.

2.4 Adapt infrastructure for modern needs

54. Require accessible buildings for public services

In the next year, establish an accessibility upgrade fund to contribute towards priority building upgrades to meet contemporary accessibility standards. By 2032, require all Victorian Government provided and funded services to be delivered from premises that meet contemporary accessibility standards.

55. Rapidly renew old public housing

Rapidly renew dilapidated public housing properties to improve functionality, accessibility and energy efficiency with a priority to renew at least half of all older low-rise apartments and older three bedroom detached dwellings by 2031

56. Upgrade and rebuild public hospital infrastructure

In the next five years, publish priorities for hospital renewal to enable modern health care services and meet future demand. In the next 10 years, redevelop the Royal Melbourne Hospital and progress the upgrade and rebuild of the Alfred Hospital and Austin Hospital.

Section 03

Harness infrastructure for productivity and growth

3.1 Shape the transport network for better access

57. Reshape the metropolitan bus network and introduce 'next generation' bus services

By 2025, reshape the metropolitan bus network in Melbourne's north-west and south-east in time for the opening of the Melbourne Metro Tunnel. Introduce 'next generation' bus services, beginning by using them on the new Doncaster busway. In the next 10 years, continue reforming bus networks in Melbourne and Geelong, including by revising the coverage standard and using more flexible bus services in lower demand areas.

58. Connect suburban jobs through 'next generation' buses and road upgrades

In the next five years, create new 'next generation' bus services and better roads to connect outer and growing suburbs to National Employment and Innovation Clusters and major employment centres. Consider using a 'next generation' bus service instead of trams between Caulfield and Rowville.

59. Increase off-peak service frequencies and suburban rail corridor capacity

Over the next five years, increase Melbourne's train service frequencies for off-peak, counter-peak and weekend services. Develop and progressively deliver a prioritised 15-year network service upgrade program for suburban train corridors, including track and signalling improvements, higher capacity trains, carriage retrofits and an upgraded train control centre.

60. Reconfigure the City Loop for more frequent and reliable services

Within the next two years, complete a business case to reconfigure the City Loop, including determining its timing. Include planning for more frequent metropolitan services on the Craigieburn, Upfield, Frankston, and Glen Waverley services, while considering a future express railway line between Camberwell and Burnley to prepare for future rail patronage on the Lilydale, Belgrave, and Alamein lines. Explore options and staging to extend metropolitan services to the Mitchell local government area, including possible station locations.

61. Prepare for Melbourne Metro Two and direct Geelong rail services

Within five years complete a business case for the Melbourne Metro Two Tunnel project, and protect the land required to construct it. Consider using the tunnel to re-route Geelong services direct to Southern Cross, and consider new stations or relocating existing stations. To shape demand for the project in the next five years, enable more intensive land use around the rail network, and introduce 'next generation' bus services between Newport and Fishermans Bend, and Victoria Park and Parkville.

62. Protect a long-term option for a new cross-city motorway

Within five years, determine an updated future alignment and preserve the option for constructing, if required, a new motorway linking the Eastern Freeway and CityLink. If delivered, implement the project with a transport network pricing scheme, and active and public transport improvements.

3.2 Improve freight efficiency for industry competitiveness

63. Optimise capacity at the Port of Melbourne

Support efforts to progressively optimise the Port of Melbourne's capacity, and actively take steps to manage amenity implications for community acceptance, as identified in our Advice on Securing Victoria's Ports Capacity.

64. Act now to protect the future Bay West Port option

Within the next five years, identify and secure land, and apply planning protection for transport corridors and buffers for a future Bay West Port, particularly for future road and rail connections. Monitor and report on the triggers to develop a new port, and commence and continue environmental assessment and monitoring over the next 30 years. Around 2040, begin detailed planning.

65. Deliver a new intermodal freight terminal for Inland Rail

In the next year, determine the preferred new intermodal terminal and facilitate its delivery, transport links and the surrounding precinct to operate soon after the Melbourne to Brisbane Inland Rail project is completed. Progress planning for another intermodal freight terminal and precinct, and secure necessary land.

66. Construct an outer metropolitan road and rail corridor

Within two years, determine staging for the outer metropolitan rail and road corridor. Subject to detailed business cases, start construction of priority sections, starting with the E6 motorway by the end of this decade. Progressively stage corridor development for completion in the next 30 years. Provide a freight rail link to coincide with the opening of the Western Intermodal Freight Terminal.

3.3 Align social infrastructure with better service delivery

67. Co-design an Aboriginal community-controlled infrastructure plan

In the next year, start a co-design process with Aboriginal Victorians to develop a plan to guide investment in Aboriginal community-controlled infrastructure to meet current and future social, economic and cultural needs.

68. Set targets to grow social housing

In the next year, set a transparent statewide social housing growth target to reach and maintain at least the national average of 4.5 social housing dwellings for every 100 households by 2031.

69. Build new hospital capacity

In the next five years, reserve land for future hospital sites. Over 30 years, build new public hospital capacity to meet Victoria's future needs, especially increases in demand from Melbourne's rapidly growing outer northern and western suburbs.

70. Deliver infrastructure for a more responsive and integrated mental health system

In the next year, establish a dedicated infrastructure fund to support more responsive and integrated mental health and wellbeing services, consistent with the recommendations of the Royal Commission into Victoria's Mental Health System.

71. Plan and consistently deliver corrections and youth justice infrastructure while managing demand with policy settings

Plan and consistently deliver corrections and youth justice infrastructure while managing demand. By 2023, undertake long-term corrections and youth justice infrastructure planning, alongside policy measures that reduce short-term volatility and demand. In the next 15 years, consistently deliver a program of corrections and youth justice infrastructure projects to meet long-term demand.

3.4 Plan for growth areas

72. Prioritise and oversee infrastructure delivery in growing communities

In the next year, empower a government body to monitor infrastructure delivery in Victoria's new growth areas and priority urban renewal precincts, and proactively advise on delivery sequencing and funding. In the next five years, develop program business cases for growth areas and precincts that consider timing, sequencing and funding of infrastructure.

73. Fund libraries and aquatic centres in growth areas

In the next five years, increase funding to support local governments to plan and deliver libraries and aquatic recreation centres in Melbourne's seven growth area municipalities.

74. Extend rail services in Melbourne's western and northern growth areas

In the next two years, develop business cases to extend electrified metropolitan train services from Sunshine to Rockbank, from Craigieburn to Beveridge, and on the Wyndham Vale corridor, to be delivered by 2031. Deliver extra services to south-east Melbourne by running Rockbank services to Pakenham via the Melbourne Metro Tunnel. Consider adding extra stations on the Wyndham Vale and Melton corridors, and secure remaining land required for stations and stabling.

75. Link outer suburbs to rail with 'next generation' buses

In the next year, introduce 'next generation' bus services towards Clyde, Mornington Peninsula, Wollert and Armstrong Creek. In the next five years, complete feasibility studies to plan the ultimate development of public transport services on these corridors and secure remaining land required.

76. Expand and upgrade Melbourne's outer suburban road and bus networks

In the next 15 years, deliver a program of upgrades to Melbourne's arterial road, freeway and bus networks beyond what is currently funded, focusing on congested roads and corridors in outer metropolitan and growth suburbs council areas.

77. Target 30% tree canopy coverage in new growth areas

Over the next 30 years, achieve 30% tree canopy coverage in new growth areas by mandating coverage during precinct development, funding relevant Victorian Government agencies and local government to plant, replace and maintain canopy trees, and work with utility providers to remove barriers to tree planting.

Section 04

Develop regional Victoria

4.1 Enhance regional market access and economic growth

78. Deliver long-term funding certainty for regional road maintenance and upgrades

Within two years, specify clear levels of service for each type of regional road and bridge. Following this, dedicate a 10-year funding program to sustainably fund Victorian Government regional road and bridge maintenance and upgrades to meet these service levels. Funding should be prioritised based on improving safety, decreasing vehicle emissions, and lifting productivity.

79. Fund and plan for ongoing regional rail freight network development and maintenance

In the next year, fund a 30-year periodic regional freight rail maintenance program, informed by a publicly available network development and asset management plan. Using the plan, thoroughly determine the feasibility of the next major regional freight upgrade within five years.

80. Upgrade power supply for agriculture and regional industry

In the next five years, contribute toward strategic power supply infrastructure upgrades for agriculture and regional industry, where an independent assessment demonstrates significant potential for increased productivity, competitiveness and growth.

81. Plan for and facilitate regional nature-based tourism investments

In the next two years, develop a Victorian nature-based tourism strategy to guide industry development and prioritise further investments. During the next 15 years, support regional tourism investment by allowing more site-specific leases for up to 49 years for infrastructure proposals that meet strict criteria and complement environmental and cultural values.

82. Develop a Victorian Aboriginal tourism strategy with Aboriginal communities

Support and partner with Aboriginal communities in the next two years to guide future investments in Aboriginal tourism and cultural heritage, including through Joint Management Plans.

4.2 Better connect the regions

83. Redesign regional public transport to meet local needs

In the next five years, redesign existing regional transport services so they are integrated, based on regional needs assessments, and sustainably funded. Use significant technological and reform opportunities to deliver innovative service models that meet local needs.

84. Address regional Victoria's digital connectivity gaps

In the next five years, continue delivering regional digital connectivity improvements, and monitor and review the need for further government investment following the roll-out of the Digital Future Now initiative.

85. Improve regional telecommunications infrastructure resilience

In the next five years, develop more resilient regional telecommunications infrastructure so communities can stay safe during emergencies, including better mobile coverage, back-up systems and power supply, and emergency mobile roaming.

86. Fund regional libraries to provide better internet access

In the next year, start a five-year funding program for libraries in regional towns and rural areas to improve community access to fast, free internet services, leveraging existing library infrastructure.

87. Use rural schools for children's specialist and allied telehealth services

Retrofit or better use selected rural school infrastructure for children's specialist and allied telehealth services to improve children's health and development. In the next year, begin a trial in a remote region, such as Wimmera Southern Mallee, to demonstrate the value of adopting the approach in other rural locations.

4.3 Foster regional Victorians' health, wellbeing and inclusion

88. Deliver multipurpose shared social service facilities in the regions

In the next year, start regional planning for social services to identify opportunities for multipurpose shared services facilities, then deliver them where appropriate, over the next five years, in partnership with local governments and community organisations.

89. Update community infrastructure

Fund regional councils in the next five years to update, repurpose or retire outdated community infrastructure for better service delivery.

90. Create climate-adapted facilities for rural communities

In the next five years, fund local governments to plan and help deliver a network of designated, accessible climate-adapted community facilities, to manage the health impacts of extreme heat and bushfire smoke.

91. Build regional residential alcohol and drug rehabilitation facilities

Within five years, build residential detoxification and rehabilitation facilities in regional Victoria to provide equitable access to alcohol and other drug treatment.

92. Fund more Youth Foyers in regional Victoria

Fund at least six new Youth Foyers in regional Victoria by 2026, to better use existing education infrastructure and support vulnerable young people.

93. Expand social housing in regional centres, in locations with good access

Focus social housing investments in regional centres, near transport and services, for better access to health, social and economic support.

94. Make social housing suitable for changing local climates

Continue to deliver a long-term program of modifying social housing to be climate-resilient by improving the energy efficiency and energy affordability of residences.

Magiclands KIOSK
HOT & COLD FOOD DRINKS ICECREAMS
BEACH SURF LIFE SAVING CLUB
WOOLAMAI BEACH SLSC
HELP POWER SURF RESCUE
JOIN
DONATE
SURF LIFESAVER
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CHANNEL
Emergency
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Smarter ways to use existing infrastructure

Overextended infrastructure, like congested freeways or overcrowded hospital emergency departments, often leads to calls for governments to solely address problems by building more infrastructure. However, the results of building new infrastructure can be complicated. Some new infrastructure is needed to manage population and demand growth. But building more infrastructure and facilities can make them easier and faster to use, attracting more people to use them. When places become more attractive, with extra facilities or faster transport options, more people gravitate to them. This phenomenon means that just building new infrastructure does not always lead to greater spare capacity and reduced congestion.

Much infrastructure is heavily used for short periods, and is largely underused at other times. For instance, many roads and public transport services are heavily congested for short periods each weekday morning and afternoon peak, but not fully used at other times during the week. Victoria's energy networks are built to manage heavy use for a few hours each year but have spare capacity at other times. Some ageing government facilities can be infrequently used, while some social services do not have enough well-designed space. But these problems are opportunities for new solutions.

For this reason, this strategy is more than a list of new infrastructure projects. It makes recommendations that encourage people to change the way they use and maintain infrastructure. Using different technologies to meet people's needs, encouraging and rewarding people to change their infrastructure use, and better maintaining and modernising the infrastructure that already exists, can help slow the demand for new infrastructure. The infrastructure that Victoria already has will need to accommodate most future growth. The COVID-19 pandemic showed Victorians are adaptable and capable of changing their behaviour. Changing how people use and manage infrastructure often pays the highest dividends in the long term. Reducing the need for new infrastructure also usually costs less, meaning more resources are available for other important purposes.

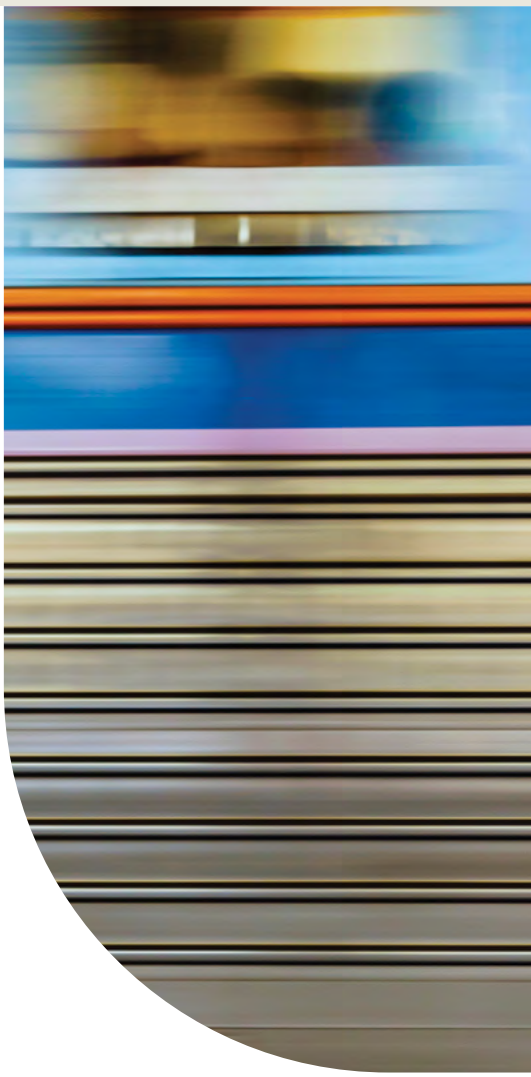
Plan infrastructure and land use together

This strategy calls attention to the deep connections between land use and infrastructure planning. The locations where people live, work, socialise, recreate and shop is what creates demand for infrastructure. This means clearly identifying places intended to accommodate growth, and making infrastructure sector plans transparent and available, so the process of integrating land use and infrastructure planning can proceed from an informed basis. For example, to better plan and make more use of infrastructure, this strategy recommends:

- Publishing transparent sectoral plans for infrastructure, allowing better coordination and optimisation of infrastructure (recommendation 32)
- Clearly identifying the locations for new housing in established suburbs and reviewing planning settings to allow denser housing in them (recommendation 35)
- Prioritising and overseeing infrastructure delivery in new growth areas and priority urban renewal precincts (recommendation 72).

Get more from transport infrastructure

The Victorian Government can make many changes that allow existing transport infrastructure to carry more passengers and move more vehicles. New digital road management systems and automated vehicles can potentially allow many more cars to use the same roads, while having some of the highest returns on investment. Redesigning the bus network with new 'next generation' services can make catching a bus equally attractive to travelling on trains and trams, expanding space-efficient public transport use, and



This strategy is more than a list of new infrastructure projects. It makes recommendations that encourage people to change the way they use and maintain infrastructure. The infrastructure that Victoria already has will need to accommodate most future growth, and changing how people use and manage infrastructure pays the highest dividends in the long term.

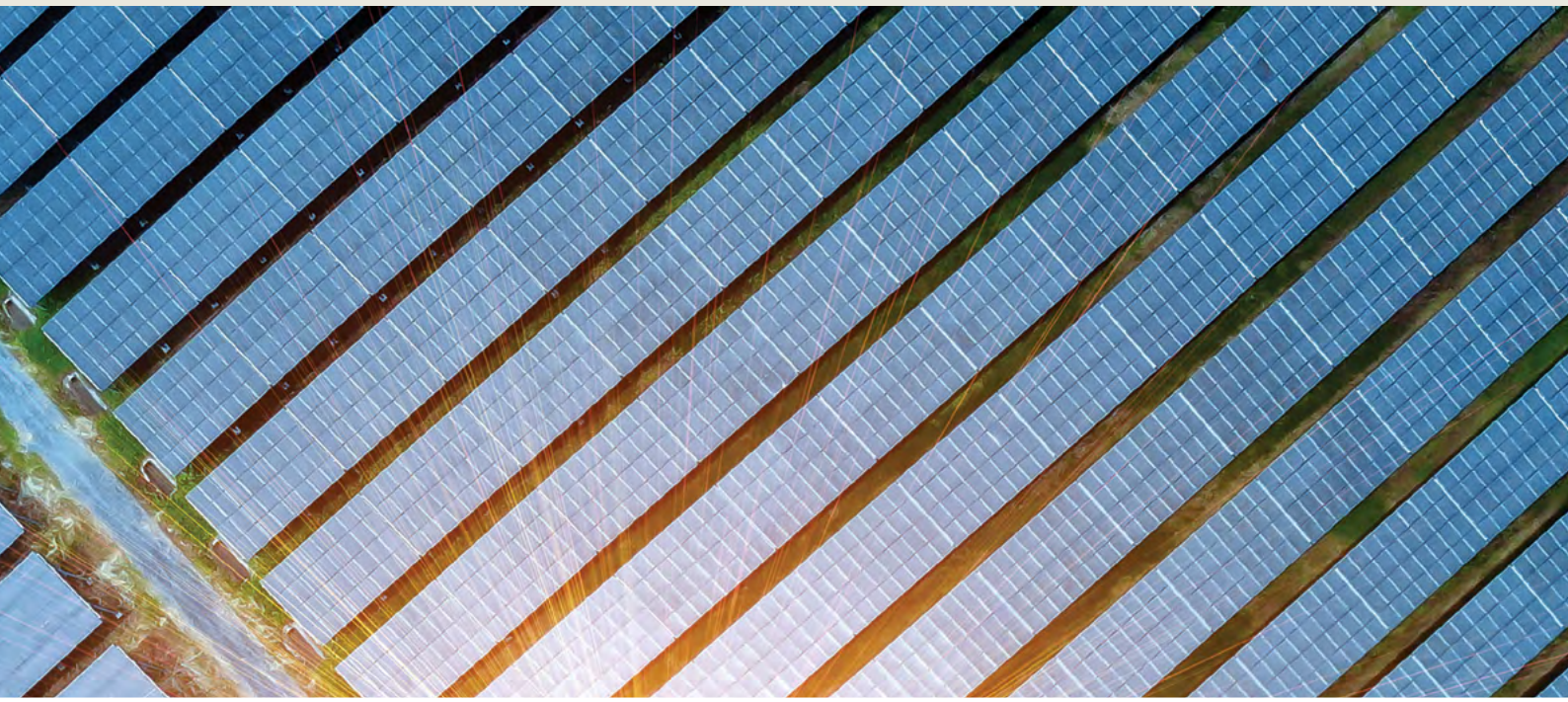
reaching more Victorians. Reclassifying bus routes will help to define the role, purpose and function of routes within the network and prioritise network investment. Reconfiguring roads can expand their carrying capacity by encouraging more efficient transport options, like walking, cycling or public transport. In Victoria's regions, we can create more useful public transport services that better meet local needs. For example, this strategy recommends:

- Integrating road management systems so roads and public transport flow more freely and operate more smoothly (recommendation 24)
- Delivering road space reallocation initiatives to better support priority movements through streets and places (recommendation 41)
- Reshaping bus networks with new 'next generation' bus services (recommendation 57)
- Incrementally expanding the capacity of suburban rail corridors, to carry more people and provide better service (recommendation 59)
- Redesigning regional public transport to focus on local needs (recommendation 83).

Encourage beneficial travel choices

The Victorian Government can encourage people to make transport choices that also benefit other people. While more transport options and better services clearly affect people's transport choices, better pricing systems can also reward people for travelling more thoughtfully of the effects on others. For example, this strategy recommends:

- Changing public transport fares to encourage people to select travel options that most benefit everyone, including by permanently discounting off-peak travel (recommendation 45), reducing bus and tram fares (recommendation 46), and removing the free tram zone (recommendation 47)
- Introducing congestion pricing on Victoria's road networks, including by trialling a congestion charge in inner Melbourne (recommendation 52), using off-peak tolls on new freeways (recommendation 51) and eventually moving to a comprehensive road pricing system (recommendation 53)
- Reforming parking charges, including by further changes to parking prices in inner Melbourne (recommendation 49), and beginning to charge for parking at transport hubs (recommendation 50).



Manage energy demand

Improving the energy efficiency of Victorian homes and workplaces reduces the energy needed to heat and cool them. This in turn reduces the need to build more electricity infrastructure, translating to lower energy bills. Energy efficiency also reduces emissions and makes the energy transition easier, including by helping manage extra demand from electrification of the transport and gas sectors. More flexible electricity prices, combined with using new technologies, can also help reduce and manage this demand. For example, this strategy recommends:

- Increasing the energy efficiency of new homes (recommendation 5)
- Encouraging energy efficiency upgrades of existing homes by mandating home energy rating disclosure (recommendation 6), and increasing minimum energy efficiency standards for rental homes (recommendation 7)
- Improving the energy efficiency of Victorian Government buildings (recommendation 8)
- Continuing electricity pricing reforms to help manage demand on energy infrastructure (recommendation 9).

Manage water and waste more efficiently

Similarly, considering all options for new water sources could deliver extra water at lower cost. Better management of water resources, like stormwater and recycled water, can help stretch the water supply and minimise the need to source more water. We can minimise the amount of waste we produce, and reuse waste materials more effectively. For example, this strategy recommends:

- Giving equal consideration to all water supply options, including purified recycled water for drinking, desalination, stormwater harvesting and moving water between Victoria's regions (recommendation 13)
- Clarifying policy settings to allow the better use of stormwater and recycled water (recommendation 14).
- Strengthening end markets for recycled materials, helping to reuse waste effectively (recommendation 29)
- Minimising production of waste in the first place (recommendation 31).

Use technology and innovation to deliver better services

Infrastructure demand is in part driven by how effectively people use it. If people can provide more services using the same amount of infrastructure, less infrastructure is needed overall. Innovation and changes in technology can help achieve this. For instance, new ways of treating patients at home, or with shorter hospital stays can reduce the hospital capacity required. Better court infrastructure can more frequently use digital and telepresence technologies in the justice system, meaning fewer courts may ultimately be needed. Existing infrastructure, like schools, can be used to help meet the other needs of children, such as remotely connecting them to health specialists with the support of a local health worker. For example, this strategy recommends:

- Using innovation to deliver better models of health care (recommendation 25)
- Modernising courts through digitisation and contemporary facilities (recommendation 26)
- Using rural schools to host supported telehealth appointments (recommendation 87).

Institute better maintenance and asset management

Keeping infrastructure in good working condition can reduce the need to upgrade and rebuild it, but much of Victoria's infrastructure is ageing and becoming run-down. Many regional roads and freight rail networks are in poor condition and need upgrading. Much social housing stock and many community facilities are reaching the end of their working lives and will require replacement. Better maintaining these assets, upgrading them to modern accessibility and energy efficiency standards, and redesigning them for contemporary service needs, means we can extend their useful life and will not need to rebuild them so often. For example, this strategy recommends:

- Improved regional road maintenance (recommendation 78) and freight rail network development and maintenance (recommendation 79)
- Renewal and upgrade of social housing stock (recommendation 55), including for energy efficiency (recommendation 94)
- Planning for multipurpose shared community facilities (recommendation 88), and better asset management of community infrastructure (recommendation 89).

Confront long-term challenges

Section 01

Victoria has faced depressions, wars, pandemics, technological disruptions, and natural disasters throughout its history. We have successfully navigated these to build a peaceful, prosperous and inclusive society. Successive crises like the 2019–20 summer bushfires and the COVID-19 pandemic show how predictions can rapidly and unexpectedly change.

Unforeseen events and slower known shifts, such as climate change, can alter long-term trajectories. Victoria must be equipped to respond and adapt to future shocks to pave the way for positive transitions. Allowing innovation to thrive, embedding resilience, adapting swiftly to change, and better managing risk will help Victorians to flourish.

Long-term planning will help Victoria to better prepare for the future, build resilience, and achieve multiple long-term goals. It will prepare Victoria to confront challenges such as responding to climate change and achieving self-determination and Closing the Gap outcomes for Aboriginal Victorians.

Victoria is well-placed to adapt to and seize opportunities. Recovering from major shocks takes time but can prompt new thinking and fresh approaches to policy challenges. Long-term planning will help Victoria to better prepare for the future, build resilience, and achieve multiple long-term goals, such as responding to climate change and achieving self-determination and Closing the Gap outcomes for Aboriginal Victorians.

Infrastructure planners face uncertainty from the future effects of technology, population, climate, social preferences, economic conditions, global factors, and emergencies, including future pandemics. These uncertainties can cause significant disruptions to communities and the economy, change the effectiveness or productivity of infrastructure, change how people use it, or remove the need for any infrastructure at all.

Yet positive opportunities and innovations arise from disruption and uncertainty. Climate change presents one of the greatest long-term challenges for Victoria. By better understanding climate risks and its causes, Victoria can build on climate change reduction pledges[1] to further mitigate emissions, adapt infrastructure to operate in the future climate, and generate new industries and employment. Disasters and emergencies create significant shocks and devastating effects for communities, highlighting the need for resilient infrastructure. The rapid pace and breadth of technological change will continue to reshape how Victorians interact with each other and the wider world, while supporting innovative new approaches. Global developments can affect trading, as seen in recycling markets. This has provided Victoria with the opportunity to overhaul recycling and resource recovery infrastructure for a more sustainable, circular economy.

Infrastructure planners and policymakers can better understand the challenges and opportunities from uncertainty by considering multiple potential future scenarios. Rather than assuming a single future path, scenarios can examine different alternatives and the impacts on infrastructure that may last for decades. For this strategy, we have modelled and considered multiple future scenarios, such as different rates of population growth, changes in technology and alternative policy settings. Scenario planning and analysis explores the different benefits of infrastructure choices in an uncertain future and the value of keeping options available for when things change. Building 'real options'[2] into plans and projects, and updating assumptions against evidence over time, means governments can make good infrastructure decisions now, with more confidence that projects will still perform in unexpected circumstances.

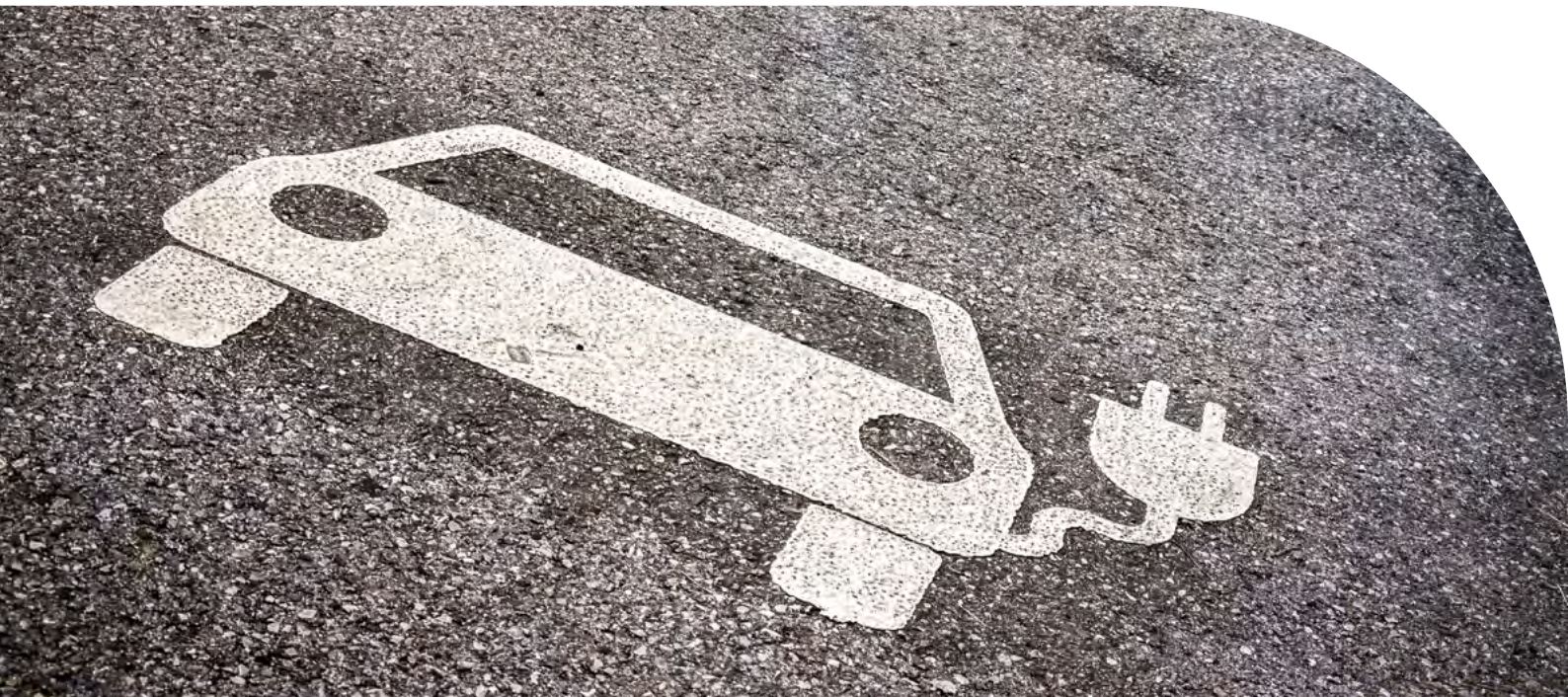
1.1

Navigate the energy transition

In Victoria, energy used to power electricity, gas and transport produces around 90% of emissions. Victoria must change the way it generates energy if it is to meet the legislated net zero emissions target by 2050.

Nations have agreed to limit global average warming to well below 2°C, and aim to limit warming to 1.5°C.[1] Global warming is fuelled by greenhouse gas emissions.[2] Global greenhouse gas emissions from human activities must fall to net zero by 2050 to have a 50% chance of keeping warming below 2°C.[3] All Australian states and territories have committed to net zero emissions by 2050, including Victoria. Business is also increasingly pricing climate change transition and physical risks into investment decisions, including by changing corporate valuations.[4]

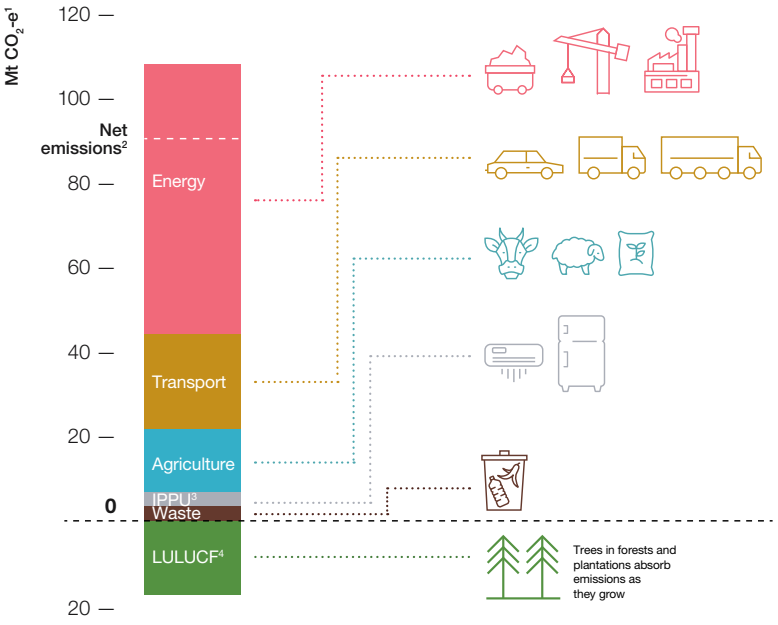
Victoria's *Climate Change Act 2017* creates a system of coordinated, whole-of-economy initiatives to achieve a net zero emissions, climate resilient state. It legislates a target for Victoria to achieve net zero greenhouse gas emissions by 2050. It also features rolling five-year targets, emissions reduction pledges, and climate change adaptation plans, while obliging all government policies, plans and decisions to consider climate change.[5] In May 2021, the Victorian Government released *Victoria's climate change strategy,* interim reduction targets and sector pledges,[6] including commitments to source 50% of Victoria's electricity from renewable resources by 2030.[7]



Road vehicles, like cars and trucks, contribute almost 90% of transport emissions. To achieve net zero transport emissions, Victoria must adopt alternative zero emission transport technologies.

Around 70% of Australia's greenhouse gas emissions are either directly attributable to or influenced by infrastructure.[8] About 90% of Victoria's emissions are produced from energy used to power electricity, gas and transport. This means Victoria must change the way it generates energy to meet the legislated net zero emissions target by 2050 – from fossil fuels to clean and renewable energy sources. Emissions from electricity generation have declined since 2005, gas emissions have stayed relatively stable, and transport emissions have increased.[9] An effective way to meet the net zero emissions goal is to use existing alternative solutions to reduce emissions as much as possible, and using emissions offsets for those that are more difficult to eliminate.

Energy powers Victoria's economy, keeps homes comfortable, and underpins the technology used by a modern society. A thriving future depends on reliable, affordable and sustainable energy, including efficient and productive energy infrastructure. Climate change mitigation, technological advances and changing consumer energy sources are disrupting Victoria's energy generation, transmission, distribution, and use. Victoria has the knowledge, technology and resolve to manage the energy sector's transition.



Victoria's greenhouse gas emissions by emissions sector 2019

1 Million tonnes of carbon dioxide equivalent emissions

2 Victoriia's net emissions are total emissions less the emissions absiorbed in the LULUCF sector

3 Industrial processes and product use

4 Land use, land use change and forestry

Figure 1: Victorian emissions by sector, 2019

This diagram shows Victoria's greenhouse gas emissions by sector.

Source: Department of Environment, Land, Water and Planning, *Victoria's Climate change report 2020,* p. 10

Transport emissions need to decline

Transport sector emissions grew more than any other sector emissions from 1990 to 2018, and they continue to grow.[10] The direction must change to reach net zero emissions. Road vehicles, like cars and trucks, contribute almost 90% of transport emissions,[11] largely from burning petrol and other fossil fuels. These internal combustion engine vehicles also produce other gases and particulates harmful to people's health.

Even with significant investment in public and active transport, road vehicles are likely to remain the dominant transport mode in Victoria.[12] Within 30 years, Victoria could have an extra 10 million road vehicle trips per day.[13] To achieve net zero emissions, and the commitments in the Victorian emission reduction pledges,[14] Victoria must adopt alternative transport technologies, like zero emissions electric and hydrogen vehicles. Doing so could also deliver health benefits worth over $700 million each year by the year 2046, especially for people living in dense urban areas and along major road corridors.[15] Achieving greenhouse gas emission reductions relies, in part, on decarbonising the power used for these vehicles.

Zero emissions vehicles are still a relatively recent technology. Electric vehicles are the most mature and proven technology for rapidly reducing transport emissions,[16] especially if paired with a decarbonised electricity sector. Hydrogen fuel cell vehicles were not available for consumer purchase in Australia as of April 2021.[17] The adoption of zero emissions vehicles in Australia is significantly lagging other countries. Australia has the fourth lowest electric vehicle sales in the OECD, making up 0.7% of new vehicle sales in 2020, compared with just 4.2% globally.[18] Battery electric vehicles make up around 0.1% of the total vehicle fleet in Australia. Based on current trends, and in the absence of any further policy incentives, uptake of battery electric vehicles is projected to reach only 3% of the total Australian vehicle fleet, or half a million vehicles, by 2029–30.[19]

Encouragingly, electric vehicles are falling in price and extending the distance they can travel on a single charge.[20] They are cheaper to run than conventional vehicles, and may cost the same to buy by as early as 2023.[21] Nations successful at increasing purchase of zero emissions vehicles have used a mix of policy approaches. Norway is a global leader, offering incentives to buy electric vehicles, exemptions from purchase and import taxes, on-road priority for traffic lanes and ferries, penalties for more emission-intensive vehicles, and a large network of charging stations.[22]

The Victorian Government released *Victoria's Zero Emissions Vehicle Roadmap* in May 2021. The roadmap encourages the uptake of zero emissions vehicles, including advocating that all governments work collectively to make Australia an attractive market for zero emissions vehicles and increasing consumer choices.[23] This needs a mix of policy approaches. For example, the Australian Government can use importation rules and vehicle emissions standards to help accelerate adoption of zero emissions vehicles. Australia is among a small minority of countries without mandatory greenhouse gas emissions or fuel efficiency standards for cars. On average, new cars sold in Australia emitted 43% more carbon dioxide for each kilometre travelled, compared with those in Europe in 2015.[24] The Victorian Government can continue to advocate for the Australian Government to use national policy changes to encourage faster uptake of zero emissions vehicles.

To meet the Victorian Government's target of net zero emissions by 2050, transport sector emissions will need to decline. Increased uptake of zero emissions vehicles is needed to contribute to decreasing transport sector emissions.

Insight

Community recommendations for increasing zero emission vehicles on Victoria's roads

In early 2021, Infrastructure Victoria shared the challenge of tackling transport emissions with a group of Victorians through a deliberative engagement process. This was the largest of its kind in Victoria, with 211 participants forming a community panel which largely represented Victoria's diverse population. The community panel focused on answering the following question:

Victoria will not reach its emissions reduction targets with continued reliance on petrol and diesel vehicles. How should the Victorian Government support more people to adopt low or zero emissions vehicles sooner?

The panel discussed the challenges of climate change, the commitment to transition to net zero emissions by 2050, and the need for resilient, lower emission, and comfortable ways to travel. They acknowledged people are making different transport choices than in the past, technology is changing rapidly, and that Australia can build on other countries' successes. They also recognised the different transport challenges and opportunities for different groups of people, such as older people, younger people, those living with a disability or newly arrived migrants, as well as Victoria's geographical differences. Panel members considered fairness during their deliberations, which formed a cornerstone of their discussions.

The community panel developed 21 recommendations, including:

- Deliver a broad community awareness and education campaign
- End the sale of new internal combustion engine vehicles by 2030
- Introduce planning controls requiring new developments to install charging infrastructure
- Provide financial incentives to support the initial transition to low or zero emissions vehicles
- Provide electric vehicle charging stations in activity and town centres
- Advocate to local governments to change their fleets to electric vehicles.

Details of the community panel deliberative engagement process and their full 21 recommendations are in *Tackling transport emissions to encourage uptake of low or zero emissions vehicles sooner – community panel report*. Further detail of Infrastructure Victoria's analysis of options for encouraging zero emissions vehicles is in *Driving down emissions: accelerating Victoria's zero emissions vehicle uptake*.

Electricity is leading the charge

Victoria is already reducing its greenhouse gas emissions from electricity generation, with nearly a 27% drop from 2005 to 2018.[25] In 2017, the Hazelwood power station closed, reducing greenhouse gas emissions by 15 million tonnes of carbon dioxide emissions a year,[26] but also removing 1600 megawatts of power from Victoria's electricity grid. The Latrobe Valley's three remaining coal-fired power stations generate most of Victoria's remaining electricity emissions.[27] They are forecast to close in the next 30 years,[28] and will become more unreliable as they age.[29] Yallourn power station is the next to close in mid-2028.[30]

Victoria's central electricity challenge is managing the eventual closure of these power stations. This must be achieved while retaining affordable, reliable, low emissions replacement energy, and ensuring the Latrobe Valley has a thriving economic future. Many inquiries, reports and strategies set out the reforms required to manage the energy transition and to secure benefits for energy consumers.[31]

Victoria achieved its renewable energy target for 2020 of 25%. The Victorian Government has a legislated target of 50% renewable energy generation by 2030.[32] The Victorian Government also released their *Energy sector emissions reduction pledge* in May 2021, which includes actions to transition to a low-emissions energy future.[33] Its new targets support adding more renewable energy generation, which is cheaper to build than new coal plants.[34] Large-scale solar and wind farms are already connecting to the electricity transmission network, accounting for 24% of the state's total generating capacity.[35] Many individual households are generating their own power using rooftop solar panels. Rooftop solar comprised 17% of generation capacity in 2020,[36] and will continue growing, including from support by the Solar Homes Program.[37] Electricity networks will need to adapt to allow two-way flows of electricity, which can involve distribution networks making location specific investments to manage voltage issues.[38]

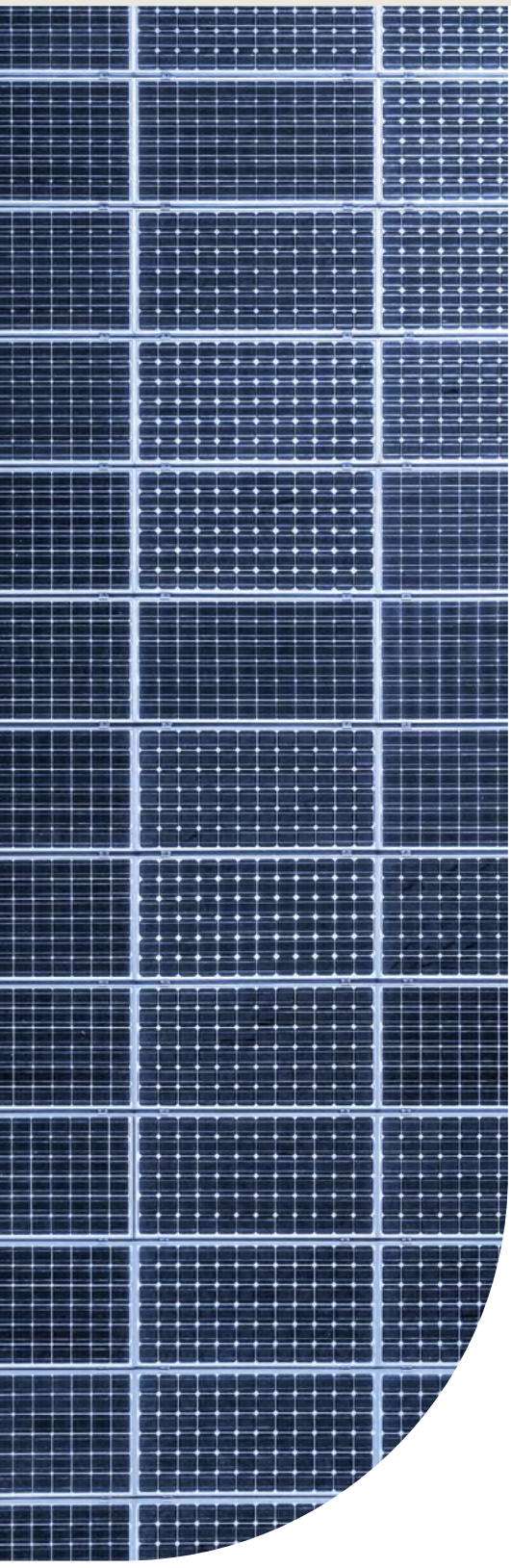
Victoria's electricity transmission infrastructure has historically been configured to carry power from the Latrobe Valley power stations to places with high energy use, such as Melbourne. In some areas, weak transmission networks cannot currently carry large amounts of electricity and some renewable energy generators are already having trouble exporting their electricity.[39] Future large-scale renewable energy will be sourced from places with good sun and wind resources, which are not always near existing high capacity transmission lines. Victoria will need to better coordinate new transmission and generation infrastructure to help bring new renewable electricity online in the right place at the right time.

Adopting renewable energy generation also creates new challenges for the electricity system's stability.[40] Intermittent electricity sources need complementing and stabilising with dispatchable power to reliably meet electricity demand, especially when the sun is not shining, or the wind is not blowing. For example, dispatchable resources include batteries, pumped hydroelectricity, or potentially gas-fired generators. The transition can be supported by new transmission infrastructure and power system services that improve voltage control, system strength, frequency management, power system inertia, and dispatchability.[41]

Victoria's energy network connects to other states allowing electricity to be shared across state borders. The national Energy Security Board, in collaboration with other energy market bodies, is working on a post-2025 market design for the National Electricity Market to support the rapid electricity transition.[42] Reform areas include resource adequacy mechanisms to deliver reliable supply to customers, essential system services to manage the complexity of operations, unlocking demand side participation, and long-term arrangements to promote efficient access and use of the electricity grid.[43]

About 30% of Australia's renewable energy jobs are in Victoria, largely in regional areas.[44] Local communities can benefit from a more dispersed energy generation system, especially in regional Victoria. Many local councils have declared climate emergencies[45] and supporting renewable energy projects can help local governments pursue local net zero emissions targets. For instance, Warrnambool City Council recognises the link between its climate emergency motion and its W2040 and Green Warrnambool plans.[46] Constructing renewable energy projects can create jobs that support electricity supply chains and provide expert services, as demonstrated by the 30 specialist firms already operating in Barwon South West.[47] Regional electricity investment can be leveraged for extra community benefits, such as developing new skills to support renewable energy industries.

Victoria has legislated a new target of 50% renewable energy generation by 2030 and is rapidly adding renewable energy generation, which is cheaper to build than new coal plants.



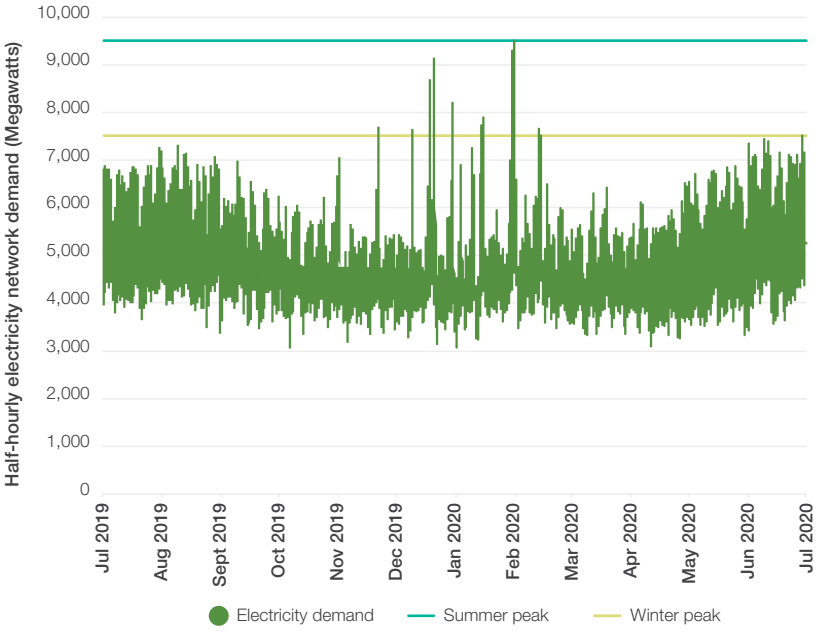
Managing and reducing energy demand makes the task easier

Electricity infrastructure must generate and transmit enough energy to meet the highest peak of electricity demand, or risk blackouts. But as Figure 2 shows, Victoria only needs this much electricity a few times each year – usually on the hottest summer evenings when people return home and turn on their appliances, especially air conditioners. This electricity capacity lies idle the rest of the time. For instance, maximum Victorian energy demand was over 9200 megawatts in 2019, but only exceeded 7800 megawatts on 14 days – the difference being equivalent to the output of a Victorian coal-fired power plant. Reducing this peak lessens the generation and network infrastructure Victoria needs, reducing the emissions generated. Avoiding constructing more infrastructure than necessary also eases upward pressure on household energy bills.

New electricity demands will likely emerge, such as greater electrification of home appliances, and widespread adoption of electric vehicles. Extensive adoption of electric vehicles could compound electricity demand peaks if they are charged at these times, for example, if people return home from work, plug in their car and turn on their air conditioner. This magnifies the urgency of better managing energy demand. Encouraging people to charge electric vehicles during off-peak periods could potentially save around $2.5 billion in extra infrastructure investment.[48]

Figure 2: Victoria uses peak electricity capacity only a few times a year

This graph shows the variation in Victorian energy demand from July 2019 to July 2020.



Source: Australian Energy Market Operator, Aggregated price and demand data – Historical Victorian data from July 2019 to June 2020

Globally, energy efficiency is predicted to be the single largest contributor to reducing greenhouse gas emissions.

Influencing energy consumption patterns can reduce overall electricity demand and shift some demand away from peak periods. Demand management pricing rewards energy consumers with significant cost savings if they reduce their energy use or shift it away from peak periods. Smart technology can automatically help people charge zero emission vehicles off-peak, or avoid using appliances during peak periods. Pricing signals can influence household and business decisions to invest in new technologies, for instance, choosing to install rooftop solar or batteries, and selling their excess solar energy back to the grid. Better signals can also encourage them to export when the system requires it most. In the long term, better signals will help consumers take advantage of the future energy market and technological improvements.[49]

Beyond simply shifting energy use, using electricity more efficiently helps reduce demand overall, ultimately saving on infrastructure costs. Globally, energy efficiency is predicted to be the single largest contributor to reducing greenhouse gas emissions for the energy sector.[50] Research suggests almost half of Australia's energy abatement by 2030 could come from energy efficiency.[51] Energy use in buildings accounts for around one-third of Victoria's total greenhouse gas emissions,[52] with heating and cooling making up over 40% of home energy costs.[53] The energy efficiency of homes and buildings can lock in future energy demand, as they are long-lasting and can be difficult to change. More than half of Australia's 2050 building stock will be constructed during the next 30 years, at prevailing energy efficiency standards.[54] The rest may need retrofitting to help prevent escalating energy costs and demand. Many well-established international energy management policies, practices, and technologies have significant potential.[55]

Energy efficiency becomes even more important in a warmer climate, avoiding extra cooling costs and heat-related health consequences. One study found residents of 0.9 energy star rated homes in Melbourne were about 50% more vulnerable to experiencing heat stress during a heatwave compared with residents of 5.4 energy star rated homes.[56] Strengthening demand management pricing provides more incentive to improve residential energy efficiency. Extensive economic research shows households respond to higher energy prices by adopting energy efficient technologies or spending more on energy saving measures.[57]

Future technology will shape energy options and use

During the next 30 years, new technologies will shape energy use, and generate new options to reduce greenhouse gas emissions and manage the energy system. Electric vehicles are already available and Victoria is conducting a zero emission public transport bus trial.[58] New battery storage is being installed, including a 300 megawatt battery.[59] The Victorian Government is also investigating the science and viability of carbon capture and storage at commercial scale.[60] Victoria also has the world's largest hydrogen demonstration project, the Hydrogen Energy Supply Chain Pilot Project.[61]

While the electricity and transport sectors have potential pathways for achieving net zero emissions, the future is less clear for natural gas. Burning natural gas emits greenhouse gases, meaning Victoria will need to transition from natural gas to other energy sources during the next 30 years to achieve its net zero emissions goal. This has implications for the extensive 33,000 kilometres of natural gas network infrastructure.[62] Victoria is the only state where most natural gas demand is from residential and small commercial customers, who mainly use it for heating and cooking. Over 80% of Victorian households are connected to the gas network.[63] Natural gas will still need to be supplied in the short to medium term, but work needs to begin now on better understanding transition pathways for natural gas and the implications for gas networks and the electricity system.

Several futures are possible. One is electrification, which could mean retiring gas networks and building more electricity infrastructure. Another possible scenario is replacing natural gas with clean hydrogen or biomethane, if technically feasible and economically competitive. This may or may not use existing gas networks for distribution.

While the cost and application of hydrogen technologies are still uncertain, they will develop over the next decade, and are acknowledged as having significant potential.[64] The National Hydrogen Strategy views clean hydrogen technologies as a significant potential competitive economic advantage for Australia.[65] It lays some foundations for a growing industry with many potential uses, including for heating, transport, electricity storage and generation, chemical feedstock and for export. Hydrogen could eventually be coupled with the energy, transport and water sectors.[66]

Infrastructure Victoria is preparing advice to the Victorian Government on the implications for gas transmission and distribution networks under different 2050 energy sector scenarios. We will report to the Victorian Government by the end of 2021. Assuming a definitive future now for Victoria's gas networks, and immediately locking in a transition pathway, may pre-empt a better future decision. But the Victorian Government can take prudent actions now to maximise Victoria's opportunities to reach net zero emissions and reduce the size of the risks from a large potentially stranded asset.[67]

Recommendations to help navigate the energy transition

Infrastructure Victoria makes the following recommendations to help manage the transition to achieve the Victorian target of net zero emissions by 2050, while retaining an affordable, sustainable and reliable energy system. They can also help support climate change adaptation (see section 1.2), improving infrastructure resilience to emergencies (see section 1.3) and regional economic development (see section 4.1).

Recommendation 01

Accelerate consumer purchases of zero emissions vehicles

In the next two years, publish a statewide electric vehicle charging network strategy, and produce charging infrastructure design standards and payment principles. Over the next five years, monitor and review the effectiveness of financial incentives in encouraging early zero emission vehicle purchases. Commit to no longer registering new petrol and diesel vehicles in Victoria by 2035 at the latest, through increasingly stringent vehicle registration emissions standards.

Cleaner energy sources can replace the fuels that power road vehicles, which generate greenhouse gas emissions. Electricity from a decarbonising energy network, or clean hydrogen, can power new zero emissions vehicles (ZEVs). Reaching net zero emissions by 2050 requires widespread ZEV adoption, including managing their energy demand (see recommendation 9).

Australia trails behind global leaders in adopting ZEVs. Research commonly cites three main ZEV purchase barriers: vehicle cost, charging infrastructure access, and range anxiety.[68] Other countries have successfully achieved rapid ZEV uptake using financial, infrastructure, and regulatory responses focused on removing these barriers. Encouraging faster uptake now allows Victorians to enjoy the benefits of ZEVs sooner, including faster emissions reductions and health benefits.[69] It also helps avoid Victoria becoming a 'dumping ground' for unwanted petrol and diesel vehicles.[70]

The Victorian Government has published *Victoria's Zero Emissions Vehicle Roadmap* to achieve faster adoption of ZEVs.[71] It includes a ZEV subsidy program providing early, time-limited, targeted, one-off financial incentives to help overcome the initial cost barrier.[72] It also includes a public education campaign to reduce public misconceptions and promote confidence in ZEVs.[73]

Infrastructure Victoria's deliberative engagement panel recommended measures like this. Subsidies are particularly effective before ZEVs reach purchase price parity with internal combustion engine vehicles, potentially as early as 2023.[74] Over the next five years, the Victorian Government should regularly monitor and review these subsidies, so they are operating effectively.

Electric vehicles require charging infrastructure. The Victorian Government has committed to accelerate charging infrastructure delivery.[75] It should start developing a statewide charging network strategy which considers all road users, including private vehicles, freight and commercial vehicles, in urban and regional areas. The charging strategy should include producing standards for design and placement of public charging infrastructure, and principles for smart charging and integrated payment systems, so electric vehicle owners can use any provider for charging. The charging strategy should also consider whether electricity distribution infrastructure is sufficient to meet highly localised energy demands in areas with high ZEV uptake.[76]

The Victorian Government should publish the statewide charging network strategy within two years. This helps provide consumers with certainty and may encourage further charging infrastructure investment by the private sector.[77]

Victoria's Zero Emissions Vehicle Roadmap sets a target for 50% of new light vehicle sales to be ZEVs by 2030. The Victorian Government should reinforce this target by committing to no longer registering new petrol and diesel vehicles by 2035 at the latest. This sends a strong market signal and helps achieve the 50% sales target, and emissions reduction targets. By setting a date now, the Victorian Government can provide confidence to consumers, industry, and vehicle manufacturers to start transitioning. It should use vehicle registration rules and air quality standards to reach these targets.[78] This involves sequentially imposing more stringent air quality standards for registering new vehicles over time.[79] Infrastructure Victoria's deliberative engagement panel and the International Energy Agency support this type of phased approach of increasing vehicle emissions standards towards a clear end date, and many other jurisdictions around the world use it.[80]

Recommendation 02

Transition government fleet and freight vehicles to zero emissions technologies

Within the next five years, require all new government fleet vehicles to be zero emissions vehicles where available. Incentivise uptake of zero emissions freight vehicles through reviewing restrictions on zero emissions freight movements on freight routes.

Buses, trucks and light commercial vehicles generate more than one third of transport sector greenhouse gas emissions.[81] Reaching net zero emissions by 2050 requires industry and government to widely adopt ZEVs, in addition to households.

The Victorian Government funds public buses and coaches, which make up around 70% of scheduled kilometres travelled by public transport vehicles.[82] The Victorian Government's target for all public transport bus purchases to be ZEVs from 2025 will assist in reducing transport sector emissions and improve people's health.[83]

Victoria's Zero Emissions Vehicle Roadmap sets a target to purchase 400 new ZEV vehicles for the government fleet by 2023.[84] In the next five years, the Victorian Government should further commit to making all new vehicles in its fleet zero emissions, where appropriate models are available. This directly increases ZEVs on Victorian roads and over time also supports a growing second-hand market.

Many freight movements occur through residential areas, creating noise and pollution. Consequently, hundreds of roads have restrictions, bans and curfews to limit truck movements.[85] Zero emissions freight vehicles are quieter and less polluting. Creating exemptions from some of these restrictions for zero emissions freight vehicles would incentivise faster adoption, especially where the exemptions are primarily due to noise and pollution, such as night curfews. Allowing only ZEVs on some routes could also incentivise uptake. This should only be done where appropriate and safe, noting that zero emission freight vehicles can still create safety concerns and disruption.

In the next five years, the Victorian Government should incentivise zero emissions freight vehicles by reviewing restrictions on zero emissions freight movements on roads. This particularly applies to roads leading to the Port of Melbourne, where Infrastructure Victoria has found the community impact of freight traffic could be a barrier to increasing the port's capacity (see recommendation 63).

Recommendation 03

Augment electricity transmission for renewable energy and resilience

Support augmentation of critical electricity transmission infrastructure by 2027–28 to accommodate new renewable energy generation and improve network resilience and reliability through interconnection with other states.

The electricity market is evolving from centralised coal-fired power generation to a highly diverse system dominated by renewable energy. However, Victoria's electricity transmission networks are designed to take power to consumers from coal-fired generators in the Latrobe Valley. The Yallourn coal-fired generator is set to close in 2028,[86] and the other two in the late 2040s.[87] Many renewable energy projects are planned in other areas of regional Victoria[88] with good wind and solar resources.

Some regional transmission networks are already experiencing significant congestion, which will become more common.[89] The transmission infrastructure in these places is not designed for high generation volumes, or to accommodate the technical requirements of renewable energy generation.[90] Victoria needs new transmission infrastructure to improve capacity and unlock the potential of renewable energy resources.[91] New transmission infrastructure should align with high concentrations of renewable energy, such as in priority Renewable Energy Zones[92] (see recommendation 4) where large-scale renewable energy can be efficiently developed. Figure 3 shows candidate zones in Victoria for large-scale renewable energy projects identified by the Victorian Government. Appropriate and timely transmission augmentation will leverage investment in renewable energy projects, support jobs,[93] and enhance system resilience and reliability.

The Australian Energy Market Operator (AEMO) is responsible for planning Victoria's transmission network. Through its *Integrated System Plan for the National Electricity Market,* AEMO has identified two critical transmission extensions for Victoria: Victoria – New South Wales Interconnector (VNI) West and Marinus Link.[94] Both projects provide access to, and support, renewable energy development in Victoria and assist in meeting the net zero emissions goal. The integrated system plan should continue to guide Victoria, alongside using transparent infrastructure assessments to support affordable, sustainable and reliable development.

The VNI West project will increase electricity sharing with New South Wales and improve access to the Snowy 2.0 pumped hydro project.[95] AEMO has identified two route options for VNI West, which are shown in Figure 4. The Victorian and Australian governments are underwriting early works to support a route that leverages a Renewable Energy Zone in Victoria's north-west and improves grid resilience against outages. The VNI West project should be delivered by 2027–28 in advance of the Yallourn power station closing, but the timing and scope should be reviewed if project costs are above $2.6 billion.[96] The Victorian Government may need to consider expediting land use planning and development approval processes to meet this timing.[97] The project will need significant coordination with the Renewable Energy Zone location and cooperation between governments.[98]

The Marinus Link project is a second, and potentially third, underground and undersea cable between Victoria and Tasmania that would access Tasmania's hydroelectricity. Three projects totalling 1.7GW have been shortlisted within the Battery of the Nation project to proceed to feasibility studies. The Victorian Government can assist by progressing design and approvals processes to support the project being shovel-ready by 2023–24, allowing the first cable to be delivered by 2028–29. This project should be delivered no later than 2036–37.[100] Cost recovery and allocation issues will need to be resolved before the project proceeds.[101]

Figure 3: Potential renewable energy zones in Victoria

This figure is a map showing potential renewable energy zones in Victoria.

- V1 Ovens Murray
- V2 Murray River
- V3 Western Victoria
- V4 South West Victoria
- V5 Gippsland
- V6 Central North Victoria

Source: Department of Environment, Land, Water and Planning

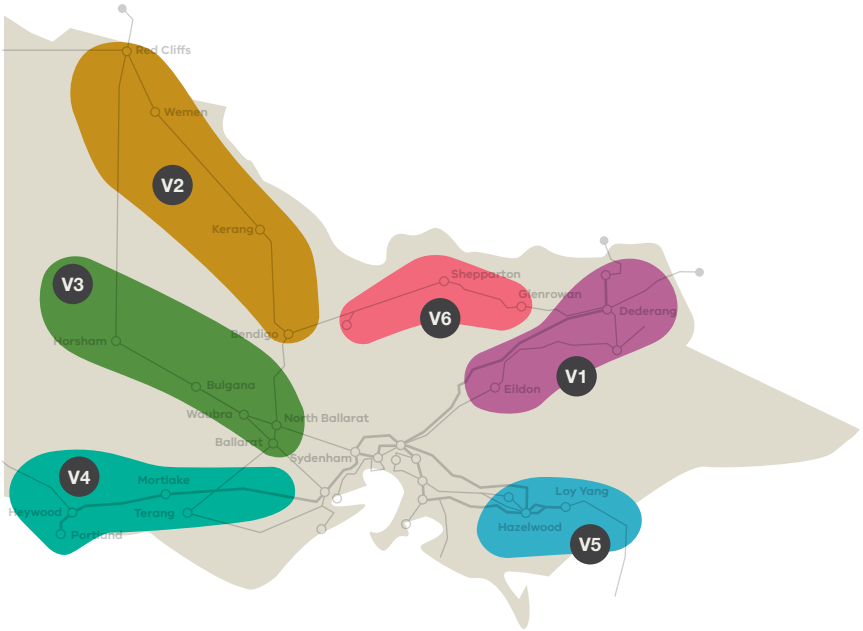
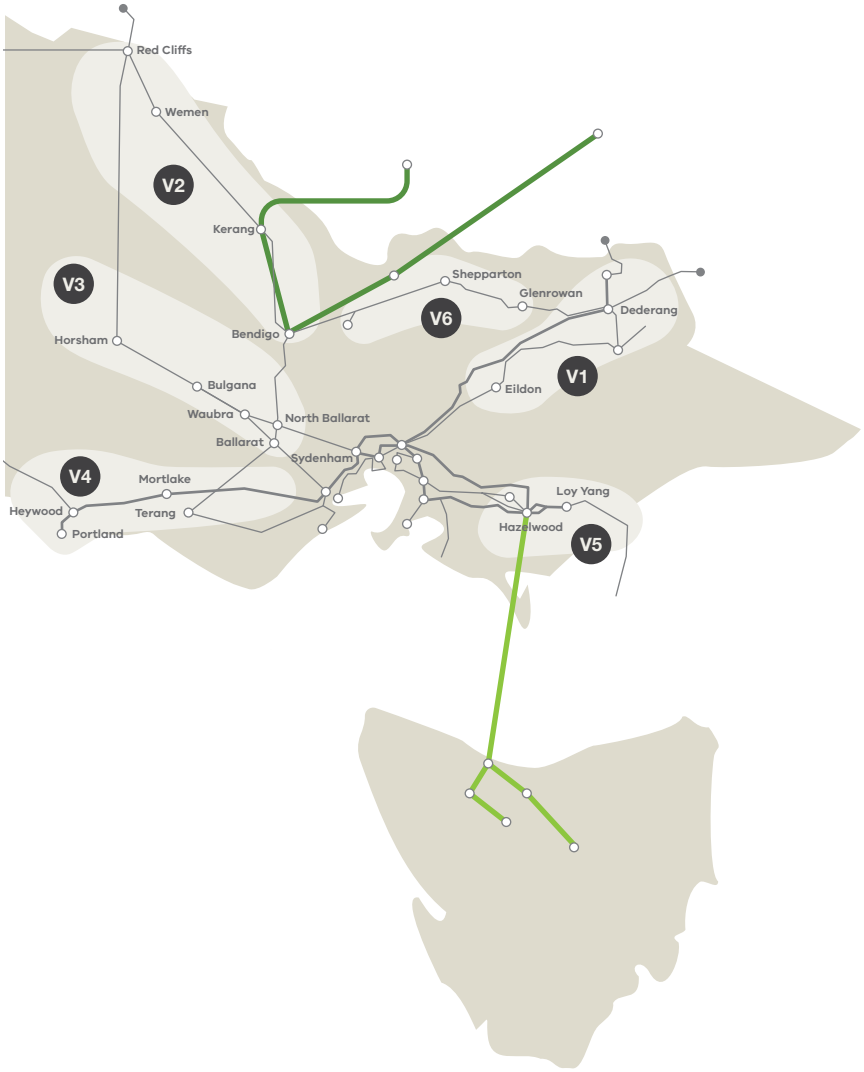


Figure 4: Potential future transmission lines for Victoria

This figure is a map showing the potential routes for the new VNI West transmission line between Victoria and New South Wales, and the Marinus Link transmission line to Tasmania.

- Candidate renewable energy zones
- Marinus Link
- VNI West
- V1 Ovens Murray
- V2 Murray River
- V3 Western Victoria
- V4 South West Victoria
- V5 Gippsland
- V6 Central North Victoria

Source: Australian Energy Market Operator



Recommendation 04

Identify and coordinate Renewable Energy Zones

In the next year, identify Renewable Energy Zones, especially in the state's north-west, and continue their development over the next 10 years.

To meet the legislated goal of net zero greenhouse gas emissions by 2050, Victoria's coal-fired power must be replaced by renewable energy, dispatchable energy, and adequate power system services. Victoria has about 7.8 gigawatts (GW) of existing or committed wind and solar generation and 2.3GW of hydro generation, with almost 16.3GW of projects lodging connection enquiries since 2019.[102]

A major challenge in the energy transition is coordinating generation development and transmission infrastructure for a reliable, sustainable and affordable electricity supply. Renewable energy investments are geographically disparate, making it difficult to create beneficial economies of scale without some government coordination.[103] Parts of the electricity transmission network are already experiencing significant congestion,[104] limiting the amount of renewable energy that can be transmitted, and preventing new generators connecting. This will worsen without new transmission investment (see recommendation 3).

Renewable Energy Zones mark out areas where significant large-scale renewable energy can be efficiently developed. AEMO supports Renewable Energy Zones because they:

- Reduce the need to build transmission into new areas
- Cut project connection costs and risks
- Optimise the mix of generation, storage and transmission investment
- Realise benefits of scale
- Promote regional expertise and employment.[105]

Of the six zones AEMO has identified for Victoria,[106] the Murray River zone in Victoria's north-west is forecast to see significant new generation by 2040.[107] It can be aligned with proposed new transmission infrastructure that will better interconnect Victoria and New South Wales (see recommendation 3).

The Victorian Government is providing significant funding to develop Victoria's Renewable Energy Zones, supported by a new body called VicGrid to actively plan and develop them.[108] VicGrid should identify the most appropriate locations for these zones in the next year, coordinated with transmission infrastructure. A strategic land use assessment would identify more specific locations for renewable energy generation, taking into consideration other land uses, such as agriculture, and potential environmental, cultural and community impacts. This helps streamline land use planning and environmental approvals to encourage faster investment and align the Renewable Energy Zones with transmission development.

VicGrid should be an ongoing steward of Victoria's Renewable Energy Zones by supporting transmission development, coordinating investments, and facilitating community engagement. It could include approaching the market for registration of interest and engaging with communities, local governments and land holders. VicGrid could also include examining the potential for industry co-location to create local jobs.[109] New South Wales is progressing its approach to coordinating Renewable Energy Zones,[110] to which Victoria can look to adapt for local conditions. Decisions on the final location of priority Renewable Energy Zones should only proceed or be sequenced on credible signals that investment is likely.

Recommendation 05

Require 7-star energy-rated new homes by 2022, and increase afterwards

Require all new homes to achieve a minimum 7.0-star NatHERS rating (or equivalent) by 2022, increasing towards 8.0 stars (or equivalent) by 2025, either through the National Construction Code or Victorian regulations.

Minimising energy demand will make the energy transition easier to achieve. Australia will build an estimated 7 million extra homes in the next three decades.[111] Building them to high energy efficiency standards has multiple benefits. They lower energy bills,[112] improve health,[113] reduce greenhouse gas emissions,[114] increase home values,[115] and save money on energy infrastructure.[116] Infrastructure costs are the largest component of Victorians' electricity bills.[117]

Peak energy demand determines the size of Victoria's energy infrastructure. Extra peak energy demand on the network requires extra infrastructure. For example, running an air conditioner at peak times could add $1200 to $1550 to the cost of the electricity network.[118] Since December 2010, electricity prices have increased over 50%.[119] More energy efficient homes means heating and cooling appliances do not need to work as hard, reducing the need for more infrastructure.

Inefficient new homes lock in extra energy use. Retrofitting homes is generally more expensive than building to higher standards in the first place. While building to a higher standard can have an incrementally higher construction cost, these are offset by lower running costs. For example, an evaluation of the 6.0-star energy rating found an annual private return on investment of 11% each year.[120]

Energy efficiency standards work. Using the National House Energy Rating Scheme (NatHERS), the average Victorian home built before 1990 achieved around 1.6 stars, while those built from 1990 to 2005, following the introduction of mandatory standards, achieved an average of 3.1 stars.[121] New homes in Victoria achieve an average 6.3 star rating,[122] but few 7.0 star homes have been built.[123] Achieving a 7.0 star NatHERS rating through smart design does not add significantly to construction costs.[124] It can reduce energy bills by 30%,[125] and each 1.0 star improvement may add around $9,000 to the value of a home.[126]

The Australian Building Codes Board is finalising the new energy efficiency standard for new homes to introduce a minimum 7.0-star NatHERS standard (or equivalent). If agreed nationally, the changes to the National Construction Code will take effect from September 2022.[127] The Victorian Government supports this change,[128] but if it does not proceed nationally, it should incorporate a 7.0-star rating into Victorian building standards. A three-year delay in raising energy efficiency standards could add $2 billion to electricity bills and cost $720 million in extra infrastructure nationally.[129] The Victorian Government should strengthen compliance and enforcement to support the implementation of the standards. This was a major theme during our consultation.[130]

Some local governments have actively encouraged new homes to be built over 7.0 stars,[131] such as the 8.2 stars rated Nightingale apartments in Brunswick.[132] In some circumstances this requires using new technology and design changes to a home's orientation and layout.[133] Planning reforms to incorporate environmentally sustainable development objectives can work in tandem with better energy efficiency.[134] The Victorian Government should continue working on the national Trajectory for Low Energy Buildings to increase the mandatory energy efficiency standard further towards 8.0 stars (or equivalent) in the next round of National Construction Code changes taking effect in 2025, or independently incorporate higher requirements in Victorian building standards. Work should begin on a regulatory impact statement from 2022.

Recommendation 06

Mandate a home energy disclosure scheme

In the next five years, develop an energy efficiency disclosure scheme for home sales, to overcome information barriers and encourage energy efficiency improvements to existing homes.

Existing homes in Victoria have an average energy rating of 2.1 stars, compared with newer homes which have a much higher average rating of 6.3 stars.[135] If a family reduced peak energy use by 1kW – about enough to run a small oil heater – almost $1000 in electricity infrastructure investment would be saved.[136]

However, owners of existing homes have few incentives to invest in energy efficiency, and the value of these improvements cannot be easily conveyed to buyers. Similarly, buyers cannot easily identify which homes have low energy running costs.[137] If owners and buyers are provided with information on the energy efficiency of homes, it can influence their decision on which home to buy or whether to upgrade.

The Victorian Government should develop a mandatory disclosure scheme to inform prospective buyers about the energy efficiency of residential properties. This could build upon existing programs such as the Victorian Residential Efficiency Scorecard and the Victorian Energy Upgrades program. A disclosure scheme can inform and incentivise better housing market performance and will complement strengthened minimum energy efficiency standards for rented homes (recommendation 7). An education program could accompany the scheme, so people can understand the energy information provided.

Several stakeholders expressed support for a disclosure scheme and offered variations of how it could be designed.[138] Victorian-specific analysis of costs and benefits will help refine the design of a mandatory disclosure scheme. The benefits of a mandatory disclosure scheme can be substantial. National modelling to 2050 estimated an economic benefit of $1.2 billion from a disclosure scheme for detached houses alone, saving the equivalent of 6.2 million homes' annual energy use.[139] Any scheme would need effective compliance and monitoring for success.

Such a scheme does not force homeowners to undertake upgrades,[140] but they can do so where cost-effective. Energy efficiency upgrades can increase the value of a home, with a review of international studies suggesting that where a disclosure scheme is in place, more energy efficient homes have a 5% to 10% higher sale price.[141]

Recommendation 07

Strengthen minimum energy efficiency standards for rented homes

In the next three years, increase minimum energy efficiency standards to reduce energy use and costs in rented homes. During the next 15 years, keep updating these standards to reflect new cost effective measures, and improve renters' ability to make home energy efficiency improvements.

Rented homes comprise around 29% of Victorian homes.[142] Rented homes are typically less energy efficient than owner-occupied properties.[143] Better energy performance in rental homes saves money for renters, helps reduce emissions, and decreases demand on infrastructure.

Improving the energy efficiency of rented homes often requires changes agreed by the property owner, who typically manages the property using an agent or property manager. Barriers, such as insecure tenancies and an uneven power dynamic with the property owner, can prevent renters from securing upgrades to their homes.[144] Despite renters feeling relatively well informed of changes that could minimise their energy bills, they may feel disempowered to approach the property owner to implement them.[145]

Many property owners are aware of the bill savings, positive environmental impacts and investment benefits of energy efficiency upgrades.[146] They can be willing to make small changes without increasing rents or selling the home.[147] However, studies have found property managers, the conduit between many renters and property owners, are less aware of energy efficiency benefits.[148] People told us of a strong desire for better quality rental housing, but they also didn't want improvement costs to have detrimental impacts.[149]

Changes to the *Residential Tenancies Act 1997* made in 2018 introduced minimum standards for rental homes, including the power to include better energy and water efficiency requirements.[150] These currently contain only very basic standards, such as requiring a minimum 2-star heater.[151] Renters can make limited modifications without permission, such as installing temporary window films for insulation, reduced heat transfer or privacy.[152] They must seek permission to modify the home for draughtproofing, but this cannot be unreasonably refused.[153] Property owners have discretion in allowing other changes, like installing ceiling insulation, solar panels, more efficient appliances, or air conditioning.

The Victorian Government announced it will introduce further changes, proposing the introduction of minimum energy efficiency standards for rental homes covering insulation, draught sealing and hot water.[154] It should strengthen these minimum standards in the next three years to improve the energy performance, affordability, and climate readiness of rental homes. National modelling of minimum energy efficiency rental standards for detached housing estimated net benefits of over $2.3 billion, if commenced in 2025. This could cumulatively save around 229.2 petajoules of energy by 2050 and help avoid or defer infrastructure investment.[155] This modelling assumed only 25% of cost-effective actions were taken, such as ceiling, wall and underfloor insulation and window covering upgrades to improve performance.[156]

There are different ways to implement minimum standards, such as by specifying minimum standards for specific home features, or a holistic assessment of the entire home, such as star ratings or the Victorian Government's Residential Efficiency Scorecard. The best option can be determined in a regulatory impact statement.

The Victorian Government should also improve renters' ability to discuss and negotiate improvements above minimum requirements with property owners. Existing incentive programs can be built upon, including examining options to improve property management practices,[157] or targeting incentives to lower-cost rental properties, with appropriate protections. These minimum standards also apply to social housing, which also requires improvements (see recommendation 94).[158]

Recommendation 08

Make Victorian Government buildings more energy efficient

Generate energy savings in existing owned and leased Victorian Government buildings through energy efficiency upgrades. Set and report against energy efficiency targets for the next five years to support delivery of energy efficiency outcomes, then review with a view to set a longer-term energy efficiency target.

Buildings account for around 20% of Australia's energy use and 18% of Australia's greenhouse gas emissions.[159] Energy savings from more efficient appliances and dwelling improvements saved 0.8 terawatt hours in 2018–19 across the national electricity market.[160] Given their high energy use, also making existing non-residential buildings more energy efficient can significantly reduce energy demand.

The Victorian Government owns or leases many buildings. Past programs and targets have produced limited results in reducing energy use. Victorian Government buildings used the same amount of energy in 2019–20 as 10 years earlier.[161]

The Victorian Government has committed to achieving a minimum 5-star energy efficiency rating from 2021 and a 6-star rating from 2025 for new government buildings.[162] It is also continuing the Greener Government Buildings program,[163] which had a 2020 target to reduce government office emissions by 30% below 2015 levels.[164] The Victorian Government should continue to generate energy efficiency savings in its existing buildings through energy efficiency upgrades. This would reduce emissions and building running costs, improve climate resilience of public buildings,[165] and avoid extra energy infrastructure investment. Projects that deliver multiple benefits should be prioritised for funding, such as improving social housing (see recommendation 94).

The Victorian Government should set energy efficiency targets for the number of existing public buildings it will upgrade in the next five years, and report on progress annually. This increases transparency on progress, for example by measuring and reporting on the energy consumption and cost of the buildings. Following this, an achievable longer-term energy efficiency target should be set for all its public buildings.

One estimate suggests Victoria could generate a net economic benefit of nearly $200 million by increasing energy efficiency for existing government-owned or leased office buildings.[166] Other public buildings produce benefits too. For instance, energy efficiency upgrades and renewable energy at the National Gallery of Victoria, regional health services, primary and secondary schools, and public transport facilities is creating $1.7 million of savings annually on energy bills and abating 9,805 tonnes of greenhouse gas emissions.[167] By taking action, the Victorian Government can demonstrate leadership for the commercial sector, while also providing visibility of benefits to the many people who use or visit government buildings.

Recommendation 09

Encourage demand management pricing to reduce peaks and optimise distributed energy

In the next 10 years, optimise use of existing electricity infrastructure by encouraging demand management pricing.

Electricity infrastructure is typically designed and built to service peaks in demand that occur only a few days a year.[168] Peak demand has been growing faster than average electricity consumption for several years,[169] but new technologies are changing how homes use electricity, and sometimes create more electricity demand. For example, while rooftop solar and energy efficiency measures have reduced energy demand from the grid, greater use of electric vehicles will increase demand.[170] The potential for electricity to replace some gas use may also add to future peak demand.[171]

Energy consumers share electricity distribution network upgrade costs in their electricity bills. This means consumers with flat-tariff electricity bills pay the same amount for electricity infrastructure to service demand peaks, regardless of their electricity use pattern. Consumers who do not contribute to high peak electricity use subsidise those who do.[172] This provides little incentive for high peak users to moderate their consumption, driving up costs for everyone.

To manage electricity demand and better use existing infrastructure, the Victorian Government should encourage pricing reforms to better signal the costs of using the infrastructure. Our research shows that people respond to electricity prices when altered to influence behaviour, and technology such as smart home devices can automate household responses for an even larger effect.[173] Demand management pricing, sometimes known as 'cost reflective pricing', encourages people to reduce their peak energy use, or shift it to off-peak periods.

The potential infrastructure savings from demand management pricing are significant. Improving existing tariffs nationwide to better manage demand could generate over $16 billion in network savings,[174] avoiding extra infrastructure costs in the long term, and ultimately translating to lower electricity bills. Improved pricing helps integrate distributed energy resources into the system. Paired with complementary energy market reforms, it can facilitate more consumer participation in energy services. For example, people with home rooftop solar and batteries could be incentivised to export energy when needed, and store it when it is not. This provides network-wide benefits, and still allows people to recoup their investment costs.[175]

Encouraging demand management pricing can also help manage the extra energy demand from widespread adoption of electric vehicles (see recommendation 1). Research for Infrastructure Victoria's *Automated and Zero Emissions Vehicles Infrastructure Advice* estimated encouraging electric vehicles to charge off-peak could save $2.5 billion in new infrastructure costs.[176]

To create the conditions for more comprehensive demand management pricing, the Victorian Government should support continued tariff reform beyond existing commitments,[177] and encourage existing customers to switch to demand management pricing. Only 17% of Victorian households are currently using variable tariff electricity plans.[178] Improving the energy efficiency of homes will also assist Victorians to reduce overall energy use and make off-peak electricity use more effective (see recommendations 5, 6, 7, 8 and 95).

Working with energy distributors and retailers, the Victorian Government should help monitor and address any equity issues arising from changes. This may include adjusting energy concessions or other measures so that all consumers, including low income households, can share in the benefits of new technologies and potential cost savings from demand management measures.

Recommendation 10

Confirm gas policies and pathways to reach net zero emissions and allow new gas-free homes

Within a year, respond to Infrastructure Victoria's Advice on Gas Infrastructure, including by considering the trajectory to transition natural gas to reach net zero emissions by 2050. This allows gas network planning changes after 2025. Adjust policies so they do not encourage or embed future residential natural gas use.

Victoria has Australia's largest natural gas infrastructure network.[179] Direct combustion and fugitive emissions make up over 20% of Victoria's greenhouse gas emissions, largely from natural gas.[180] Embedding long-term natural gas use does not align with Victoria's 2050 net zero emissions target.

Uniquely, Victoria's network-supplied gas demand is largely from residential and small commercial customers, rather than industry.[181] Near-term natural gas use is forecast to decrease,[182] but some residential use is projected to increase slightly, driven by connections for new homes in Melbourne's growth areas and regional towns that will likely continue installing mainly gas appliances.[183] Some industrial gas uses are difficult to replace, but residential uses can be electrified.[184] For example, 'The Cape' in Gippsland is an example of a gas-free Victorian housing estate.[185] Many Australian homes have never been connected to natural gas.

We do not yet know if maintaining a long-term Victorian gas network will be viable or necessary. Ultimately, the net zero emissions target means the natural gas network will be largely retired or used for transporting another fuel, like clean hydrogen or biomethane. A blend of natural gas and clean hydrogen could produce slightly less emissions without significant distribution network modification.[186] But clean hydrogen is not ready for mass distribution,[187] and does not necessarily require a fixed distribution network. It could also be transported by road or rail or manufactured on site.

Meanwhile, expanding existing natural gas networks further embeds future emissions, and could produce a larger potentially stranded asset. The Victorian Government should change policies to avoid encouraging gas network expansion, or further embedding residential natural gas use.

For instance, the Victorian Government should amend planning regulations to clarify that greenfield housing estates[188] and urban renewal precincts do not require new gas infrastructure.[189] These planning regulations have likely caused new developments, like the Quandong Precinct in Wyndham,[190] to construct expensive gas networks. Some local governments support gas-free homes and buildings. For example, the City of Yarra has pledged to switch its buildings from gas to renewable energy.[191] Another local government told us that growth area gas infrastructure requirements are 'cost prohibitive',[192] and a third identified planning barriers to all-electric redevelopment precincts.[193] Other policies also embed gas usage, such as requiring gas-boosters for solar hot water systems,[194] or subsidising gas hot water systems.[195]

The Victorian Government should publicly consider natural gas transition pathways that align with Victoria's net zero emissions target. This weighs up future trade-offs, while signalling future changes to industry. For instance, fully converting gas appliances to electricity takes advantage of electricity decarbonisation but requires significant electricity network upgrades.[196]

The Victorian Government has asked us for advice on Victoria's gas infrastructure by December 2021.[197] This complements its proposed gas substitution roadmap, which will include aspirational natural gas displacement targets for 2025 and 2030.[198] Our advice will outline the gas infrastructure implications of different pathways to net zero emissions. The Victorian Government should respond to our advice within a year and use it to converse with industry and communities to confirm the policy direction. More detailed work should start on pathways for retiring or repurposing gas networks to keep future options open. This allows more flexibility for adapting gas network infrastructure plans after 2025, which aligns the Australian Energy Regulator's 2028–2032 regulatory period. This is the five-year pricing period which approves new investments in gas infrastructure.

1.2

Respond to a changing climate

Climate change will result in more frequent and intense bushfires, heatwaves, droughts, extreme rainfall events and coastal inundation in coming decades.[1] Victorians are already seeing climate change affect society, the economy and the environment, most recently in extreme droughts, floods, and catastrophic bushfires. It also affects Victoria's First Nations peoples, whose traditional lands and waters are heavily impacted. These impacts can be broad and widespread for the whole community. For example, a heatwave can increase demands on the health system, disrupt public transport, and cause a loss of power supply.[2] Flooding from stormwater can displace people from their homes and damage buildings.[3] Climate change is already increasing the death rate from warm season heat-related deaths on every continent.[4]

Infrastructure contributes to climate change by generating greenhouse gas emissions from its direct operations, the materials used in its construction, and the activities it enables.[5] For example, transport emissions have increased more than 60% since 1990, accounting for around one-fifth of total emissions in 2019.[6] The infrastructure Victoria builds today can lock in future emissions,[7] especially without a plan to convert it to zero emissions technology later.

New infrastructure must also function in a warmer, drier climate and be resilient to more extreme weather. These changes affect infrastructure's performance under extreme conditions, and the demand for it.[8] Changing operating conditions may require changes to the location, design, construction, operation, maintenance and upgrade of infrastructure, and in some cases reassessing assets' continued viability. The infrastructure decisions Victoria makes now will affect its climate change response in coming decades and constrain future choices.

The last comprehensive assessment of climate change risk to Victoria's infrastructure was produced in 2007.[9] Evidence produced since means the climate consequences for infrastructure are now better understood and can be better incorporated into infrastructure and built environment frameworks.[10] For example, using the most up to date information available on the likely future climate[11] would support building homes accordingly. Shorter infrastructure life or planning for major future retrofits may need to be considered if Victoria is to achieve its net zero emissions goal.

Climate change introduces new risks

Victorian average temperatures have increased 1.2°C since official records began in 1910,[12] with temperatures tracking towards the higher range of emissions pathways.[13]

The mean sea level for Melbourne has risen 2 millimetres each year since 1966.[14] Victoria has experienced an increase in dangerous fire weather and length of fire seasons since the 1950s.[15]

By the 2050s, under a high emissions scenario and compared with the period of 1986–2005, Victoria could experience:[16]

x2

Double the number of **very hot days**

2.4°C

Average annual **temperature increases** of up to 2.4°C

Declines in cool season rainfall

More **intense downpours**

x2

Longer fire seasons with up to double the number of 'high' fire danger days

24cm

Sea levels rising by around 24 centimetres

35–75%

Declines in alpine snowfall of 35–75%.

Even with strong global emissions reductions, the effects of this warmer, drier future climate will vary across regions. For instance, projected changes in temperature are higher inland compared with coastal areas.[17] Summer rainfall has increased in the north, but winter rainfall has declined statewide,[18] with winter rainfall tracking towards the higher emissions pathway[19] and average annual rainfall declining overall. While average changes might seem small, they reflect significant extremes of heat and rainfall that can be very challenging for people, infrastructure and the environment. At the time of writing, 34 out of Victoria's 79 local councils have recognised, acknowledged or declared a climate emergency.[20]

Climate change means less water in storages

Water infrastructure and supply are acutely vulnerable to climate change impacts. Figure 5 shows that rainfall in Victoria is projected to decrease. A warmer, drier climate means less rainfall flowing into Victoria's rivers and dams, putting more pressure on urban water supplies. Water infrastructure will also be affected by more frequent extreme rainfall events, movement and changes in groundwater, and higher average temperatures with lower average rainfall. This suggests higher risks of water shortages and drainage and sewerage damage from stormwater flooding.[21] More frequent and intense bushfires also risk damage to catchments and water storages, from ash and debris contaminating the water supply.[22]

Water resource and supply planning[23] incorporates climate change projections and scenarios, and increased monitoring, to better understand potential future water availability.[24] Combined with high population growth, water shortages could emerge in Melbourne as soon as 2028[25] under a high climate change scenario, with even a mid-range scenario seeing shortages by 2043.[26] Shortfalls may occur earlier in some regional areas, including as early as 2025 in areas serviced by Coliban Water which includes Bendigo[27] and 2031 in areas serviced by Greater Western Water which includes Bacchus Marsh, Melton, Sunbury and parts of the Macedon Ranges.[28]

Drought will continue to be a feature of Victoria's climate and is acutely felt by regional Victorians and the agricultural sector. Agriculture is Victoria's largest water user,[29] and a significant regional employer.[30]

Climate change poses a risk to agriculture in every Victorian region.[31] For example, the agriculture sector incurs almost half of the total economic impacts from a severe heatwave.[32] The Victorian Government will invest $20 million from 2021–22 to 2025–26 to accelerate Victoria's agriculture sector response to a changing climate.[33]

Climate change is increasing the intensity and frequency of hot days and heatwaves, exacerbating any drought conditions. The severity of the millennium drought has been linked to human-induced climate change,[34] and time spent in drought is projected to increase across southern Australia.[35] During droughts, the warmer, drier weather increases water demand and reduces water storages. Victoria will need to increase resilience and prepare for longer, more intense future droughts.

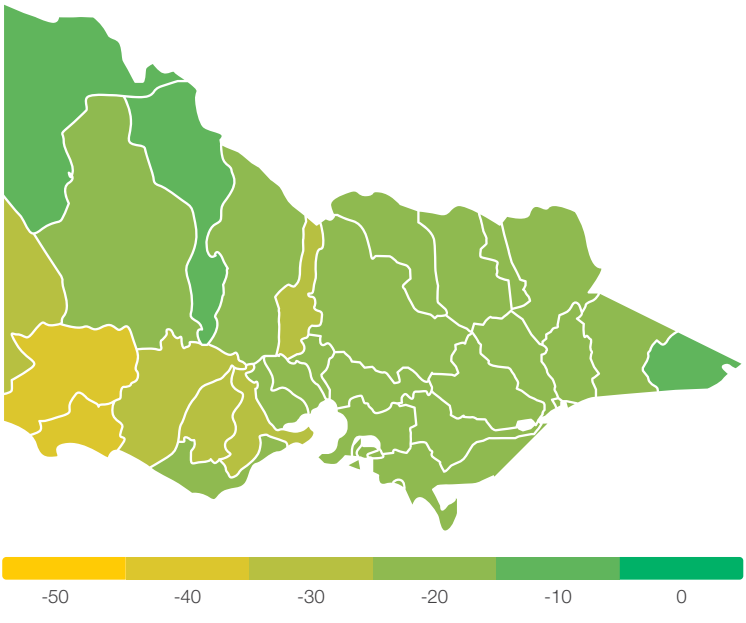


Figure 5: Victoria will get drier as rainfall decreases

This map shows the projected percentage change in water runoff into Victoria's basins under a medium-impact scenario by 2065, relative to 1986 to 2005. In this scenario, future runoff and streamflow in Victoria will likely decline as less future rainfall is projected, particularly cool season rainfall important for water storage filling. Higher potential evapotranspiration — which is surface evaporation, soil moisture evaporation and plant transpiration combined — is also predicted. This is just one of many scenarios, with projections ranging from zero decrease in runoff to high decreases in runoff.

Source: Hope, P. et al., *A synthesis of findings from the Victorian Climate* Initiative (VicCI), Australian Bureau of Meteorology, 2017, pp. 37–45

Victoria will be at risk from more frequent and intense bushfires

Victoria is one of the most fire prone places on Earth.[36] The 2009 Black Saturday bushfires and the 2019–20 summer bushfires in East Gippsland and the state's north-east resulted in significant loss of life, property, wildlife, and natural ecosystems. More intense fire behaviour, increased fire activity, longer and earlier fire seasons, and droughts are clearly linked to climate change.[37]

In the 2019–20 Victorian summer bushfires, more than 300 homes were destroyed and 1.2 million hectares of land was burnt – making it the largest bushfire since 1939.[38] It affected at least 60% of the state's national parks and nature reserves,[39] impacting significant environmental assets and biodiversity. The bushfires revealed the region's vulnerabilities, with communities and visitors cut off and in direct danger, including more than a thousand evacuated by sea from Mallacoota.

Bushfires highlight risks to electricity, telecommunications, water supply and transport infrastructure, among other vulnerabilities. Without access to critical phone and internet connections for emergency management information, people are at greater risk,[40] including local residents, and holidaymakers who are less likely to have a bushfire plan.

Recommendations to respond to climate change

Infrastructure Victoria makes the following recommendations to help respond to a changing climate. These are further complemented by recommendations to navigate the energy transition (see section 1.1), improve urban open space and tree canopy (see recommendations 37 and 77), build resilience to emergencies (see section 1.3), and respond to climate risks in regional areas (see section 4.3). Many more of our recommendations in other sections have climate benefits, including improvements to land use planning and transport networks.

Recommendation 11

Specify climate scenarios and carbon value in assessing infrastructure

In the next year, update and expand practical instructions for government agencies on integrating climate-related risks into infrastructure assessments. This should include high, medium and low future climate change scenarios, transitional risks and valuing emission reductions.

Current Victorian Government infrastructure investment guidance observes the *Climate Change Act 2017* requirement to consider climate risk,[41] but has not provided detailed advice on doing so and includes some outdated information.[42] At a minimum, the Victorian Government should update this guidance to explicitly determine climate scenarios for assessing infrastructure resilience, such as a future with 1.5°C of warming, and potentially more extreme scenarios. It should also explicitly advise on the appropriate method of calculating the value of avoided carbon emissions, for use in calculating emission reduction benefits. The approaches recommended should consider recognised data,[43] research,[44] systems and tools.

The infrastructure Victoria builds now will exist long afterwards and must keep performing in a changing climate. But the Victorian Government has no infrastructure performance benchmark for future climate conditions. This creates difficulties for infrastructure planners, developers and operators in assessing and responding to climate change. It also means climate risk assessments use different assumptions and methodologies in infrastructure assessments, making comparisons difficult.

Producing new, specific guidance on assessing climate risk can complement existing infrastructure investment guidelines, including on future climate scenarios, assumptions, and the value of emission reductions.

Carbon valuation is a well-established tool to measure the value of emission reductions in economic assessments of proposals. Current Victorian carbon valuation guidance was prepared in 2013, relies on the since-repealed national carbon pricing mechanism,[45] and does not consider Victoria's goal to achieve net zero emissions by 2050.[46] It does not clarify appropriate emissions to count, such as whether to include emissions embodied in materials, those generated by lifetime operation of the infrastructure, or indirect emissions from energy use or emissions enabled by the proposal. In updating guidance, the Victorian Government can draw on a growing body of national and international literature on using scenarios to assess climate-related risks,[47] and guidance on emissions measurement and carbon valuation.[48]

Specific guidance for government agencies can encourage and make it easier for strategic planners and project developers to assess their climate risks.

It fosters greater consistency, improving comparability across sectors and projects and contributing to a more efficient climate response. Better assessments support better decisions, reducing the risk of stranded assets or avoidable future refurbishment and retrofit, and help agencies meet their obligations under the *Climate Change Act 2017,* including emission reduction targets.[49] For example, the *Guidelines for Assessing the Impact of Climate Change on Water Availability*[50] provide a consistent approach for applying high, medium and low climate scenarios, and considers population growth and water use behaviour.

Recommendation 12

Strategically review climate consequences for infrastructure

Strategically review the climate change consequences for Victoria's infrastructure needs and priorities, beginning in November 2021 after delivering the adaptation plans under the *Climate Change Act 2017.*

Victoria can take a strategic approach to enhancing the climate resilience of its infrastructure, informed by a clear understanding of climate risks across regions and infrastructure sectors, with options to reduce those risks. This can improve the design, construction,[51] operation, maintenance and renewal[52] of Victoria's infrastructure to reduce its vulnerability to adverse impacts, build economic and social resilience, and reduce emissions. For example, incorporating water sensitive design into land use planning can help reduce the impact of flood risk to homes and other infrastructure.[53]

No current and comprehensive assessment catalogues climate risks for Victoria's infrastructure.[54] This makes the process for identifying and assessing material risks to infrastructure more difficult, leading to inconsistent or incomparable assessments. As a result, Victoria's infrastructure may not perform as predicted in the future climate, and infrastructure planning could miss cost-effective opportunities to reduce emissions.

Victoria's evidence base and policy environment for climate action is evolving rapidly. The Victorian Government has published the first science report under the *Climate Change Act 2017,*[55] and released local-scale climate projections that will enable detailed analysis of potential climate impacts.[56] In May 2021, it released *Victoria's climate change strategy* and emission reduction pledges, with targets to reduce emissions from 2005 levels by 28–33% by 2025, and 45–50% by 2030.[57] Work is underway to develop adaptation action plans for all major sectors and systems which are expected by October 2021.[58] This process will continue, with new targets, pledges and plans set at five-yearly intervals.

The right time for a strategic review is following the delivery of the first set of adaptation plans. While the review would support some of the adaption priorities in *Victoria's Climate Change Strategy,* starting earlier would likely duplicate efforts already underway across the Victorian Government. By commencing afterwards, from November 2021, all evidence generated could provide a contemporary, comprehensive basis to assess Victoria's infrastructure needs and priorities to support the transition to a net zero emissions, climate resilient state. The strategic review could consolidate the evidence, identify any remaining gaps and consequences, interdependencies, immediate and medium-term actions,[59] and provide strong evidence-based needs and priorities for infrastructure investment. This could then inform the review of the 2030 interim emissions target due in 2023; the next round of sector pledges due in 2025; and subsequent adaptation plans due in 2026.[60]

Responses may include identifying investment priorities, updating land use planning policies,[61] strengthening building codes and standards,[62] updating regional and sectoral strategies, or undertaking further research[63] and analysis to improve understanding of risks and potential responses that build in infrastructure resilience.[64]

Recommendation 13

Consider all water supply sources

Consider all water sources for supply augmentation, including identifying and addressing barriers to purified recycled drinking water within the next 10 years. When planning for future water supply, investigate all options including, but not limited to recycled water, seawater desalination, stormwater harvesting and better use of the water grid.

Climate change pressures and risks are already affecting Victoria's water supplies and infrastructure. Along with population growth and increasing uses of water, how we plan and apply water conservation options[65] will become more critical in the future for water security.

The Victorian Government should consider all alternative water sources, such as recycled water, stormwater, and seawater[66] which, unlike water from rivers and aquifers, are not dependent on rain and are less affected by climate change.[67] Currently, the use of purified recycled water for drinking is constrained by the Victorian Government's policy opposition,[68] and the requirement for dedicated distribution infrastructure which dramatically increases the cost of use. Allowing all viable technologies and options to be equally considered helps decision-makers choose water options that are efficient, fit for purpose, sustainable and affordable.

Recycled water and stormwater can be made safe for drinking and can be major water supply augmentation options,[69] noting that recycled water's quality and quantity are more predictable than treated stormwater. Recycled water can be cheaper to produce than desalinated water and could be a more flexible part of water networks than decentralised schemes.[70]

People drink purified recycled water in Western Australia, and internationally in Singapore, California and Namibia.[71]

Stormwater harvesting and reuse projects can be viable where there is clear policy supporting the use of stormwater for drinking.[72] Removing untreated stormwater from receiving waterways improves water quality and flow while also improving water security.[73] In some cases, bulk use of stormwater for other purposes, such as watering sporting fields and increasing tree canopy coverage, can reduce pressure on drinking water supplies.

The Victorian Government should remove current policy restrictions to allow evaluation of all water augmentation options based on their economic merit, health and environmental impacts.[74] This includes allowing consideration of purified recycled drinking water and removing restrictions on moving water between regions using the water grid. Better use of the water grid can delay using more expensive supply options or new investment in water plants.[75]

The health risks of purified recycled water must be carefully managed, with proper monitoring, oversight, and adherence to Australian guidelines and standards.[76] Taking steps toward drinking purified recycled water would likely include community education to improve water literacy, better regulatory frameworks to manage health risks, and capacity and capability building for regulators. Victorian households appear supportive of recycled drinking water when it secures supply and does not increase their water bill.[77]

The Victorian Government should build the community's understanding of the use of alternative water sources, develop guidance on trade-off decisions, and commission health studies and investigations into achieving safe purified recycled drinking water. It should also consider ways for economically viable infrastructure to be piloted and monitored, such as Western Australia's Groundwater Replenishment Trial.[78]

Recommendation 14

Progress integrated water cycle management

Within five years, accelerate progress toward an integrated model of water cycle management, starting by clarifying policy settings to allow the better use of stormwater and recycled water.

Climate change is making parts of Victoria drier, and population growth places pressure on water supplies from increasing consumption and sewage volumes. Urban expansion causes more runoff from impervious surfaces such as roads, paths and buildings. The environment absorbs less stormwater in these places, with more untreated and potentially polluted water flowing into waterways.[79]

The way Victoria plans, manages, applies relevant regulations,[80] and delivers water must evolve to use water more wisely. For example, non-conventional water sources such as stormwater and recycled water offer significant potential to augment existing supply, recharge aquifers and strengthen stream flows.[81] In 2016, 337 gigalitres of stormwater was 'lost' to waterways and 276 gigalitres of treated wastewater ended up in the sea. That same year, Melbourne's total water consumption was about 516 gigalitres.[82] More recycled water and stormwater use would support the resilience of the water system.[83]

Current policy arrangements make it difficult to integrate innovative uses of water across the water cycle. Reflecting historical development, different entities share responsibilities for water supply, wastewater, stormwater and waterway health.[84] Victorian Government stormwater policies are implemented almost exclusively through land use planning policy and building codes which focus on mitigating the risk of floods through drainage,[85] with local governments responsible for most street and local drainage infrastructure.[86]

A more integrated model of water cycle management promotes a collaborative planning approach that brings together all elements of the water cycle.[87] Diversifying supply reduces the need for expensive upgrades,[88] allows stormwater to be used for recreational lakes and wetland habitats,[89] and reduces pollution in waterways. It supports environmental, health and amenity improvements to public spaces[90] by enabling greater flows to habitat corridors,[91] increasing permeable surfaces,[92] and supporting increased tree canopy cover.[93] For example, Moonee Ponds Creek's Chain of Ponds Collaboration[94] has improved amenity and helped manage flood and pollution risks.[95]

The Victorian Government supports an integrated approach,[96] but implementation is challenging for different policy, planning and regulatory reasons. While some progress is occurring through the Integrated Water Management Forums,[97] continued effort is needed to promote water-sensitive city ideas into non-water sectors, including in the design of new precincts, buildings and infrastructure.

Within five years, the Victorian Government should accelerate progress toward integrated water cycle management, bringing stormwater and recycled water into existing frameworks. Initiatives to address current barriers should align with community preferences[98] and may include:

- Early engagement between land and water planners on stormwater and recycled water use in developments, particularly in the redevelopment of established estates[99] and in new growth areas[100]
- Identifying priority opportunities to improve health and sustainability outcomes by recycling wastewater
- Reviewing land use and water planning policies[101] and frameworks to identify and address barriers to integration, such as guidance on meeting targets,[102] best use of recycled water[103] and land acquisition[104] requirements
- Clarifying goals, funding arrangements, and roles and responsibilities for stormwater management
- Treat stormwater and recycled water as long-term assessments, and include them in water planning, cost-sharing and entitlement frameworks[105]
- Further including Traditional Owners in water planning and management
- Better integrating local and system-wide water planning.

Recommendation 15

Improve decision-making for urban water investment

In the next five years, clearly allocate the roles and responsibilities for urban water systems and major supply augmentation planning.

Securing Victoria's water supplies in a climate-constrained future will require collaborative and integrated planning, ongoing community engagement,[106] and clear investment and funding arrangements.[107] Ambiguous responsibilities can impede responsive and considered investment decisions, causing delays when there is ample water supply, or rushed and potentially unwise decisions when water is scarce.

After the millennium drought, the Productivity Commission concluded some state government decisions to invest in new water infrastructure were potentially unnecessary or ill-timed.[108] Similarly, the Commission questioned decisions to intervene in specific investment decisions, concluding that interventions should be determined through clear planning processes, following review by an appropriate independent regulator.[109] The major investments taken to secure water during the millennium drought revealed the vulnerabilities of traditional approaches to water planning.[110]

While water authorities have made some improvements to water planning since the millennium drought, the ultimate authority to make decisions on water infrastructure remains unclear. The Victorian Government has provided guidance on the governance and legislative framework that regulates the Victorian water industry,[111] but this does not specify who can decide to invest in future major water supply projects. Public water corporations provide many water services,[112] including investing in infrastructure to support their core functions. At present, Victoria uses a mix of central and delegated investment decisions with no clear thresholds between them. There is no clear mechanism for coordinated water supply planning to identify and escalate major investment needs with system-wide benefits.

Where water service provision has been separated from government policy-making functions, it has delivered more cost-efficient water services in Australia.[113] Governments should clearly allocate roles and responsibilities for urban water systems and major supply augmentation planning, recognising that ultimate responsibility rests with them.[114]

The Victorian Government should clearly allocate roles and responsibilities including four main elements:

- Assign responsibility for strategic urban water planning to a body, such as the Department of Environment, Land, Water and Planning, Melbourne Water or an independent entity, to coordinate existing planning, clarify the sequence of actions and identify the need and timing for major system augmentation[115]
- Assign a body to take ownership of major system augmentations, integrate ongoing engagement,[116] and transparently assess the investment options
- Provide independent technical and economic regulation through an appropriate independent and transparent oversight mechanism[117]
- Clearly specify and delegate investment decisions within the normal operating scope of public water corporations, and allow them to be made independently, subject only to the approval of the regulator.

Our research suggests that delegating investment decisions within the normal operating scope of those entities would be appropriate, and would support more efficient long-term planning and investment.[118] It could also allow public water corporations to better prioritise the interests of water customers, as around 60% of Victorian households want to be more engaged in long-term water infrastructure planning.[119]

Recommendation 16

Strengthen agricultural water security by modernising irrigation

In the next 30 years, contribute funding toward planning and delivery of water infrastructure and irrigation modernisation projects across Victoria.

Agriculture needs a secure water supply to grow fresh produce and raise livestock. Farmers use water to irrigate crops and pasture, apply pesticide and fertiliser, cool crops and control frost.[120] Scarce water supplies can interrupt agricultural production, and threaten regional incomes and jobs. Victoria's rainfall patterns are already changing, affecting farming operations and disrupting traditional growing patterns.[121] Climate projections indicate these trends will continue. For example, the future climates of Hamilton and Warrnambool could be hotter and drier by 2050, more like the current climate of Benalla today.[122]

Protecting and adapting farming for the future means securing reliable, sustainable water supplies.[123] Victoria is Australia's largest agriculture producer, producing $15.9 billion worth of agricultural product from only 11.5 million hectares of land.[124] Better water infrastructure can support agriculture's long-term future and prosperity. Victorian agriculture's growth prospects rely on this infrastructure, particularly highly water-dependent sectors like dairy and horticulture. When coupled with adaptation planning, modern water infrastructure can also support agriculture businesses to make changes that allow for continued profitability in the face of rapidly changing climate conditions.

Water infrastructure is generally paid for by water users. However, governments can fund district scale projects generating broader community and environmental benefits, and the planning and research that demonstrates their potential. Better infrastructure planning and delivering upgrades can reduce water wastage and safeguard agricultural water. It can also deliver broader benefits, such as reducing farm run-off into waterways and securing supply chains in the retail, processing and transport industries.

The Victorian Government already supports district-scale irrigation projects, such as the Macalister Irrigation District Modernisation Project in East Gippsland. It can also support early planning and development for potential water infrastructure projects.[125] This can help find new sources of water, such as groundwater, and assess their technical and economic merits. Irrigation projects can also affect traditional Aboriginal waters and should engage Traditional Owners in water management.

For example, the Victorian Government could investigate the development of the Great South Coast's Dilwyn Formation, a naturally occurring underground aquifer system.[126] Technical studies suggest it has an untapped 15 gigalitres of available water.[127] Development of the region's aquifer resources will build water security and support future investment in agriculture.[128]

Other such projects should be investigated to build on Victoria's agricultural strengths, which include fertile soils in some areas and existing access to markets. In the context of climate change, water infrastructure for irrigation needs a continuous and long-term focus. This will be complemented by Victorian and Australian Government funding to modernise and improve water efficiency on farms.[129] Considering alternative sources for urban water supply, including recycled water (see recommendation 13), can also further help improve water security for the agriculture industry, by minimising competition for water between sectors.[130]

Recommendation 17

Upgrade Victoria's emergency water network

In the next year, assess the condition, capacity and security of Victoria's emergency water supply point network, and upgrade or replace inadequate supply points. Clarify ongoing responsibility for monitoring, maintenance and funding to secure a resilient network.

Agriculture supports one in 16 Victorian jobs,[131] many of which are located in regional Victoria.[132] Meat, dairy, horticulture and animal fibre, such as wool, comprise the majority of Victoria's food and fibre export earnings.[133] This income, these jobs and the communities they support are threatened by the consequences of climate change. Longer, more intense droughts and increased bushfire risk increase the need for resilience and preparedness. Agriculture is particularly at risk from these events.

Emergency water supply points are a network of 300 places providing water to farmers for stock watering and domestic use during dry conditions. They can also supply water to bushfire-affected livestock, and some sites can be used by firefighters during bushfires. The water is free for stock and domestic use, but farmers must arrange to transport the water ('water carting') at their own cost.[134] They draw from groundwater through bores, access water channels or reservoirs, or are connected to urban water systems. Emergency water supply points are one mechanism to help farmers maintain base stock levels through droughts, allowing re-stocking and protecting future production after the drought has passed.

No current comprehensive audit or assessment of emergency water supply points exists. Past drought conditions in some regions revealed the poor condition of some supply points, meaning drought assistance funding was needed to rapidly improve them, including establishing replacement points and upgrading existing sites for better access and water flow.[135] Some supply points elsewhere are also likely to be in poor condition, difficult to use, or their water source may be unreliable during droughts.

The Victorian Government can make sure it has a fit for purpose network of emergency water supply points, optimised for future climatic conditions, to be better prepared for less rainfall and increased bushfire risk. This requires a full assessment of the whole emergency water supply point network across Victoria, matched with future climate projections, to identify places where emergency water supplies may be insufficient. This assessment can audit the existing supply points and determine the condition, capacity and security of their water source during drought. This can be matched with projections of likely drought conditions under future climatic conditions to determine the performance required.

The infrastructure response can be replacement supply points connected to more reliable water sources, new tanks connected to existing supply points, upgrades such as installing meters, or road improvements so trucks can gain better access.[136] The assessment should identify ongoing monitoring,[137] maintenance and funding[138] responsibilities, so the network is available when needed.

1.3

Embed resilience

Victoria's changing climate is leading to more frequent and severe natural hazards and emergencies including bushfires, extreme heat, and flooding. It is also increasing the likelihood of extreme weather events occurring consecutively, or even at the same time.[1] This was demonstrated during 2019–20, where drought and bushfires were rapidly followed by storms and flooding. The COVID-19 pandemic rapidly followed this series of emergencies, compounding their effects.[2]

Climate change and its impact on natural disasters has a human and a financial cost.[3] These include loss of life, negative impact on health and wellbeing, reduced safety, biodiversity loss, and damage to property, infrastructure, agriculture and industry.[4] The economic costs from bushfires alone are projected to rise from an average of $172 million a year in 2014 to $378 million a year by 2050. Heatwaves caused by climate change are expected to cost Victoria $179 million annually by 2030,[5] and could cause an extra 6214 deaths in Victoria by 2050.[6] The costs associated with severe natural disasters can be much greater. For example, the economic costs to agriculture of the 2010–11 Victorian floods were estimated at $1.5 billion to $2 billion, including lost pasture, crops, stock and equipment.[7] Costs associated with Victoria's Black Saturday bushfires were estimated at more than $4 billion.[8]

Climate change is not the only risk Victorian communities face. The COVID-19 pandemic has led to health and economic damage worldwide. The speed of change is increasing, and risks can escalate rapidly.[9] Infrastructure, and the communities it serves, urgently need to adapt to this changing landscape. This will involve taking practical actions to manage risk, increase protection, and strengthen resilience.[10]

Victoria's coastal areas face increased flooding and erosion

Victoria's coasts are home to nearly 14% of the state's population[11] and they receive around 70 million visits each year.[12] Victoria's coasts have special significance to many of Victoria's First Nations peoples. Coastal infrastructure supports communities and industries, including tourism and fishing, and caters for residents and seasonal tourists. For instance, Lorne welcomes an extra 20,000 people during the annual Pier to Pub swim, a 20-fold increase of its normal population.[13]

Rising sea levels and increasing heavy rainfall are projected to increase coastal erosion and flooding, damaging many low-lying ecosystems, infrastructure, and homes.[14] More frequent storm surges can make this worse.

Victoria is heavily exposed to rising sea levels. A sea level rise of 0.8 metres would put $18.3 billion of infrastructure at risk of inundation and erosion, including:[15]

31,000 to 48,000 homes

valued at $6.5 to $10.3 billion

Up to 2000 commercial buildings

valued at $12 billion

527 kilometres of roads

valued at $9.8 billion

Valuable infrastructure is close to the coast, including buildings, hospitals, roads, rail, electricity, telecommunications, stormwater, drainage, and sewerage assets. Rising sea levels have social and economic impacts beyond the infrastructure itself. Erosion is visibly threatening the Great Ocean Road's $1.1 billion visitor economy,[16] while Phillip Island[17] and Inverloch[18] are witnessing the loss of popular beaches. Coastal ecosystems could also change, affecting biodiversity. For example, mangroves usually found in coastal saline water have begun appearing in the Gippsland Lakes.[19]

Resilient infrastructure can better withstand extreme events

Victoria's social and economic wellbeing depends on its critical infrastructure.[20] Critical infrastructure supports services which are essential for everyday life, such as food, water, energy, transport and health care.[21] It is also essential for the community, economy and governments to withstand and respond to crises.[22]

A disruption to critical infrastructure can have significant implications, affecting supply chains and service continuity.[23] The 2019–20 summer bushfires demonstrated the vulnerabilities of communities when critical infrastructure fails in an emergency. Thirty-eight towns lost communication, mostly caused by power outages, and impassable roads cut off 17 of these towns.[24] Similarly, a changing climate will alter the environmental conditions under which infrastructure must perform. In contrast, the COVID-19 pandemic highlighted the adaptability of Victoria's infrastructure, as critical infrastructure services and networks were able to reconfigure quickly and offer different models of delivery.[25] Digital technologies played a major role in supporting business and community resilience, highlighting the importance of technology and innovation in prevention, preparedness, response and recovery.

Infrastructure will need to be resilient so it can be relied upon during a crisis, or in changing social, economic, and environmental circumstances. Infrastructure resilience can be improved in different ways, including by building to different standards and designs, building in safer places, or having better integrated plans to protect and rapidly repair it when damaged. Resilience considerations should be central to infrastructure investment decision-making. The infrastructure Victoria builds now will need to serve communities for many years to come.

Communities need to build resilience too

Infrastructure can support community resilience, for example by providing emergency shelter during extreme heat events, by enabling transport and communications during times of emergency, or by supporting emergency services' response.

However, the intensifying nature of extreme events will place escalating demands on even the most resilient infrastructure and challenge the capacity of emergency services.[26] Communities must form realistic expectations of emergency services' ability to mitigate risk or respond in the face of catastrophe. This also means that communities and individuals must maximise their own preparedness for potential disasters, based on an informed understanding of the available emergency response. An inquiry into the 2019–20 Victorian bushfire season identified that, despite considerable progress, a challenge remains in ensuring people have a clear understanding of the risks they face.[27]

Community resilience is based on more than the infrastructure and services that support it. Resilient communities work together to cope with emergencies, to strengthen essential infrastructure and facilities so that support systems continue to function when needed. They stay informed, so they are better able to make decisions and take action before, during and after emergencies.[28] Victoria's shared responsibility approach to emergency management leverages local knowledge, resources and experience in emergency planning, and helps to develop community resilience.[29]

Recommendations to embed resilience

Infrastructure Victoria is making the following recommendations to embed resilience. They can also help climate change adaptation (see section 1.2). Elsewhere we make recommendations to improve the resilience of telecommunications infrastructure (see recommendation 85), make social housing suitable for changing climates (see recommendation 94) and create climate-adapted facilities for rural communities (see recommendation 90).

Recommendation 18

Invest in protection and adaptation for Victoria's coasts

In the next year, develop clear guidance on coastal adaptation planning, including thresholds, triggers, and planning guidelines to support local area decision-making. Invest in coastal protection upgrades and maintenance, including beach and dune protection and rehabilitation, and storm surge protection, over the next eight years.

Victoria's coasts are vulnerable to climate change, erosion, increasingly severe storm surges, rising sea levels and population growth.[30] Left unchecked, these events and activities will threaten residential, commercial, and industrial property, as well as essential public infrastructure.[31]

Victoria's culture is indelibly influenced by the coast. With 2000 kilometres of Victorian coastline,[32] almost one in five Victorians live near the coast, and 80% visit coastal areas each year.[33] Coastal areas drive regional economies, with contributions from ports, trade, fisheries and tourism. Coasts also have heritage value with complex histories and meaning, including places of natural significance and the past and present traditions of Aboriginal Traditional Owners.[34] Faced with rising sea levels and extreme weather, coastal communities will urgently need to adapt and make difficult decisions about when to protect or modify infrastructure, or when to retreat and let nature take its course.[35]

The Victorian Government's *Marine and Coastal Policy* guides decision-makers in the planning, management and sustainable use of Victoria's marine environment.[36] It outlines different adaptation actions to help manage climate change impacts on coastal communities, including by redesigning or enhancing protection of assets. It also considers retreating from threatened areas by relocating assets.[37] This usefully sets out a pathway approach to guide decision-making but fails to offer any guidance on what circumstances or thresholds should trigger a particular response.

At the same time, many of Victoria's coastal protection assets are in poor condition or are approaching the end of their life.[38] These include a mix of natural and built infrastructure to help protect against inundation and erosion, including sea walls, artificial headlands, dune management and beach nourishment. The Victorian Auditor-General found coastal asset maintenance has been reactive and not wholly effective, focusing on assets in the worst condition or repeating the previous year's activities rather than taking a risk-based approach.[39] Victorian Government agencies tasked with coastal protection have unstable and unreliable funding, causing more coastal infrastructure to degrade and extending maintenance backlogs.[40] For example, Parks Victoria costed its backlog at over $5 million for three years running.[41]

To support communities to proactively plan for coastal hazard risk, the Victorian Government should specify appropriate thresholds or triggers for each type of adaptation action under the *Marine and Coastal Policy.* Guidance should support local area risk assessment and decision-making on coastal hazards, aiding communities to implement the pathway approach to coastal adaptation planning outlined in the policy.[42] The implications for Victoria's statutory and policy planning framework can be considered to better manage new development and make any necessary changes in land use.[43] To further safeguard Victoria's coasts, the Victorian Government should commit at least an extra $30 million for coastal infrastructure maintenance and upgrades in the coming eight years. This would provide funding certainty for agencies involved in coastal protection, building on previous one-off funding commitments,[44] while allowing for more strategic management of coastal assets most at risk.

Coastal management and adaptation in Queensland and Western Australia

QCoast2100: coastal hazards adaptation program

QCoast2100 is a $13 million Queensland Government commitment to support local councils in proactively managing the risk to coastal development.[45] The program provides the funding, tools and technical support for coastal councils to prepare and implement adaptation plans and strategies to address coastal hazard risks.

The program has supported 31 out of 41 eligible councils to develop a *Coastal Hazard Adaptation Strategy* addressing coastal hazard risks related to climate change. It includes all 'at risk' major urban centres and more than 90% of the 'at risk' population along Queensland's coast.

Western Australia Coastal Zone Strategy

The *WA Coastal Zone Strategy*[46] is an integrated framework for coastal management and adaptation. Together with the *State Coastal Planning Policy*[47] and the *Coastal Hazard and Risk Management and Adaptation Planning Guidelines,*[48] it outlines Western Australia's approach to coastal planning and management, including the Western Australian Government's position on coastal protection measures to mitigate the impacts of coastal erosion and inundation.

The strategy stipulates that coastal protection works should only be undertaken as a last resort, when justified in the public interest to protect high value property and infrastructure, with funding based on a 'beneficiary pays' principle to minimise the risk to public funds. Wherever possible, existing developments should use planned or managed retreat. Where retreat is not viable, design approaches to accommodate risk should be considered.

Recommendation 19

Build back better after emergencies

In the next year, consider policy changes and funding mechanisms so high priority public infrastructure destroyed by emergencies is built to a more resilient standard or in less vulnerable locations.

Resilient infrastructure supports communities to withstand, respond to, and recover from the impacts of disasters, emergencies and extreme weather events. These events can destroy public infrastructure, showing its susceptibility to damage. From 2002–03 to 2010–11, about 1.6% of Australia's total public infrastructure spending was on restoring critical infrastructure after extreme weather events. Directly replacing Australia's critical infrastructure will need an estimated $17 billion from 2015 to 2050 due to the impact of natural disasters. Most of this cost will be borne by governments, and ultimately taxpayers, as owners of these assets.[49]

Community recovery and rebuilding after natural disasters is an opportunity to reassess the resilience of lost or damaged infrastructure, including its location and construction quality. The urgency to rebuild can overwhelm careful consideration of future needs, and insurance policies often only fund 'like-for-like' reconstruction. Infrastructure damaged by emergencies is clearly vulnerable. Simply replacing it does not increase resilience and risks the same damage reoccurring.

The Productivity Commission observes that governments overinvest in post-disaster reconstruction and underinvest in measures that limit these impacts in the first place. As such, natural disaster costs have become a growing, unfunded government liability.[50] Carefully targeted investment in resilience measures now will reduce government expenditure on natural disaster relief and recovery by more than 50% by 2050.[51] Infrastructure Australia has called for greater focus on resilience and infrastructure maintenance, noting the frequency and intensity of extreme weather events is increasingly likely to threaten certain assets.[52]

The Victorian Government should consider measures to enable resilience when rebuilding infrastructure destroyed in emergencies. It should also review agreements so insurance payments can be used to fund more resilient infrastructure rather than a 'like-for-like' rebuild. For example, roads could be rebuilt to be more resilient to flood or fire, or community and emergency services infrastructure could be consolidated in a safer place or built to a higher standard. This can help assure communities they will be less vulnerable, reduce emergency disruptions, and reduce recovery and reconstruction costs. This process should consider the standard and location of infrastructure in assessing vulnerability and compare the whole-life costs of building to higher standards with the future risk of damage and repair or replacement costs.

Similarly, the Victorian Government should consider the most appropriate mechanism to fund the costs of 'building back better'.[53] One option is a dedicated recovery betterment fund to supplement insurance payments so infrastructure can be rebuilt to a higher standard, or in a different location. This helps reduce the time it takes to source funding to cover the gap between replacement costs and more resilient infrastructure. For example, in response to the 2019 north Queensland floods, the Queensland and Australian governments established a $100 million fund to build better, more resilient, essential public infrastructure.[54]

Cost sharing between the Victorian and Australian governments for relief and recovery efforts following eligible disasters is governed by the Disaster Recovery Funding Arrangements 2018.[55] Urgent financial assistance is also provided using Treasurer's Advance funding.[56]

A review of the Disaster Recovery Funding Arrangements is underway, led by the Australian Government, which will consider how funding can be better used to improve infrastructure resilience during the rebuilding process.[57] Any new funding mechanisms should continue to include appropriate cost sharing arrangements between the Victorian and Australian governments.

Recommendation 20

Improve critical infrastructure information flows and embed resilience

Over the next five years, expand information sharing capabilities and embed resilience across and between critical infrastructure sectors and jurisdictions. Among mechanisms to achieve this, consider expanding the Victorian legislated definition of critical infrastructure beyond energy, water, and transport.

Critical infrastructure helps sustain human life and maintain wellbeing. During emergencies and disasters, it is the highest priority to keep communities safe and functioning. Critical infrastructure resilience refers to its capacity to function or be rapidly repaired during or after emergencies. Critical infrastructure systems, networks and supply chains are increasingly complex and interconnected. Disruptions in one sector can quickly affect others, causing serious cascading failures.

Recent emergencies show that a wide range of infrastructure is crucial to Victorian communities. For instance, telecommunications outages during the 2019–20 summer bushfires impeded rapid dissemination of information to communities at risk.[58] Similarly, the COVID-19 pandemic has tested the 'surge' capacity of health services[59] and showed the crucial function of food and grocery supply chains.[60] Emergency events do not respect geographical boundaries or organisational responsibilities. The 2019–20 bushfires highlighted difficulties in sharing information on critical infrastructure assets, particularly when managing cross-border fires. Critical infrastructure operators, sectors and governments limited or delayed sharing information, inhibiting a timely, coordinated response, and good recovery planning.[61]

The Victorian Critical Infrastructure Register provides a central record of the infrastructure that is most important to the functioning of the Victorian community, to allow for information to be accessed for coordination. However, some forms of infrastructure, like health, and information and communications technology (ICT), are not included. Access to the register is restricted. Deeper consideration should be given to allowing other appropriate agencies to have access, their ease of access, and the ICT systems and capabilities required to achieve this while still maintaining security.

The Victorian Government should improve information sharing capabilities across all critical infrastructure sectors and jurisdictions, building upon the existing Sector Resilience Networks. All critical infrastructure sectors should be required to consider resilience when building and maintaining infrastructure, as is currently the case for energy, water and transport, which are defined as an essential service in the *Emergency Management Act 2013*.[62] Without this requirement, communities are vulnerable to more widespread disruption and higher recovery costs.[63]

The Australian Government has proposed amendments to the *Security of Critical Infrastructure Act 2018* to bring 11 sectors within the scope of critical infrastructure, aiming to better respond to natural disasters and human-induced threats.[64] Once implemented, the Victorian Government should review its legislative definition of an essential service to reflect the broader range of infrastructure that is critical in emergencies, while seeking to avoid duplication of obligations for those sectors affected. Updates should encompass existing policy, governance arrangements, and decision-making mechanisms.

1.4

Embrace technology and innovation

Technology is increasingly important for everyday life, from the smart phone to apps and smart home appliances. Figure 6 shows the rapid increase of internet use by Australians. Technology has provided new ways to communicate, work, access services and connect socially.

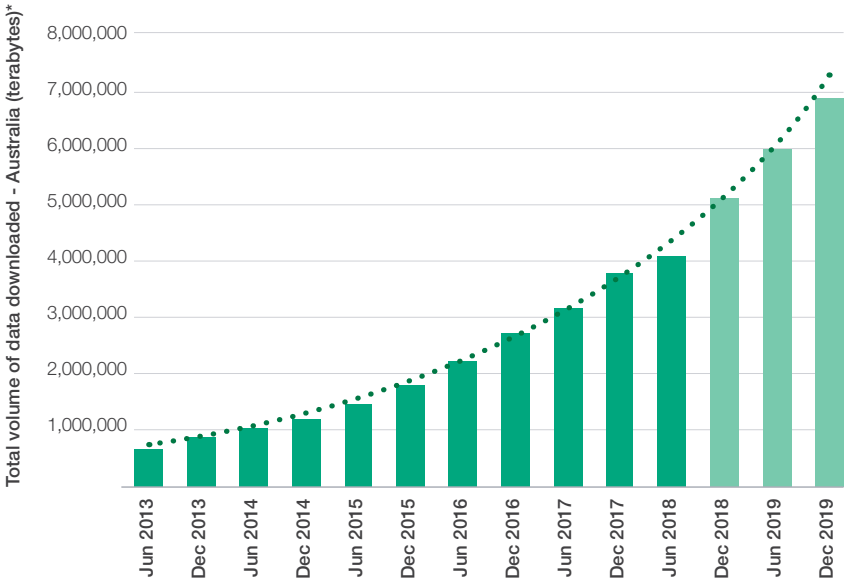
While the ways technology will continue to change people's lives over the next 30 years is unknown, our recommendations support Victoria to embrace technological opportunities to enhance efficiency and productivity, allow new industries to flourish, provide better access to services, and improve people's quality of life.

Rapid technological change accelerates innovation

Victorians adapted during the COVID-19 pandemic in ways previously not thought possible. In 2018, one quarter of Australians were unfamiliar with technologies such as digital education, telehealth, and on-demand transport,[1] but the COVID-19 pandemic hyper-charged technology use. Many businesses rapidly moved online, causing e-commerce to explode with record growth of 169.9% in Victoria in the year to August 2020.[2] This shows technology can facilitate rapid change, and that people can swiftly adapt.

Figure 6: Australians have rapidly increased their internet usage

This graph shows the rapid increase in data downloaded, with a seven-fold increase from June 2013 to December 2019. The graph shows data from the Australian Bureau of Statistics (ABS) from 2013 to 2018, when it switches to the Australian Competition and Consumer Commission (ACCC). Responsibility for collecting internet data use changed in December 2018 from the ABS to the ACCC. Note that ACCC data on the graphic is illustrative, and is not directly comparable to the ABS data.



We can retain and learn from many of the technological adaptations made during the pandemic. The growing practice of telemedicine and telehealth services can promote better access to health services, particularly in areas of regional Victoria where access to skilled medical specialists and health professionals is more challenging. Digital access can substitute for many face-to-face interactions including remote working, video-conferencing, and remote service delivery. It can potentially overcome many disparities, including limited transport access or distance.

Globally, technology is rapidly changing, driven by rising internet use, digitisation, smart technologies, and automation. Many new technologies with potential implications for infrastructure are developing swiftly, such as 5G mobile, artificial intelligence, automated and connected vehicles, drones, virtual and augmented reality, the `Internet of Things', and digital health and education.[3] They have immense potential benefits, with some estimating that digital innovation could deliver $315 billion in gross economic value to Australia during the next decade.[4]

Technology can change the infrastructure that Victoria needs. For example, automated vehicles could lead to significant network efficiency improvements that could mitigate congestion and boost economic growth.[5] This could mean redesigning road layouts and avoiding or delaying major infrastructure investments.[6] Other technology is still at early concept stage or is unproven, making it difficult to anticipate any benefits of supporting infrastructure. These may simply require monitoring technological developments, such as urban air mobility and hyperloop technologies.

New technology and applications are also increasing productivity, enhancing services, and promoting innovation. Technology can underpin new business models, such as using reverse osmosis to create drinking water, or using algorithms to closely match users and providers, such as in ride sharing. Technology can help integrate transport services, with public and private transport services combining to deliver affordable and sustainable choices and a seamless customer experience.

Sometimes allowing new technology to flourish requires regulatory changes. Regulatory shortcomings can impose costs on business and the community.[7] During rapid technological evolution, prescriptive regulation can stifle innovation. Instead, regulation focusing on outcomes, such as safety, can protect consumers while allowing innovation to flourish.[8]

Widespread adoption of rapidly advancing technology also has risks. For example, digital technologies need strong privacy safeguards and robust cyber security, so information is non-identifiable and stored securely. Cyber-breaches can erode community trust, and potentially discourage use or thwart innovation. Governments must also consider the fairness and ethics of automating public functions so the benefits of technology are equitably distributed and do not undermine labour standards.

In a hyper-connected world, individuals and families who cannot afford or are not able to access personal technology are at risk of deepening disadvantage. The social consequences of rapid technology change means governments need to focus on sharing the benefits widely. For example, people who can afford rooftop solar and energy efficiency upgrades are rewarded with lower bills and more efficient usage, while those who cannot end up paying higher energy bills. Our community panel on accelerating adoption of electric and low-emission vehicles identified major principles of a just transition, equitable access, and sharing knowledge.[9]

Technology can provide alternative service delivery methods

As business models change, so too can government services. Government providers can try different ways of working, including innovative models of health care, justice and policing services. Technology can transform government services, which in turn alters their infrastructure requirements. Digital technology can substitute for buildings. Health services demonstrated and expanded different ways of providing health care during the COVID-19 pandemic, without necessarily requiring more dedicated infrastructure, including by evolving telehealth, outreach services, and 'hospital in the home' arrangements.[10] Telehealth services complement in-person care by providing telephone and online health services, allowing easier and potentially earlier interventions. Over 56 million telehealth services were delivered and 83,540 providers used telehealth services nationally from 13 March 2020 to 21 April 2021.[11] An NBN Co survey also found 48% of respondents who needed to access a health service during the pandemic used a telehealth service, and 63% are willing to consider telehealth.[12]

Similarly, the COVID-19 pandemic drastically transformed the administration of courts and tribunals, which were required to change traditional protocols and procedures.[13] For example, virtual courtrooms allow many cases to progress without the participants needing to attend in person.

Technology and data analytics can help infrastructure perform better

Technology provides new ways of collecting and disseminating information about infrastructure and the services it supports. Technologies can create, collect, and analyse data, supporting more targeted interventions, superior service delivery models, and better asset management.

Victorians are increasingly using new technology to help manage their daily lives. Apps can show people how much electricity they use, count their steps, and support their budgeting goals. An Australian survey identified that 75% of respondents used the internet to download an app in 2017–18 and that 35% used one or more smart home activated tools in the same period.[15] Smart homes with Wi-Fi connected devices create an 'Internet of Things', allowing people to turn on televisions, lights and appliances by voice command, set timers, ask questions about the weather or even remotely check visitors at their door.[16]

Intelligent transport systems can communicate between private and public transport vehicles, and between vehicles and infrastructure. This has the dual benefits of reducing manual processes for managing traffic flows and responding more quickly to manage congestion and reduce queuing. Victoria already has limited dedicated traffic signals that prioritise movements of buses and trams. Traffic light synchronisation in Orange County, California, reduced overall travel times by 11%, the number of stops by 75% and greenhouse gas emissions by 7%.[17]

Case study

Embedded technology in bridges for better asset management

Victoria has thousands of rail and road bridges which need to stay structurally sound and safe for users. FiBridge is an innovative technology trial to improve management and maintenance of Victoria's bridges. Advanced fibre-optic sensors on rail and road bridges collect real time structural performance data and send the information back for analysis by asset managers. This can immediately identify anomalies in the bridge's condition. It can replace some in-person inspections, providing faster, cheaper, and more accurate condition reports. It can detect faults earlier, potentially averting disastrous bridge failures and helping target inspections and maintenance to the most needed places.[14]

Incorporating uncertainty into infrastructure planning

Planning for infrastructure in uncertain times is challenging. The exact evolution of technology is unpredictable, as is its impact on long-lived assets. Challenging assumptions can have a profound impact on predictions for infrastructure investment.

Scenario planning involves constructing multiple different projections under different assumptions. It improves understanding of the value of infrastructure investments in different possible futures. It also helps document the value of keeping options open under different possible circumstances, and identifies situations where infrastructure could become redundant.

Infrastructure sectors that undertake scenario planning are better prepared. For example, to help plan for the nation's electricity and gas needs, the AEMO has developed an Integrated System Plan, using several scenarios that represent plausible futures to assess risks, opportunities and development needs.[18] The electricity sector is experiencing considerable disruption from renewable and storage technologies, but the pace of growth is uncertain with national consensus still to be reached on greenhouse gas emission reduction aspirations. The Integrated System Plan identifies the infrastructure investments that hold the most value in different circumstances, and the potential impact of not investing.

Similarly, in preparing our *Advice on Automated and Zero Emissions Vehicles Infrastructure,* we modelled several scenarios based on different assumptions about the availability and use of transport technologies.[19] We prepared multiple transport and land use modelling scenarios in developing this strategy. We are also examining implications for Victoria's gas network infrastructure under different 2050 energy sector scenarios, providing our final advice to the Victorian Government by the end of 2021.

Having staged, incremental planning for infrastructure projects also helps to manage uncertainty. For instance, designing infrastructure to adapt as technologies mature keeps infrastructure resilient and investments productive. New and significantly upgraded infrastructure can consider its capability to be connected, including by embedding technology.[20] It can also assist infrastructure maintenance, recording its condition to support continuing safe and effective operation over its useful life.

Recommendations to embrace technological opportunities and innovation

Infrastructure Victoria makes the following recommendations to better position the Victorian Government to capitalise on technological opportunities and innovate in core service delivery. These are complemented by recommendations to unlock regional economic growth opportunities (see section 4.1) and keep regional Victorians connected (see section 4.2). Many other recommendations incorporate developments in new technology.

Recommendation 21

Prepare for increasingly automated vehicle fleets

In the next year, begin updating transport regulations to allow automated vehicle operation on the road network. In the next 10 years, upgrade roads and communications infrastructure to help facilitate increasingly connected and automated vehicles, particularly for corporate and government fleets. Develop policy, business case and land use planning guidance to maximise the benefits of automated vehicles and mitigate their risks.

Automated vehicle technology could radically change Victoria's transport system and alter transport demand patterns. It could deliver considerable benefits, including reducing road deaths and improving people's access to education, services, and social connections. But the technology is still evolving, and its transformative potential relies on private sector innovation and government preparedness to maximise its benefits, while minimising any adverse outcomes.

Many benefits of automated vehicles may be realised without government intervention, but the lack of national coordination could slow their adoption. The Victorian Government should take immediate actions to enable their use,[21] which also supports delivery of the *Victoria's Zero Emissions Vehicle Roadmap*.[22] The current regulatory framework for automated vehicles needs to be updated. The National Transport and Infrastructure Council agreed in June 2020 to a single, national approach to regulating automated vehicles on Australian roads. It includes a national regulator and a national law, supported by a general safety duty. This requires changing driving laws to support automated vehicles and developing a safety assurance system. The Victorian Government can expand the current permit scheme for automated vehicle trials, consistent with the national approach.[23] It can also change road maintenance and management practices and integrate automated vehicles into transport pricing.

As this regulatory change occurs, the Victorian Government should develop specific guidance for transport project business cases, accounting for the risks, opportunities and uncertainties posed by automated vehicles, including new ways to use and manage road space, consistent with real options analysis methodology.[24] For example, our *Advice on Automated and Zero Emission Vehicles* outlined scenarios where vehicle-to-vehicle communications means they can safely travel faster, and more closely together. This means existing road lanes could carry more traffic, deferring road investment and potentially providing more road space for others, such as cyclists and pedestrians.[25] Conversely, automated vehicles could lead to more traffic from empty running vehicles and more convenient car travel. This can be mitigated by encouraging public and active transport and implementing transport network pricing (see recommendation 53).

The Victorian Government should also allow flexible planning to support property owners and local authorities to adapt to automated vehicles. Immediate priorities include flexibility in statutory planning for car parking infrastructure and design standards to allow for retrofits. They also include introducing flexible kerb space in high density areas, so spaces better meet changing demand and usage patterns, as well as local transport and land use goals.[26]

New vehicle owners already benefit from increasingly automated features, including new safety features. Fleet operators are likely to adopt automated features earlier than others, due to their scale, and the potential fleet-wide efficiency gains and operating cost savings. This includes truck and delivery van fleet operators, bus and coach companies, ride-share and taxi companies, and corporate vehicle fleets – including those of the Victorian Government. These potential savings, and the opportunity to accelerate adoption of the technologies, means the Victorian Government should actively seek out opportunities for early deployment of automated vehicles. Areas with lower traffic volumes and fewer safety risks may be good locations for the testing and early deployment of more advanced vehicles.

Recommendation 22

Facilitate integration of public transport with new mobility services

In the next five years, develop open access ticketing platforms to facilitate integration of public transport modes with new mobility services, incorporating better data sharing and collection. Remove public transport contract barriers to allow integration of existing and emerging transport modes and services.

New businesses are using technology to disrupt traditional transport models. They are creating new ways for people to manage how they get around, reducing the need to own a car, consult a map or check a timetable. New mobility services can improve the ease and efficiency of using transport, providing a cheaper, seamless, and more attractive alternative to traditional car ownership.[27] Online platforms use artificial intelligence to match, schedule, dispatch, plan and buy transport trips – all through a single app. These services also streamline payment systems and data analysis,[28] and unlock opportunities for innovative transport service design and delivery.[29]

New mobility services can help people travel from transport hubs to their individual destinations more cheaply and efficiently than traditional public transport services. They may also be a prerequisite for maximising the benefits of automated vehicles, especially to facilitate efficient use of shared fleets.[30] If managed appropriately, technology offers the opportunity to build digital literacy through improved access to local transport services. This will especially improve mobility for people who cannot drive, or cannot afford to, including some people with disability or older Victorians.[31]

As these technologies develop, people will increasingly want to compare services offered by multiple independent providers across all modes – public transport, taxis, ride-share, bike-share, and even automated vehicles. Around the world, people can increasingly pay for multi-stage journeys in a single transaction through a single portal by selecting one or multiple combinations of different transport services, at varying prices.[32] This approach encourages people to monitor different transport prices, and respond by changing their behaviour, including if transport prices change to help manage demand (see section 2.3).

To successfully integrate mobility apps into the transport system, the Victorian Government should facilitate open, integrated payments across third-party purchasing platforms, ticketing, validation, and barrier systems for public transport.[33] This should be incorporated into the update of the ticketing services tender due in 2023. This will need to overcome the commercial issues of revenue allocation, including from public transport ticket sales. Third-party access to public transport ticketing means new mobility service providers can include public transport in their journey planning, booking and billing systems. As part of collaborative arrangements for third-party access, providers should also be required to share useful, de-identified data and information.

The Victorian Government should also ensure new contracts for public transport operators allow for changes to accommodate new mobility services. This includes an option for new mobility service providers to bid for the provision of local transport services currently provided by buses in metropolitan and regional areas. Current public transport contracts prevent new transport business from operating public transport-style services, stopping development of these options. Better data collection and sharing (see recommendation 40) will also assist the development of new mobility services. The Victorian Government could consider using a third-party firm for sourcing and collecting data.

Case study

New mobility services are operating around the world

Whim: Helsinki, Finland[34]

Whim is a Finnish mobile app designed to improve transport route efficiency and information transparency. It allows people to book and pay for transport in a single transaction and operates across multiple transport modes, including public transport, bike-sharing, share-cars, long distance trains and taxi services. The app is a user-friendly and engaging platform, and centralises transport information for the entire transport system.[35] Whim was the world's first mobility service to offer multi-transport ticketing across different services in one app.

polygoCard: Stuttgart, Germany[36]

The polygoCard is the primary online mobility service in Stuttgart, Germany. It is a multi-modal booking platform that includes many types of public and private transport. It works for public transport, and car and bicycle sharing services, including for electric vehicles. Monthly public transport ticket subscribers receive 30 minutes of free access to conventional bikeshare, a free 15 minutes of electric bikeshare and discounts on all other bikeshare tariffs, including cargo bikes. The polygoCard also integrates local library membership and provides access to many city services.

Based initially on a federal grant to promote new mobility integration, the polygoCard was developed collaboratively between the government and private sector, with over 23 partners involved in the initial design stage, including with traffic, science, consulting and software expertise. These partnerships incorporated knowledge of public transport options like Stuttgart's light rail, bus, S-Bahn and regional train services.[37]

arevo: Victoria, Australia[38]

The RACV has developed arevo, a free app. It allows people to schedule their journeys in one place, including public transport, ride-share, car, car-share, cycling and walking. It also provides public transport timetable and car parking information, can be used to top up myki cards, and provides public transport disruption notifications. Bookings are currently redirected to partner apps to finalise payment, but developers are looking to consolidate bookings into the platform.

Recommendation 23

Incorporate personal mobility devices in regulation

In the next two years, incorporate nationally consistent rules for personal mobility devices in Victorian legislation, update existing active transport design standards to better accommodate new devices and develop a statewide regulatory framework for shared mobility schemes.

New personal mobility technologies are rapidly emerging, like electric bikes and scooters. They can expand options for many short, local journeys. However, their unique operating characteristics combined with existing transport infrastructure design poses distinct challenges. Integrating personal mobility devices into the transport system needs comprehensive change to safely realise their full potential and reduce the risk of conflicts and collisions.

Different cities have had different experiences with shared mobility schemes. Conventional bike share schemes have flourished in some cities. But they floundered in others, including Melbourne. In the United States, trips taken on shared mobility schemes almost quadrupled from 2017 to 2019.[39] However, much of this activity has been highly concentrated, with six US cities accounting for 84% of all trips on station-based bike share schemes, and only three cities accounting for 40% of all e-scooter trips in 2018.[40] Device costs have fallen, potentially increasing consumer purchases, including reports of an increase in electric bicycle sales in Australia during the COVID-19 pandemic.[41]

Using more personal mobility devices could help improve Victoria's transport system. Over half of Melbourne's car trips are less than 6 kilometres long,[42] so mobility devices could help reduce road congestion. But only certain places in Melbourne have shared schemes, without any standard regulatory framework or design standards. For example, current electric bicycle shared schemes focus on inner Melbourne and nearby public transport stops. Individual operators strike unique agreements with different local governments, leading to different practices in each place, and no agreed process for new market entrants. This adds to local governments' regulatory burden, and effort is duplicated across councils.

As these devices have emerged, providers have become more familiar with consumer preferences, but regulation has not kept pace. Without reform, existing inconsistencies in Transport Accident Commission (TAC) coverage, particularly on shared paths, will be exacerbated.[43] Current personal mobility device legislation varies in different states and territories, often subject to ministerial exemption, potentially creating a confusing patchwork of regulatory systems nationwide.

The National Transport Commission (NTC) has proposed regulating personal mobility device imports using uniform device operating standards. It has also proposed national model legislation for modern, uniform road rules.[44] The Victorian Government should support a national regulatory approach and incorporate these rules for personal mobility devices into Victorian legislation in the next two years. It should also overhaul existing state-based active transport facility design standards to incorporate space requirements for secure personal mobility device parking and storage. This would create more consistent outcomes in public spaces.

The Victorian Government should develop a standard, statewide regulatory framework for shared mobility schemes. The framework should include a consistent enforcement approach to help reduce clutter and manage vandalism. It should also manage safety and crash risks, potentially requiring shared mobility schemes to make contributions to the TAC. The Department of Transport's *Movement and Place Framework* could be developed to help identify good locations for shared mobility scheme infrastructure, including by considering reallocating road space to accommodate them (see recommendation 41).

Recommendation 24

Introduce new road network demand management technology

In the next five years, progressively introduce new road network demand management technologies across the state and integrate management systems for different road-based transport modes. Combine them with a road infrastructure upgrade program to optimise the benefits of technologies, such as by providing extra clearways and introducing dedicated lanes for bus routes.

Technology and data analytics can help transport infrastructure perform better, making road operations more agile and responsive. Victoria's road network operations management technology is decades old and underperforming. Outdated, manually intensive and time-consuming ICT control and review systems manage trams, buses and the road network. This means many major routes are only considered once each decade, when traffic managers examine their performance, layout, and traffic signalling for efficient operation. Without intervention, network performance will decline as traffic and transport movements grow, and mobility options will require more sophisticated network management.

In the next five years, the Victorian Government should update the road network operations management system to better manage traffic flows.[45] As Victoria continues to grow, the existing road network will need to cater for most extra trips, increasing pressure on motorways and the arterial road network. The Victorian Government has begun funding better data collection and traffic light timing, but will need to do more to create a modern, integrated, multi-modal, real-time network operations system.[46] A step in achieving this is to integrate the separate road management systems so they can be managed together. Victoria can learn from successful Australian and international examples, such as the network-wide operating system upgrades underway to manage road networks in real time in Sydney[47] and the United Kingdom.[48]

More efficient road management improves safety, travel times and reliability, as shown in Figure 7. A modern system can maximise infrastructure efficiency, while allowing for scalable upgrades to progressively improve the whole transport network. It can use traffic lane technology to detect the location of buses, trams and emergency vehicles, and coordinate traffic signals to provide them a more reliable journey with potentially better travel times. It can also detect the presence of pedestrians to allow them enough time to cross the road safely or shorten or skip crossing cycles when no one is there. A modern system can identify road users by transport mode, including motorcyclists, detect unexpected incidents, adjust signals and information to divert traffic, change traffic patterns, and improve intersection performance.

In the next five years the Victorian Government should develop and apply modern technology so transport management systems can better coordinate all modes, including emerging modes, in real time. For instance, it can use 'managed motorway' technology, apply it to all transport modes, and use technology for better real-time communication with drivers. It should also apply technology to improve operational practices, such as better road rule enforcement, faster disruption responses, quicker road crash clearing, and better priority movements for emergency vehicles.

Consistent with international examples, our strategic assessment found improving road operations management can have very large benefits and relatively low costs.[49] Our modelling assumed that the system achieved an operation efficiency of just over 5% in the operation of many of Melbourne's arterial roads, resulting in much better travel times. Sensitivity testing indicates that even if only half of this efficiency improvement was achieved, the initiative would still be compelling.

Our modelling also combined the introduction of a new road management system with infrastructure upgrades that produce a more efficient road layout for private vehicles and public transport. This included implementing selected new metropolitan clearways and giving specific bus routes a dedicated lane.[50] The Bus Reform Implementation Plan, scheduled for completion by 2023, provides the ideal opportunity to integrate road management technology investment with bus network reliability and performance objectives.[51]

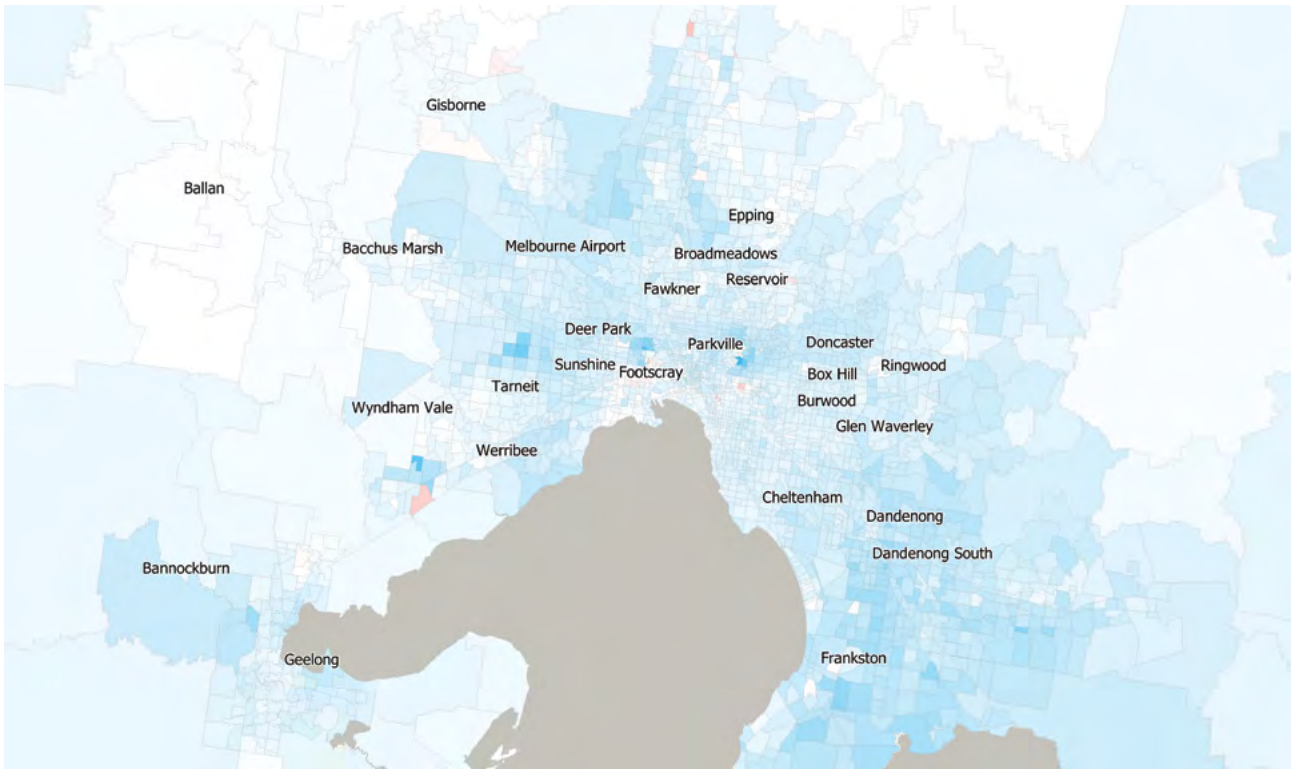
The Victorian Government should complement the introduction of new on-road demand management technologies with a program of infrastructure upgrades over the next five years to maximise its benefits. This can be combined with better driver education and road rule enforcement to help improve traffic flows. A road management system can also more readily help realise the benefits of 'Big Build' projects and the changes in travel patterns created by their completion. For example, after removing a level crossing, a road management system can alter traffic signal timings so cars can flow more freely after the improvement, and not simply get caught at the next traffic light.

A more efficient road network can also create challenges. Short-term congestion relief encourages more car use. This worsens congestion in heavily used areas over the long term, such as in inner Melbourne. Better travel times may encourage more people to live in peri-urban areas beyond Melbourne's urban growth boundary, and travel further to work.[52] To prevent these outcomes, the Victorian Government can plan to change the way the network operates to efficiently cater for increasing transport movements (see recommendation 33). This includes planning to use the technology to harness desirable benefits, such as reconciling competing demands for road space by different transport modes (see recommendation 41).

Modernising Victoria's road network operations management systems also provides an opportunity to integrate emerging transport services into the network such as new mobility services and automated vehicles (see recommendations 21 and 22) and move towards managed motorways.[53] In future, automated and connected vehicles will need to be connected to a management system to deliver maximum benefits. A modern system could communicate directly with them and provide updates on unexpected changes in traffic conditions and natural disasters, such as in the event of a road accident, new pothole, flooding or a tree falling across the road.[54]

Figure 7: Better road management systems have widespread benefits

This diagram shows that the benefits of better road management systems and use of technology are experienced across the Greater Melbourne road network.



Changes in private vehicle travel times, 2036

Given the strategic nature of the model used to illustrate these benefits, model noise can lead to small travel time increase anomalies.

Recommendation 25

Use innovation to deliver better models of health care

Within two years, help slow the growth in demand for hospital infrastructure by developing a comprehensive statewide health innovation strategy, supported by funding over five years to promote and progressively implement better models of health care.

Victorians enjoy one of the highest average life expectancies in the world,[55] thanks in part to the public hospital system. However, demand for hospital services continues to increase faster than the capacity to fund them.[56] Population growth, ageing and changing health needs mean hospitals may need to provide 80% more inpatient services over the next 20 years.[57] Building new infrastructure (recommendation 69) and upgrading existing facilities (recommendation 56) will be critical, but not enough. Even if hospital efficiency continues to improve at current rates, Victoria would need additional capacity equivalent to hundreds of new beds each year to meet demand, which is challenging and expensive.[58]

Systemic improvements to technology, service delivery and practice can help slow growing demand for more hospital infrastructure.[59] Innovative, integrated health care models can provide people, especially the elderly, those in remote areas and people with disabilities, greater choice and better access to quality services in their communities and own homes,[60] leaving hospital beds for the most complex and demanding cases. Victorian Government commitments to provide more at-home care, improved telehealth services, mental health hospitals in the home,[61] new community hospitals[62] and more local mental health services[63] are examples of ways pressure can be diverted from acute care.

The health sector is used to adapting to developments in medical science, technology, data and practice, but progress needs to be accelerated and innovations by individual providers scaled up.[64] Within two years, the Victorian Government should develop a clear, comprehensive and statewide health innovation strategy to promote systematic improvement and help slow the need for hospital expansion. This should promote better models of care, with clear pathways from local and primary care to more advanced treatment, focusing on early intervention and community services. The strategy should encourage improvements to business models, delivery and technology that improve service quality and capacity.[65] The strategy should also be revised regularly to reflect evolving best practice, in consultation with health providers, emergency services and other stakeholders.

The new strategy should establish priorities for, and be supported by, a dedicated fund that is released on completion of the strategy and incentivises the development and implementation of promising innovations and research.[66] The Victorian Government has previously used funds for health innovation, but these were small scale and the most notable – the Better Care Victoria Innovation Fund – concluded in 2020.[67] The new innovation fund should support a pipeline of projects at varying levels of readiness and risk, enabling pragmatic research, trials and the system wide deployment of new models of care. Digital health, remotely delivered cardiac services and cooperative models based on those used by Aboriginal community controlled organisations are areas stakeholders have told us may offer particular potential.[68]

The innovation fund should be overseen by an entity already responsible for health service planning and improvement to avoid duplication. It should also explore governance, project and resourcing synergies with the mental health and wellbeing innovation fund recommended by the Royal Commission.[69] It should be provided with an initial five-year budget, with an evaluation of the fund's effectiveness in the penultimate year to determine whether to continue beyond that timeframe.

Case study

Innovations that improved care and hospital efficiency

The health sector has a long history of capitalising on technology, research and emerging best practice to provide better patient outcomes and more efficient hospital services.[70]

Telehealth and telemedicine have enormous potential, including in regional areas where limited capacity and long distances can make it difficult for patients to access care. This was the case even before the COVID-19 pandemic. In 2016–17, Mildura Base Hospital used a telehealth model to connect its small intensive care unit to 24/7 support from specialists from the Alfred Hospital, the Royal Melbourne Hospital, and the Royal Children's Hospital.[71] Doctors were able to see patients in real time and assist personnel in Mildura with assessment and advice. Telehealth consultations allowed Mildura Base Hospital to provide care comparable to larger services, and reduced transfers of seriously ill patients to other facilities by over 21%, often to Melbourne, 500 kilometres away. It saved $300,000 in ambulance costs alone.[72] In 2019, the model was extended to hospitals in Bairnsdale, Central Gippsland, and Wimmera.[73]

Practical improvements to delivery of health care can have a major impact. In 2017 and 2018, 11 public hospitals implemented a clinical 'pathway' for the early management of sepsis, a life threatening response to infection that killed over 3200 Victorians the previous year. Initially piloted by the Royal Melbourne Hospital, the pathway established clear clinical criteria for diagnosis and immediate responses to reduce delays associated with varied practice. Standardising initial sepsis management had remarkable results. Patients were half as likely to die from sepsis, while admissions to intensive care fell by a third. The average length of patients' hospital stays decreased by 30%.[74]

Recommendation 26

Modernise courts through digitisation and contemporary shared facilities

In the next year, begin increasing court efficiency and help meet demand by digitising suitable court systems and procedures. Invest in new contemporary, adaptable, multi-jurisdictional court facilities during the next 10 years.

Victoria's courts are under pressure, especially in Melbourne.[75] Growing demand has been complicated by policy changes, such as for bail,[76] sentencing[77] and family violence, resulting in cases that are more complex and time consuming to resolve.[78] Capacity constraints and delays cause longer periods of uncertainty for victims, more time on remand for accused people, and greater overcrowding in remand facilities. The COVID-19 pandemic has caused significant case backlogs, particularly for complex and criminal proceedings.[79]

In response to the pandemic, the Victorian Government accelerated technology upgrades to courts to keep them operating, protect the health and safety of users, and increase access to digital hearing services.[80] Courts increasingly use remote testimony to reduce attendances for filing hearings,[81] and have taken steps to digitise document management. New legislation provides a legal basis for courts to hear more matters remotely.[82]

The Victorian Government should build on this digital transformation. Modern facilities and technology, virtual courtrooms and remote testimony can simplify court processes, improve convenience, and reduce litigation costs and infrastructure requirements.[83] The Victorian Government has provided funds to support digitisation of the Magistrates' Court and the Victorian Civil and Administrative Tribunal.[84] This investment will need to continue so more civil and non complex matters are conducted online to free up capacity for cases that must be held in person. Remote hearings can also reduce the need for expensive prisoner transport, which costs millions of dollars annually.[85]

The integrated case management system planned for the Magistrates' Court and the Children's Court[86] should be expanded to all courts. This would improve information sharing, enable digital document lodgement and record management, inform judicial decision-making, and support analysis of court processes.[87, 88] Online dispute resolution, already used by the Victorian Civil and Administrative Tribunal and Magistrates' Court,[89] should be extended to appropriate non-criminal, pre-trial and post-trial matters in other jurisdictions. All court and tribunal rooms should be enabled with reliable, secure and scalable internet and audio-visual links. In implementing upgrades, care must be taken so people without access to suitable technology or adequate digital literacy are not disadvantaged.[90]

Victoria will still need more, and more modern, court infrastructure. Many courts are constrained by inflexible, outdated assets and systems,[91] and a large proportion of buildings in Court Services Victoria's portfolio are over 50 years old.[92] The issue is most pressing in the central Melbourne legal precinct: Magistrates' Court assets are increasingly out of date,[93] while substandard fire and safety systems forced the Supreme Court to close facilities on Lonsdale Street.[94]

To increase court efficiency and meet demand, the Victorian Government should invest in contemporary, adaptable, multi-jurisdictional facilities in the next 10 years. The new Bendigo Law Court Redevelopment is an example of infrastructure designed to serve all jurisdictions and specialist courts, and supports digital evidence, video conferencing, Wi-Fi, and digital recording.[95] Central Melbourne is the most pressing priority, followed by renewal of aged facilities in the city's rapidly growing north and south. Targeted investment in regional cities experiencing increasing demand should be complemented by greater use of digital or alternative service channels (such as Justice Service Centres) for minor civil or tribunal matters, and the consolidation of underused or unsuitable facilities.[96]

Recommendation 27

Improve technology and infrastructure for a responsive police service

In the next 10 years, invest in technological capacity to better support a responsive police service, and deliver infrastructure to enable a contemporary hub-and-spoke policing model, co-located with health and human services where appropriate.

Victoria's police service faces challenging trends. Crime is increasingly sophisticated, while complex issues such as family violence, mental illness, and alcohol and drug dependence require closer cooperation with other agencies and jurisdictions. Community values and expectations continue to evolve, informing changes to legislation, legal processes, transparency and professional standards.[97] Emergencies like the catastrophic bushfires of 2019–20 and the COVID-19 pandemic will continue to periodically demand major commitments.[98]

Victoria Police's Service Delivery Reform program is an opportunity for new investments, including $300 million for system enhancements and reform,[99] to deliver a more responsive, visible and modern force.

Investing in new technology can aid more complex investigations. Analytics can identify lines of enquiry that accelerate and enhance investigations, while remote sensors can enhance situational awareness and the timeliness of police responses. Better visualisation and analytical tools, used by a skilled workforce, can improve assessment of disparate pieces of information. This can support intelligence activities through processing sensor data to identify hotspots, connect crimes and link offenders.[100] Police can use increasing capabilities of mobile devices to process and receive information outside police stations, enabling them to do their jobs effectively while being more visible in their communities.[101]

More flexible and dynamic business processes can support Victoria Police to be more agile. They can better manage, structure and store information, organise and assess data and evidence, support effective relationships with other government agencies and help maintain reliable central records. A priority opportunity is using web interfaces and social media to make it easier to connect with and receive information from the public, including victims of family violence who may feel unsafe speaking on a telephone. Information needs to be reliably accessed, in a relevant and useful format for the officer relying or acting on it.[102]

A more visible police presence in the community could encourage good behaviour, help prevent crime and harm, and improve feelings of safety.[103] Yet many current police stations are clustered in older suburbs away from places with high demand, and are infrequently visited.[104] Infrastructure investment can support a contemporary hub-and-spoke policing model that sees more police officers in the community, supported by more efficient corporate services and better links to other justice and human services.[105] Hubs can also support police services running from smaller contact points in mobile facilities, shopping centres, and community centres, which saves infrastructure costs.[106]

While not universally appropriate, delivering centralised hub stations in metropolitan Melbourne offers potential to enable police to respond to areas of greatest demand. These could be co-located with appropriate health and human services,[107] and build on the multi-disciplinary centres considered by the Family Violence Royal Commission.[108] An example is the $45 million Wyndham Police complex, which can accommodate hundreds of police and staff[109] and is a major pillar of the Wyndham Justice Precinct's integrated approach to policing, court, corrections, health and local government services.

1.5

Build a circular economy for waste and recycling

Reducing waste, reusing materials and recycling resources conserves valuable virgin materials, increases economic productivity, and reduces pollution and greenhouse gas emissions. With targeted infrastructure initiatives and the right policy settings, Victoria can meet growing demand for resource recovery and accelerate the transition to a circular economy.[1]

A circular economy shifts away from the 'take, make, use, waste'[2] approach to a 'closed loop' system. A circular economy aims to reduce the environmental impacts of production and consumption by avoiding waste, and reusing or recycling materials.[3] It creates commercial opportunities by improving the quality and quantity of valuable materials recovered from waste, reducing extraction requirements, increasing demand for recovered materials, and generating new jobs and skills.

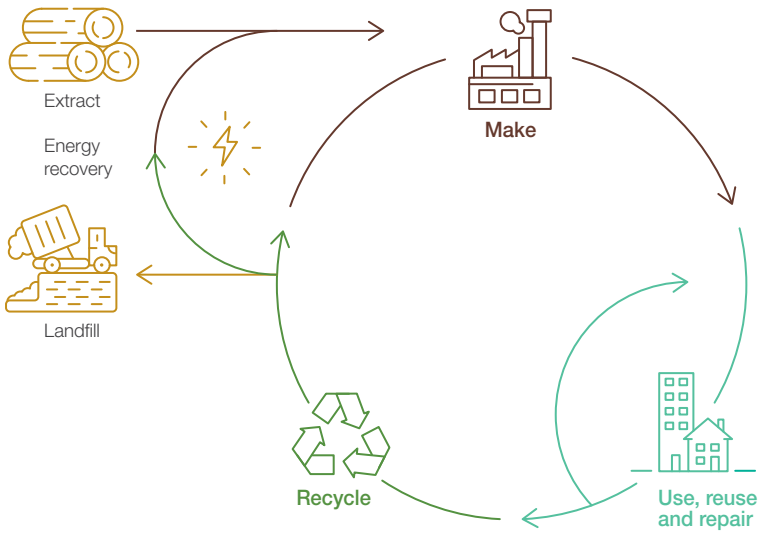
Figure 8: Resource flows in a circular economy[4]

This diagram shows the three principles of a circular economy:

1. Design out waste and pollution from products

2. Keep products and materials in use for as long as possible

3. Regenerate natural systems by redesigning food systems and recovering organic material.



Source: DELWP, *Recycling Victoria: A new economy,* State of Victoria, 2020, p. 9

In early 2020, the Victorian Government publicly committed to transitioning to a circular economy in its new policy framework *Recycling Victoria: A new economy.*[5] This policy proposes a new waste authority,[6] complements the national waste targets[7] and advocates for effective product stewardship schemes governed by the Australian Government.[8] Sustainability Victoria also released the *Path to Half* report in February 2021, prioritising solutions to reduce food waste by half by 2030.[9] In May 2021, the Victorian Government released *Victoria's climate change strategy* and its *Waste sector emission reduction pledge,* which reduces emissions and also reinforces the Victorian Government's commitment to halving food waste by 2030 and diverting 80% of waste from landfill.

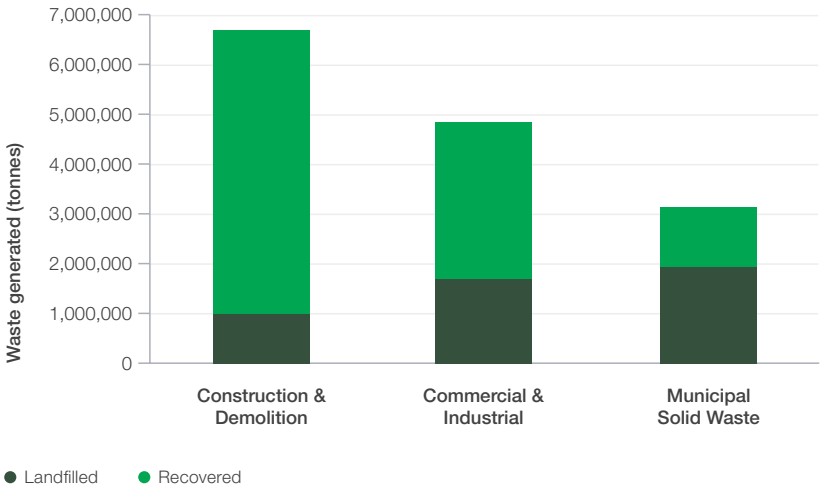
We estimate materials worth about $1.21 billion were recovered in Victoria in the 2018–19 financial year.[10] While the value of recovered materials will vary with commodity prices, this figure demonstrates the economic potential of higher rates of resource recovery, particularly if materials are processed and used locally. For every 10,000 tonnes of waste recycled, 9.2 jobs are generated, compared with 2.8 jobs for landfill.[11] Increasing Victoria's recovery rate from 69% to 90% could support as many as 5000 more jobs[12] in developing and producing high quality recovered materials for use in major infrastructure projects, manufacturing and agriculture.[13] Many of these jobs would be in regional Victoria.[14] If household waste was recycled more efficiently, the economic benefits for Victoria over 20 years could be as much as $3.6 billion.[15]

Victoria's waste has untapped potential

Despite past objectives to transition to a circular economy and recognition of the waste hierarchy,[16] Victoria is producing more waste today than ever before. From 2000 to 2018, waste generation doubled from 7.4 million to 14.4 million tonnes each year. About 30% was buried in landfill. Resource recovery rates have stagnated at just under 70% of total waste, with international market changes and weak local recyclable material markets causing significant stockpiling and landfilling. The actual recycling rate may be significantly lower than this because the ultimate fate of recovered materials is often unclear.[17] The recovery rate is higher for some materials, such as 90% for metals, and lower for others, such as organics at 43%, and plastics at 23%.[18] Figure 9 shows that waste recovery rates are relatively high in the construction and demolition sector, but much lower for municipal waste.

Figure 9: Municipal resource recovery rates are the lowest

This graph shows that in 2020, the construction and demolition and the commercial and industrial sectors recovered more solid waste than sent to landfill, but more municipal waste was sent to landfill than recovered.



Source: Infrastructure Victoria, *Advice on recycling and resource recovery infrastructure,* Melbourne, VIC, Infrastructure Victoria, 2020, p. 46

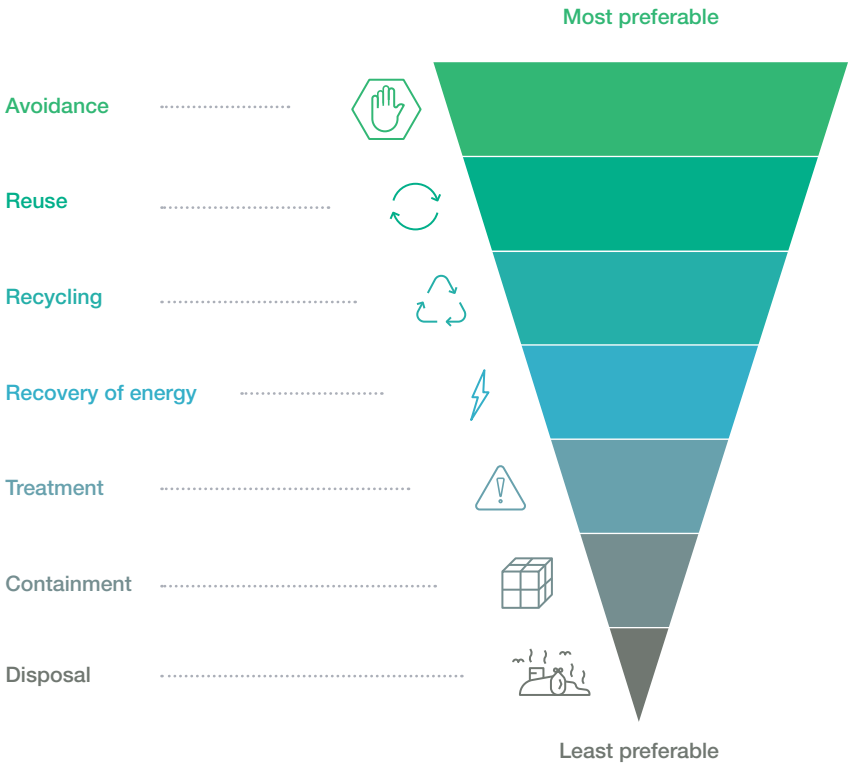
Meeting the ambitious new targets in the Victorian Government's new waste and recycling plan will require significantly more waste reduction and increasing recycling in accordance with the waste hierarchy shown in Figure 10.

In 2017–18, Victoria exported 12% of material recovered for recycling,[21] but many destination countries no longer accept it without meeting strict standards. By 2018–19, the quantity of materials exported for recycling had fallen by 11% compared with 2017–18, as exporters could not find overseas markets.[22] These changes caused global prices to plummet, particularly for paper, card and plastics. Without enough local processing capacity, some facilities closed or stockpiled material, and several councils were forced to send their recycling to landfill. Sending potentially reusable materials to landfill, waste stockpiling and illegal dumping all pose environmental and public health risks, such as past stockpile fires in Melbourne, which caused damage to the sites and surrounding areas.[23]

The Council of Australian Governments (COAG) agreed to progressively ban waste exports from 1 January 2021. Without immediate planning for and investing in local infrastructure to recycle more materials to local and global market standards, Victoria will have significant capacity and capability shortfalls for recycling paper and cardboard by 2024, followed by a shortfall for plastics in 2025. Similarly, Victoria's capacity to manage recovered organics and e-waste will be exceeded by 2025 and 2030 respectively.[24] Table 1 shows that Victoria will not meet its recovery targets for paper and cardboard, plastic, and organics from 2025 to 2039 without more investment in local recycling infrastructure and capacity and e-waste recovery targets will not be met in 2030 and 2039.

Figure 10: Avoiding waste and reusing material are the most preferable approaches[20]

This diagram shows the waste hierarchy, with avoiding waste the most preferable, following by reuse and recycling and the recovery of energy. Treatment and containment are less preferred and disposing of waste is the least preferred.



Source: Infrastructure Victoria, *Advice on recycling and resource recovery infrastructure,* Melbourne, VIC, Infrastructure Victoria, 2020, p. 44

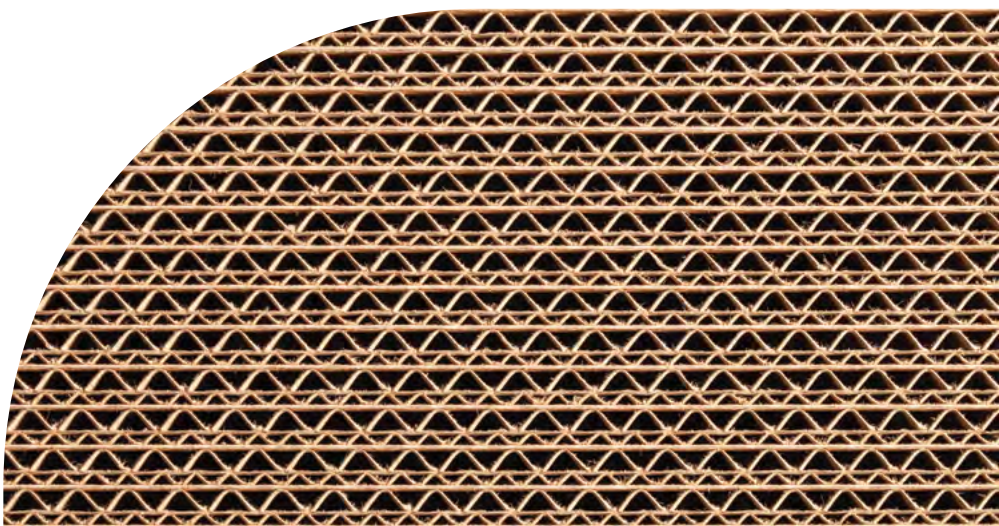


Table 1: Current processing facilities cannot meet future COAG targets for all materials

Priority material	2025 (COAG ban & 70% recovery rate)	2030 (80% recovery rate)	2039 (90% recovery rate)
Paper and cardboard	✗	✗	✗
Plastic	✗	✗	✗
Organics	✗	✗	✗
E-waste	✓	✗	✗
Glass	✓	✓	✓
Tyres	✓	✓	✓

Source: Infrastructure Victoria, *Advice on recycling and resource recovery infrastructure,* April 2020, p.49

In April 2020, we delivered our advice to the Victorian Government on the infrastructure required for, and the role of government in, supporting a more sustainable resource recovery and recycling sector.[25] This advice informed government action, and the release of a new plan for waste and recycling.

We found $1 billion in infrastructure investment from government and the private sector could transform Victoria's resource and recycling sector to recover up to 90% of waste by 2039, cutting emissions, reducing reliance on virgin materials, and limiting impacts on the environment. This would require 3.1 million more tonnes of processing capacity. Supporting actions would be needed for the infrastructure investment to be successful, including governance changes, market development, and changes to community and business behaviour.

Waste-to-energy has a role in managing non-recoverable or non-recyclable waste. Energy recovery is a better outcome than disposal to landfill, but Victoria should still prioritise waste reduction, reuse, and recycling. Waste-to-energy solutions higher on the waste hierarchy, such as anaerobic digestion of organic materials, are higher priority than incinerating mixed residual waste. Waste-to-energy solutions will require careful management to avoid risks, such as demand for feedstock creating perverse incentives to generate more waste, or undermining improvements to reuse and recycling options.

Governance can reshape investment opportunities

The Victorian Government sets objectives, makes policies, regulates the recycling and resource recovery sector, monitors and evaluates performance, and makes infrastructure plans. It can facilitate and leverage private investment to achieve its objectives.[26] It can also help develop the new markets that recycling industries need for long-term sustainability.[27] Local government manages household waste collection, disposal and recycling. Water corporations manage the removal and treatment of wastewater and sewage.[28]

All governments should encourage a sustainable recycling and recovery industry, but their roles often overlap and are not always clearly defined. Legislative and regulatory gaps, uncertain funding, and lack of clarity about roles and responsibilities can make long-term planning difficult and prevent the sector functioning efficiently.[29] Different recycling services in different local government areas, driven by complex and varied waste management approaches,[30] have contributed to confusion and material contamination.

A few private firms own, operate and fund most of Victoria's recovery and reprocessing infrastructure. This has curtailed competition, innovation and investment, and made the sector slow to respond to local and global market changes.

Harmonising Victoria's policy and strategy to improve recycling and resource recovery with applicable legislation and regulation could provide significant benefits.[31] Our research into jurisdictions with high performing recycling and resource recovery systems, such as Wales, Germany, South Korea and South Australia indicated the foundation of success is an overarching policy framework for waste, recycling and resource recovery. It includes long-term commitments and multiple interventions across the material value cycle. Policies, planning and performance monitoring need to be appropriately funded, adapted over time and supported by targets that incentivise performance.[32]

Victorians are willing to change their behaviour

Victorians are passionate about recycling. In late 2019, we surveyed 1000 people about household waste. We found most want to do the right thing. The vast majority feel it is important to reduce landfill waste, consistently recycle when provided with a kerbside recycling bin, and almost all are willing to change the way they sort rubbish.[33] But about a quarter thought the content of recycling bins ended up in landfill, and a similar proportion were unsure of the correct bin to use.[34] Victorians told us they want a simple, consistent system which supports the benefits of recycling.[35]

In the long term, a genuinely sustainable approach will require changing behaviour.[36] In 2018, only 39% of household waste was recovered, with the rest sent to landfill.[37] Victorians can make a real difference if supported to reduce waste and improve household waste recovery rates through separation of different materials. Food waste is a particularly big opportunity.[38]

Over one-third of household waste is food, almost all of which can be reprocessed,[39] but instead most goes to landfill. The commercial and industrial sector also sends significant food waste to landfill. Food waste comprises 19% of all material buried in landfill each year, creating significant greenhouse gas emissions and pollution.[40] A well-promoted, carefully designed system could capture as much as 70% of food waste[41] and reduce emissions.[42]

Recommendations for a circular economy

Building on our previous advice and considering progress since then, Infrastructure Victoria makes the following recommendations to help Victoria transition to a circular economy. While our circular economy recommendations focus on waste and recycling, our recommendations on climate change, transport, and energy also support moving towards a circular economy. For example, they include increasing the use of stormwater and recycled water (recommendation 13), increasing electric vehicle adoption (recommendations 1 and 2), and augmenting energy transmission for renewable energy (recommendation 3).

Recommendation 28

Facilitate improved recycling infrastructure for priority materials

In the next year, focus efforts to increase and upgrade waste processing infrastructure on six priority materials. Facilitate increased recovery and reprocessing capacity and capability for paper and card, plastics, and organics by 2025. Revisit funding mechanisms and align recycling infrastructure with land use settings.

Victoria's recycling and resource recovery system currently lacks the capacity and capability to process recovered materials to a standard that would allow them to be reused locally or exported for reuse overseas.[43] There is a particular need to improve the recovery and reprocessing of plastics, paper and cardboard, glass, organic materials, tyres and electronic waste.[44] These six materials are generated in large volumes, have relatively low recovery rates, pose significant environmental risks if improperly managed, and present economic opportunities for metropolitan and regional areas if their sorting and processing is improved.[45]

The Victorian Government should facilitate the development of new and upgraded recovery and reprocessing infrastructure focused on these six priority materials.[46] Our *Advice on Recycling and Resource Recovery Infrastructure* sets out the specific infrastructure requirements,[47] based on current and projected waste generation, existing infrastructure capacity and capability, and regulatory and policy changes by the Victorian and Australian governments. Our research determined 87 new or upgraded recovery and reprocessing facilities will be needed by 2039, 52 of which should be located outside of metropolitan Melbourne – indicative locations include Ballarat and Geelong.[48] Greater capacity to reprocess organic material, plastics, paper and card is particularly urgent, as Victoria does not have the capacity to meet the 2025 targets for these materials agreed by the Council of Australian Governments in the *National Waste Policy Action Plan.*[49]

While processing facilities are owned by the private sector, the Victorian Government can assist by establishing objectives, identifying emerging infrastructure gaps, facilitating and leveraging public[50] and private investment and providing funding to the sector to achieve targets and improve environmental performance.[51] The *Statewide Waste and Resource Recovery Infrastructure Plan* was developed to guide infrastructure provision, but capacity and capability gaps remain.[52]

Long distances between waste sources and end markets add transport costs that make recycling economically unviable in some instances, particularly in regional Victoria.[53] Locating a significant proportion of new and upgraded processing infrastructure in regional areas would allow those areas to process materials generated locally and from Melbourne and provide products, such as compost for agriculture, to local users with lower transport costs.[54] The Victorian Government has allocated funding to accelerate construction of recycling infrastructure in Victoria's regions.[55]

The Victorian Government should update the *Statewide Waste and Resource Recovery Infrastructure Plan* to support integrated systems[56] and implementation with land use planning, economic development initiatives and resource strategies. It should strengthen the status of the *Statewide Waste and Resource Recovery Infrastructure Plan* in the Victoria Planning Provisions so waste management and planning decisions are coordinated between different governments.

In January 2021, the Victorian and Australian governments announced a joint $46 million recycling infrastructure initiative. To date, seven projects have received funding totalling $8.1 million.[57] The Australian and Victorian governments will also invest a combined $24 million, with Visy Industries contributing an additional $13 million, to fund Australia's first drum pulper to recycle Victoria's waste paper and cardboard at the Coolaroo Paper Mill.[58] The Victorian Government should review the effectiveness of its existing funding mechanisms for co-investment in recovery and reprocessing infrastructure and trial new approaches. Improved approaches could include the use of auctions, bid schedule tenders, rebates, subsidies and low interest loans.[59]

Recommendation 29

Strengthen end markets for recycled materials

Continue to deliver market development for recycled materials by updating standards and specifications to be performance-based rather than material-based, and explicitly require the Victorian public sector to use recycled products where feasible. In the next five years, support research, development and demonstrations to build confidence and demand for recycled products.

The supply of recyclable materials has not been matched by demand for them.[60] More reliable markets for priority materials – recyclable glass, plastic, paper and card, organics, tyres and electronic waste – would support economic development, help address the stockpiling of recovered materials, and reduce Victoria's reliance on landfill. Markets for these materials vary substantially, presenting different challenges for each material. Ongoing research and development can help to identify new potential uses for recycled materials, either as direct substitutes for virgin materials or for new uses. A $30 million Recycled Markets Acceleration package will support local manufacturers and attract new manufacturers in making new products using recycled materials.[61]

The Victorian Government should continue work to remove the barriers to strengthen markets for recycled materials. Other than facilitating infrastructure (see recommendation 28), the Victorian Government should also improve the safety, environmental value, confidence in, and authorisation to use recycled products. The Victorian Government should prioritise working with the industry to develop clear, standardised approaches to communicate recycled content information in products. Existing industry approaches for product disclosure could be facilitated and promoted.

The Victorian Government's *Recycled First* policy requires contractors to preference recycled materials and to justify using virgin resources. This should be expanded beyond its current limited scope that only covers major infrastructure projects. The Victorian Government should update its *Social Procurement Framework*[62] to more explicitly require public sector agencies to use recycled materials, building on the requirement to use recycled content in construction.[63] It should collaborate with local councils and the Australian Government to jointly promote public sector use of recycled materials.

The Victorian Government and responsible agencies should embrace performance-based specifications and standards for materials, such as specifying levels of fatigue or cracking. This prescribes the outcome required, and allows industry to determine compliant inputs, including recycled products.

In collaboration with the Australian Government, the Victorian Government should continue targeted research and demonstration activities for each priority material to alleviate product-specific challenges, such as applying organic materials to land and using recycled plastic in packaging. Previous collaborations have increased the use of recycled materials in roads and railways,[64] and transport infrastructure remains an area of further potential.[65]

Recommendation 30

Address barriers to recycling and reducing waste

In the next year, reduce recyclable material contamination by supporting greater consistency in kerbside and commercial collection and separation of glass, paper, cardboard and organic materials. In the next year, design and implement behaviour change programs to reduce contamination, and consistently maintain further behaviour change programs in the next 30 years.

Over 90% of Victorians are open to putting more effort towards managing their waste.[66] A simple, consistent sorting and collection system can reduce contamination and improve recycling quality, helping the community and businesses to understand recycling's benefits.[67]

Contamination occurs when people dispose of items in the wrong bin. Contaminated recycled materials have lower market value, in turn reducing investment incentives in reprocessing and recycling infrastructure.[68] Improving source separation and consistency in waste collection is essential for reducing contamination. Contamination rates in Victorian municipal solid waste averaged 10.5% in 2018–19, with different council areas ranging from 3% to 29%.[69] Not all councils accept the same materials in recycling collections, due to differences in what local processors will accept, and bin lids differ in colour and meaning across the state.[70] These differences confuse people and contribute to contamination. Infrastructure Victoria commissioned polling suggesting a quarter of people with co-mingled kerbside collection are unsure which bin to use.[71]

The Victorian Government has provided over $86 million to local government to deliver the new four bin service with standard bin-lid coverings for household collection. The Victorian Government should continue to deliver on Recycling Victoria's commitment to implement a clear, consistent, statewide approach to kerbside collections, supported by greater separation of materials – including organics, glass, paper and cardboard. This should include requiring local governments to standardise bins for household collections, advocating for and supporting the review of the *Australian Standard for Mobile Waste Containers,* finalise delivery of the announced container deposit scheme,[72] and establishing a minimum service standard for local government waste services for greater collection consistency.[73]

The Victorian Government should consistently invest in behaviour change programs to encourage waste minimisation, contamination reduction, and purchase of more recycled, reusable or compostable products. Current waste education focuses on handling waste after generation, rather than avoiding its production. It is generally provided in an unplanned way, and underfunded compared with other government campaigns, limiting behaviour change effects.[74] Making recycling simpler, easier and more consistent also supports more effective behaviour change programs.[75]

Limited coordination and sharing of behaviour change campaign materials between the Victorian Government, local governments and industry makes disseminating simple, consistent messages complicated. Partnerships between governments and industry should develop these messages, supported by Victorian Government management and funding. Statewide messaging should allow for nuance where needed, such as in different regions, or in culturally and linguistically diverse communities.[76] Program monitoring, evaluation and consumer research should inform continuous program improvements.[77] To the maximum extent possible, programs should be integrated with relevant industry and national packaging and labelling initiatives, such as the Australasian Recycling Label and National Packaging Targets, and leverage consumer behaviour research from the private sector.[78]

Recommendation 31

Minimise waste and improve residual waste infrastructure planning

In the next two years, improve infrastructure planning for managing residual waste, and further clarify the role of waste-to-energy facilities. Over the next 30 years, consistently invest in waste avoidance through behaviour change programs, pricing, regulation and other incentives.

A circular economy means using materials for as long as possible. Residual waste is material that cannot be viably recycled or reused. Currently almost all residual waste is buried in landfill. This is the least preferable outcome on the waste hierarchy, as all remaining value of these materials is lost. Energy can be extracted from materials that are no longer useful, using thermal and biological waste-to-energy facilities as an alternative to landfill.[79] This recovers some value, reduces greenhouse gas emissions from organic waste and reduces landfill's long-term environmental impact. Waste-to-energy also has a role in contributing towards water sectors emission reductions.[80] For example, sewerage is converted to biogas at the Western Treatment Plant to meet most of its electricity needs[81] and Greater Western Water's waste-to-energy facility will reduce the plant's greenhouse gas emissions by about 900 tonnes annually.[82]

The Victorian Government should increase and accelerate efforts to minimise waste production across all sectors through facilitating collaboration,[83] behaviour change programs, pricing, rules and regulations (including planning or operational permits), and other incentives. Waste avoidance is the best way to manage waste. If Victoria continues on its current trajectory, residual waste is projected to increase from 4.4 million tonnes in 2017–18 to 5.7 million tonnes in 2037–38.[84]

The Victorian Government should improve monitoring of the production, composition and destiny of residual waste with better data collection, analysis and reporting. Victoria needs enough planned landfill and waste-to-energy capacity to manage its residual waste. Landfill will always be a part of waste management systems and is especially important for contingency planning. The *Statewide Waste and Resource Recovery Infrastructure Plan,* aims to minimise waste going to landfill and planned for no new metropolitan landfill sites. Waste-to-energy can support this goal by keeping existing landfill capacity for unrecoverable materials.

The Victorian Government should strengthen infrastructure planning to manage residual waste through the *Statewide Waste and Resource Recovery Infrastructure Plan.* Waste infrastructure planning should account for integration across waste streams,[85] options to co-locate infrastructure,[86] and the changing generation and composition of residual waste. Infrastructure planning for residual waste should explicitly consider landfill as well as waste-to-energy facilities. Waste-to-energy processes generate residual materials which, unless used elsewhere, will go to landfill. Landfill planning should include the potential need to manage these residual materials.

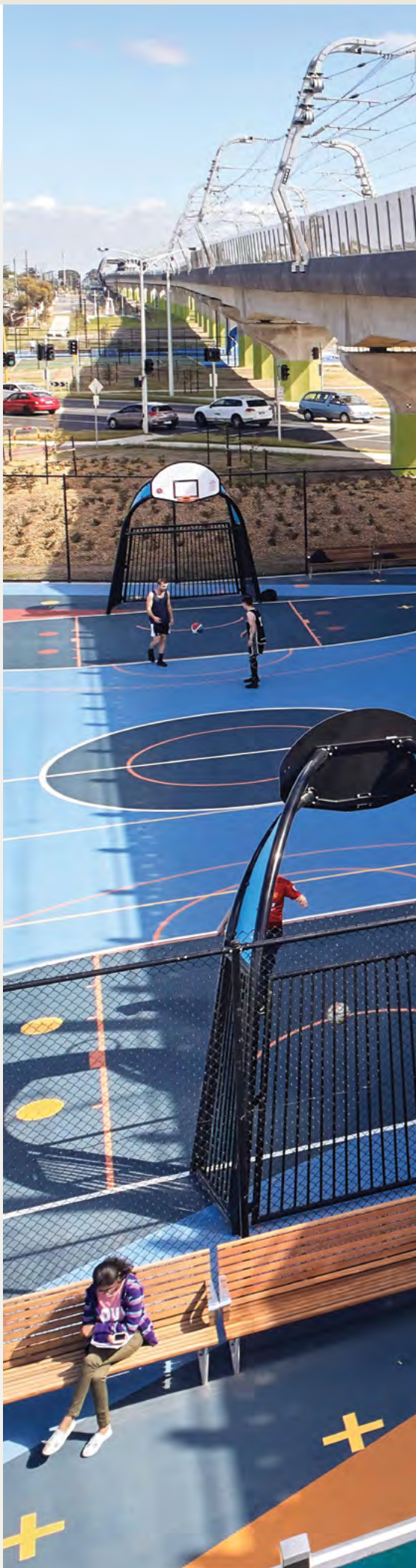
Victoria should be looking to link its strong agricultural sector with renewable energy and recycling by using waste (domestic, commercial and agricultural) to create on-demand renewable energy with bioenergy, biomass and composting facilities.[87] The Victorian Government should give effect to Recycling Victoria's commitment to develop a waste-to-energy framework.[88] Clear policy is necessary to achieve desired outcomes and mitigate against risks, such as feedstock demand creating perverse incentives for more waste generation, undermining reuse and recycling improvements. The Victorian Government should regularly review the cap of 1 million tonnes per year on the amount of waste that can be used in a thermal waste-to-energy facility in Recycling Victoria.[89]

Manage urban change

Section 02

Victoria's population and economy have grown quickly, putting pressure on land use and infrastructure. The COVID-19 pandemic temporarily slowed this growth. Population and economic growth should resume in the medium term, and continue to increase over the next 30 years. The Victorian Government can make decisions now that prepare Victoria to better manage growth and avoid the problems of the past.

Fortunately, most of the infrastructure required to meet future needs already exists. If better used, integrated, priced and managed, this existing infrastructure can meet demand faster, more cheaply, more equitably, and with fewer environmental impacts than most new construction projects.



Planning reform and transport infrastructure can affect people's preferences and choices about where they live. Integrating land use and infrastructure planning can create better urban environments, enhance economic performance, support more inclusive communities and minimise ecological impacts.

Government decision-making alone does not determine the shape of urban environments. Individuals, families and businesses make housing and location choices, considering affordability, safety, amenity, neighbourhood characteristics, and access to education and employment.[1] Business needs determine desirable locations, including market access, land costs, worker availability and transport infrastructure.[2] Effective government interventions consider and are influenced by these decisions.

Victoria's cities and regions must reflect that people, and their aspirations, are different than in the past and may continue to change. People have different needs, more diverse family structures, cultural heritage, career options, service needs and housing choices. A changing economy and society also alter people's choices, behaviours and preferences. These characteristics will continue evolving, including from the effects of the COVID-19 pandemic.

Land use planning and regulation, together with infrastructure planning and delivery, can affect the location choices of people and businesses. Planning reform and transport infrastructure can affect people's location preferences and choices, in turn affecting patterns of economic and social activity and movements that affect people's daily lives. For example, they influence the economy's productivity, job creation, road congestion, public transport crowding, and the location of new homes and businesses. Integrating land use and infrastructure planning can combine these forces to create better urban environments, deliver superior economic performance, support more inclusive communities, and minimise ecological impacts.

Many established suburbs of Melbourne can accommodate more homes in better locations, with plentiful access to jobs, services, and good transport connections.[3] Better integration can draw upon their existing infrastructure. By understanding community needs, and carefully investing in supporting infrastructure and upgrades, these established places can add more homes, and be sustainable and inclusive communities.[4]

Similarly, Victorians can better use existing infrastructure if demand for it is managed. People can be encouraged to use infrastructure more when it has spare capacity and be rewarded for curtailing unnecessary use when it is under strain. Prices can send strong signals that influence behaviour and help manage demand. This can vastly reduce the need to build new infrastructure and provide better services.[5]

As Victoria grows and changes, land for building infrastructure will become scarcer and more expensive. It will increase the cost and complexity of infrastructure projects and multi-unit housing developments. The noise and disruption of these projects will affect more residents. Improving the management of existing infrastructure by investing in strong asset management capabilities – the cycle of procurement, construction, maintenance, repair, renewal and disposal – means Victoria can use infrastructure more effectively for longer, and ultimately achieve better value for money.

Photography by Peter Bennetts, Designed by ASPECT Studios

Insight

Encouraging more homes in established areas can mitigate outwards expansion

Melbourne has only five million people, but is geographically the 29th largest city in the world.[6] If planning for major infrastructure sectors is not integrated with clear policy directions for the future location of jobs and housing, the Victorian Government may not meet *Plan Melbourne's* aspiration for 70% of new housing to be built in established suburbs by 2051.

We have undertaken detailed modelling of several scenarios and found that technological changes reduce the need, cost or the inconvenience of travel. This includes scenarios featuring:

- More working from home
- Deployment of automated vehicles
- Implementing better road management systems.

These scenarios could encourage more Victorians to move outwards into Melbourne's new growth areas, and peri-urban and regional locations. By 2051, Melbourne's metropolitan area could potentially extend from Torquay to Wallan to Warragul. Regional cities face similar pressures for outward expansion. While these changes may increase housing choice and make new growth and regional areas more attractive, continued outward expansion will have social, environmental and economic costs.[7]

Infrastructure costs two to four times more in greenfield than established areas to support new housing, and major transport infrastructure connections to new suburbs in Melbourne and regional cities are very expensive. Faster expansion of greenfield areas requires faster delivery of new infrastructure in those places, including for transport, social infrastructure and utilities. For example, faster outward expansion could place pressure on energy infrastructure, especially if people use electric vehicles, and charge them in peak periods.

In new suburbs, new residents also move in far more quickly than new jobs are created, and these local jobs do not always match their skills or training. And the land on which new suburbs are built is no longer available for other productive uses like agriculture.

While some Victorians may always want to live in new suburbs, our research and modelling show more people may choose to live in existing suburbs when they provide more housing choices with good access to transport, employment, services and recreation. Decisions by governments, including the infrastructure projects they fund and the land use settings they apply, affects the relative attractiveness of these different places. This section of this strategy sets out priority infrastructure policies, reforms and projects to make the most of opportunities in established urban areas.

2.1

Integrate land use and infrastructure planning

Integrated land use and infrastructure planning is a powerful tool which can influence the shape, structure, and economic, social, and environmental performance of a city. Population growth creates demand for more homes, and new residents require access to utilities, roads and public transport, employment opportunities, shopping, entertainment, and health, education and community services. New infrastructure and growing communities also attract businesses and employers, creating demand for further residential, commercial and industrial construction. Better aligning land use and infrastructure planning can improve Victoria's urban development, creating a sense of place that improves social outcomes, sustainability and adds economic value.

Integrated approaches promote higher productivity, greater social interaction and a more sustainable urban footprint. Planning land use and infrastructure together encourages development in places that can accommodate growth and where the required services and infrastructure can be delivered.

Integration means planning together

Integrated land use and infrastructure planning can better manage change in communities and unlock greater benefits. It can deliver a shared aspiration for a city or region and help coordinate investments and policy reforms to achieve that vision.[1] A more integrated approach promotes higher productivity, greater social interaction and capital, and a more sustainable urban footprint. It supports better local outcomes for communities by providing the right infrastructure at the right time, including essential social infrastructure and transport connections to the things people need.[2] It can also support protection of sensitive areas such as water catchments.

Integration means collaborating to achieve common objectives for urban efficiency, sustainability and equity.[3] It requires different governments and agencies to understand the multiple objectives each are trying to achieve and to transparently observe, understand, contribute to, and support one another's plans. Each organisation can incorporate this knowledge in revisions to their plans to better align their efforts.

In the past, Victorian governments have been reluctant to publish long-term plans which commit them to infrastructure projects. However, the benefits of publishing these plans outweigh the risks. Being transparent about the planning process builds community, business and local government confidence, allowing them to make decisions and investments that align with and enhance government plans.[4] Publication increases opportunities for collaboration between agencies, with other levels of government, and with the private and not-for-profit sectors. Planning land use and infrastructure together means development is encouraged in places that can accommodate growth, and the required infrastructure and services are delivered sequentially when needed.

As Victoria grows and changes, building and modernising infrastructure will become more complex. Land in large cities is scarce and expensive, and development and construction become more complicated over time. Integrated planning identifies underused infrastructure, reveals opportunities for co-location,[5] and considers how infrastructure upgrades can be combined to lower costs and limit disruption.[6]

The Victorian Government's infrastructure pipeline provides many opportunities for better integration with land use and between infrastructure sectors. The Level Crossing Removal Project has integrated open space into its delivery and provides other supporting transport solutions. For example, the Caulfield to Dandenong rail project adds 17 kilometres of continuous pedestrian and cycling paths along with open and community spaces.[7] The Suburban Rail Loop project also seeks to better connect people to jobs and services, and will require inter-agency and inter-governmental coordination to plan for land use changes and different future infrastructure demands.

Insight

Revitalising central Dandenong using integrated land use and infrastructure planning

Revitalising Central Dandenong is a long-term initiative seeking to transform Dandenong into a vibrant and thriving economic hub.[8] It uses land use and infrastructure together to produce better outcomes for the area.

Dandenong was part of the Transit City Program which sought to restructure parts of Melbourne by focusing on higher density, mixed use developments around major transport nodes. In 2005, the Victorian Government invested $290 million, and the City of Greater Dandenong invested around $100 million over 10 years in revitalising central Dandenong.[9]

Alongside changes in land use planning controls and the transfer of some planning powers to the Minister for Planning, Places Victoria (now Development Victoria) and the City of Greater Dandenong made many significant investments to transform the centre, including:[10]

- Redeveloping the Dandenong Market
- Acquiring land next to Dandenong station to redevelop into homes[11]
- Widening streets and extending a bridge to improve access to the Dandenong city centre
- Realigning major east-west arterial roads to remove traffic from nearby streets and encourage pedestrian use
- Building new government offices, including for the Australian Tax Office and a Victorian Government Services Hub
- Building new municipal offices with an integrated library, civic plaza, green space, and a giant screen
- Transforming the city's main street to a green, pedestrian-friendly boulevard
- Improving pedestrian and cycling links between Dandenong station and the city centre
- Constructing a new multi-sports court stadium.

Place-making requires a sustained effort over a long time. Revitalising central Dandenong contributed to many positive changes in the area including:

- A near doubling of people living in Dandenong
- A fall in unemployment
- Increased density, with units and terraces increasing as a proportion of all homes.[12]

The revitalisation has created more government office space, upgraded infrastructure, facilitated private sector investment, and significantly improved community infrastructure and public spaces.

Victoria can learn from examples elsewhere

Victoria is not alone in grappling with integrated land use and infrastructure planning. Around the world, governments face challenges in planning infrastructure for populations that grow, change, and move over time. Leading examples of better integrated planning use similar processes and practices, even in places with radically different institutions. Common governance arrangements include strong laws that mandate collaboration, transparent decision-making and published plans, strong community consultation and engagement, and a public-facing coordinating institution that facilitates inter-agency cooperation.

For example, Metro Vancouver is a federation of 21 municipalities, one electoral area and one Treaty First Nation that collaboratively plans for and delivers regional-scale services.[13] *Metro Vancouver 2040* is the region's growth strategy, pursuing land use policies for regional development and efficiently providing transport, regional infrastructure and community services. It is legally required to 'promote human settlement that is socially, economically and environmentally healthy and makes efficient use of public facilities and services, land and other resources'.[14] An update of the plan is currently underway alongside a regional transport strategy update.[15]

Similarly, legislation requires the Mayor of London to develop a spatial development strategy, known as the London Plan, alongside a transport strategy, a housing strategy and an environmental strategy. All strategies are publicly available and required to be consistent. The London Plan details how 'housing, social, economic, cultural, environmental and transport policies tie together to achieve maximum impact'.[16]

In Australia, the New South Wales Government set up the Greater Sydney Commission to coordinate and align planning to shape Greater Sydney's future. The Greater Sydney Region Plan[17] identifies three integrated and connected cities to rebalance Greater Sydney and place houses, jobs, infrastructure and services within easier reach of more residents. It was prepared alongside the NSW Future Transport Plan[18] and the NSW State Infrastructure Strategy.[19]

Victoria can learn from these examples, and others, to improve the integration of its land use and infrastructure planning and delivery.

Around the world, governments face common and unique challenges in planning infrastructure for populations that grow, change and move over time. Victoria can learn from the examples of other jurisdictions to improve and inform their planning and delivery.

A new approach can overcome current challenges

Fragmented decision-making, ambiguous responsibilities and undisclosed plans hinder integrated planning. Taking an isolated, sector by sector approach 'can lead to siloed planning and infrastructure decision-making, inconsistent outcomes, and unintended consequences for places and communities'.[20] The absence of effective collaboration arrangements and transparency means that plans often only achieve narrow agency goals, and miss opportunities to deliver broader benefits. It can also duplicate effort, cause extra disruption and generate unexpected changes in communities.

Integrated land use and infrastructure planning has been a Victorian Government goal for some time. For example, it is specifically mentioned in the *Transport Integration Act 2010*[21] and Victorian planning strategies such as *Plan Melbourne.* However, it is still not always evident in practice.

For instance, *Plan Melbourne* was developed without a corresponding transport plan. The Victorian Auditor-General's Office has identified many other examples where better integration could have delivered better results. These include delivering better transport infrastructure in growth areas,[22] better delivery of maternal and child health, kindergarten services and related infrastructure,[23] and fewer delays, frustrations and risks.[24]

Inadequately integrated planning can also mean revenue is not available for services or to fund infrastructure construction and maintenance. Infrastructure in Victoria is funded from different sources, including user charges, infrastructure developer contributions, and Australian, Victorian and local government budgets.

If infrastructure construction, operation and maintenance is not properly costed and revenue sources identified, it can have unexpected impacts on the Victorian Budget, and potentially conflict with the Victorian Government's fiscal policies and objectives. Good integrated planning means identifying funding and revenue sources so enough funding is available when it is needed.

New technologies and software combined with shared data and mapping can also assist in streamlining planning processes and integrating land use planning and infrastructure. For example, 'Digital twins' are a virtual representation of a system and can combine datasets from transport, utilities, property, planning and the environment to help foresee potential infrastructure barriers to development, and forecast impacts of development proposals. The Digital Twin Victoria program is seeking to support better integrated planning and decision-making, facilitate co-design of scenarios to inform decision-making, avoid duplication of effort and data, streamline approval processes and reduce the costs of maintaining assets.[25]

Infrastructure Victoria has conducted detailed research into better ways to improve infrastructure and land use planning in established areas for growth and renewal. In this research, we focused on population-serving infrastructure provided by the Victorian Government, local governments and the private sector. This includes schools, libraries, community facilities, open space, sports grounds, swimming pools, social housing and utilities. More detail on this research is available in the technical paper *Growing together: The case for better integration of land use and infrastructure planning in established areas*.

Recommendations to support integrated land use and infrastructure planning

Infrastructure Victoria makes the following recommendations to help integrate land use and infrastructure planning. We also make specific recommendations about integrating land use and infrastructure planning in established suburbs (see section 2.2) and growth areas (see section 3.4).

Recommendation 32

Produce public plans for priority infrastructure sectors

In the next five years, develop and publish long-term statewide infrastructure plans for priority infrastructure sectors for which the Victorian Government maintains substantial responsibilities, including sequencing and timelines for investment.

Current infrastructure planning approaches are inconsistent, lack mechanisms to actively coordinate investments and services, hamper local government planning and investment, and frustrate private and not-for-profit investments.[26] Existing infrastructure planning is compartmentalised, and does not support or encourage agencies and departments to find synergies, combine funding and synchronise infrastructure delivery.

Integrated land use and infrastructure planning requires a willingness to discuss options openly and transparently as a priority, long before final commitments or budget decisions are made. Only when agencies make their ideas transparent to others can the process of integrating decisions begin. Agencies cannot work together to align their decisions if they do not know what others are planning. Governments and the private and not-for-profit sectors cannot align their decision-making to invest and support government objectives.

To better integrate land use and infrastructure planning, the Victorian Government should prepare and publish long-term statewide[27] plans for priority infrastructure sectors in the next five years. At a minimum, these should include the following sectors, for which the Victorian Government maintains substantial responsibilities:

- Transport infrastructure, including all transport modes (see recommendation 33)
- Health infrastructure, including hospitals and other health facilities
- Social housing and social services facilities
- Education, including schools, TAFE and early childhood facilities
- Justice and emergency services infrastructure
- Water and sewerage infrastructure
- Recycling and resource recovery infrastructure.

These plans should include sequencing and timelines for infrastructure decision-making and investment, and be informed by the Victorian Government's *Victoria in Future* population projections, existing infrastructure plans, current land use policies and early engagement with local government.[28] This would require the Victorian Government to develop greater comfort with sharing ideas before final commitments are made. The plans should take account of changes in policy priorities and technologies.[29]

Clear plans allow other agencies, local government, important stakeholders including Aboriginal communities,[30] and the private sector to align their decisions.[31] For example, they can help identify the best locations for land use zone changes (see recommendation 35), acquisition of land for infrastructure, and inform development contributions (see recommendation 34). The delivery of infrastructure plans could be overseen by an infrastructure monitoring body (see recommendation 72).

Recommendation 33

Publish Victoria's transport plan

In the next year, develop and publish Victoria's integrated transport plan. Require the transport and strategic land use plans to align with each other.

Victoria does not have a publicly available integrated transport plan. The *Transport Integration Act 2010* requires the Victorian Government to prepare a transport plan,[32] but does not require this to be published. Infrastructure Victoria is unaware of a single, integrated document fulfilling the transport plan requirements of the *Transport Integration Act.*

Without a transparent transport plan, the proposals for addressing transport challenges and forward planning intentions are not clear. This can make integration with land use planning challenging. Victorian Government agencies, local governments and the private sector are unable to collaborate on transport planning, and cannot capitalise on opportunities to coordinate their investments in the infrastructure required for growing communities. Local governments, who manage most of the streets across the network, cannot plan local infrastructure properly without visibility of connections to the wider transport network,[33] while industry is unable to confidently identify emerging long-term freight and logistics challenges.[34] The Auditor-General observes that the Victorian Government's transport reliability performance indicator does not clearly state what is being measured or how.[35]

A public, integrated transport plan would support the Victorian Government to effectively prepare for growth and change, demonstrate good public sector governance, and build community confidence.[36] Transport planning can influence access disparities, carbon emissions and pollution, anticipate future transport technologies,[37] and create a common blueprint for transport investment against which to assess potential projects and policy changes. Infrastructure projects are increasing in size and complexity and their outcomes depend on the quality of planning and decision-making.[38]

In the next year, the Victorian Government should develop and publish a transport plan that meets *Transport Integration Act* requirements. Concurrently, it should require the transport and strategic land use plans, including *Plan Melbourne* and the eight regional growth plans, to align. The transport plan should include:

- All transport modes, including motor vehicles, motorcycles and scooters, freight, public transport, active transport (walking and cycling), and emerging personal mobility and transport services
- Aligning network development and operating plans for different modes and networks, including translating these into road and rail network operating plans
- Planning, prioritisation, asset management, and route and service infrastructure standards, including for roads and rail, buses, trams and trains, ticketing, data, network management, and information and communications technology capacity and capability
- Major service and policy changes, including initiatives that manage demand, sustainability requirements, and sequencing and timing for delivering new transport infrastructure
- Alignment with endorsed, strategic land use plans, including adopting the same time horizon (while *Plan Melbourne* and regional growth plans have 30-year horizons, publication dates mean the former considers the period to 2050[39] and the latter looks out to 2041[40])
- The approach and consequent changes required to support emerging transport technologies, how these align with the wider transport network, and measures to mitigate unintended consequences
- How policies, reforms and projects combine to achieve the Victorian Government's transport and broader objectives, including economic growth, social inclusion and intergenerational equity
- Achieving net zero emissions and climate adaptation, under the *Climate Change Act.*[41]

Transport planning must be agile and adaptable to changing conditions and show how network changes already underway can combine to achieve better outcomes. The transport plan should also fully address relevant and agreed recommendations in this strategy, and be regularly reviewed and updated to reflect changing needs.

Recommendation 34

Review Victoria's infrastructure contribution system to cover gaps

In the next two years, complete a review of Victoria's many infrastructure contributions schemes to create a consistent and efficient system that contributes to Victorian and local government infrastructure costs. A revised infrastructure contribution system can apply more broadly, including in established suburbs, growth areas, peri-urban areas, and regional cities.

Up to 80% of Melbourne's new homes are built in established suburbs.[42] Other areas, including peri-urban areas and regional centres, also have high housing growth. Established areas need investment to support more homes or greater commercial development, particularly if infrastructure needs to be upgraded or augmented, or land needs to be acquired for infrastructure expansion.[43] For example, when existing facilities can no longer accommodate extra demand in rapidly growing established suburbs, the Victorian and local governments must buy land for new schools, open space and community facilities.[44] Depending on the location and extent of growth in peri-urban areas, they may also require upgrades and new infrastructure similar to new growth areas.

Infrastructure contributions schemes are widely used in new growth areas but are less common in established Melbourne suburbs, regional centres, and peri-urban areas. Arrangements can be complex, time consuming, inflexible and inconsistent.[45] A patchwork of inconsistent infrastructure contributions schemes can disincentivise development, with developers avoiding areas where they would need to make contributions.[46] Contributions could also suppress development in the places where it is preferred. The New South Wales Productivity Commission found New South Wales, infrastructure contributions system to be overly complex, with disparate special contributions and missed opportunities to capture value uplift around major projects.[47] The New South Wales Government accepted the Productivity Commission's recommendation to include a contribution for state infrastructure.[48]

Outside new growth areas, infrastructure contribution schemes are managed by local governments and are largely used for local government infrastructure. Unlike the Growth Areas Infrastructure Contribution (GAIC), which has had mixed success in contributing to funding state infrastructure,[49] infrastructure contributions usually do not fund Victorian Government infrastructure.[50] Infrastructure costs outside new growth areas fall more heavily on the Victorian Budget.

The Victorian Government should complete a review of Victoria's infrastructure contributions schemes. Informed by this review, a consistent, efficient and transparent[51] contributions system should be implemented with a clear scheme for the level of infrastructure costs to be collected from developers. The system should apply to areas with significant housing growth or new commercial development.[52] It can help fund local and Victorian Government infrastructure required to support population and commercial growth (see recommendation 72). Broad coverage could keep charges relatively low and predictable. The revenue can fund infrastructure priorities to support and manage growth.

The revised contribution system could impose a charge on sites with extra dwellings or commercial floorspace and need not be limited to individual precincts. For example, it could extend to all subdivisions that create more dwellings. The revised system should be able to be readily implemented, and have strong monitoring, oversight and evaluation mechanisms, including set review timeframes. If it generates contributions at similar per-home rates as the GAIC, a new system could raise many hundreds of millions of dollars annually.[53]

2.2

Create thriving urban places

Building more homes in established suburbs can bring substantial benefits, if managed by the right land use policies, settings and models of infrastructure delivery. It can reduce public infrastructure costs,[1] and reduce encroachment into valuable agricultural and environmental land from development. Building more homes near public transport and employment centres improves physical activity levels by encouraging walking and cycling.[2] More housing choice can support more diverse communities that include people of different ages, abilities and cultural backgrounds, and help create a sense of safety and belonging.

Building more homes in well-located areas also generates broader productivity effects, connecting people and businesses more readily. Closer connections mean businesses can more easily find customers, access workers and share more knowledge and resources.[3] Concentrated, specialised and diverse businesses compete more fiercely, adapt more quickly to economic shocks, and generate fertile ground for innovation in ideas and technologies.[4] These drivers create more jobs and businesses, improve productivity, and give people more opportunity to find jobs using their skills and talents.[5]

Building more homes in established areas can bring substantial benefits. More housing choice can support more diverse communities and enhance social inclusiveness and connection.

Better infrastructure and land use planning can produce better outcomes

Plan Melbourne, and its preceding metropolitan strategies, aim to facilitate the supply of more homes in places with good infrastructure and amenity.[6] It aims to create local neighbourhoods where people can access most of their everyday needs (except work) within a 20-minute walk, cycle or public transport trip.[7] Yet only a quarter of new homes in Melbourne are built in identified activity centres[8] with good access to services, public transport, and jobs.

Beyond *Plan Melbourne's* identification of six 'places of state significance that will be the focus for investment and growth',[9] no public Victorian Government document clearly specifies the established suburbs where extra new homes might be built, or how many might be built there. This can mean home-building in established areas occurs in a haphazard and disparate fashion, with only small numbers of extra homes built or new homes being built wherever possible, including places with limited access to services. Inadequate prioritisation and planning of places for more intense development can lead to local disputes, especially in relation to medium and high density development. From 2011 to 2017, more than half of projects with six or more dwellings were referred to the Victorian Civil Administrative Tribunal for decision.[10]

Inflexible or restrictive land use settings can also discourage more homes being built in well connected places where existing infrastructure can accommodate much more housing. We undertook modelling to investigate the effect of relaxing land use planning requirements in carefully selected locations in Melbourne, around train stations and along transport corridors.[11] This also meant overall private motorised vehicle trips were lower than comparable scenarios, as people living in these areas are more likely to walk or cycle to their destination. It also resulted in more public transport use, as more residents live in areas with good public transport services.[12] Even with more use, public transport was also less crowded as trips were shorter.[13]

Building extra new homes in less well-connected places, or without the right infrastructure, can cause problems. For example, building more homes in places with limited public transport access increases local traffic congestion. Short trips by private vehicles contribute significantly to localised congestion that can have cumulative and flow-on effects across the transport network.[14] Pollution and noise from increased traffic also negatively impacts health and wellbeing, air quality and social interaction, and produces greenhouse gas emissions. Careful consideration of local transport needs in densifying communities can reduce these impacts, by improving walking, cycling and public transport options.

The delivery of the new Suburban Rail Loop is an opportunity to use integrated transport and land use planning to deliver benefits for Melburnians. The project will shape the city for many years to come. Its planning and delivery can help the Victorian Government progress its transport objectives, and also promote economic growth and residential development in priority locations (such as near planned stations) and a more sustainable urban footprint for Melbourne.[15] Our community research on 'density done well'[16] (see Insight box) reveals that it is not necessarily building more homes in established areas that causes community anxiety. Rather, people want to maintain and improve the quality of their local area and ensure the extra infrastructure needed to accommodate more residents will be delivered. If done well, the construction of more homes is paired with quality urban design, diverse commercial opportunities, and community services, walkable, safe and green open spaces, good public transport, and choice of affordable housing options.

Insight

The community's view of 'density done well'

Infrastructure Victoria worked with community members around Melbourne to understand 'what does density done well look like?' We sought to gain insight into the values and principles important to communities around increasing urban density and using existing infrastructure. This occurred through two stages of consultative workshops with a diverse group of participants from three established Melbourne suburbs. We selected Heidelberg, Camberwell and Footscray, as these suburbs have good public transport and mixed density levels. Some participants were randomly selected, and others self-selected, to ensure a mix of experiences and views.

The first stage focused on small group discussions for each suburb on questions like: 'what is density done well?', 'what makes a great place?' and exploring how communities perceive density in the local urban area. The second stage brought the three groups together to identify common values and principles when considering 'density done well'.

There were different views among the participants, but the main message was that people are willing to embrace greater density under the right conditions. The group delivered nine agreed themes for what makes 'density done well'.

The nine themes, in order of relative importance are:

01. Quality urban design

02. Public transport

03. Housing affordability and choice

04. A good public environment

05. Pedestrian friendly access

06. Accessible places

07. Community safety

08. Inclusion

09. A mix of uses and diversity of things to do

The full report is available at infrastructurevictoria.com.au[17]

Infrastructure can help create sustainable, inclusive communities

Places need to cater for the people who live there and evolve with those communities as they change over time. This includes meeting the needs of people at different life stages – children, young people, adults, families, and older Victorians. It involves providing for the whole community, including people with low and high incomes, and a diversity of abilities and skills, cultural needs, and genders. It can recognise the inclusion and self-determination of Victoria's First Nations people, and help Close the Gap in outcomes for Aboriginal Victorians. Rapidly changing neighbourhoods, including established areas experiencing construction of many new homes, need to cater for diversity, and make new people welcome.

The design of communities can physically limit people's participation in education, work, community, culture and civic life. Building and modifying infrastructure for accessibility and creating easy to navigate environments can make a significant difference. This includes supporting Victorians as they age, people with disabilities, and their families, friends, and carers. It also makes urban environments easier to navigate for everyone, including people with prams and strollers, and those using shopping trolleys or carrying luggage.

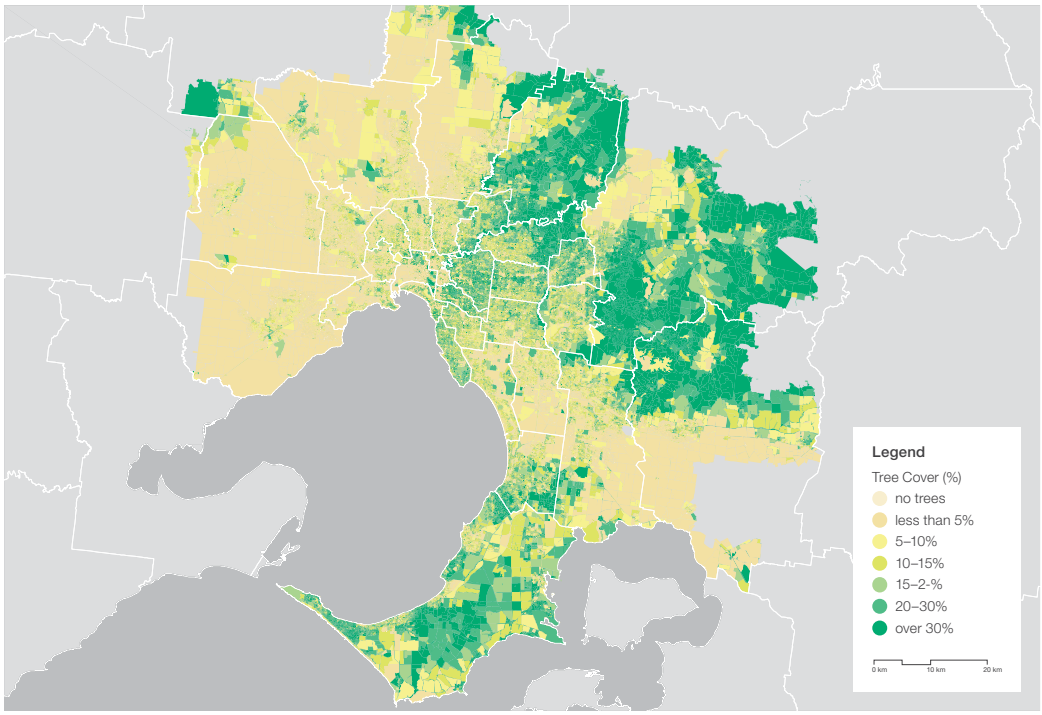
Places with good access to jobs, services and amenity are often highly valued by potential home buyers and investors, and often have higher land prices as a result. Construction of higher density housing also often requires high land values so developers can achieve a reasonable return on their investment.[18] These factors often mean that rapidly densifying established suburbs do not produce much housing affordable for people on low incomes. At the same time, many Victorians cannot find housing they can afford, with more than 140,000 Victorian households experiencing rental stress in 2017–18[19] with that number potentially higher since the COVID-19 pandemic. It is these same households who can most benefit from better access to jobs and services.

Desirable places to live have good amenities, services and infrastructure, including environmental infrastructure such as open space. Open space takes different forms, from bushland, water courses and parklands to sports fields, racetracks and utility reservations.[20] Population growth and development activity is causing private outdoor space to decline in some places,[21] leading to more reliance on public open spaces. Restrictions during the COVID-19 pandemic highlighted the importance of easy access to green and public open spaces, and the contribution this made to communities' physical and mental health, wellbeing, and resilience.[22]

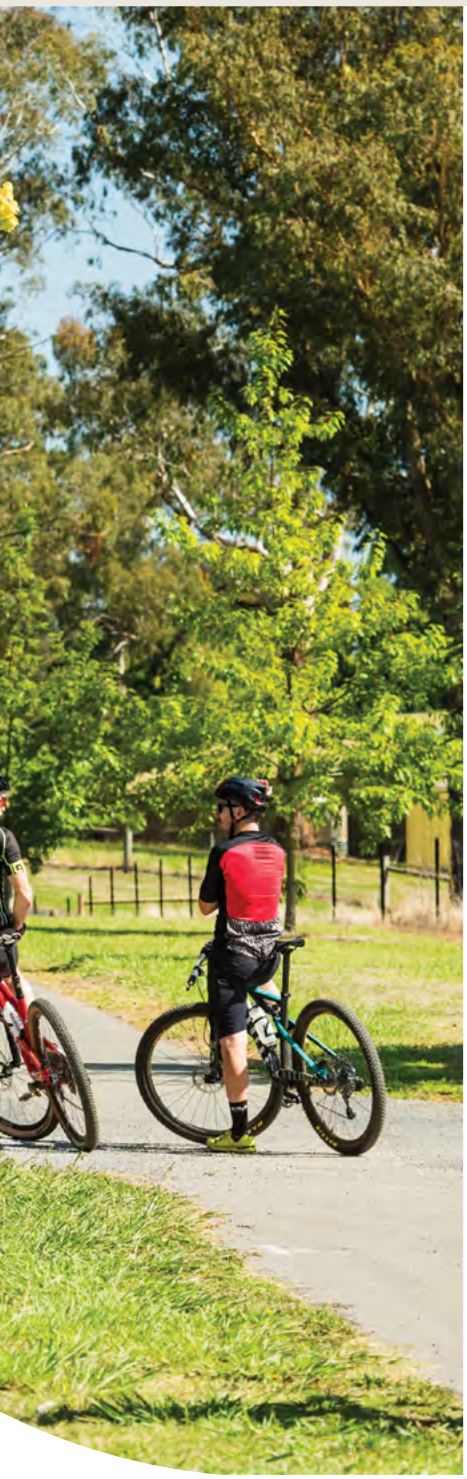
Green and public open spaces will retain their importance after the pandemic for those same reasons, while also preparing areas for a changing climate. Adequate tree canopy cover on public and private land helps cool urban areas through shading, making neighbourhoods more resilient to hotter weather. Tree canopy cover is unequal across Melbourne's suburbs, as shown in Figure 11. With increasing density, efforts to improve Melbourne's tree canopy and public open spaces need to be well coordinated to create connections across suburbs and areas to enhance environmental, recreational, cultural, and social values. This can be paired with integrated water management initiatives (see recommendation 14) to keep more water in local environments for greening, cooling, and amenity.

Figure 11: Tree canopy cover is lower in Melbourne's northern and western suburbs

This map shows the tree canopy cover of Greater Melbourne is concentrated in the north-eastern suburbs, the eastern suburbs and along the Mornington Peninsula. The map shows very little canopy cover in Melbourne's north and west.



Source: Hurley et al., *Urban vegetation cover analysis Melbourne Metropolitan Region,* Melbourne, Department of Environment, Land, Water and Planning, 2018, p. 3



Changes can deliver thriving urban places

Some former industrial areas can be prime locations for new residential development. Often, these areas are already close to jobs but have inferior transport connections or lack the amenity and services required for thriving communities. Redevelopment with the right type of infrastructure at the right time could unlock their potential.[23]

Places with good access to public transport can attract other amenities to locate nearby. Melbourne's iconic trams complement the train network. They support a wide range of trips at different times on any given day, linking different transport modes together to service more types of journeys. As some areas grow faster than others, delivering tram services differently can help keep pace with demand where it is needed and reduce car trips.

Thinking beyond usual solutions can support change and create thriving urban places. This includes reimagining the use of space in urban areas and investing in local solutions. For instance, roads take up a significant proportion of land for vehicle travel and parking in established areas of Melbourne and regional cities. Other uses may become more important over time but would require looking at a wider range of solutions. For instance, active transport investment can deliver many benefits, such as reduced congestion, improved health and wellbeing, reduced vehicle costs, environmental benefits and infrastructure savings.[24] For each person who cycles 20 minutes to work and back, the economy can benefit by $14.30; and each person who walks 20 minutes to work and back could generate another $8.48 in benefits.[25]

Ways to create more inclusive local places include improving public transport, protecting and enhancing open space, creating housing diversity, accessibility, and affordability, and ensuring infrastructure is accessible to all Victorians. Working with local governments where there are shared responsibilities can improve urban environments for residents and enhance the performance of Victoria's cities.

Recommendations to create thriving urban places

Infrastructure Victoria makes the following recommendations to create thriving and more inclusive urban environments. We also make specific recommendations to help integrate land use and infrastructure planning (see section 2.1), deliver better access to transport and social infrastructure (see sections 3.1 and 3.3) and improve planning for growth areas (see section 3.4).

Recommendation 35

Support more homes in priority established places

In the next year, identify new priority locations in established suburbs for residential intensification to better use existing infrastructure. Following this, in partnership with local government, review planning settings to allow increased housing density and establish design review advisory panels.

The housing preferences of Melburnians are changing, with as few as half wanting standalone homes.[26] Markets are responding to these changing tastes, with new apartments and townhouses outpacing new standalone housing.[27] Prioritising home building in established suburbs ultimately costs Victorians less than expanding in new growth areas. Infrastructure costs in established suburbs with the capacity to support growth can be two to four times cheaper than in new growth suburbs.[28]

Our research shows people identify quality urban design, access to services, open spaces, good public transport and diverse, affordable housing options as principles for achieving better outcomes as residential densities increase in established suburbs.[29] *Plan Melbourne* identifies over 130 metropolitan and major activity centres, but these accommodated only 21% of new housing in the decade to 2018.[30] In established middle and outer suburbs, most new homes are far from the amenity, opportunities, and better transport choices often available in activity centres.

Our modelling shows allowing more people to live closer to jobs and services can grow Victoria's economy and increase transport network efficiency.[31] *Plan Melbourne* generally supports delivering more housing closer to jobs and transport, stating the benefits of a more compact, sustainable city.[32] Indeed, *Plan Melbourne* recognises 'it will be necessary to define locations best able to support increased densities'[33] – but does not specify how.

Plan Melbourne identifies six places to focus investment and growth – Arden, Fishermans Bend, Footscray, Parkville, Richmond to Docklands, and Sunshine.[34] Other priority places in established areas should also be identified for denser residential development, balanced with commercial and industrial growth needs. For example, the new Suburban Rail Loop stations could be priority locations for more development. This process should explicitly account for the growth potential of a place along with its market readiness, existing and planned transport infrastructure, and open space. This approach can also apply to priority locations experiencing growth in the established areas of regional cities.[35]

The Victorian Government should develop clear criteria to identify priority places, and better integrate land use and infrastructure planning for these to efficiently and effectively deliver a denser urban form. It should include these places in the forthcoming Metropolitan Regional Land Use Framework Plans,[36] partner with local governments to develop or update associated structure plans, and support planning scheme amendments. Precinct plans should detail the local community's aspirations, any barriers to achieving them, and the infrastructure, cost and funding mechanisms required. This could include reviewing current land use zones to support more housing. Land use rezoning can potentially remove restrictions and improve certainty for residential development.[37]

Our community research determined good urban design was among their top principles.[38] To recognise this, and contribute to quality urban places, the Victorian Government should partner with local government to couple zoning changes with a new design review advisory process for significant developments in priority locations, a process already used internationally.[39] This could be developed with the Victorian Government Architect and incorporate features of existing design advisory services of local governments.[40] Combined with other planning reforms that help manage development risks,[41] the process formally incorporates design considerations through early engagement with proponents.[42]

Recommendation 36

Use value-capture mechanisms to deliver very low income housing

Within the next two years, change and actively apply planning regulations to provide affordable rental housing for Victorians on very low incomes in places with good access to public transport and services, when they are re-zoned for more intensive residential use.

Places with good transport access and amenity are often highly valued by potential home buyers and investors. There is a shortage in Melbourne of over 50,000 affordable private rental dwellings for people in the bottom 20% of incomes.[43] This income category is broadly similar to the income levels attached to the 'very low income households' category of affordable housing in the *Planning and Environment Act 1987.*[44]

In Melbourne, the most pressing housing affordability problem is for people renting on very low incomes. 90% of Melbourne's private renters with incomes in the bottom 20% experience housing stress,[45] while 64% of private renters in the next 20% of incomes can secure affordable rental homes in the private market.[46] Technically Melbourne has enough affordable rental housing for the latter group, although some may be occupied by higher income households or not in desirable locations.[47] Targeting affordable housing at higher income groups potentially uses the value-capture opportunity for lower priority groups.

Some affordable rental housing schemes, such as the National Rental Affordability Scheme,[48] produce discounted rental homes – typically renting at 20% lower than the market rate. This would usually still not be affordable for households on the lowest incomes. Similarly, using a value capture mechanism for other categories of low and moderate income affordable housing in the *Planning and Environment Act,* would divert stock from those most in need, who experience the largest deficit of affordable housing. This includes Aboriginal Victorians, who have worse housing outcomes than other Victorians on multiple indicators.

Changes to zoning can result in significant windfalls for landowners not previously captured by current taxes and charges.[49] Planning regulations can be used for residential developments to include a proportion of affordable housing.[50] Placing extra conditions on land use during re-zoning is one way to capture some of this value to fund infrastructure such as low income housing.

Capturing the value of development in this way can meet the twin goals of building extra homes in good locations and providing affordable homes to people on very low incomes. By using the re-zoning process to insert mandatory requirements to provide affordable housing, part of the windfall gains can be captured for social benefits. This means that any compliance costs are fully offset by land value increases, helping prevent any development disincentives.

The Victorian Government has proposed a new revenue initiative to capture windfall gains associated with planning decisions to rezone land, gains not previously captured by government.[51] However, the windfall gains tax is capable of operating in tandem with a value capture mechanism for affordable housing, although may reduce the revenue it collects.

The Victorian Government should introduce mandatory requirements when re-zoning residential land in suitable locations to include a value-capture mechanism to generate 'very low income', affordable rental housing in Victoria. The mechanism should be applied when land is re-zoned for more intensive residential use in locations with good access to public transport and services. Together with setting growth targets for social housing (see recommendation 68), this reform can reduce levels of housing stress and homelessness and help create more inclusive communities.

Recommendation 37

Develop an interconnected open space network

In the next three years, help create an interconnected open space network and extend the urban tree canopy, by providing direct funding, and reviewing and reforming the developer open space contribution scheme.

Greater residential densities, smaller households and changing job markets increase demand for easily accessible local open space.[52] People heavily used public open spaces during the COVID-19 pandemic, demonstrating its health[53] and resilience value.[54] Public open space, including parks, local streets, waterways, Crown land, and trails, also supports expanding tree cover, helping reduce urban temperatures[55] and local flooding.[56] Our community research found safe, adaptable multi-functional spaces help manage the impacts of higher residential densities.[57]

Established suburbs have diminishing amounts of private open space and tree canopy cover.[58] Engineering standards and building requirements, including for utilities, road safety and bushfire mitigation, can prevent the planting of more street trees.[59] More well-designed, accessible public open space can help compensate for this loss.[60] Connected patches and corridors of open space provide opportunities for recreation, active transport,[61] and habitat connectivity.[62] Street trees increase canopy cover and provide cooler, shaded corridors for walking and cycling.[63] Fishermans Bend is a good example of open space network planning, which focuses open space along connected corridors and serves multiple functions, including promoting active transport, biodiversity and recreation.[64]

Despite interconnection being a longstanding policy goal of the Victorian Government, open space often occurs in isolated patches. Local government open space strategies typically emphasise increasing the amount of open space and access for residents.[65] Land use and infrastructure planners rarely measure its connectivity.[66] An interconnected open space network emphasises connections between open spaces and draws attention to opportunities such as public surface car parks or school grounds. It can potentially address uneven open space distribution and improve its overall quality.[67] It can improve street tree coverage, including by reallocating land previously used for roads.

Building on its release of a high-level *Open Space Strategy* in early 2021,[68] the Victorian Government should work with local councils in Melbourne and larger regional cities to fund connectivity improvements and tree planting in open space planning and delivery, such as using tree-planting programs.[69] Local government urban forest strategies can also include tree canopy targets,[70] reflecting those in *Living Melbourne*[71] and Land Use Framework Plans. Local Aboriginal communities should also be consulted about appropriate connectivity improvements.

Currently, planning laws require open space contributions when developers subdivide land.[72] These were adopted in 1966,[73] but have never been reviewed. Local government use of open space contributions is not coordinated to improve Melbourne's urban forest.[74] A previous inquiry recommended developing more effective, enforceable and transparent contributions, and ensuring cash-in-lieu contributions can fund open space improvements.[75]

The Victorian Government should review the scope of,[76] and then reform, open space contribution schemes to explicitly state a connectivity objective, and mandate financial contributions for links and planting. This stronger legislative basis would prioritise connectivity and tree cover when purchasing or managing open space. The Victorian Government should also preference connections when purchasing parkland,[77] evaluate open space contributions for connectivity, and monitor expansion of urban tree canopy over time.

Recommendation 38

Partner with local governments to fund pedestrian infrastructure

Over the next five years, partner with local governments to fund pedestrian infrastructure network upgrades to connect people to priority places, including central Melbourne, the Monash National Employment and Innovation Cluster, other activity centres and train stations.

Walkable cities and suburbs deliver many benefits. Walking supports overall health and wellbeing, and social inclusion.[78] A daily, 20-minute long and brisk walk can reduce the chance of early death from 16% to 30%,[79] increase life expectancy by up to three years[80] and help prevent chronic disease.[81] One study estimates every kilometre walked daily delivers $1.68 in health benefits for the walker.[82] Footpaths provide access to open spaces and other local amenities, take up less land, and cost less than roads and public transport. More people walking more often also helps reduce road congestion and public transport crowding, improves air quality and reduces greenhouse gas emissions.[83] The Victorian Government has committed to increasing active transport mode share to 25% by 2030.[84]

Our community research found that Melburnians prioritise pedestrian-friendly environments as a principle of density done well (see recommendation 35).[85] Walking is already the most common way people travel for distances less than 1 kilometre long,[86] but people still use cars for many short trips. These car trips contribute to congestion in local streets and can have negative flow-on effects across the transport network.[87]

Investing in pedestrian infrastructure and programs that support active and public transport enable people to walk more often.[88] Infrastructure Victoria estimates more than 200,000 daily trips currently taken by car to major centres could instead be walked or cycled. As around two thirds of these trips are to central Melbourne or the Monash National Employment and Innovation Cluster, so improving pedestrian infrastructure in and to these areas is a priority.[89] Good walking infrastructure would also support the development and vibrancy of urban renewal precincts like Fishermans Bend.

By investing in well-designed pedestrian infrastructure, the Victorian Government can help manage congestion, improve peoples' health, and reduce greenhouse gas emissions. Working with local government, it can coordinate pedestrian infrastructure funding, lead efforts to collect better data (see recommendation 40) and help ensure accountability.[90] Improvements could also encourage investment in and the development of major activity centres.[91]

In the next five years, the Victorian Government should work with local councils to upgrade the pedestrian infrastructure network in priority locations.[92] It should provide some funding for new footpaths, pavement improvements, and better timing at traffic lights. It should improve Principal Pedestrian Networks within a 15-minute walk of train stations and major public transport stops to promote the safety and priority of pedestrian movements. This could include widening paths, improving lighting, simplifying route navigation, and delivering more tree canopy and vegetation (see recommendations 37 and 77), street furniture, water fountains and toilets.[93] These measures make it easier for travellers to transfer from one mode of transport to another (for example, walking to trains or buses), create more attractive walking routes to public transport connections and reduce parking pressures.

Recommendation 39

Transform cycling in Melbourne, Ballarat, Bendigo and Geelong

In the next 10 years, prioritise and significantly progress developing a continuous network of high quality, safer cycling corridors in Melbourne, Ballarat, Bendigo and Geelong, including separated cycle ways and more storage at train stations and activity centres. In the next five years, immediate priorities include connections within and between central Melbourne and surrounding suburbs, and connections to the Monash, La Trobe and Sunshine National Employment and Innovation Clusters.

More than half of Melbourne's vehicle trips are less than 6 kilometres.[94] Converting even a small proportion of these trips to cycling can help reduce localised congestion,[95] improve air quality and health, and cut carbon emissions. Cycling is one of the cheapest, cleanest and most space efficient modes of transport.[96] Cycling for 30 minutes a day, five days a week, can reduce the physical inactivity disease burden by 26%,[97] and countries with higher cycling rates have lower obesity rates than Australia.[98]

The share of cycling for trips in Victoria has changed little in the last five years. A network of high quality cycling links, including separated cycle ways, are a prerequisite to building a safer, more connected and lower stress cycling culture.[99] Faster increases in cycling occur in cities that have:

- Expanded and improved bike lanes and paths
- Introduced traffic calming measures and bicycle storage
- Improved integration with public transport
- Implemented bike sharing, training programs, and promotional events.[100]

Victorian research estimates up to 78% of Victorians are interested but remain concerned about the safety of cycling.[101] Low stress cycling networks have lower traffic speeds, more physical separation from other vehicles, car parking and other hazards, direct routes, and no gaps in the cycling network.[102] Cities are increasingly realising that cycling infrastructure that makes riders feel safe is a prerequisite to enticing more people to use it.[103] New separated cycling infrastructure in Bendigo coincided with sizeable increases in cycling demand on that route.[104] Beyond conventional bicycles, well-designed separated cycle ways can be used by e-bikes and other personal mobility devices, expanding the diversity of people who can use them, and extending the distance people can travel.

Not all trips on Victoria's network can be practically cycled, and not all Victorians can or want to cycle. But in Melbourne alone, over 200,000 daily car and public transport peak hour trips could be cycled or walked to National Employment and Innovation Clusters (NEICs) and to central Melbourne.[105]

The Victorian Government has committed to increasing active transport mode share to 25% by 2030.[106] But its investment in the cycling network remains relatively small at $100 million over five years in the Victorian Cycling Strategy 2018–2028, along with $16 million in other funds slated for pop-up cycling routes.[107] The Victorian Government Strategic Cycling Corridor Network comprises routes on roads and paths managed by the Victorian and local governments. If local governments are unaware of Victorian Government cycling priorities, they cannot make coordinated investments to improve routes with segments managed by both.

The Victorian Government should prioritise and implement a phased program of network improvements on the Strategic Cycling Corridors, in Melbourne and regional centres, over the next 10 years.[108] More direct funding will help manage demand on the road network, improve urban environments and increase access to train stations and activity centres.

Over the next five years, the Victorian Government should prioritise connections with high potential for cycling for trips from Richmond, Carlton, North Melbourne, and South Yarra to the central city,[109] including allowing access through and around the Hoddle grid. Better cycling connections can help activate urban renewal precincts, like Fishermans Bend. Connections to Monash, La Trobe and Sunshine NEICs also have potential, as do many trips to Monash from Clayton, Springvale, Oakleigh and Huntingdale stations.[110]

Planning work should begin immediately with identified priority investments delivered within five years. More investment will be required once further opportunities are identified through better network planning using improved modelling tools (see recommendation 40) and through road space reallocation projects (see recommendation 41).

Case study

Cycling investments pay off internationally

Copenhagen, London and Seville demonstrate that sustained investment in cycling infrastructure can lead to more cycling trips, outpacing growth in other transport modes.

Copenhagen has invested in 150 kilometres of high quality cycle superhighways since 2012, with plans for further expansion in the next 25 years. Since the network has been installed, cycling has increased by 23%, with cyclists covering 400,000 kilometres each day. Better health from cycling has translated into 121,000 fewer sick leave days taken each year.[111]

London's Cycle Superhighways, a fully separated cycle lane through central London, and Quietways have supported increased cycling with a doubling in cycling as a mode share from 1.2% in 2000 to 2.5% in 2018.[112]

From 2006 to 2007 an additional 80 kilometres of fully separated bicycle lanes were constructed in Seville, Spain.[113] The lanes re-purposed car parking space, and were built on the same level as footpaths and in both directions. The network has been expanded since, creating a 180-kilometre cycle network in the city, with a resulting significant increase in cycling.[114]

Recommendation 40

Improve walking and cycling data to better estimate travel, health and safety impacts and benefits

In the next year, begin developing better walking and cycling information and data. In the next three years, incorporate this data and information into Victorian Government transport models for strategic and project planning, and project appraisal to guide investment decisions.

Providing choices for the growing demands on the network, while maintaining amenity of growing urban areas, requires consideration of all transport options. This includes being able to fully assess the health and safety benefits. Properly incorporating walking and cycling into evidence-based planning, investment and reform requires assessment on an equal basis with motorised transport.

The Victorian Government uses three main transport models. Each model applies a different method to assess how motorised travel behaviour might change in response to different interventions to generate evidence for infrastructure investment. The model used depends on the nature and scale of interventions being assessed, the stage of a project's development, and the detail required.[115] The models are the Victorian Integrated Transport Model,[116] the Melbourne Activity Based Model,[117] and the Detailed Operational Model for Intersection and Network Optimisation.[118] Bespoke models have been developed for other forms of transport to fill existing gaps, such as the Inner Melbourne Bicycle Model.

While useful tools, transport models focus substantially on time savings from motorised travel, despite almost 20% of trips being made by walking and cycling.[119] There is a lack of data and detail for modelling non-motorised travel behaviour patterns. This makes it difficult to develop strong investment cases for active transport infrastructure, even though targeted walking and cycling projects can significantly manage demand on the transport system,[120] reduce health costs,[121] promote neighbourhood vibrancy, and reduce greenhouse gas emissions.[122] The COVID-19 pandemic highlighted the value of walking and cycling, however in the absence of reliable data it has been difficult to evaluate.

The Victorian Government should develop a data management framework to better collect and share information on walking and cycling. The framework should clarify how data is collected, stored, used, and shared. This data should be used to inform transport modelling and decision-making. Better data on active travel can help shape community priorities and inform systematic forecasting and impact modelling. Short-term projects, such as the Summer Streets and School and Community Safety programs, provide opportunities to supplement existing walking and cycling data.

Improved walking and cycling data has multiple uses for government decision-makers, and in the private and not-for-profit sectors. Better data could inform priorities and investment decisions, such as to identify where to increase tree canopy and improve open space network (see recommendations 37 and 77), and provide indicators of community health and wellbeing. This will also help achieve Victoria's target of 25% of trips by active transport by 2030.[123]

Generating this data and integrating it into the data management framework and models should begin immediately. The Victorian Government should use this new data to help guide policy priorities and investment decisions (see recommendations 38 and 39). While full integration will take time, and require iterative updates, these improved changes should be finalised within three years.

Recommendation 41

Reallocate road space to priority transport modes

In the next year, start delivering road space reallocation initiatives to better support and enforce priority movement through streets and places. Adopt a five-year target for delivery of more ambitious road space reallocation initiatives. Legislate for faster, simpler, and more consultative road space reallocation in government decision-making.

Roads occupy significant space in urban environments. Over time, more people and more freight move along roads that stay the same size. Some roads are well suited for vehicle movements, while others are not. A mass of vehicles moving through streets can degrade the vibrancy, character and inclusivity of local communities. Different transport modes, such as walking, cycling, public transport, electric scooters, motorcycles, or cars, affect places and segments of the transport network differently. For example, too many cars cause congestion.

Resolving this requires a more deliberate approach to designing and using roads, beyond simply funnelling maximum traffic along them. Roads should instead prioritise space to better reflect their desired movement functions. Combining road and place management recognises that road space is valuable, finite and must be safely managed for all – not just vehicles. It means collaboratively managing all space on a street, from the buildings on one side to those on the other, and not just specific spaces managed by individual agencies, such as footpaths or tram tracks.

The Victorian Government should identify priority transport modes in different locations, using data to provide insights, including using the Department of Transport's Movement and Place Framework. It should then begin delivering the road space reallocation initiatives most readily implemented.[124] Other priority places are those experiencing a rapid change in their function. For example, the opening of a major project, such as the West Gate Tunnel or the North East Link, will change travel patterns, including diverting traffic away from other roads. The changes in traffic on other roads presents a priority opportunity to reallocate their road space to other purposes.

Road space reallocation initiatives could include improving driving education, campaigns and giving motorists more prominent cues, like more visible street markings to better communicate priority movements. Long-term and more ambitious initiatives should carefully consider interactions with places, to avoid negative effects on their amenity. These include infrastructure changes such as gradually installing tramway barriers, protecting cycleways, widening footpaths, or replacing parking with better bus and tram stops or 'pocket parks'. They also include targeted enforcement to help improve road user compliance and realise road space allocation benefits. We have previously identified streets in the cities of Stonnington and Yarra as potential priority places.[125]

On some roads, transport movements with the capacity to carry the most people and highest volume of goods are most important, meaning alternative options for parking during busy times may be the best use of road space. The Victorian Government could designate other roads for quieter, lower impact, zero emissions freight vehicles, particularly at night, or for cycling (see recommendations 2 and 39). Technology can assist with prioritising road space at different times of the day (see recommendation 24).

Engaging and consulting local communities and property owners can promote faster and more accepted changes, strengthen evidence, better communicate different options and consequences, and pilot and better prepare for changes.[126] Research finds that local, gradual initiatives have been most successful in reallocating road space. Along major corridors, the Victorian Government should design specific consultation and review processes, as occurred for Punt Road.[127]

Complex and time-consuming decision-making is a barrier to reallocating road space. In Victoria, unlike other states, Ministers directly determine which transport modes have priority on specific roads by legislative instrument.[128] This allocation process can be slow to respond to transport demand changes and tends to preserve the status quo long after it is appropriate. Rapidly changing urban areas require more agility, and experiences from the COVID-19 pandemic provide potential insights on better methods of decision-making. The Victorian Government should amend the *Road Management Act 2004* to allow for faster, simpler decisions.

Recommendation 42

Redesign tram routes

In the next 10 years, redesign tram routes, including short shuttle routes, and reserve land for future tram depots, for more capacity in fast growing inner Melbourne areas.

Melbourne's trams link 32 major activity centres across the city, and usually provide an all day, turn up and go service. Highly useful in dense, established areas, tram services transport people to work, and also carry many travellers to appointments, services, shopping and entertainment throughout the day and evening.[129]

Rapid population growth in many areas of inner Melbourne is leading to overcrowding on some parts of the tram network, while services are under-utilised in other parts of the city. Tram overcrowding is most pronounced in and close to Melbourne's city centre, exacerbated by the Free Tram Zone (see recommendation 47).[130] Demand has also grown strongly in Southbank, north of Park Street, and in the western parts of inner Melbourne. Figure 12 shows that without further investment, many of Melbourne's trams will be near or over capacity by 2051.

Within five years, the Victorian Government should redesign many parts of the tram network so they can continue to provide attractive and cost-effective services in areas experiencing high demand. Redesigned routes would also help to make the most efficient use of the tram fleet as it expands, including its 2020 order for 100 new trams.[131]

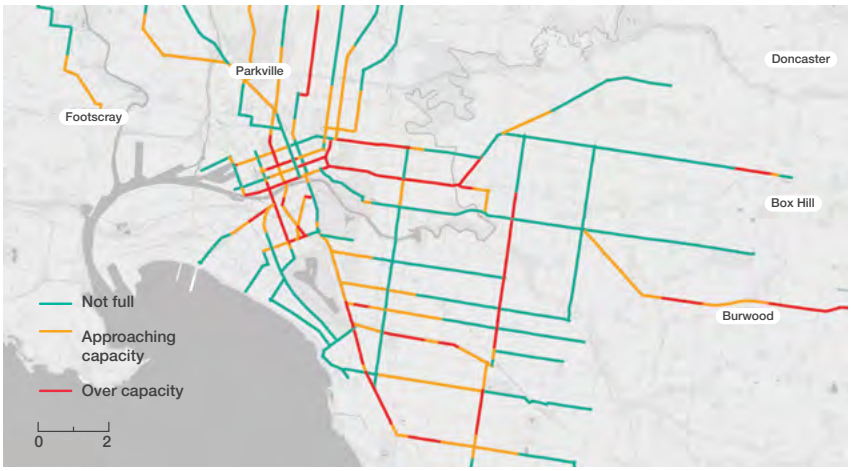
The Victorian Government should also build infrastructure so trams routes can adapt to the opening of Melbourne Metro and Anzac Station rail-tram interchange in 2025. At this time, some St Kilda Road trams should be diverted to the western side of the city centre.

In parallel, the Victorian Government should introduce short 'shuttle services' to relieve overcrowding in busy and growing sections of the tram network, especially at peak periods. For example, Victoria Street in Richmond is currently served by the Route 109 tram to Box Hill and the shorter Route 12 service, which originates at Victoria Gardens shopping centre.[132] This combination helps accommodate large passenger loads along the growing Victoria Street precinct while providing a quality service all the way to Box Hill.

As the tram fleet grows, Melbourne will require more tram depots. Increasingly expensive land in inner suburbs means that delays in purchasing land for tram depots could lead to greater acquisition costs. To minimise these costs, the Victorian Government should identify and reserve land for future tram depots within 10 years. It should also leverage the opportunity presented by renewing tram assets, including depots and digital systems, to facilitate the introduction of redesigned tram routes and improve safety, accessibility and operational performance.

Figure 12: The tram network is projected to become crowded without change in 2051

This map shows Melbourne's tram network and identifies that many lines will be near or over capacity in the mornings without further investment.



Source: Arup, *Strategy update: Problem definition modelling outcomes*, report for Infrastructure Victoria, November 2020

Recommendation 43

Activate urban renewal with new tram links

In the next year, fund the northern Fishermans Bend tram connection for delivery by 2026 and complete the planning for the southern route. Within two to five years, commit to delivering a tram extension to Arden, and to the former defence site at Maribyrnong if required.

Bringing jobs and people closer together can create benefits. Many of the new jobs created in Melbourne over the next two decades are projected to be concentrated in the inner suburbs, which have several suitable redevelopment locations. These urban renewal precincts include Fishermans Bend precinct and the precinct around the proposed new Arden train station.[133] The former defence site at Maribyrnong is also an identified urban renewal area.[134]

Expanding the tram network to renewal precincts would be an efficient, sustainable way to accommodate growing passenger numbers in these areas, particularly if trams have a dedicated right of way. Tram access encourages people to drive less and supports diverse residential and commercial development along transport corridors and in activity centres. Early investment in public transport can also provide industry with the certainty it needs to make complementary development investments, as in Melbourne's Docklands[135] or London's Canary Wharf.[136]

Fishermans Bend is Australia's largest urban renewal site,[137] and is planned to include major housing developments, a National Employment and Innovation Cluster,[138] and a new University of Melbourne campus.[139] The precinct aims to attract 80,000 jobs and 80,000 residents by 2051.[140] All of these people will need travel options, and residential development alone is projected to create 260,000 extra daily trips.[141] Yet there are only limited Yarra River crossings, existing roads cannot meet growing demand efficiently or sustainably, and other movements are impeded by the freeway.[142]

The Victorian Government should plan for two tram routes to connect Fishermans Bend to the broader transport network, north and south of the West Gate Freeway.[143] The northern route is most urgent, and should be delivered by 2026 to provide businesses, workers and students easy access. The southern connection can be delivered later, with timing aligned to delivery of forecast residential development.[144] Delays would risk missing the Victorian Government's target of 80% of trips undertaken by public or active transport[145] and discourage investment.

Fishermans Bend is not the only urban area experiencing significant renewal. Large-scale development is also projected for the area between the western parts of the city centre and the Arden precinct, catalysed by the new train station. The *Arden Precinct Development Plan* recognises the need for better connections and proposes a transport interchange for easy passenger arrival from bus, car or taxi drop off, along with accommodation for trams within a dedicated right of way.[146]

The former defence site at Maribyrnong has longer-term potential for urban renewal,[147] and early commitment to a new tram extension would improve transport options, support development, and reduce car dependence.

Within two to five years, the Victorian Government should commit to a tram extension to Arden. If required, it should also extend trams to the former Maribyrnong defence site. This would assist the development of corresponding precinct structure plans, and mitigate the challenges and often high costs of retrofitting tram routes later.[148] It should also reserve land to retain the option for a tram connection to Footscray along Dynon Road. This could be used initially as a corridor for 'next generation' bus services to the inner west (recommendations 57 and 58).

Recommendation 44

Plan for and fund public transport accessibility, including tram stop upgrades

Fund public transport accessibility improvements to infrastructure and services, including for priority tram and bus stops, to make substantial progress toward the legislated 2032 accessibility targets.

Infrastructure needs to cater for the diverse needs of Victoria's changing population. More accessible public transport is easier to use, especially for people with disability, older Victorians, those with injuries or chronic health conditions, or people with prams, personal shopping trolleys, walking frames or luggage. Inaccessible public transport can be a barrier to full participation in communities, making it difficult to access jobs, services, and social networks. It can also constrain the mobility and participation of carers. One in five Victorians has a disability,[149] and nearly one in six is aged over 65 years[150] – projected to increase to more than one in five in the next 30 years.[151]

More accessible public transport for metropolitan and regional areas would help address structural discrimination against people with disability. Under Australian law, public transport networks are required to be fully accessible by 2032.[152] The Victorian Government has stated it prefers to deliver accessibility works during asset upgrades,[153] but this makes progress relatively slow. The Victorian Government's *Accessible Public Transport Action Plan 2020–24* sets out priority measures to improve access to all modes of public transport,[154] but it is yet to be supported by funding, and does not measure or articulate desired progress toward the accessibility targets.

Many elements of Victoria's public transport network need to be upgraded to comply with standards. Many tram and bus stops do not meet accessibility standards. Modern vehicles, like low floor trams and buses, are more accessible but need to be supported by upgrades to stops and curbs that allow people to get on and off services easily, allow clearance around bus shelters and provide footpath access to stops across and along roads.[155] This will require further investment in more low-floor buses, accessible bus stops, and delivering bus stop shelters (see recommendation 57).[156]

Improving tram accessibility is a priority. Only around 400 of over 1700 tram stops are currently accessible[157] and, unlike with trains and buses, drivers cannot manually deploy ramps to assist passengers to board. More accessible vehicles will help, and the Yarra Trams *Accessibility Action Plan* envisages making all trams low-floor models by 2031.[158]

New trams will, however, need to be supported with more accessible tram stops to provide easier access, which also boosts efficiency, reduces boarding delays and caters for more passengers by allowing people to board more quickly. The Victorian Government is working to upgrade stops on the network,[159] but historically did not meet upgrade targets for several years.[160] Its development of a *Tram Stop Accessibility Strategy*[161] is a valuable opportunity to do better. The strategy should set out criteria for priority upgrades, including those with high use, strategically located, high projected population growth nearby, opportunities for synergies with other projects, and innovative design. Delivery agencies can reduce costs by combining construction with scheduled maintenance or other projects, consulting with user groups to optimise designs, and by reconsidering the number of stops required along corridors.

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Steer changes in travel behaviour

In 2015, congestion cost Victorians over $4.6 billion and was set to more than double by 2030. This would cost Melburnians an extra $1700 each year, compared with an efficient transport network.[1] While the COVID-19 pandemic temporarily paused congestion, Melbourne experienced a swift return to busy roads, with some even more congested than before.[2]

When many people want to travel at the same time, using the same transport infrastructure, conditions rapidly become congested, slowing speeds and generating crowding for everyone.[3] For example, Victorian morning peak hour public transport commuters experienced crowding for 20% of their journey on average in 2018, and Victorian motorists travelled in congested conditions for 22% of their morning commute.[4] Meanwhile, many roads and public transport services are underused outside of peak periods and on weekends, and some even during peak periods, such as suburban bus services.[5] By encouraging people to travel at a slightly different time, or choosing different travel method, Victorians can get more value out of the transport system and reduce congestion.

Many factors affect people's travel choices, including the options available, and their cost, speed, convenience, comfort and safety. This strategy makes many recommendations about improving transport infrastructure and services, including for walking, cycling, buses, trams, trains and roads.

Transport pricing is another tool to influence people's transport choices, but is not being used for maximum effect. Transport prices, such as public transport fares, vehicle registration costs or road tolls, affect the financial costs of different transport options, and influence the way people view the relative costs and benefits of travel at different times or using different modes.

People do not often consider the impact of their individual travel choices on others. When people choose to travel at busy times on crowded public transport or congested roads, they make the problem a little worse for everyone else. This costs everyone extra time and money. Good pricing of transport is the simplest way of helping people include their effects on others in their decision-making. For example, people can be rewarded for choices that help reduce congestion by charging lower prices at times or on modes with spare capacity. This maximises use of existing infrastructure, and minimises the amount of extra infrastructure needed.

Better transport pricing has been a focus of Infrastructure Victoria's work program during the past four years, and our research has documented its considerable benefits using enhanced modelling, international case studies and direct consultation with the community.

We have published two research papers, *Good move: fixing transport congestion* and *Fair move: better public transport fares for Melbourne* to detail our findings.[6] The modelling done for these reports was conducted pre-the COVID-19 pandemic, but the outcomes will hold assuming Melbourne's transport patterns return to pre-COVID-19 pandemic levels. We also investigated the short-term impacts of the COVID-19 pandemic in our report *Transporting Melbourne's recovery*. That report highlighted that better pricing transport networks could improve transport use during the pandemic. For example, lower off-peak fares will make travel on public transport safer by reducing crowding and enabling physical distancing. We are currently doing extra modelling to investigate how the COVID-19 pandemic might change the shape of Melbourne.

Many factors affect people's travel choices and this strategy makes recommendations about improving existing transport infrastructure and services to change travel behvaiour. This includes for walking, cycling, buses, trams, trains and for road users, including cars and motorcycles.

Our transport network faces major challenges

Without action, pressure on Victoria's transport network will worsen as population grows. Trips will become longer, less comfortable and more unreliable, costing people and businesses time and money. This pressure will be largest in Greater Melbourne, where an extra 3.6 to 6.5 million trips are projected to be made every day on roads and public transport by 2036.[7] Road congestion could cost Victoria $10.2 billion by 2031 as drivers face longer journeys with increasingly unpredictable travel times.[8]

Congestion and overcrowding on public transport mean longer and more variable travel times, resulting in frustration and lost productivity. Even with the Melbourne Metro Tunnel project, modelling indicates many rail lines could become overcrowded,[9] and more than 30% of public transport trips could be undertaken in crowded conditions by 2046.[10] Inferior public transport performance will lead to more people choosing to travel by car, which, in turn, creates even more congestion.

Traditionally, Victoria supported a growing population by building more transport infrastructure. Victoria will still need targeted investment to efficiently move people and freight. But solely expanding roads and public transport may only temporarily relieve congestion, because providing more transport capacity also creates extra demand.[11] While extra capacity initially improves travel times and reduces congestion, eventually they increase as more people use the new infrastructure. Every new major road in Melbourne has become regularly congested during peak times.[12] Similarly, extra public transport infrastructure has temporarily increased capacity at peak times and reduced crowding, but congestion problems soon return. Building new infrastructure will not be enough to solve transport congestion problems without other changes.

Current prices do not reward beneficial travel choices

Victoria's current transport prices provide few rewards for people to make travel choices that consider their effect on others. Most motorists pay a set of fixed charges (including registration, accident insurance, and stamp duty) regardless of how much they travel, and pay fuel excise levied by the Australian Government. Fixed charges mean drivers pay the same amount no matter how often they access the road network, and do not reflect all the costs of road infrastructure – including congestion, air and noise pollution, carbon emissions and road trauma.

Road congestion is exacerbated by Melbourne's large amount of free or cheap on-street parking.[13] This encourages drivers to cruise for parking, contributing to congestion, and preventing other, potentially better uses of valuable land – for instance, for bus, tram and bicycle lanes, wider footpaths or even green space.[14] Cheap parking also discourages people from walking or cycling to reach public transport.

Similarly, while public transport operating costs vary by mode, distance travelled, and time of day, Melbourne's public transport fare structure does not reflect these costs. The common fare structure across most modes of public transport means that some modes are underused, like buses, while others, like trains, are overused. The simplistic fare structure also means people making short trips on cheaper modes are cross-subsidising other travellers. While some concession fares are available, vulnerable Victorians who are less able to travel in crowded conditions, or people who need reliable travel (for example, those with caring commitments), are less able to use public transport to access jobs, services and amenities.[15]

Transport network pricing is one of the most effective ways to ease congestion

Our research shows that comprehensive pricing reforms for roads, public transport and parking is the most effective way to reduce congestion and get the most from the transport system. Transport network pricing[16] would replace fixed upfront charges and uniform fares with flexible prices set to encourage travel at times, to places and by modes that generate the greatest benefits relative to costs, taking the impact of an individual's use on others into account. A person's travel decisions can be affected by multiple considerations, including changes in preferences potentially arising from the COVID-19 pandemic. A comprehensive transport network pricing scheme can also consider other costs, such as air pollution and road trauma, and could incorporate fairness measures.

Encouragingly, Victorians are increasingly open to changing their behaviour, with one in four people saying they could change the time or mode of travel if conditions were right.[17] More voices are calling for congestion charging and more use of transport network pricing, including Infrastructure Australia,[18] Infrastructure Partnerships Australia,[19] the NSW Productivity Commission,[20] the Grattan Institute,[21] the NSW Review of Federal Financial Relations,[22] the City of Melbourne[23] and the Committee for Melbourne.[24]

Transport network pricing is not a new concept. Other cities have effective road pricing regimes, including London, Stockholm, Milan and Singapore, where it has reduced congestion, improved average car speeds and decreased emissions.[25]

The Victorian Government has begun to change transport pricing systems. The Melbourne inner city parking levy has taken about 3900 vehicles out of the morning peak by reducing long-term, off street parking spaces. By comparison, accommodating 3900 vehicles with a new freeway would likely cost over $1 billion.[26] The Victorian Government has started a trial of discounted off-peak public transport fares. They have announced congestion-charging tolls on the West Gate Tunnel project, and a distance-based charge for electric vehicles. These initiatives are positive steps toward transport pricing reform.

Further complementary pricing changes can help change the travel choices of Victorians to prevent more congestion and deliver a better travel experience for everyone. It also helps generate the most value from new transport infrastructure investments by preserving their benefits, instead of induced demand eroding those benefits over time. For example, a combination of off-peak and lower fares, improved public transport services and road user charging can encourage more people to use public transport.

Priority reforms work together for greatest effect

Planning for change now can reap the benefits of changed behaviour and avoid unnecessary costs. It also gives people greater certainty, so they can make choices about the most efficient and cost effective ways to travel.

Implementing further transport network pricing is challenging and will take time. Through extensive research, modelling, consultation and community engagement, Infrastructure Victoria identified several prompt steps to deliver long-term, sustainable change. The following recommendations complement each other. They also complement our recommendations on improving services and transport infrastructure as the benefits from these investments will be even greater with pricing reforms.

Over time, these reforms can reduce crowding and congestion. They are all steps in moving to comprehensive transport network pricing across all travel modes, including parking, which encourages a more efficient and equitable transport system. Governance reforms will need to support implementation of transport network pricing. Early introduction of an independent adviser to monitor, review and advise on pricing in the system can make the transition and proposed reforms better.

Recommendations to steer changes in travel behaviour

Infrastructure Victoria makes the following recommendations to drive changes in travel behaviour. Table 2 summarises these recommendations and sets a suggested timeline for their implementation.

Table 2: Timing of proposed transport network pricing reforms

0-1 year	1-5 years	5–10 years
Offer permanent off-peak discounts for public transport fares	Reduce inner Melbourne congestion by further reforming parking pricing	Phase out fixed road user charges and introduce user pays pricing
Reduce bus and tram fares	Price parking at major public transport hubs	
Remove the free tram zone	Incorporate congestion pricing into all new metropolitan freeways	
Appoint an independent transport pricing adviser	Trial full-scale congestion pricing in inner Melbourne	

Recommendation 45

Adopt permanent off-peak discounts for public transport fares

Permanently adopt discounted off-peak fares for metropolitan public transport and discontinue ticket types that do not offer discounts for off-peak travel.

Charging lower fares during off-peak periods can encourage more people out of cars and onto partially empty public transport services. It can also help reduce crowding on public transport during peak periods by rewarding people who travel at quieter times. Less crowding in peak periods helps improve reliability, because passengers can be accommodated on other services during a failure or disruption, allowing people to complete their journey without extensive delays.

Infrastructure Victoria investigated the structure and pricing of public transport fares in *Fair move: better public transport fares for Melbourne.*[27] Our research found that encouraging more people to travel on public transport outside peak hours has higher net benefits than doing so during peak periods, and should be priced accordingly. Our modelling showed that fares that vary by time of day as well as mode of travel would result in 96,000 fewer car trips each day and remove 78,000 tonnes of greenhouse gas emissions each year. It would also result in less crowding on peak hour train services and create an extra 100,000 off-peak public transport trips each day. Lower fares were also shown to benefit those on low incomes the most.

Before the COVID-19 pandemic, Victoria's public transport was overcrowded during peak periods and underused the rest of the day, as shown in Figure 13. During the COVID recovery, physical distancing is more difficult on some peak services, while off-peak services have ample capacity. In response, the Victoria Government is trialling discounted off-peak fares and increasing off-peak services.[28] This also supports embedding positive new behaviours, such as more flexible start and finish times for work during the pandemic.

The Victorian Government should continue to develop and permanently adopt discounted off-peak public transport fares to help manage road congestion and demand on crowded public transport services, and to take advantage of changes in workplace flexibility.[29] The off-peak fare discount needs to be big enough to encourage people to change their travel behaviour, and in our modelling the discount was 50%. The Victorian Government can refine the exact hours and conditions of off peak discounts to better support people to make changes to their travel behaviour to benefit everyone, and so fares are simple enough to understand intuitively.

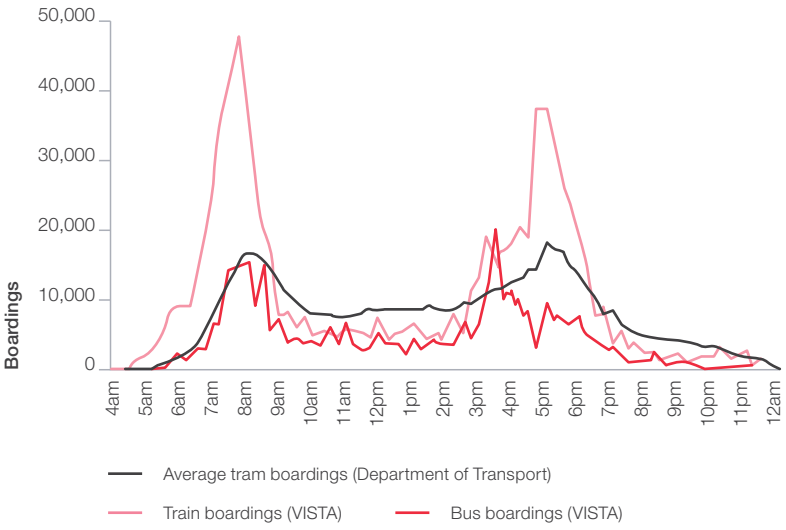
Not all sectors of the public transport network need time-specific fares. For example, most suburban bus routes would benefit from low fares at all times of the day (see recommendation 46).[30]

The current public transport fare system offers different payment options, including a 'myki pass' which gives users unlimited travel over a specific number of days.[31] But the fixed price means myki passholders receive no reward if they shift their travel outside peak hour.

The Victorian Government should ensure everyone is rewarded if they choose to switch their travel outside peak periods. It can do this by discontinuing fixed fare myki passes, and reviewing daily fare caps. These changes create more opportunities for people to save money by changing their travel patterns. Removing fixed-price ticket types is also fairer, as larger upfront costs make accessing them more challenging for Victorians on low incomes. It also simplifies ticketing choices, reducing the documented problems of Victorians choosing the wrong ticket for their journey, and ultimately paying too much.[32]

Figure 13: Melbourne's public transport use is highest in peak periods

This graph shows public transport use patterns in 2018.



Source: Department of Transport, Victorian Integrated Survey of Travel and Activity (VISTA), 2018

Recommendation 46

Reduce bus and tram fares

In the next year, reduce bus and tram fares, while maintaining an integrated ticketing system, to encourage people to make greater use of cost-effective public transport services that can be quickly expanded.

Distinct types of public transport have different costs and benefits. This includes the different costs of building infrastructure, buying vehicles, and operating the services. It includes the differing benefits of public transport use, like reducing traffic congestion, air pollution, and injuries from road crashes. Reducing bus and tram fares can help encourage people to catch underused services more often, which can be quickly and cheaply expanded to carry more passengers.

Our analysis in *Fair move: better public transport fares* for Melbourne showed that tram capacity can be added relatively cheaply compared with trains, and still significantly reduces car use and associated road congestion. Lower tram fares better reflect the short trips overwhelmingly taken by tram users, the lower cost of providing extra trips, and the congestion reduction benefits.

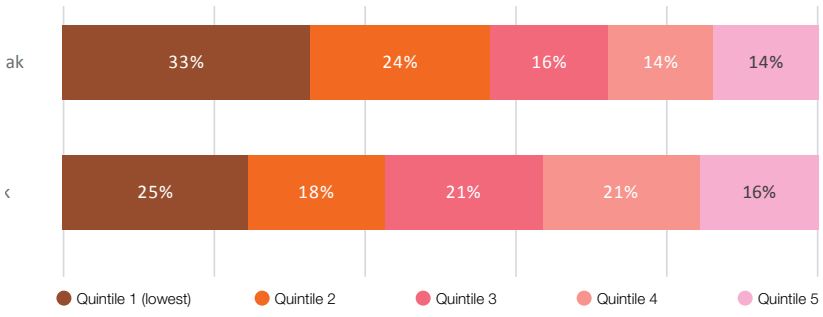
We also found that relatively high bus fares discourage people from catching buses. Melbourne's bus system is currently underused. Many buses run largely empty and can provide extra journeys with low infrastructure costs and high social benefits.[33] Infrastructure Victoria's modelling showed that by making buses cheaper,[34] they would carry around 93,000 extra people each day.[35] We also estimate that 70% of bus routes run at below a third of their capacity during the morning peak. The average bus route is only 25% full during the morning peak period, while over 80% of train and tram routes are full.[36]

Adding more frequent and direct bus services can help attract passengers by offering faster, more convenient, and more attractive services (see recommendations 57 and 58). If a short bus trip, such as to the local shops, costs the same as a long peak period train service from suburban Melbourne to the city, even frequent local bus services will struggle to attract passengers. Lower fares encourage more people to use buses, generating extra patronage to strengthen the case for better, more frequent services. In turn, better services can more easily attract more passengers at a lower price. Expanding the bus network is among the most cost-effective ways of expanding Victoria's public transport capacity – but only if people catch them.

Lower bus and tram fares also improve equity and fairness while giving consumers a more attractive alternative to driving their car.[37] Our research shows that buses are overwhelmingly used by people on lower incomes, compared with other modes. Reducing bus fares improves public transport network efficiency, and also benefits people on the lowest incomes the most.[38] Buses are the most available public transport mode in heavily car dependent outer suburbs, and encouraging extra bus trips helps reduce reliance on cars and eases traffic congestion.

The Victorian Government should reduce bus and tram fares to attract more people to use public transport on service types which can be easily expanded. The fare structure should continue to have a level of integration for multi-modal trips, such as by not charging people extra for a bus trip that connects to a train service.[39]

Figure 14: Lower income earners are more likely to use buses in off-peak periods



Source: *VISTA 2018, Infrastructure Victoria analysis of bus patronage*

Recommendation 47

Remove the free tram zone

In the next year, remove the free tram zone to improve equity, enhance the performance of the tram network and provide better safety and transport access for those most in need.

Melbourne's free tram zone includes the busiest tram corridor on the world's largest tram network, running a tram each way every minute for most of the day.[40] Yet many city tram services are crowded preventing access for older Victorians, people with a disability, pregnant women, and parents with prams and young children.[41]

These same Victorians have the greatest need for better mobility from trams. Free fares encourage extra people to crowd onto trams in the busiest section of the network and exclude those most needing the service. The free tram zone also encourages people to catch a tram instead of walking or cycling short distances,[42] reducing the health benefits generated.[43] After the zone was introduced, tram passengers increased by 30%, but the average fare paid fell by 18%, reducing total fares collected.[44] The free tram zone also increased delays at tram stops by 7% to 38%, requiring the scheduling of extra time into timetables.

The free tram zone is also inequitable, as people who live in, stay in, or drive to the zone benefit most. Most Victorians don't benefit from it at all. People who drive to the city centre and residents living near free tram zone stops have above average incomes.[45] The zone also privileges some retailers and businesses over others. Rather than free fares for a small fraction of inner-city tram trips, lower fares for all tram trips would make better use of the entire tram network and be more equitable (see recommendation 46).

Some argue the free tram zone benefits Melbourne's tourism. But we found no evidence that free public transport increases tourist numbers, or even that general public transport performance substantially affects tourist satisfaction.[46] Creating an easy to use ticketing system can help visitors use public transport to reach all Victorian attractions, and not just those in the centre of Melbourne. For example, the Victorian Government can expand the capability to use mobile phones in the ticketing system and allow direct use of credit cards to touch on and off, as is available in Sydney.[47]

The Victorian Government should remove the free tram zone, charging for trips there like any similar part of the public transport network. An exception should be the City Circle Tourist Tram, which serves a different purpose and is a genuine tourism facility. Reintroducing fares for travel within the free tram zone will reduce crowding, encourage active transport, and make trams more accessible and comfortable. It will also improve the performance of the tram network by reducing delays caused by the extra time taken by passengers getting on and off heavily crowded trams.

Recommendation 48

Appoint an independent transport pricing adviser

In the next year, appoint an independent body to advise on and monitor transport prices over the next 30 years.

Transport charges in Melbourne have largely fixed, flat structures, if they exist at all. They have not been designed with any specific objectives, such as to reduce congestion and crowding, they do not encourage the most efficient use of the transport network, nor do they support fairness. This is largely because current transport prices have accrued over time from disconnected, unplanned and incremental decision-making, without any consistent guiding direction, principles or policy rationale.

As soon as is feasible, the Victorian Government should appoint an independent body to advise on transport prices to help achieve better outcomes from pricing decisions. An independent adviser can encourage prices to be regularly adjusted to respond to changing needs as Victoria continues to grow. By having an independent adviser, Victoria's transport pricing decisions can become more coherent, and clearly identify the benefits the pricing system is trying to produce.

The adviser should consider many factors in determining prices that will most benefit society, such as congestion and improving transport access. It could also include social and environmental benefits such as lower pollution levels, increased physical activity and reduced road trauma. In New South Wales, maximum fare increases are set by the Independent Pricing and Regulatory Tribunal.[48] The Essential Services Commission in Victoria already approves changes to taxi fares and may be well positioned to take on this role.

An independent body can advise on changes to transport prices such as public transport fares (recommendations 45, 46 and 47), road tolls (recommendation 51), congestion charges (recommendation 52 and 53) and even parking fees (recommendation 48 and 49). The independent adviser could encourage government agencies to explain how their pricing proposals achieve specified outcomes, making the process more transparent. Input and advice could also be provided when pricing reforms are being designed.

The suite of transport network pricing reforms we propose are not reliant on having an independent transport pricing adviser. However, the reform process will likely be more effective and have greater public acceptance with an independent body in place. A community panel convened by Infrastructure Victoria said there should be an independent body for pricing to ensure accountability, transparency and adequate community consultation when proposing a change to transport pricing.[49]

Recommendation 49

Reduce inner Melbourne congestion by further reforming parking pricing

Within the next two years, review the Melbourne Congestion Levy on parking to increase its value, expand the properties it applies to, and cover a wider area. In the next five years, consider extending the levy to on-street parking and supporting a trial of demand-responsive pricing for inner Melbourne on-street parking.

The Melbourne Congestion Levy aims to reduce traffic congestion in central Melbourne by encouraging alternatives to driving and parking, including public transport, cycling, and walking. The congestion levy is charged each calendar year to private and public off-street car parking spaces in specified areas.[50]

The congestion levy has reduced the supply of long-term car parking spaces. Expanding the levy is likely to result in further reductions,[51] while also reducing traffic congestion by encouraging more people to travel by public or active transport. Applying the levy to more parking spots could achieve the same congestion reduction as a larger price increase.

Expanding the area covered by the congestion levy would provide benefits in other locations. For example, areas east of Hoddle Street and inner Melbourne suburbs such as Richmond, South Yarra, Windsor and Prahran are also significantly congested,[52] and have good public transport alternatives.

A further shift to public or active transport could be achieved by extending the congestion levy to on-street parking. This is likely to prompt local governments to re-evaluate how they price and provide parking. Spaces withdrawn from on-street parking can create more room for through traffic or be reallocated for cycling, walking or other uses (see recommendations 38 and 39). As with other measures designed to reduce the amount of driving during peak times to central Melbourne, an increase in the levy is unlikely to have significant negative equity impacts because peak period drivers to the city centre tend to have above average incomes.[53]

The Victorian Government should:

- Charge a higher rate of the levy
- Apply it to a wider range of properties
- Expand its coverage to include areas east of the current zone including Richmond, South Yarra, Windsor and Prahran
- Establish revenue sharing arrangements with each local council subject to the levy
- Consider applying the levy to on-street parking.

Trialling dynamic parking pricing is another way to better manage on-street parking. Dynamic parking pricing varies prices over time and between locations to manage demand. San Francisco has successfully trialled and implemented this approach.

Demand-responsive dynamic parking prices are set to achieve an occupancy target and eliminate cruising for parking. The system adjusts prices on each city block to achieve occupancy rates of 60% to 80% during defined pricing periods, rather than charging the same hourly rate all day.

The City of Melbourne has expressed interest in a pilot study of dynamic parking pricing and recognises the significant productivity benefits of parking technology to facilitate dynamic pricing.[54] The Victorian Government should support and encourage the City of Melbourne to conduct such a trial.

Recommendation 50

Price parking at major public transport hubs

In the next five years, charge parking fees at major public transport hubs, followed by all train stations and park-and-rides, to help encourage people to travel there using public and active transport, and to make parking spaces available for public transport users who need them most.

Train stations and park-and-ride facilities have free parking. It is available on a first come, first served basis, and most car parks fill up very early on weekday mornings. This means people miss out if they cannot get to a parking spot very early, due to other commitments, such as caring for others or taking children to school. Free parking encourages some people to drive rather than walk, cycle or catch a local connecting bus to reach their transport hub and encourages overuse of valuable land for carparks.

Charging for parking helps solve these problems.[55] It encourages people to walk, cycle or catch a bus to their train station or transport hub, freeing up space for others. It also complements our recommendations to encourage walking, cycling and catching buses (see recommendations 38, 39, 57 and 58). It means parking will fill up less quickly, so people who must drive can park later in the morning.[56] With fewer parking spots needed, people may put less pressure on governments to spend taxpayers' money to convert valuable land into more carparks.

The Victorian Government should charge for parking at all transport hubs in the next five years, preferably guided by advice from an independent pricing adviser (see recommendation 48). This pricing should begin at large, well-connected, and accessible public transport facilities in inner Melbourne train stations. For example, Footscray train station features good local public and active transport connections. This allows transport planners to work out the best models to eventually apply to other train stations and park-and-ride facilities.

The Victorian Government should set parking fees so some parking spots remain vacant for much of the morning peak, meaning people arriving later can still park there. This also assists people choosing to work more flexibly, or take advantage of off-peak fares (see recommendation 45). The price required will vary from place to place, while parking outside peak periods should attract a lower fee.

We recommend a trial of demand-responsive pricing for on-street parking in inner Melbourne (see recommendation 49). It could also be considered for parking fees at train stations and park-and-rides. Another option is allowing people to pre-book spaces, like the Park&Ride booking system in NSW, which allows people to reserve and be assured of a parking space, rather than try their luck on a first come, first served basis.[57]

Options also exist to only allow people who use public transport to park in these facilities, or to charge a much higher rate for those who are not using public transport, as is the case in Perth and pre-booked commuter parking in NSW.[58]

Potential negative equity impacts of charging parking fees may be reduced by applying the same concession card discounts used for public transport. Some free parking spots should continue to be reserved for select public transport users, such as people with a disability.

Recommendation 51

Incorporate congestion pricing for all new metropolitan freeways

Apply congestion based peak and off-peak tolling to all new metropolitan freeways, including the North East Link, to better manage traffic flow and impacts on nearby local roads.

Road congestion occurs across Melbourne's freeways and major arterial roads, and it will worsen as the city grows. Broader transport network pricing reform can help manage these problems. Victorians are used to making choices that involve balancing quality, convenience and price in other forms of travel, including ride sharing, airfares, and accommodation.[59]

Applying congestion reducing tolls to new metropolitan freeways means traffic will flow more freely and reduces time spent travelling in peak periods. Low off-peak tolls may also attract traffic from parallel arterial roads, improving amenity for nearby residents. The Victorian Government has already proposed congestion-managing tolls for the West Gate Tunnel project, where vehicles exiting to the city centre in morning peak periods would be charged a higher price.[60]

The Victorian Government should extend congestion pricing to plans for new freeways in Melbourne. It should design the charges to manage road congestion and optimise the use of this new infrastructure. Tolls should be lower in off-peak periods, possibly with intermediate tolls during the shoulder periods to avoid abrupt changes. Tolls would also need to consider traffic impacts on nearby roads. For example, an excessive peak toll charge on the North East Link could result in too much congestion remaining on Greensborough, Rosanna, Lower Heidelberg, Manningham and Bulleen Roads, which also connect the Western Ring Road and Eastern Freeway. A well-priced peak toll balances these traffic management challenges while offering a lower toll at times when the freeway is underutilised. This will encourage some users to shift their time of travel to off-peak times, and others to get off local roads and onto the freeway during the day.

Significant negative equity impacts are unlikely as peak period traffic is mainly for driving to and from work.[61] Lower prices in off-peak periods may have positive impacts for those on lower incomes. Road tolls could also receive concession discounts, like public transport. Concessional road use should still face peak and off-peak prices – just at lower rates than other drivers. This would preserve incentives for low income Victorians to drive during off-peak rather than in peak periods.

Recommendation 52

Trial full-scale congestion pricing in inner Melbourne

In the next five years, trial full-scale congestion pricing in inner Melbourne to reduce congestion on inner city roads.

Road congestion means longer journeys with increasingly unpredictable travel times. Inner Melbourne experiences the city's worst congestion, and easing it will yield considerable economic and social benefits.[62] The current transport pricing system does not reflect the delays and costs that vehicles impose on other road users and society.[63] International evidence, such as from London, Stockholm and Milan, shows introducing congestion pricing has a sustained effect on reducing congestion.[64]

The Victorian Government should conduct a full-scale congestion pricing trial in inner Melbourne within the next five years, in anticipation of broader application. Private vehicles entering a cordon during peak hours would be charged a toll. The toll should be set to achieve targeted minimum vehicle speeds, on average, on major roads within the cordon. These speeds should be monitored so if they are regularly exceeded, the tolls can be reduced. If speeds regularly fall below the target average speeds, the tolls should be raised. This could be done once a month or once a quarter to give motorists some certainty about the charges they face. For example, tolls are likely to be lower during the summer holidays when traffic in inner Melbourne is lower. The peak hours to which tolls apply could be set in a similar way. For example, if average speeds slow too much earlier than the defined peak period, then the peak period should be changed so tolls apply earlier.

This road congestion pricing trial would accompany pricing reforms in public transport (see recommendations 45, 46 and 47), and parking (see recommendations 49 and 50). The trial could be supported with advice from the independent transport pricing adviser (see recommendation 48).

Choosing the right boundary for a toll cordon will depend on the costs and benefits of managing demand in different places. We modelled a scenario with a cordon bounded by CityLink, the West Gate Freeway, Punt Road and Alexandra Parade.[65] The Victorian Government can establish a cordon at relatively low cost using a license plate recognition system, or a GPS-based system like that being introduced in Singapore.[66] Our research suggests congestion pricing can increase vehicle speeds within the cordon by 25%, and means motorists can reduce their time spent in congested peak hour traffic by around 8% each day, on average.[67] Significant negative equity impacts are unlikely, as drivers to inner Melbourne typically have above average incomes.[68]

A trial of congestion pricing will also require good public transport options.[69] The Victorian Government could expand services to cater for increased demand on certain routes due to the new road congestion charge, such as providing more tram services (see recommendation 42). London and Stockholm increased public transport services when successfully introducing similar road pricing schemes. Discounted off-peak public transport fares (see recommendation 45) will also encourage off-peak travel and reduce the need for extra services.

Trials also help develop community acceptance of transport pricing. This was evident in the Stockholm experience and with Infrastructure Victoria's transport network pricing community panel, which stipulated pricing schemes should be trialled before implementation.[70]

Recommendation 53

Phase out fixed road user charges and introduce user pays charging

Replace fixed road user charges with variable distance-based and congestion charges over the next 10 years, by gradually expanding and reforming the existing electric vehicle charge. Ensure user pays charging reflects the relative costs of road use, encouraging people to adopt beneficial travel behaviour.

Victorian motorists typically pay fixed road charges regardless of how much they travel, such as for vehicle registration and stamp duty charges.[71] People pay the same whether driving hundreds of kilometres each week or making infrequent trips to the shops, or whether they drive in inner city peak hour traffic or the regions mid-morning. These fixed charges do not reflect the relative costs of providing road infrastructure, the costs of congestion, air and noise pollution, carbon emissions, and road trauma.

Victoria's fixed road user charges do not reward people for making transport choices that benefit others. They do not encourage people to consider changing the time of day, destination, mode, route, or quality of their journey. This means not enough people are strongly motivated to change their travel patterns to help prevent worsening congestion.[72] We found that introducing user pays and congestion charging could lead to up to 168,000 fewer car trips every day, and almost halving car trips in inner Melbourne.[73]

In the next 10 years, the Victorian Government should phase out existing vehicle and road charges. They should be replaced with charges that incentivise drivers to better use Victoria's roads. For example, the Victorian Government can use its existing distance-based electric and hybrid vehicles reform as a transition strategy for all other vehicle types by further reducing fixed fees in exchange for distance-based charges. Once in place, drivers can expect less congestion and more predictable travel times. This will also likely reduce greenhouse gas emissions and improve road safety. The Victorian Government's zero and low emission vehicles road user charge is a promising step in this direction.[74]

Charges should reflect the relative costs of building and maintaining roads, congestion, carbon emissions, air and noise pollution and road trauma.[75] They should vary by time of day and location. Because different vehicle types contribute differently to each cost, charges should also vary by vehicle type.[76] For example, vehicles contributing less air and noise pollution, like electric vehicles, should be charged less.[77] Vehicles that contribute more to road damage, such as large trucks, should be charged more.[78]

To motivate people to make beneficial transport choices, road user charges should ultimately combine a distance charge and a congestion charge at the times and locations of road congestion.[79] Low income and vulnerable Victorians can receive discounts on road user charges, like those for public transport. Designers can also consider the implications for those living more remotely and the fairness of the system. To support this, an independent transport pricing adviser should review the road user charges (see recommendation 48).

Some of our other recommended reforms, such as applying congestion charges to new freeways (see recommendation 51), are building blocks toward this broader, integrated system. They can prove the benefits of congestion charging and offer lessons for the design of road reforms.

2.4

Adapt infrastructure for modern needs

Creating better communities does not always mean building new infrastructure. Even under projections for a growing population, Victoria already has most of the infrastructure it will need by 2051. Looking after and using existing infrastructure better can be much cheaper than building new infrastructure, especially in established areas where construction might be particularly complicated and expensive. Well-maintained assets can remain sustainable and effective as they age, as demand grows and as technology continues to improve.

Infrastructure investment is at record highs in Victoria. The Victorian Government plans to spend an average of $22.5 billion a year on infrastructure over the 2021–22 budget forward estimates[1] and local governments collectively budgeted $19.8 billion for capital works in the 2020–21 financial year.[2] All governments have made significant new commitments to infrastructure spending, including to mitigate the economic effects of the COVID-19 pandemic. Yet this is only a fraction of the value of public assets. In 2018, the Victorian Government managed non-financial assets valued at $265 billion,[3] not including $14.2 billion of physical assets held by public hospital services.[4] VicTrack and VicRoads alone managed more than $92 billion in transport assets.[5] Councils manage over $100 billion of assets including local roads, street and local drainage services, and community, sports and recreation facilities.[6]

When it is well managed and maintained, infrastructure should last a long time. This means many current facilities, including major hospitals, much of the transport network, and public buildings used to deliver services, will still provide vital services to future generations. When infrastructure is not well managed and maintained it becomes less efficient and effective, and Victorians may experience reduced service quality. Waiting times to access non-urgent health care could increase due to bed unavailability, or transport services could be interrupted from worn train tracks. For some of Victoria's most vulnerable public housing residents, ageing facilities can mean an extremely hot home in summer and a cold home in winter, impacting their health and wellbeing.

Building new infrastructure is not always required to meet the challenges of a growing and changing population. Victoria already has most of the infrastructure it will need to support its population to 2051.

Managing assets well is cheaper than new infrastructure

Ensuring public assets are fit for purpose, efficient, effective and adaptable helps meet growing demand pressures as technologies, demand and service delivery models evolve. Proactive and evidence-based management practices support asset maintenance, upgrades, and the eventual replacement, consolidation or disposal of assets when they are no longer suitable.

Sound asset management requires effective planning, acquisition, operation and disposal of assets to meet current and likely future service delivery demands.[7] The asset management lifecycle involves initial assessment of investment proposals, ongoing maintenance and renewal, and asset replacement or disposal decisions, as shown in Figure 15.[8] Good asset management can optimise the use and lifespan of existing infrastructure, minimise or defer the need for new assets, reduce disruptions, and allow for rapid responses to changing demand or other circumstances.[9] In contrast, inadequate attention to maintenance can accelerate the need for major repairs, shorten the operational life of facilities, and create worse outcomes for users.[10]

Despite major new infrastructure investments, the management of existing public sector assets is often neglected.[11] Victorian Government assets are managed under the *Asset Management Accountability Framework,* overseen by the Department of Treasury and Finance.[12] It requires accountability for asset management, and many agencies have improved their approaches since its introduction.[13] However, agencies inconsistently interpret their responsibilities and often focus on building or buying new assets, rather than managing existing assets strategically to maximise value.[14]

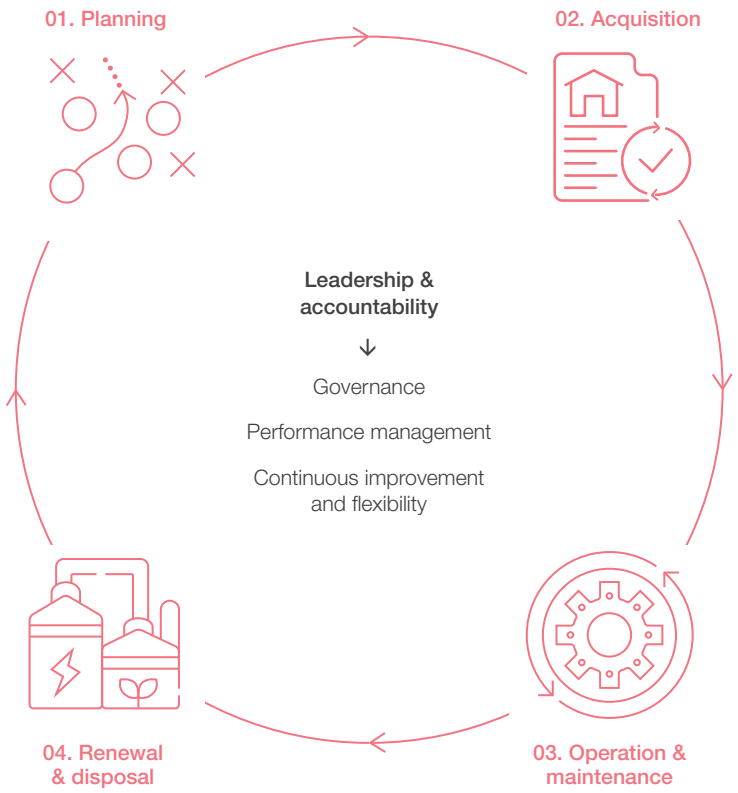
Inadequate and reactive asset management can incur higher maintenance costs, reduce financial sustainability and cause premature deterioration. In some sectors, buildings and fixtures are becoming more difficult to maintain in an acceptable condition as they grow old or are heavily used, and less able to support effective, safe and efficient services.[15] Outdated buildings can be inaccessible, energy inefficient, unable to integrate modern technology, or unsafe.

In rural areas, some councils struggle to maintain many ageing assets that no longer meet community needs (see recommendation 89). A reluctance to dispose of facilities that no longer meet needs, particularly in the face of community opposition, can prevent the rationalisation or consolidation of facilities, even when it could enable a higher quality of service delivery.[16]

Victorian Government agencies often have limited or inaccurate data on the condition of their assets.[17] Agencies need good asset condition data to make strategic decisions about maintenance and infrastructure spending. Better data can help them get the best value from investments, make good decisions about when to acquire, renew or divest assets, be responsive to changes in demand or use, and provide better services.[18]

Figure 15: The asset management lifecycle

This figure shows the phases of the asset management lifecycle, from planning and acquisition to operation and maintenance, and renewal and disposal.



01. Planning

- Asset management strategy
- Planning for uncertainty
- Business case
- Risk management
- Cost benefit analysis
- Accounting treatment
- Non-asset alternatives

02. Acquisition

- Aquisition process
- Risk evaluation
- Procurement method

03. Operation & maintenance

- Monitoring
- Maintenance
- Information management
- Asset valuation
- Utilisation
- Functionality

04. Renewal & disposal

- Retirement
- Replacement
- Renewal

A more strategic and transparent approach to asset management is likely to involve a greater commitment to timely maintenance, asset renewal and retirement. It would make facilities and the services they provide more reliable, reduce interruptions, promote more integrated infrastructure planning and generate greater efficiency. Ongoing monitoring of demand, innovations and asset condition helps infrastructure planning across the lifecycle and aligns upgrades, rebuilds, consolidations and divestments with needs. It also means building new infrastructure only when it is necessary.

Today's infrastructure will need to meet evolving needs

Even well-maintained, upgraded and renewed infrastructure will need to adapt and evolve. The pace of change in technology and service innovation is rapid, and inflexible assets risk premature redundancy. Building facilities to be as flexible as possible would support simpler, less expensive and faster upgrades when required, which can be many times during the decades that most assets are in place.[19] Planning for upgrades, rebuilds and new infrastructure should consider the ease of future asset maintenance, upgrades, expansion and possible repurposing if required. Some projects can be planned to allow for future expansion, including through design or site choices that preserve options.

Public buildings and infrastructure need to adapt to match the changing needs of Victorians. Many public buildings do not provide suitable access for those with impaired mobility. The need for dignified access to, and use of, commercial and public buildings will only become more pressing as Victoria's population continues to age. Evolving building standards and the impacts of climate change mean ageing properties may need upgrades to keep people safe, comfortable and healthy. As a service provider, major landowner, employer and tenant, the Victorian Government is uniquely placed to drive positive, long-term change.

Recommendations for better managed and more modern infrastructure

Infrastructure Victoria makes the following recommendations to adapt infrastructure for modern needs. These would be most effective if complemented by improvements to planning and funding that support: resilient infrastructure networks and assets (see section 1.3); public transport accessibility (recommendation 44); the maintenance of regional roads and rail freight networks (recommendations 78 and 79); cooperation with regional councils on community infrastructure (recommendation 89); and making social housing suitable for changing climates (recommendation 95).

Recommendation 54

Require accessible buildings for public services

In the next year, establish an accessibility upgrade fund to contribute towards priority building upgrades to meet contemporary accessibility standards. By 2032, require all Victorian Government provided and funded services to be delivered from premises that meet contemporary accessibility standards.

Infrastructure supports delivery of many different public services, but not everyone can access the buildings used to deliver these services. One in five Victorians has a disability,[20] and nearly one in six is aged over 65 years.[21] Many older buildings used to deliver services were not built to contemporary accessibility standards. These include schools, police stations, sporting and cultural facilities, buildings used to deliver community services,[22] and associated pathways, car parks and seating.[23]

In May 2011, the Australian Government introduced the *Disability (Access to Premises – Buildings) Standards 2010.*[24] These standards provide references to technical specifications to ensure dignified access to, and use of, commercial and public buildings. They aim to provide older people and people with mobility, vision, and hearing impairments with better access to places and services and more opportunities to connect with family, friends, and the community.[25]

These standards have largely been incorporated in legislation and building standards[26] but only apply to new and refurbished premises. Many legacy buildings are not required to meet these standards until they undergo a major renovation or refurbishment. Consequently, some public services are delivered from inaccessible buildings, making it hard for people to access those services. For example, evidence from Odyssey House Victoria shows that residential facilities delivering alcohol and other drug rehabilitation services require upgrades to improve accessibility.[27]

All Victorians have a right to equal access to public services and the premises delivering them. The buildings enabling these services are also workplaces, and need to be accessible if the Victorian Government is to achieve its 12% target for employment of people with a disability in the Victorian Public Service by 2025.[28]

The Victorian Government has committed to using universal design principles when designing infrastructure and public transport projects.[29] However, these tend to only apply to designing new buildings or upgrades and not improving existing infrastructure. There is currently no requirement for buildings delivering public services to meet contemporary accessibility standards.

The Victorian Government should adopt a policy requiring all buildings delivering public services to achieve contemporary accessibility standards by 2032, even if they were constructed before the standards came into effect. This aligns with the same timeline for achieving improved accessibility on the public transport network (see recommendation 44).

Proactive retrofitting will be a significant undertaking, but the Victorian Government does not need to upgrade every building. Over a 10-year period, it can relocate services from inaccessible buildings to accessible ones, especially if buildings are leased. It can incorporate advice from diverse communities about accessibility requirements. In some cases, it may be more cost-effective to retire old government-owned buildings than retrofit them, and government consideration of property disposals should prioritise inaccessible buildings. Simpler modifications can be incorporated into regular maintenance work. Appropriate exemptions should be included for heritage buildings where providing good accessibility is not feasible.

For larger, unavoidable and priority upgrades, the Victorian Government should establish a fund to contribute to upgrade costs. Work needs to begin immediately to achieve the 2032 target, including identifying and costing priority upgrades to establish a suitably sized fund.

Recommendation 55

Rapidly renew old public housing

Rapidly renew dilapidated public housing properties to improve functionality, accessibility and energy efficiency with a priority to renew at least half of all older low-rise apartments and older three bedroom detached dwellings by 2031.

Victoria's public housing is deteriorating, with over 60% of dwellings being more than 30 years old.[30] Housing over 30 years old has higher maintenance costs than newer homes.[31] Ageing homes mean rising maintenance costs, putting extra pressure on the system's financial sustainability.

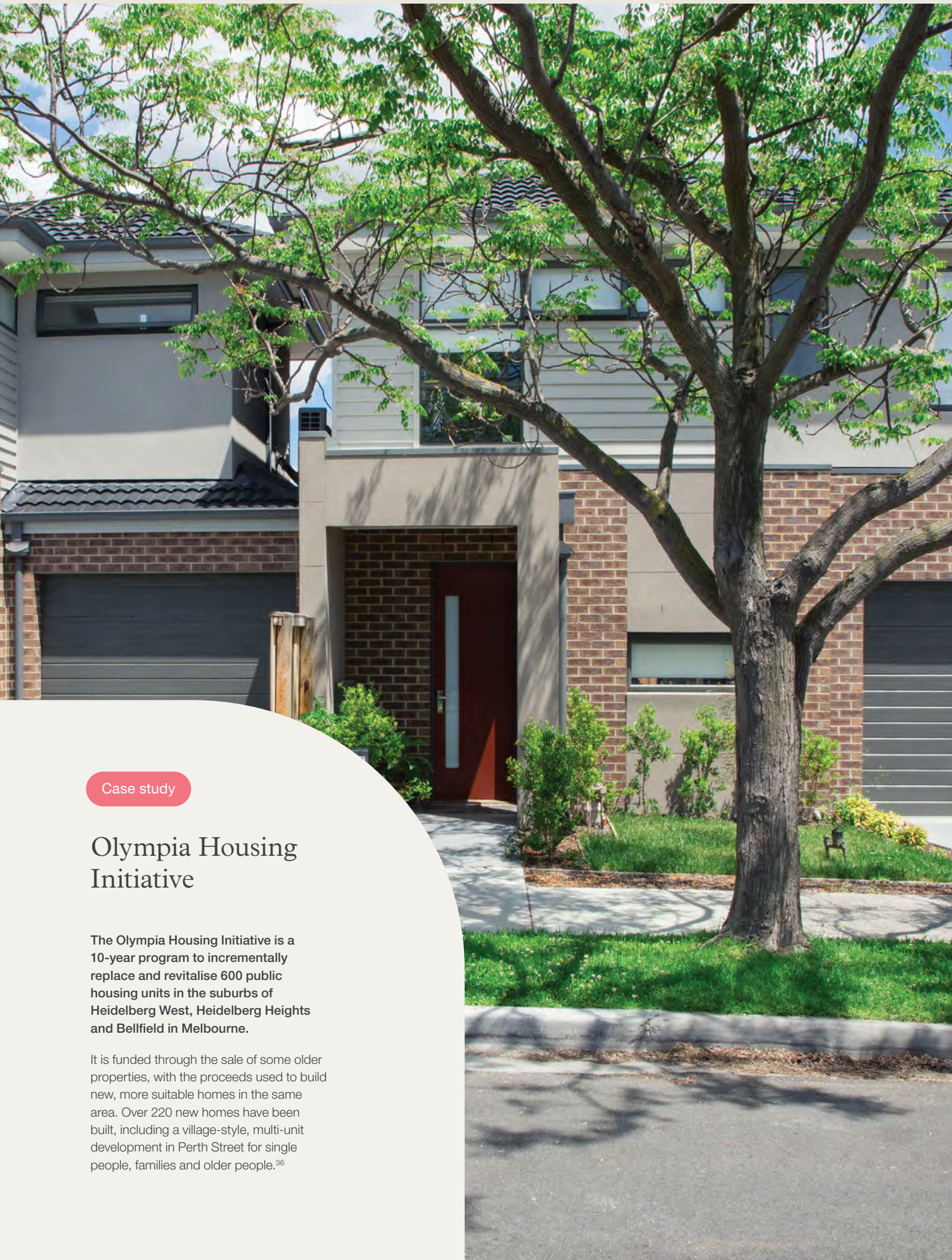
The Victorian Government has recognised the need for improvement. Its $5.3 billion Big Housing Build program, COVID-19 stimulus package, and other investments have allocated over $1 billion to improve maintenance and renewal of public housing.

Victoria's public housing portfolio does not meet the current needs of its tenants. Nearly half of tenants live alone,[32] but nearly half of public housing dwellings have three bedrooms.[33] This problem is even more pronounced for new applicants, with around 80% seeking one- or two-bedroom dwellings.[34] Many older properties are poorly designed, with inadequate accessibility and energy efficiency. Inaccessible homes include low-rise apartments or 'walk-ups', which can only be reached by flights of stairs and are inappropriate for growing numbers of older people and people with a disability. Low energy efficiency means higher energy bills and lower health outcomes. These issues will worsen as climate change intensifies, but smaller upgrades can be a useful solution (see recommendation 95). Aboriginal Victorians are more likely to need and use social housing than other Victorians, and better homes can also better meet their cultural needs and help Close the Gap in outcomes for Aboriginal Victorians.

Renewing older low-rise apartment estates and detached three-bedroom dwellings should be an immediate priority. Renewal will most likely involve demolition and replacement of the existing housing, but depending on the form of the existing housing, may involve renovation and expansion. Low-rise apartment estates in good locations offer strong redevelopment and intensification opportunities, either to generate extra housing or leverage land value to lower redevelopment costs. Older detached dwellings have high maintenance costs. By creating smaller attached dwellings on larger blocks, housing can better match tenant need. Some estates for renewal may not be in desirable locations. In these cases, rebuilding could occur in a better location.

Relocating tenants can present a challenge in renewing and disposing of old public housing stock. Increased targeting means social housing is now usually only offered to highly disadvantaged people, meaning they stay longer and create few natural vacancies. The Director of Housing has legal powers to relocate tenants,[35] but this can prove challenging if housing managers cannot offer attractive alternatives, such as modern one- or two-bedroom apartments. Social housing supply growth (see recommendation 68) should be used to assist tenant relocation for faster retirement of old assets, by providing new, fit for purpose homes for transfers.

Rapid renewal of old public housing stock needs extra funding, over and above that being provided for new supply. However, in the long term this will be at least partially offset by lower maintenance costs, better matching of tenants to housing, and better tenant health. In some cases, renewal costs can be reduced by leveraging land value, such as in the Olympia Housing Initiative.



Case study

Olympia Housing Initiative

The Olympia Housing Initiative is a 10-year program to incrementally replace and revitalise 600 public housing units in the suburbs of Heidelberg West, Heidelberg Heights and Bellfield in Melbourne.

It is funded through the sale of some older properties, with the proceeds used to build new, more suitable homes in the same area. Over 220 new homes have been built, including a village-style, multi-unit development in Perth Street for single people, families and older people.[36]

Recommendation 56

Upgrade and rebuild public hospital infrastructure

In the next five years, publish priorities for hospital renewal to enable modern health care services and meet future demand. In the next 10 years, redevelop the Royal Melbourne Hospital and progress the upgrade and rebuild of the Alfred Hospital and Austin Hospital.

Growing demand on Victoria's hospital system will require existing facilities to operate efficiently even as innovative new models of care are explored (recommendation 25) and new capacity built (recommendation 69). Many public hospital facilities are close to, or past, their envisaged lifespans.[37] Spending on capital works has not kept pace with the need for asset maintenance and renewal, nor with advances in medical science and technology.[38] Aged facilities can require more frequent and expensive emergency repairs.[39] Many older buildings do not meet modern standards for accessibility, safety or energy efficiency.[40]

The Victorian Government should work with public hospitals and health services to establish a more strategic and proactive approach to the statewide, whole-of-life management and renewal of hospital assets. Within five years, it should publish priorities for rebuilds and major upgrades, ideally in a public plan for health infrastructure that also includes sequencing and timelines for investment (recommendation 32). Supported by regular condition assessments of hospital assets, a transparent approach could provide greater certainty for government agencies, hospital managers, stakeholders and the public, and result in fewer interruptions to patient care.[41]

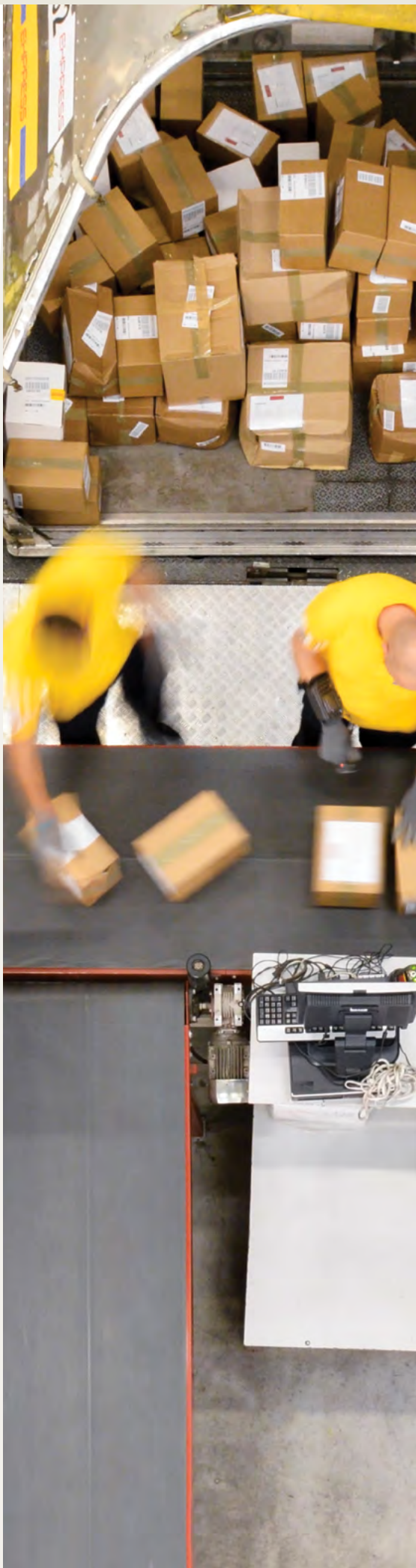
Some of Victoria's most critical hospitals are those most in need of renewal. The Alfred, Royal Melbourne (City Campus) and Austin hospitals are priorities, as they are three of the state's largest hospitals and provide a significant share of specialist health services across the state, including major trauma care. They also have significantly aged infrastructure. Maintenance issues at the Alfred Hospital have become disruptive system failures, forcing the temporary relocation of services and requiring around $45 million in funding for emergency repairs each year.[42] The Royal Melbourne Hospital's ageing facilities restrict effective delivery of care and research.[43] Most operating theatres are close to 40 years old at the Austin Hospital and need urgent redevelopment.[44] Short-term funding has addressed critical failures, but major capital works are required.[45]

The Victorian Government has funded initial planning for redevelopment of the Royal Melbourne Hospital, including a new campus in the Arden precinct.[46] In the next decade, it should deliver the project and finalise planning for the rebuild or major refurbishment of the Alfred and Austin hospitals, with a view to delivering both as soon as possible. The full cost of renewing all three hospitals is estimated at around $6 to $7 billion.[47] Project sequencing and staging can enable the continued delivery of services while mitigating cost, timing and other risks associated with parallel delivery. Infrastructure renewal will also benefit surrounding precincts.

The cost of required upgrades and rebuilds across Victoria over coming decades will be significant. These will be partly offset by savings from more efficient service delivery and facility management, fewer interruptions to patient care and a reduced need for expensive emergency repairs. Final costs and timelines will depend on government decisions on how best to balance planned service need and asset condition. Those same decisions should inform use of existing resources, including the Metropolitan and Regional Health Infrastructure Funds, and may require investment in data collection and systems.

Harness infrastructure for productivity and growth

Section 03



As Victoria's population has increased, cities and towns have grown to provide homes for new residents. As the destination for most new arrivals, Melbourne has expanded particularly rapidly, including outwards, with new growth suburbs under construction in the city's west, north and south-east.

More homes are also being built in Melbourne's inner suburbs, sharing space with commercial uses and shifting previously industrial centres to residential areas. An increasing population helps to drive economic development and thriving communities, but it can also put pressure on existing infrastructure and services.

Concentrate investment where it can do the most good, enable services and infrastructure to meet future demand, and measurably improve the lives of every Victorian now and into the future.

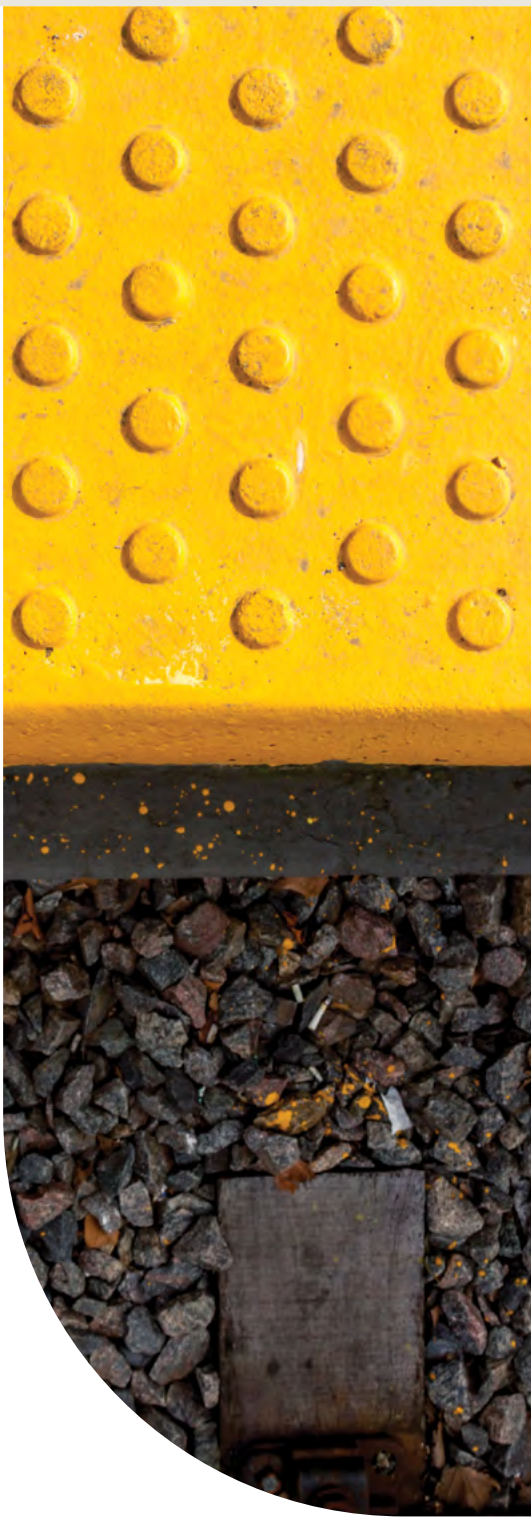
Other sections of this strategy discuss how the Victorian Government can address a significant amount of increasing demand through better use of existing infrastructure. Recommendations point to the benefits of using new technology, improving asset management and resilience, and using prices to influence behaviour that can manage demand. In some cases this will simply not be enough and new infrastructure will be needed. Victorian Government Budgets, however, will be constrained – especially once the time for recovery stimulus is past. The challenge is to carefully select projects that produce the best outcomes, so that scarce funding can deliver maximum benefits.

How the Victorian Government decides to use existing infrastructure, and the new infrastructure projects to prioritise and deliver, will change depending on its objectives. New infrastructure can help prepare for long-term growth, maximise efficiencies, and be designed to deliver social, economic and environmental benefits. Major projects should carefully consider all available options, with final decisions based on outcomes of detailed feasibility studies and business cases ahead of announcements.

One major challenge is meeting the needs of new neighbourhoods built on previously rural land. These areas have relatively affordable housing costs but little existing infrastructure to support new residents and their access to employment, services and recreation. Public transport and roads in outer suburbs are less developed, meaning there are fewer options for people who need to commute to the city, inner or middle suburbs, and congestion will only worsen without good transport infrastructure. Freight movements also require reliable travel with reasonable travel times. The rapid development of new estates has also caused environmental issues. As plot sizes shrink, and house sizes grow, less land is available for existing vegetation or new trees.

Statewide, the Victorian Government also faces challenges in delivering suitable, sufficient and timely services. Demand is increasing for health, education, social housing, justice, and other social services as populations grow, communities become more diverse, government policies change and society evolves. Sufficient, modern, and flexible infrastructure will be needed to provide the services required to respond.

Selecting the best new infrastructure projects can help create a more prosperous, sustainable and inclusive Victoria. This would concentrate investment where it can do the most good, enable services and infrastructure to meet future demand, and measurably improve the lives of every Victorian.



3.1

Shape the transport network for better access

Victorians depend on transport infrastructure to support their economic, social and cultural connections. Prosperity and productivity partially rely on public and private transport moving smoothly on road and rail networks, creating reliable and efficient movements of people and goods. Transport connects people to their jobs and livelihoods. It helps people access the services that help them stay productive and well, such as health, education, community and recreational services. It connects them with friends and family, and opportunities to take part in cultural and civic life.

The Victorian Government has embarked on an expansive transport infrastructure program to cater for the population boom. The `Big Build' initiative includes 165 road and rail projects, with approximately $80 billion worth of transport infrastructure projects currently underway.[1] The program's flagship projects include the Metro Tunnel project, Level Crossing Removal Project, North East Link and early works for the Suburban Rail Loop. Our recommendations will secure or further realise benefits from these Big Build investments, including for major projects we have strategically assessed. For example, upgrading road management systems (see recommendation 24) can more easily accommodate changing travel patterns, including from these projects. The transport system must continue to adapt as the city expands.

Transport infrastructure is costly and often disruptive to build, and infrastructure projects will become more expensive and complex as Melbourne develops. Many of our recommendations provide ways to better use existing infrastructure, minimising the need for more new construction. But if rapid economic and population growth returns, Victoria must build extra transport infrastructure to keep the economy moving and underpin Victorians' quality of life. To maximise the long-term benefits of major projects, transport infrastructure planning and delivery must be strategic, select the best projects in the right order, and be integrated with land use planning, including the protection of corridors.

The Victorian Government must strike a balance between responding to existing demand and shaping future growth. It can create a financially, socially and environmentally sustainable transport system by combining efficiency improvements with carefully selected new construction projects.

Victoria's population has been growing

Before the COVID-19 pandemic, Victoria's population had been growing strongly for over a decade. Never had the state added so many new residents so quickly.[2] In 2019, Victoria added 132,400 extra people to its population – a 2.0% increase on the previous year, and the largest increase of all Australian states and territories.[3] Migration was the largest single driver of population growth, with new births also contributing significantly.[4] Greater Melbourne absorbed most of this increase with only 15% settling in the regions in 2018-19.

Population growth is far from uniform or certain, and some places will grow faster than others. In our modelling for this strategy, we examined population scenarios with three to six million extra Victorians by 2051.[6] As the COVID-19 pandemic illustrated, population growth is uncertain. The impact of the COVID-19 pandemic is expected to initially pause population growth and then progressively increase over the coming decade. The Australian Bureau of Statistics projects Victoria's population growth will recover to pre-pandemic growth rates by 2023–24, faster than other states and territories.[7]

Even with these uncertainties, we still expect most of Victoria's population growth will concentrate in Greater Melbourne. Over the next 15 years, over 30% of Melbourne's population growth will occur in new growth areas in the north, west and south-east.[8] Regional population growth will disproportionately occur in the major centres like Geelong, Ballarat and Bendigo. The location of population growth fuels demand for more transport trips, and so requires more transport infrastructure.

Victoria's jobs will grow and change

We expect Victoria to have five to six million jobs by 2051.[9] We expect service sectors to disproportionately generate new jobs, including in the health, education and professional services sectors. In all our modelling scenarios, most of Victoria's extra jobs were created in Melbourne's established areas.

Different jobs have different productivity effects, meaning they produce different economic contributions. Better paid jobs tend to cluster in certain locations, like the central city, and generate higher economic output for each worker. *Plan Melbourne* identifies National Employment and Innovation Clusters to encourage these clusters outside the central city. Transport infrastructure can help develop these clusters, by expanding the labour pool and allowing quick trips between clusters.

Connecting people to opportunities

Future population growth and job creation have different distribution patterns. Some urban areas are projected to combine strong population and job growth like Melbourne's inner and eastern suburbs. People living in Melbourne's established inner and middle ring suburbs have access to comparatively diverse local job and education options. A well-developed motorway network serves these suburbs with high quality road links and interchanges, offering motorists many route options. Inner suburbs also enjoy plentiful public transport options, with trams, trains and buses offering good connectivity. The middle ring suburbs have regular train and bus services.

But in other places, strong population growth is not accompanied by much employment growth, such as in Melbourne's outer northern and western growth areas, as shown in Figure 17.

These places are distant from areas projected to generate many jobs, especially higher-paying specialist employment. This means people living there have fewer job choices and must travel further to reach them. This potentially means people may settle for lower paid work than they are capable of, and places extra pressure on transport networks to accommodate longer trips.

Figure 18 shows that without further investment, large sections of Melbourne's rail network will be heavily congested by 2036. As rail and other transport networks become more congested and unreliable, fewer workers can access employment precincts. This also means employers can find it increasingly difficult to find skilled staff willing to travel to their business, compromising business growth and productivity.

Figure 16: Melbourne's functional urban areas

This map shows the functional urban areas used throughout this strategy. The map shows inner Melbourne, middle Melbourne and outer Melbourne. It also shows the new growth areas on the edges of the city.

- Inner Melbourne
- Middle Melbourne
- Outer Melbourne
- Melbourne's new growth areas
- Regional cities
- Other regional areas

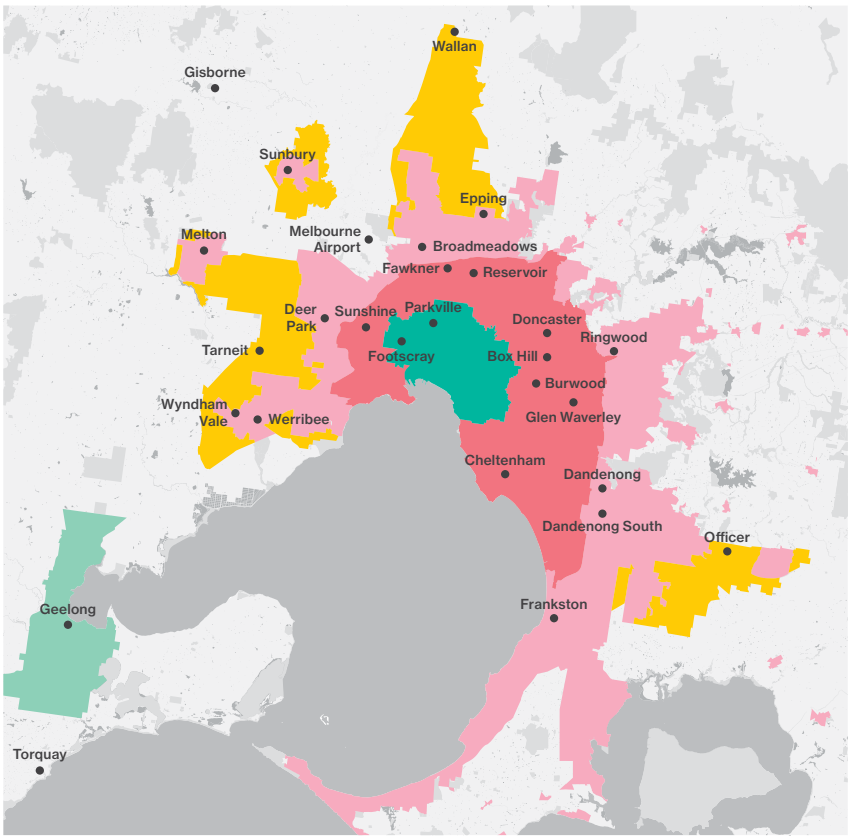
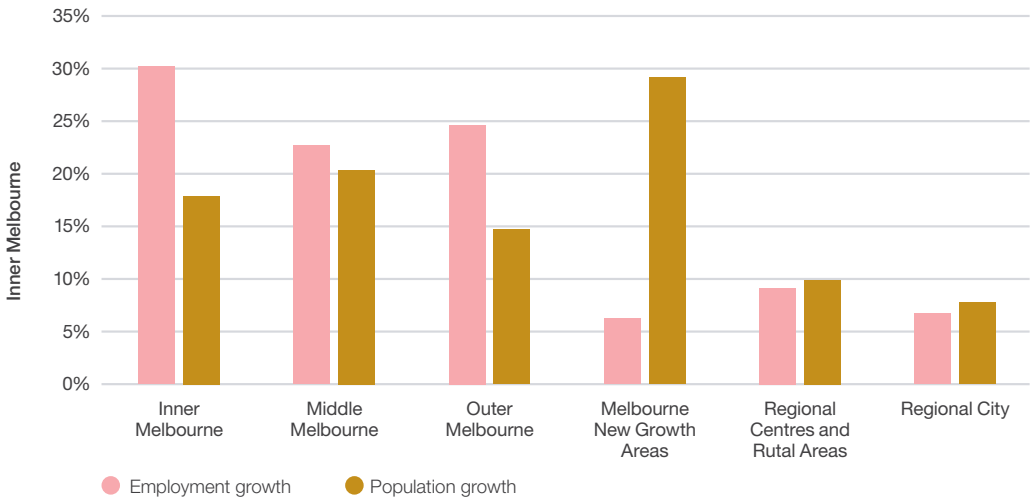


Figure 17: Comparison of employment and population growth projections (2018 to 2051)

This graph shows that inner Melbourne employment is projected to grow more than its population, while in new growth areas, population growth will far outstrip employment opportunities.



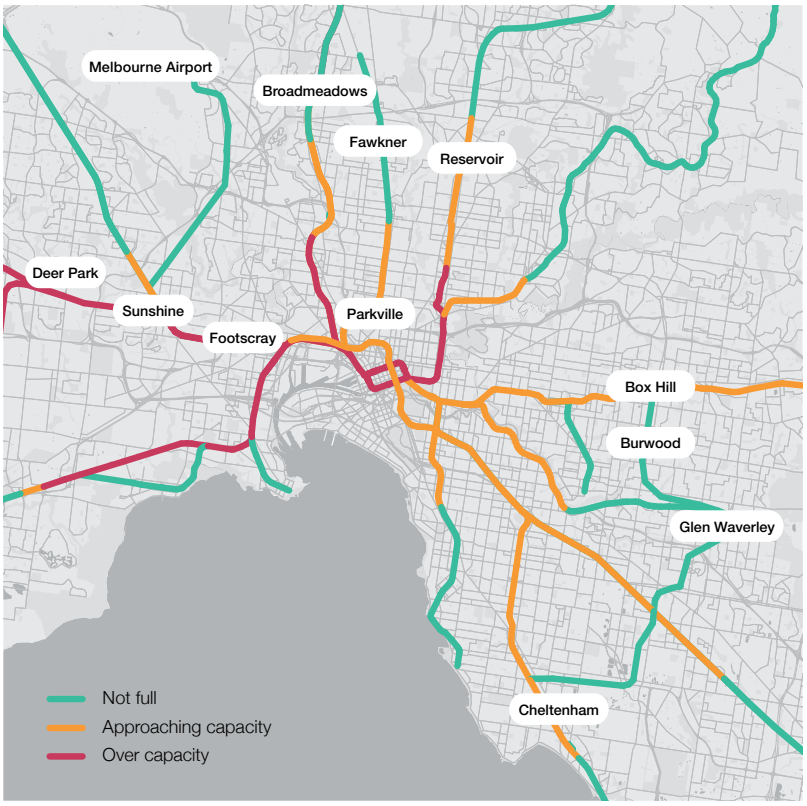
Source: Infrastructure Victoria, *Major transport program strategic assessment report,* 2021

These places also have fewer transport options. Motorists have access to fewer nearby arterial roads or motorways, and fewer route choices. The radial nature of the train network means the distance between rail lines, and often train stations, grows with distance from the central city, making access to trains in outer suburbs and new growth areas difficult. Bus and train services are less frequent. People living in fast growing areas of Melbourne's north and west also use the same transport corridors as growing regional centres, such as Geelong and Ballarat. This can compromise access to metropolitan Melbourne from these regional centres.

In outer growth areas of Melbourne, projected strong population growth is not accompanied by similar employment growth, which impacts access to where jobs are located.

Figure 18: The rail network is projected to become crowded without change

This map shows the rail network in 2036 is likely to be heavily congested in the mornings without further investment, especially in the west, north and north-east corridors.



Source: Arup, *Strategy update: Problem definition modelling outcomes,* report for Infrastructure Victoria, 2020

Achieving environmental and resilience outcomes

Victoria will not meet its net zero emissions target if transport sector emissions keep growing. If Victoria does not transition to zero emissions vehicles, and cars stay the dominant form of transport, emissions will increase drastically. In this scenario, transport emissions from private vehicles would double to 288,000 metric tonnes each weekday in 2051, equal to burning 1600 railcars of coal.[10] To meet emissions targets, Victoria will need to transition to zero emissions vehicles (see recommendations 1 and 2), but can also accelerate emissions reductions by switching to less emissions-intensive transport modes, like walking, cycling and public transport. Transport projects also generate emissions during their construction.

Transport projects can also convert natural landscapes to impervious surfaces. This can increase waterway pollution from road runoff and affect biodiversity by fragmenting habitats and movement corridors. Construction projects may remove established trees, contributing to the loss of tree canopy, and worsening urban heat island effects.

Future uncertainty and more regular disruptions mean the transport network needs adapt and perform in different scenarios. For instance, some people may continue working from home all or part of the time after the COVID-19 pandemic. Automated vehicles may also dramatically change transport use and vehicle performance. For this strategy, we have assessed different scenarios, including a permanent shift to more people working from home, different population growth rates, and the introduction of electric and automated vehicles.

The benefits of major transport projects

City shaping transport projects that significantly improve accessibility can influence household and business location choices, by reducing travel times and congestion, and improving transport network capacity. These types of projects can shape urban development and strengthen Victoria's economy by delivering broader economic benefits.

For example, over time, businesses will gravitate towards areas with high accessibility, reducing transaction costs by easier contact with suppliers and customers, and better access to skilled workers. Business preferences vary by industry. For instance, manufacturing and logistics requires larger plots with good access to freight links and ports. In contrast, knowledge-intensive firms require offices with a smaller land requirement, and access to a deep labour pool. These differences drive the location choices of firms, and influence benefits likely to arise from major transport projects.

Transport projects can also affect the location of demand for housing. They can support greater residential development in established areas by reducing congestion in these places, if supported by appropriate land use settings. This reduces demand for homes in new growth areas. Infrastructure capital costs in greenfield areas can be two to four times higher than in established areas, when existing infrastructure in established areas has the capacity to support growth, excluding transport costs.[11]

Transport projects improve access to employment opportunities, education, health care, and community and social services, helping reduce disadvantage, particularly in areas that currently have limited access to these services. Suitable and accessible transport options can also reduce the risk of exclusion from economic, social and political participation in society for at-risk groups. Transport projects can also improve health outcomes if they encourage more active transport trips, such as walking or cycling. Residents living in neighbourhoods with better active and public transport options are likely to undertake more physical activity when travelling. Public transport projects that encourage more walking and less car-based transport will contribute to improved health outcomes.

Transport project delivery can also help achieve other social and environmental objectives. For example, good environmental and climate change assessment can reduce greenhouse gas emissions (see recommendation 11). Similarly, social procurement can help achieve social policy objectives, such as providing jobs for Aboriginal Victorians and helping Close the Gap in outcomes for Aboriginal Victorians. The final section of this strategy, 'Delivering infrastructure policies, reforms and projects', documents other ways to produce benefits during infrastructure delivery.

Recommendations to improve transport access

Infrastructure Victoria makes the following recommendations to improve transport access. They build on recommendations elsewhere, including to adopt new transport technology (see section 1.3), support more homes in existing suburbs (see section 2.2), adopt transport network pricing (see section 2.3), support freight movements (see section 3.2), plan for growth areas (see section 3.4) and support regional Victoria's economic development (see section 4.1) and connectivity (see section 4.2). Adopting and combining these approaches can get the most from major transport projects.

Transport investments should be based on robust evidence, including detailed feasibility studies and businesses cases.

Recommendation 57

Reshape the metropolitan bus network and introduce 'next generation' bus services

By 2025, reshape the metropolitan bus network in Melbourne's north-west and south-east in time for the opening of the Melbourne Metro Tunnel. Introduce 'next generation' bus services, beginning by using them on the new Doncaster busway. In the next 10 years, continue reforming bus networks in Melbourne and Geelong, including by revising the coverage standard and using more flexible bus services in lower demand areas.

For most Victorians, buses are the closest public transport option to home. Buses do not require large, expensive, immovable infrastructure investments and can operate on most roads. The relatively low capital cost of buses means they can respond quickly to changes in population, technology, policy and behaviour.[12]

Melbourne's bus services run long distances, making up 72% of public transport service kilometres in the city each year, but they only account for 21% of passengers.[13] In 2016, only around 60% of the metropolitan bus routes averaged more than 20 boardings each hour.[14] The remainder are infrequent, meandering services, many running in low density suburbs with high car ownership.[15] This is partly influenced by the current metropolitan bus coverage standard that specifies that 95% of households must be within 400 metres of a bus route.[16] But as people will often walk further to a frequent, high-quality bus service,[17] this distance could be expanded when this type of service is available.

Introducing new, more efficient bus services helps to improve access to larger suburban centres and new growth areas, enhancing accessibility and amenity for residents, workers and visitors. Victoria has successfully introduced premium bus services and reshaped bus networks. The Victorian Government is proposing to undertake network reform to the metropolitan bus network as part of Victoria's Bus Plan.[18] The introduction of premium 'SmartBus' services in the last decade have delivered more direct and frequent services, longer operating hours, better on-road bus reliability, faster travel times and better customer information. Passengers increased by up to 70% in the first two years, and have continued to grow faster than other bus routes.[19] Similarly, the redesigned bus networks in Brimbank[20] and Wyndham, high frequency shuttle buses from train stations to universities and shopping centres, and Skybus improvements, have also boosted bus patronage.[21]

High quality, sustainable public transport is needed to support rapid growth in Melbourne and Geelong. The Victorian Government should progressively reform Melbourne and Geelong's[22] bus network, including developing a 'next generation' of zero-emissions, frequent, high quality bus services. The reformed network should be based on new route classifications that distinguish between different types of public bus services (see box):

- 'Next generation' bus services
- Connector bus services
- Local bus services.

The time is right for reform. Changes to bus contracts have made it much easier to change bus routes.[23] Expiry of the myki contract in 2023 may also make restructuring services easier and provides an opportunity to introduce more flexible service options.

In particular, the opening of the Melbourne Metro Tunnel in 2025 will require changes to the bus network. Reforming bus networks is a particular priority in Melbourne's north-west and south-east, where buses will connect to the Sunbury, Cranbourne and Pakenham train services proposed to use the new rail tunnel. The Victorian Government should take this opportunity to reshape, reform and expand the bus network at the same time.[24] The Victorian Government should also use this opportunity to reform the metropolitan bus coverage standard to better align with community needs and consider also applying it to Geelong.

Similarly, the opening of the Doncaster Busway in the mid-2020s provides an opportunity to introduce the 'next generation' bus service across that network,[25] which could then be used as an approach for improvements on other corridors (including those prioritised in recommendations 58 and 75).

Case study

New 'Next generation' bus services can be the top of a three-tier public bus network

Around the world, governments are using new technology and infrastructure to re-imagine bus services to provide a superior public transport experience, more like a train or tram.

For example, the Netherlands is aiming to make all buses zero emissions by 2025, and using the opportunity to create a new level of service, with a quiet, comfortable riding experience that improves amenity and health, while reducing emissions.[26] Many stakeholders advocated the benefits of these type of technologies, including 'bus rapid transit' or 'trackless trams'.[27]

These 'next generation' services can become the top level in a three-tiered bus network:

'Next generation' bus services

Running on the Principal Public Transport Network, these bus routes would be frequent, direct, prominent, and coordinated with other public transport modes. They would use zero emission technology. They can include rapid, limited stop services, including having dedicated rights of way in reserved busways or sharing existing tram rights of way. Introducing zero-emission buses (see recommendation 2) provides an opportunity to procure new, modern buses with attractive features and greater comfort. These services can have universally accessible tram-style stops and charge the same fares as other buses.

Connector bus services

These medium level services provide direct, regular connections to the nearest activity centre and link to higher quality 'next generation' bus services and other public transport modes. Their service frequency and operating hours would be coordinated to connecting train and tram services.

Local bus services

These local services provide access to the nearest activity centre or public transport interchange for those unable to access a direct service, especially in low density, low demand areas, like in industrial precincts such as in Dandenong. These can include greater use of flexible bus services that are universally accessible, with some demand-responsive features, like the Woodend FlexiRide Service or Telebus services.[28]

Recommendation 58

Connect suburban jobs through 'next generation' buses and road upgrades

In the next five years, create new 'next generation' bus services and better roads to connect outer and growing suburbs to National Employment and Innovation Clusters and major employment centres. Consider using a 'next generation' bus service instead of trams between Caulfield and Rowville.

Public transport is more effective in places where many jobs cluster together. In the next five years, the Victorian Government should design and deliver 'next generation' bus services between the National Employment and Innovation Clusters (NEICs), their surrounding suburbs and other nearby employment centres. It should begin with the Monash, La Trobe and Sunshine NEICs, before extending to other NEICs and *Plan Melbourne's* 12 Metropolitan Activity Centres. Prioritising 'next generation' bus services (see recommendation 57) would:

- Improve frequencies and modify alignments of some existing bus routes, and introduce new services to connect the proposed train stations along the entire Suburban Rail Loop project, to start building patronage for it.[29] Upon the project's completion, the bus network should be simplified.
- Better connect the La Trobe NEIC to the eastern suburbs and northern growth areas.[30] This could include services to better connect South Morang, and potentially sharing the Plenty Road median with trams to achieve faster, more reliable travel times.[31]
- Upgrade bus services to the Sunshine NEIC, including connections to growing areas in Highpoint, Footscray and Hobsons Bay. These new services would include on-road priority and dedicated lanes, recognising that the fast-growing inner west does not have an extensive tram network, unlike other inner areas. Complementary road improvements timed with the opening of West Gate Tunnel will help achieve this.[32]

A tram service connecting Rowville, the Monash NEIC, Chadstone, and Caulfield Station is unlikely to attract enough extra passengers or stimulate sufficient new development to justify such a large public investment, compared with other, more cost-effective options that can be delivered faster. Instead, the Victorian Government should consider a high frequency,[33] 'next generation' bus service with its own right of way. Priority bus lanes could be delivered, including with a potential Wellington Road upgrade. A new 'next generation' service can provide better access to the knowledge and industrial parts of the Monash NEIC, and deliver better coverage to lower density areas in the east, towards Rowville, and to multiple destinations in the west.[34]

Private vehicles provide good access for jobs in dispersed industrial precincts, which can be difficult for public transport to serve efficiently. However, more flexible public transport services (see recommendation 57) could connect these areas to nearby public transport interchanges.[35] The Victorian Government should develop road network improvement projects to better connect nearby suburbs to industrial areas. For example, priority areas could be the Dandenong NEIC and *Plan Melbourne's* designated State Significant Industrial Precincts. Beyond improving outer suburban arterial roads (see recommendation 76), the Victorian Government should:

- Continue to improve access into Dandenong South NEIC from Casey and Cardinia growth areas by developing east-west arterial road links
- Upgrade the Calder and Western Freeways and continue to develop the Palmers Road and Calder Park Drive corridor
- Upgrade the Hume Freeway, Mickleham Road and Somerton Road, and consider building the Bulla Bypass.

Recommendation 59

Increase off-peak service frequencies and suburban rail corridor capacity

Over the next five years, increase Melbourne's train service frequencies for off-peak, counter-peak and weekend services. Develop and progressively deliver a prioritised 15-year network service upgrade program for suburban train corridors, including track and signalling improvements, higher capacity trains, carriage retrofits and an upgraded train control centre.

Our modelling shows train travel is the fastest growing form of motorised transport, with the metropolitan train network expected to carry an extra 500,000 to 900,000 passengers each day by 2036. Growing rail service demand could worsen train overcrowding, preventing passengers boarding at some stations on multiple rail lines, and restricting further land use development around them. Infrequent train services can also inhibit development in some places. Regular rail infrastructure upgrades can adjust the network to cater for more passengers to help accommodate this extra demand and prepare rail corridors for major projects.

For example, the Clifton Hill rail group will soon become very congested. The corridor faces constraints which restrict service frequencies, including antiquated signalling and track layout. Without upgrades, Clifton Hill train services will experience severe overcrowding in coming years, particularly during peak periods.[36] Corridor upgrades can also prepare the line for the potential Melbourne Metro Two project (see recommendation 61).

Most people take the train to travel to work or education, often in peak periods, meaning significantly fewer passengers travel in off-peak periods. Melbourne's rail network is an outlier among global urban rail systems, with most others having more frequent off-peak services, used for a greater variety of trips throughout the day and evening.

Increasing frequencies towards 'turn-up-and-go' train services, including for off-peak, counter-peak and weekend services, brings people more travel choices for more types of journeys in more of Melbourne's suburbs, including getting across to the other side of the city. With roads getting busier for more hours during the week, improving train frequencies helps to reduce car trips, thus reducing congestion. More frequent services outside peak periods can combine with off-peak fare discounts (see recommendation 45) to give people easier, cheaper travel choices, help spread out demand on the train network, and make better use of Victoria's existing assets.

A train network with separate, segregated rail lines can carry more passengers and is more resilient to disruptions. The Melbourne Metro Tunnel project is a step toward untangling the network and enabling more capacity on some rail lines.[37] Realising these potential capacity benefits requires extra, currently unfunded, complementary corridor upgrades.

The train network's capacity and service quality also contributes to the complex choices people make about where to live and work, and informs decisions on investing in and developing new housing and mixed-use developments.[38,39] Our modelling has also shown that improving service levels can make places around suburban stations more attractive places to live and work.[40]

In the next five years, the Victorian Government should increase Melbourne's train service frequencies for off-peak, counter-peak and weekend services. It should also develop, progressively deliver and regularly update a 15-year network service upgrade program to cater for growing demand along each suburban rail corridor. This program should prioritise infrastructure upgrades to rail lines with high population and passenger growth, and that are nearing their maximum capacity. For each train corridor, the program should identify infrastructure upgrades and priority timetable improvements to allow more trains to run more frequently, and more reliably.

Photography by Peter Bennetts, Designed by ASPECT Studios

The upgrade program should address regional and freight train needs on relevant corridors, realise capacity benefits enabled by the Melbourne Metro Tunnel, and modernise the existing train control centre.

The corridor upgrades program should consider all methods of delivering extra capacity, such as track and signalling improvements, new higher capacity trains and train carriage retrofits. The program should clarify rail service improvements that better respond to demand changes, and coordinate with tram and bus service improvements.[41] It should comprise a continuous flow of projects to support a sustainable and competitive rail manufacturing and construction industry.

The program could also provide opportunities to help reduce rail disruptions, and coordinate with other projects to realise delivery efficiencies.

Developing and publishing the network service upgrade program would help identify places where more intensive land use can be supported, such as train stations attaining 'turn-up-and-go' services. This helps identify priority places for more intensive land use, including more housing (see recommendation 35), and gives investors, homebuyers and employers the confidence to take full advantage of future public transport investments.

Recommendation 60

Reconfigure the City Loop for more frequent and reliable services

Within the next two years, complete a business case to reconfigure the City Loop, including determining its timing. Include planning for more frequent metropolitan services on the Craigieburn, Upfield, Frankston, and Glen Waverley services, while considering a future express railway line between Camberwell and Burnley to prepare for future rail patronage on the Lilydale, Belgrave, and Alamein lines. Explore options and staging to extend metropolitan services to the Mitchell local government area, including possible station locations.

The current train network is nearing capacity and will not support many more trains to enter the City Loop. Major rail projects are underway or planned that will allow more trains to reach central Melbourne, including the Melbourne Metro Tunnel project, currently under construction and due for completion in 2025.[42] But different parts of Melbourne are growing at different rates. This means patronage is increasing faster on some rail lines than others.

For instance, the Shepparton, Seymour and Craigieburn line faces increased demand, driven by the expansion of the northern growth corridor beyond Craigieburn to Donnybrook, Beveridge and Wallan, and more homes being built in existing suburbs along the Upfield and Craigieburn rail lines.[43] The Victorian Government's fast-tracking of precinct structure plans in the northern growth corridor could further increase the rate of growth and rail demand on this corridor, also affecting V/Line services to Shepparton and Seymour.

Our modelling suggests the Craigieburn suburban line, and Shepparton and Seymour regional lines, will reach capacity in the 2030s.[44] Once the Melbourne Metro Tunnel is completed, the Craigieburn and Upfield lines will still share one City Loop track, constraining the number of train services on each line. Similarly, the Belgrave, Lilydale and Glen Waverley lines will still share one other City Loop track, constraining the number of services on each. Increasing demand for more Belgrave and Lilydale train services will create pressure to schedule more Glen Waverley trains to avoid the City Loop and terminate at Flinders Street Station. This limits the frequency of Glen Waverley trains, because each service needs extra time to turn back afterwards.

Changing the way that the City Loop works can help relieve this pressure. The City Loop consists of four sets of tracks that circle central Melbourne. Building three kilometres of new train tunnel would allow for the redesign of two of the four City Loop tunnels, creating a pair of underground cross-city tracks from Richmond to North Melbourne. This will allow more trains to pass through the city and continue to the other side, rather than travelling around the City Loop and returning. For example, services on the Werribee and Frankston rail lines already use this method to run more train services into the city.

Reconfiguring the City Loop would separate the Craigieburn and Upfield lines, allowing trains to run through the city and continue to the other side, such as onto the Frankston or Glen Waverley lines. They would no longer need to share the same City Loop track, meaning that a disruption on one line will not affect others. Many more services could operate, increasing the capacity, frequency and reliability of train services.

Reconfiguring the City Loop achieves two-thirds of the capacity uplift of the Melbourne Metro Tunnel project for about a fifth of new rail tunnel length. In our strategic project assessment, we included extending metropolitan services to Beveridge and other upgrades to the Upfield rail line, such as better signalling and high power capacity to improve service frequency.[45] The Victorian Government should complete a detailed business case for the project, which may also identify cost savings or further value creation, and provide options on disruption management during delivery.

Reconfiguring the City Loop also has other benefits. It could allow more frequent services on the Frankston and Glen Waverley lines, using depot facilities in Melbourne's north. Glen Waverley services could continue through the city rather than terminating at Flinders Street. It would also provide better access generally to an expanding central city, including jobs in Arden, Cremorne and Caulfield. With better access, more people will use public transport, reducing road congestion. Reconfiguring the City Loop also allows metropolitan services to be extended beyond Craigieburn towards Wallan (see recommendation 74). It provides options to improve V/Line services to Shepparton and Seymour, including getting them into the city more reliably. It also presents opportunities for better bus connections to rail services on these corridors.[46]

Our modelling shows that providing more frequent train services in these parts of the network attracts more jobs and housing along the Craigieburn and Upfield rail lines and surrounding areas, and other places such as Cheltenham and Moorabbin. For example, running a more frequent Upfield peak period train service could encourage greater development along its rail corridor. This helps suburban locations attract jobs closer to people's homes. The Victorian Government should enable more intensive development along this corridor to maximise the benefits of the Melbourne Metro Tunnel project.

The project also prepares for the potential separation of the Lilydale and Belgrave lines from the Alamein line. This requires a new express rail track to be built between Burnley and Camberwell. Our modelling shows this may be needed in the mid-2040s to manage patronage levels.[47] This will mean Ringwood and Box Hill services stop at fewer stations between Camberwell and the city, and allows better stopping-all-stations services to Alamein, Auburn and Hawthorn.

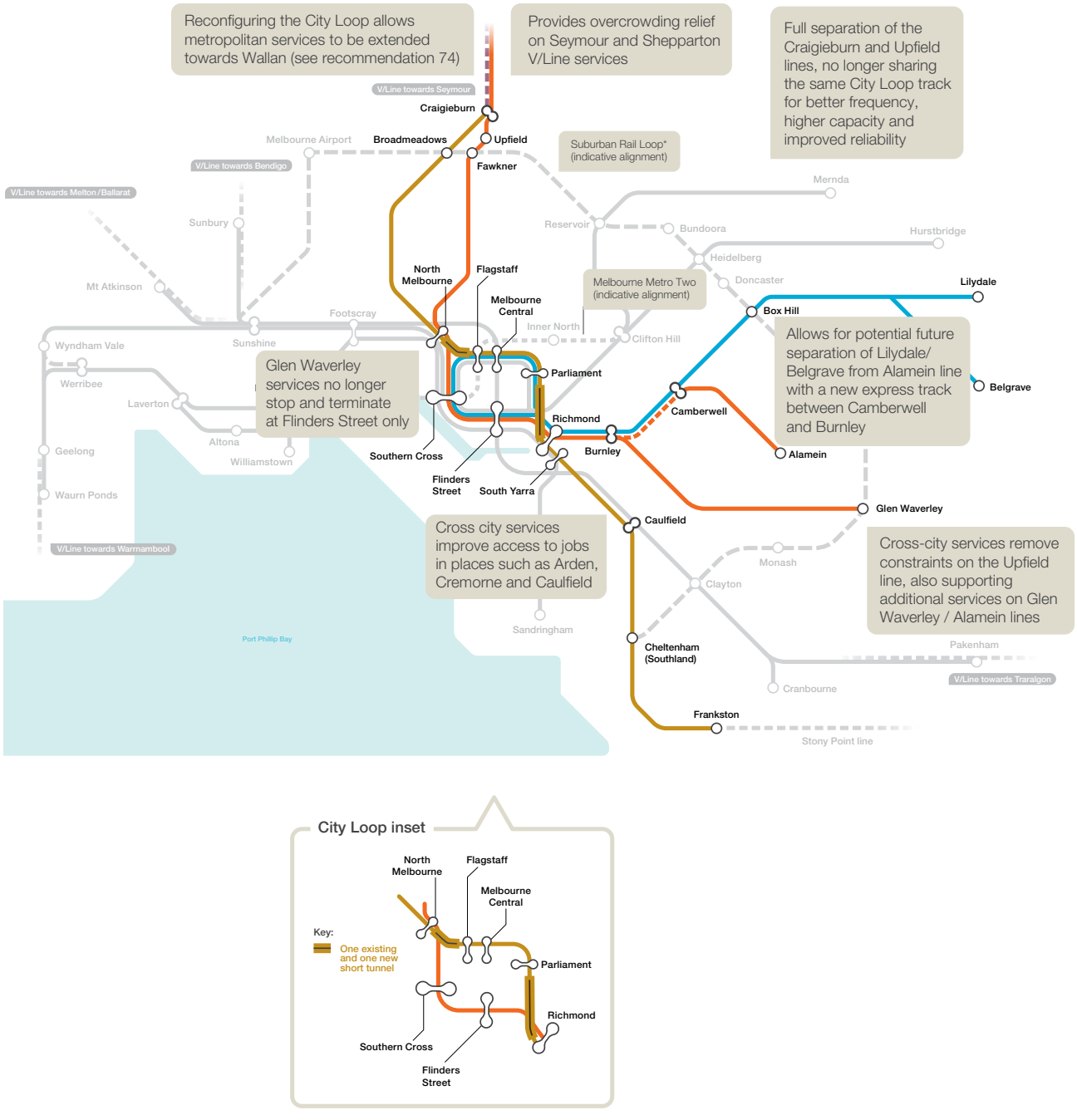
The Melbourne Metro Tunnel will enable some new services on Craigieburn and Upfield lines, but these would reach capacity by the mid-2030s. If these new services were introduced without reconfiguring the City Loop first, they would be heavily disrupted for long periods during the project's construction, and affect many more passengers. Reconfiguring the City Loop immediately after completing the Melbourne Metro Tunnel minimises disruptions to passengers, particularly as the realignment of the Cranbourne and Pakenham services through the Melbourne Metro Tunnel upon opening can leave one of the two loop tunnels affected by this project empty. The Victorian Government should start detailed design and planning quickly to identify critical works to undertake before the Melbourne Metro Tunnel is completed. This can avoid significant disruption to the network.

The window of opportunity to deliver the City Loop reconfiguration project will close as demand continues to increase, and the network may only temporarily have enough spare capacity to change train service patterns during construction to minimise passenger impacts.[48]

The Victorian Government should complete a business case for the project within the next two years. Reconfiguring the City Loop would enable more frequent and reliable services by creating two high frequency separated lines connecting northern and south-eastern areas. The business case should consider timing, including starting the project immediately after the Melbourne Metro Tunnel is completed, and planning for additional express lines between Camberwell and Burnley, and staging rail extensions to the Mitchell local government area.

Figure 19: Reconfiguring the City Loop allows more trains to run through the city

This map shows the potential benefits of the Reconfiguring the City Loop project, with two new rail tunnels providing more capacity and services on several metro train lines, and enabling electrification of services to the growing north, towards Wallan.



**SRL West is still under investigation by the Victorian Government and we have therefore assumed it involves the extension of Wyndham Vale RRL services to Werribee.*

Recommendation 61

Prepare for Melbourne Metro Two and direct Geelong rail services

Within five years, complete a business case for the Melbourne Metro Two Tunnel project, and protect the land required to construct it. Consider using the tunnel to re-route Geelong services direct to Southern Cross, and consider new stations or relocating existing stations. To shape demand for the project in the next five years, enable more intensive land use around the rail network, and introduce 'next generation' bus services between Newport and Fishermans Bend.

Plan Melbourne **identifies the central city, Fishermans Bend, Parkville, East Werribee and La Trobe as National Employment and Innovation Clusters (NEICs) and knowledge economy locations, needing high capacity transport connections.[49] As currently conceived, the proposed Melbourne Metro Two (MM2) project includes a pair of new rail lines from the inner north, through Central Melbourne and Fishermans Bend, to Newport to provide these connections. Given the Victorian Government's commitment to the Geelong Fast Rail project, the MM2 tunnel could provide a more direct service for electrified rail services from Geelong to Southern Cross station.**

MM2 will also support more travel to Melbourne and provide an attractive rail service for local travel in Geelong. It has enough seating to accommodate all passengers from Geelong in 2051. The project contributes to resolving network capacity issues, improving access to NEICs and Geelong, and can encourage more intensive development in some established areas of Melbourne and Geelong.

Our strategic assessment indicates that MM2 has the potential to deliver substantial benefits, but requires refinement to find cost-effective solutions to the construction challenges.[50] This includes considering electrification, alternative alignments through the northern section of the tunnel, and technology improvements for power and signalling. These considerations will have significant implications for cost, staging, delivery times, and the overall assessment of the project.

Fishermans Bend, Australia's largest urban renewal precinct, will require a heavy rail connection to achieve the 80,000 jobs and 80,000 residents anticipated for the precinct.[51] The proposed new Fishermans Bend tram (see recommendation 43) is needed to support initial urban redevelopment by providing access to the central city in the short to medium term. But our modelling shows the tram line will reach peak period capacity by the mid-2030s.

Our modelling also indicates that the Werribee and Wyndham Vale Regional Rail Link lines will be overcrowded in the 2030s, with Clifton Hill group services similarly affected in the following decade. Crowding is likely to prevent people boarding at inner city train stations, and those in Tarneit and Truganina. Urban development in Fishermans Bend and related tram crowding indicates that MM2 should be staged, starting with the western section between Newport and Southern Cross stations.

MM2 will increase capacity and frequency on several rail lines, particularly those passing through Newport and Clifton Hill, as shown in Figure 20. It will provide a superior service and relieve future pressure on the public transport network. Its more direct connection will significantly improve access to jobs from areas that would otherwise have low access. MM2 could also allow potential new electrified Geelong trains to use the new tunnel as a more direct route to Southern Cross via new stations in Fishermans Bend. Our modelling indicates this new rail infrastructure and extra services may encourage more people to move to Melbourne's northern and south-western growth areas.

Realigning new electric Geelong trains through the MM2 tunnel can attract more people and jobs to Geelong. In completing the business case, the Victorian Government should consider new stations, or relocation of existing stations, on the Geelong rail line corridor to support development in Corio and at Avalon Airport, which could connect to a shuttle bus service to connect people to the rail line.[52] Consideration could also be given to

a potential new train station at east Werribee to support the development of the East Werribee NEIC.

MM2 also creates new opportunities for residential intensification in Wyndham, Hobsons Bay, Darebin, Banyule and Whittlesea municipalities.[53] This includes land near rail lines that indirectly benefit from the project, including the Wyndham Vale, Altona, Williamstown and Hurstbridge lines. To maximise the benefits of the project, the Victorian Government should enable more intensive land use along these rail corridors, and encourage denser development near Geelong's train stations, to provide more housing options as alternatives to a more dispersed settlement pattern in Geelong's northern and western growth areas.[54] People living near the train stations are more likely to catch the train.[55] This builds rail demand to enhance the benefits of MM2, and helps prevent road congestion that could otherwise reduce those benefits.

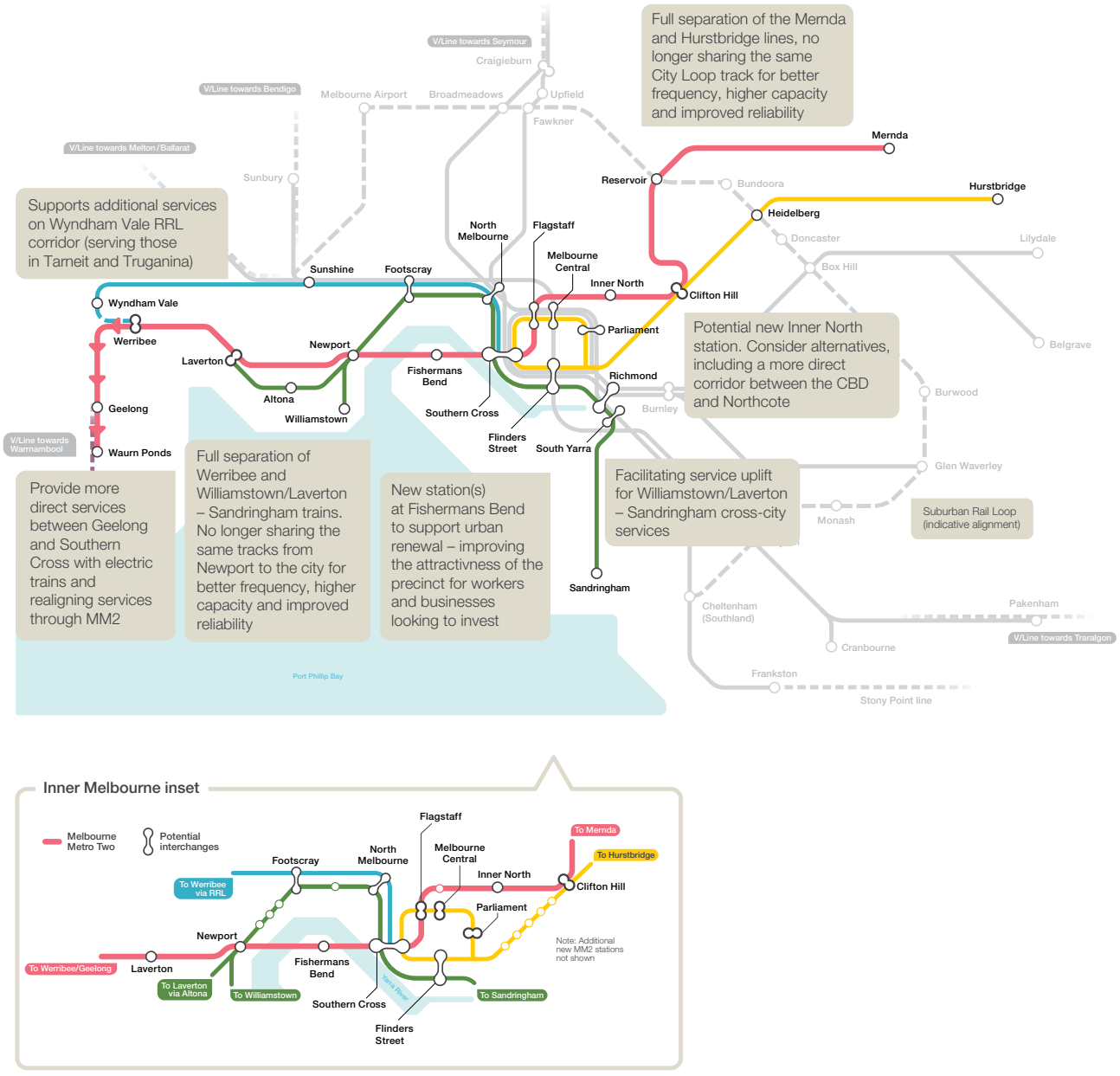
Our modelling also suggests that realigning Mernda services through an underground tunnel through Clifton Hill and Fitzroy may not represent best value for money. An extensive tram network already serves this area, so a new rail tunnel delivers fewer transport benefits and limited land use changes relative to its cost. Instead, an alternative alignment may be a more direct and less costly option, such as along the former Inner Circle railway line, with a potential new station.

The Victorian Government should begin the work necessary to retain MM2 as a future preferred corridor, refining this proposal and assessing alternatives with lower costs. In the next five years, it should complete an MM2 business case, detailing potential staging of the project, considering wider metropolitan and regional network benefits, and proposing strategies for more housing and jobs along existing rail corridors to enhance the project's benefits (see recommendation 35). The business case should identify and protect the preferred corridor and station sites, particularly where development pressures threaten to inflate land prices or complicate construction. MM2, or a similar project, may be required as soon as 15 years from now, and may take a decade or more to deliver.[56]

In the next five years, it should also introduce 'next generation' bus services with on-road priority (see recommendation 57) to connect the train stations on the proposed MM2 corridor. On-road priority and road space reallocation can be undertaken as part of implementing improved bus services between Victoria Park and Parkville to further improve service attractiveness. As part of introducing network reform in Fishermans Bend, new bus services should operate from Newport train station to Fishermans Bend, and on to central Melbourne. These reforms will help manage existing demand, help reduce crowding on the Werribee and Clifton Hill Group rail lines and develop future demand. A similar 'next generation' bus service from Armstrong Creek and Wollert to nearby rail lines would also support MM2 (see recommendation 75). Once complete, existing bus routes should also be reconfigured to make best use of the new rail connection.

Figure 20: Melbourne Metro Two

This map shows the potential benefits of the Melbourne Metro Two tunnel project, with a rail tunnel providing train services from Newport, through the city and to Clifton Hill.



Recommendation 62

Protect a long-term option for a new cross-city motorway

Within five years, determine an updated future alignment and preserve the option for constructing, if required, a new motorway linking the Eastern Freeway and CityLink. If delivered, implement the project with a transport network pricing scheme, and active and public transport improvements.

Our modelling shows inner Melbourne road congestion will significantly increase in coming decades. Congested kilometres on roads during the morning peak will nearly double to 24% from 2018 to 2036, and then rise to 31% by 2051,[57] even with greater use of public transport. Targeted demand management policy, such as a cordon charge in inner Melbourne (see recommendation 52), could almost halve the number of people driving within the cordon and significantly reduce road congestion.[58]

Beyond transport pricing arrangements, other future changes could also increase or decrease the need for another cross-city road connection, making it prudent to review potential alignments and protect the corridor for a new cross-city motorway. For example, demand for cross-city travel could be affected by changes in population and economic growth or distribution, the lower costs of zero emission or automated vehicles, as could changes to people's preferred method of travel as seen in the COVID-19 pandemic.

In 2013, a business case was prepared for a new, 18-kilometre cross-city road connecting the Eastern Freeway at Hoddle Street, to CityLink, the Port of Melbourne Precinct and then the Western Ring Road, at Sunshine West. Since then, the West Gate Tunnel began construction, providing a connection from the Western Ring Road to CityLink and the Port of Melbourne, serving the same function as the western section of the original proposal. Our analysis indicates the need for the CityLink to the Eastern Freeway section of the original proposal is less compelling than in our 2016 strategy, as some major east-west movements have been improved from the widening of the Monash Freeway, the CityLink-Tulla Widening project, and the North East Link.[59]

We commissioned transport modelling of a version of the remaining eastern section between CityLink and the Eastern Freeway. We found this would provide an alternative connection to the M1 Monash Freeway and North East Link and facilitate freight movement across Melbourne.

The modelling showed the project produces a general redistribution of traffic by drawing small amounts from the North East Link, CityLink and the West Gate Freeway. Travel time gains for those using the new motorway are counter-balanced by more congestion on the Eastern Freeway, including towards the EastLink tunnel in Ringwood. This means the project has modest usage and network benefits, and its costs exceeded its benefits.

Our modelling shows that streets leading to the freeway in the eastern suburbs become more congested and reduce the amenity of surrounding residential areas without substantial mitigation measures. In contrast, a reduction in traffic improves the accessibility and amenity of inner Melbourne, attracting more people to live in these areas.

To successfully deliver potential benefits, any new cross-city motorway should be delivered with a transport network pricing regime in place (see recommendations 52 and 53). Transport network pricing helps mitigate adverse traffic impacts and produces better integrated network outcomes, compared with only tolling the motorway. These prices help manage otherwise congested traffic flows, including:

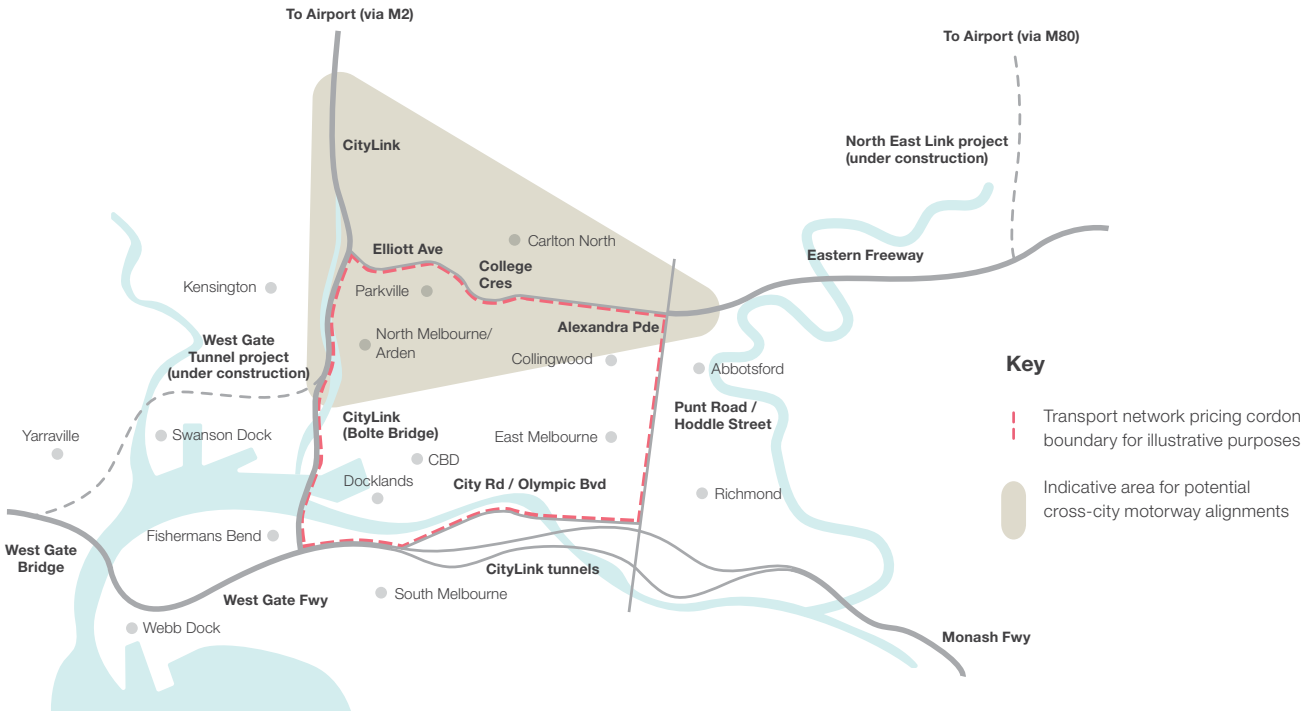
- Into inner Melbourne including from the western and eastern side, including preserving uncongested access to the Port of Melbourne
- Across the broader motorway network, including to help manage increased congestion along the Eastern Freeway towards the EastLink tunnels
- Into roads and streets that connect into the motorway, which can be managed through ramp pricing.

Any cross-city motorway project should include initiatives to help manage extra transport demand from extra inner Melbourne growth, such as introducing new Doncaster busway services that operate in their own lane along Alexandra Parade and Princess Street. It should clearly designate priority streets for accessing the Eastern Freeway. The project can also include local improvements for tram and bus services crossing Alexandra Parade, and for cyclists and pedestrians crossing the corridor, such as signal priorities, new tree planting, open space and vegetation buffers. People living nearby already cycle more than other Melburnians. The project can incorporate cycling infrastructure, such as dedicated cycles lanes or off-road paths above the tunnel alignment to facilitate east-west movements, a cycling path in the median of Alexandra Parade, or cycling priority on nearby local streets.

With these pre-conditions, the Victorian Government should keep the option of a longer-term link between the Eastern Freeway and CityLink by preserving an updated corridor for it to be delivered if circumstances require. The updated alignment must consider the implications of the construction of the West Gate Tunnel Project, urban renewal in Arden Macaulay[60] and at the Fitzroy Gasworks site,[61] open space requirements, and its impacts on Moonee Ponds Creek, including its Aboriginal cultural heritage, biodiversity and water quality.[62] Failing to protect a corridor could create unnecessary challenges in land acquisition and design, if the project is to proceed.

Any business case for a cross-city motorway should also assess the likely impact of transport network pricing and automated vehicles (see recommendation 21), as potential alternatives as well as complementary options, and opportunities to improve public and active transport. While there is no immediate need for a road connection between the Eastern Freeway and CityLink, one may be necessary within the next 30 years.

Figure 21: Protect a long-term option for new cross-city motorway



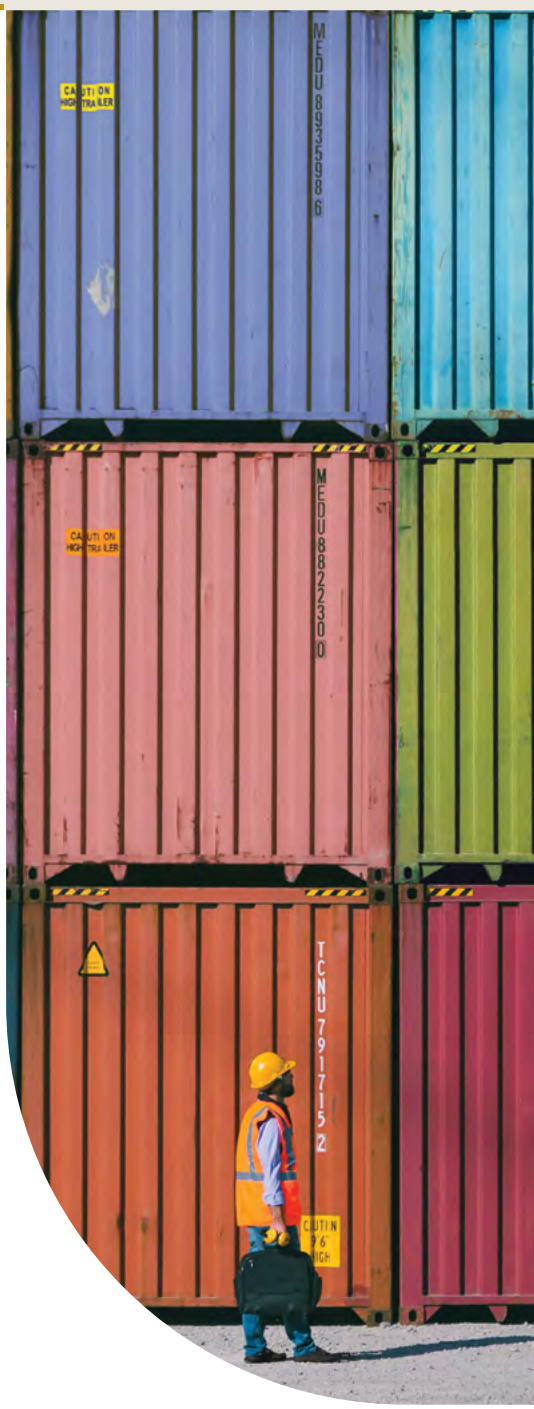
3.2

Improve freight efficiency for industry competitiveness

Victoria's prosperity is supported by businesses that move billions of dollars in goods every month – across the state, elsewhere in Australia and to overseas markets – including many items that people use every day.[1]

Businesses across metropolitan and regional Victoria will continue to need strong and flexible connections to their domestic and international customers, including through freight terminals and ports, to remain competitive. Freight companies and operators themselves need modern, adaptable infrastructure to nimbly respond to changing market conditions. Keeping freight moving as efficiently as possible helps keep costs down, maximises trade and creates the environment for companies to grasp new opportunities.[2]

Long-term planning for, and investment in, Victoria's freight infrastructure can support business operations in the face of economic transitions, technological change, and changing consumer behaviour. Freight connections also support greater resilience in a dynamic global marketplace, including in the event of major shocks, such as the COVID-19 pandemic, that disrupt trade and supply chains.



Freight volumes will continue to grow and place pressure on road networks

Growing freight volumes place pressure on the transport networks they use. However, this task has historically not been evenly distributed between road and rail. Most of Victoria's freight is moved on the road network, with the fleet of freight trucks increasing by 35% in the decade to 2017.[3] By contrast, the volume of freight moved by rail has not changed significantly in decades, and has declined for some markets.[4]

Manufacturing remains a major contributor to the economy, with around 300,000 Victorians employed in manufacturing in early 2020.[5] Many industrial and logistics precincts are in Melbourne's outer suburbs, where they generate demand for transport and logistics services, industrial land and ports. Location and transport connections are important factors for growing industrial sectors. Motorway network accessibility along with labour and land availability are two elements that heavily influence where freight distributors locate.[6] The road networks in and near these places will need to move freight reliably and efficiently around the metropolitan area, connecting with regional and interstate producers, and international ports. But the city's outer suburbs have underdeveloped motorways and freeways compared with established areas, limiting their capacity to accommodate extra freight. As these areas grow and develop, their land values rise, making further road expansion more expensive. Retrofitting road networks can also be expensive. Early protection and purchase of land for future freight terminals and transport corridors can reduce this risk, keeping more freight options affordable.

A strong and efficient freight rail system can be safer, more reliable and less polluting than road freight. It can help reduce demand on freeways from road freight.[7] Replacing trucks with rail can assist in relieving road congestion, pollution and maintenance costs, particularly in metropolitan areas.[8]

Ports and freight terminals are critical for prosperity and productivity

Ports are crucial freight gateways. They allow exporters, such as agricultural and natural resource producers and manufacturers, to access international markets[9] and help importers keep costs low.[10]

While efficient ports benefit all Victorians, nearby communities and ecosystems can experience negative amenity impacts from freight movements, including increased transport network congestion, habitat loss, reduced air quality, and noise pollution. These must be considered and managed to keep port operations acceptable to local communities.[11] Our *Advice on securing Victoria's ports capacity* found the most efficient approach to expanding port capacity – namely optimising the Port of Melbourne to realise its maximum capacity by the middle of the century – is simply not possible without community support.[12]

Freight precincts and terminals maintain a central position in supply chains, as they connect freight networks and customers. Intermodal terminals can support these connections by enabling the rapid, cost-effective transfer of freight from one transport mode to another, for example, between road and rail. Effective terminal operations and sufficient capacity are therefore essential building blocks for the overall efficiency of supply chains. They also ease the transport burden for ports, reduce impacts for neighbouring suburbs and are essential for increasing the amount of freight transported and distributed by rail.[13]

Protecting land gives Victoria more options

Freight terminals and port capacity are necessary to meet the growing freight demand and support the arrival of the Inland Rail project.

The price of land has grown faster than the rate of inflation, and industrial land values in different areas of Melbourne increased from 25% to 105% in the five years to 2019.[14] In such circumstances, any delay in acquiring land for a corridor can add materially to the cost of a project.[15] Protecting future options by reserving land and corridors will yield substantial cost savings. These savings could be further increased if land is acquired early.[16]

Acquiring entire corridors usually requires governments to make large, upfront outlays, using funds that can be otherwise used for more pressing infrastructure priorities. However, substantial funds can be saved through reserving a corridor and then progressively acquiring the properties.[17]

The Victorian Government's Principal Freight Network aims to protect freight operations, precincts and corridors from urban residential encroachment. First established over a decade ago, it does not currently reflect freight corridors that have since been developed in regional areas and metropolitan Melbourne. Iterative reviews – including one currently underway – are opportunities to update protections to reflect emerging priorities.[18]

Recommendations to move more freight, faster and more reliably

Infrastructure Victoria recommends four major infrastructure initiatives to help keep the freight network efficient. These are described in recommendations 63 to 66 below and are shown in Figure 22. We also make recommendations relevant to freight transport in advocating for changes in travel behaviour (see section 2.3), reshaping the transport network (see section 3.1), and enhancing market access and productivity in regional Victoria (see section 4.1).

Figure 22: Proposed freight infrastructure connects freight terminals and ports

This map shows proposed future investments in freight infrastructure, including optimising freight capacity at the Port of Melbourne, protecting potential for a new Bay West Port, new road and rail networks connecting to freight terminals, and a rail and road corridor in outer Melbourne.

Recommendation 63

Optimise capacity at the Port of Melbourne

Support efforts to progressively optimise the Port of Melbourne's capacity, and actively take steps to manage amenity implications for community acceptance, as identified in our *Advice on securing Victoria's ports capacity*.

The Port of Melbourne is Victoria's only container port and the busiest in Australia, responsible for around 36% of national container trade.[19] It handles over 3 million Twenty-foot Equivalent Units (TEU) in goods each year, and over 8250 shipping containers and 850 motor vehicles each day.[20]

The port's capacity – currently 4.4 million TEU a year – needs to grow to provide exporters reliable, cost-effective access to markets and keep costs low for importers.[21] Trade volumes increased by 2.1% a year over the decade to 2018–19[22] and will continue to grow.[23] We anticipate demand of 4.2 to 5.5 million TEU by 2031, and 6.2 million to 8.8 million TEU by 2051.[24] The port will also need to adapt to increasingly large container ships, with international vessels now being built that are too large for current facilities.[25]

Historically the port has expanded to meet increasing demand, but future development may be constrained by surrounding residential areas.[26] Our research has found optimising the port's capacity is the most cost-effective way to meet demand to around 2055. We estimate the Port of Melbourne's capacity could be increased to 8 million TEU each year, at a cost of approximately $6.8 billion in capital and operating expenses.[27] Building a second container port at Bay West (see recommendation 64) only becomes economically competitive once this capacity is exceeded.[28]

The Victorian Government should continue to support efforts to optimise the capacity of the Port of Melbourne. Investments in channels, terminals, transport networks and better operating procedures can progressively increase capacity. The timing and sequencing of upgrades will depend on trade growth, future vessel sizes, transport network development and congestion levels.[29] As approvals and construction have long lead times, planning will need to be flexible to allow for upgrades to be delayed or brought forward.[30]

Capacity enhancements can be simple and relatively cheap initially, but will become more complex as the port's capacity approaches 8 million TEU.[31] Some costs will be borne by the port operator or funded by road tolls or stevedore rents. The Victorian Government may need to fund interventions with wider community benefits, such as new transport links which improve network performance.[32] This could involve rail freight shuttles between Swanson Dock and suburban terminals, or reserving land for a potential freight rail link to Webb Dock. Alternative freight alignments to those identified in the Fishermans Bend Framework that could be more compatible with future land use[33] should also be investigated.[34]

Increasing port activity risks more transport congestion, maritime habitat loss, reduced air quality and noise pollution in nearby areas.[35] The Victorian Government will need to build and maintain community acceptance as the port grows and gets busier, through measures such as: regulating noise and emission standards for trucks and encouraging the use of zero emission vehicles (recommendation 2); moving more freight by rail; maintaining suitable buffers between the port and sensitive land uses[36]; and transitioning transport companies from congested sites in residential areas to industrial land with good road and rail transport access.[37]

Recommendation 64

Act now to protect the future Bay West Port option

Within the next five years, identify and secure land, and apply planning protection for transport corridors and buffers for a future Bay West Port, particularly for future road and rail connections. Monitor and report on the triggers to develop a new port, and commence and continue environmental assessment and monitoring over the next 30 years. Around 2040, begin detailed planning.

Our *Advice on securing Victoria's ports capacity* found Victoria will not need a second major container port until around 2055.[38] Detailed planning for a new port should start around 2040,[39] or when triggered by other changes such as accelerated demand, congestion, amenity impacts or cost changes.[40] The Victorian Government should act on our immediate recommendations, including:

- Monitoring and publicly reporting on triggers for developing a new port
- Undertaking further options analysis and environmental assessment
- Identifying land for the port
- Applying planning protection overlays for associated road and rail transport corridors and buffer zones, and
- Beginning baseline environmental monitoring.

Action is needed immediately to secure road and rail access corridors connecting the future Bay West Port with the existing and future principal freight network, as significant land development pressures exist within the Urban Growth Boundary in Melbourne's west, which may restrict future access to the Port.[41]

The Terms of Reference for our advice requested we prepare an assessment of the sites at Bay West and the Port of Hastings.[42] We determined Bay West to be a superior container port location on nearly every criterion examined.[43] It is more cost effective, flexible, scalable, and closer to existing and planned freight networks. This makes it far more economically efficient by making freight costs much cheaper. It has fewer and more easily managed environmental impacts and is further from existing homes.

The Bay West site interacts with other nearby land uses, including Melbourne's Western Treatment Plant, sensitive coastal and marine habitats, and Melbourne's growing south-western suburbs. The Victorian Government should place planning protection overlays on land for the port, associated road and rail transport corridors, and for buffer zones, particularly south and west of Werribee. This prevents urban encroachment, which could limit the port's operational hours or reduce residential amenity. It also facilitates further infrastructure investment aligned with the Principal Freight Network to access the future port, help manage environmental impacts, and help stop land price inflation, reducing future land acquisition costs. For the best result, the Victorian Government can plan the site in consultation with relevant stakeholders such as Melbourne Water and Wyndham City Council.

The Bay West site involves interaction with internationally significant habitat, including the west of Port Phillip Bay and the Bellarine Peninsula Ramsar wetland. This is likely to lead to an extended and complex approvals phase during the development of the Bay West Port. The Victorian Government should create a transparent, long-run environmental evidence base by commencing baseline evidence gathering and environmental monitoring including for water quality, hydrodynamics, coastal and seabed morphology, coastal and marine habitats, and flora and fauna.[44] This can inform a 'working with nature'[45] approach to the port's development, to improve environmental outcomes, and support regulatory approvals.

Recommendation 65

Deliver a new intermodal freight terminal for Inland Rail

In the next year, determine the preferred new intermodal terminal and facilitate its delivery, transport links and the surrounding precinct to operate soon after the Melbourne to Brisbane Inland Rail project is completed. Progress planning for another intermodal freight terminal and precinct, and secure necessary land.

Soaring future freight volumes, and sizeable road freight transport movements, requires developing an intermodal freight network.[46,47] Intermodal freight terminals connect road and rail networks to customer-facing industry operations. Strategically located terminals with good transport connections facilitate efficient freight movement and keep supply chain costs down.[48] They work best in manufacturing and logistics precincts, separated from incompatible land uses, such as housing.

Victoria's growing freight task requires more intermodal freight terminals, including developing connecting transport networks, and avoiding operating restrictions from incompatible land uses. *Plan Melbourne* identifies the Western Intermodal Freight Terminal at Truganina, in Melbourne's west, and the Beveridge Intermodal Freight Terminal in Melbourne's north, as State Significant Transport Gateways.[49,50] They are priorities in the *Victorian Freight Plan.*[51]

The Inland Rail alignment will improve Melbourne to Brisbane freight travel times and efficiency.[52] Inland Rail began construction in 2018, and is scheduled for completion in 2025.[53] Victoria has no freight terminals capable of handling the double stacked, 1.8 kilometre trains the project will enable. Accommodating these larger trains requires extensive and costly modification of bridges, overpasses, and other infrastructure to reach existing freight terminals. Melbourne's current major freight hub at Dynon is approaching capacity and will not be able to efficiently cope with growing numbers of larger trains.

To take full advantage of Inland Rail, a new terminal needs to be delivered as soon as practical, although this may not be in time for the opening of Inland Rail. The Victorian and Australian governments need to determine which of the terminals is to be developed first, and an appropriate project delivery model. Both proposed new terminals are strategically located and can accommodate these longer, double stacked trains. They have major road access and are in designated State Significant Industrial Precincts. The Beveridge terminal is near Inland Rail and the interstate rail network, as well as the proposed outer metropolitan road and rail corridor (see recommendation 66). However, it is far from current industry locations. The Western Intermodal Freight Terminal could connect to the interstate rail network with a proposed new rail connection as part of the proposed outer metropolitan road and rail, which could also ultimately connect it to the proposed Bay West Port (see recommendation 64).

The Western terminal is better located to attract more freight onto rail, although it needs a new rail connection. It is located closer to more customers and logistics warehouses, can better realise supply chain efficiencies, and congestion benefits. Many industry and community stakeholders support its higher priority,[54] and the Victorian Government believes it should be developed first.[55] The Victorian and Australian governments are developing a project business case to confirm the first terminal for delivery.[56]

After identifying the preferred terminal site, the Victorian Government should rapidly deliver the terminal so that it is operational as soon as possible after the Inland Rail project is completed. This includes identifying preferred private sector partners and securing land. For the Western site, the Victorian Government will need to work with the Australian Government to deliver the outer metropolitan rail corridor. This includes conducting required environmental assessments and developing connecting transport corridors, including the Principal Freight Network. It also includes changing land use planning settings, including to protect the terminals from encroaching development, and consider terminal access for rail freight shuttles from Port of Melbourne.

Regardless of the sequence, the Victorian Government should progress planning for terminals and the surrounding precincts, and secure necessary land. Delays could drive up land acquisition costs, introduce uncertainty that discourages investors, or allow incompatible surrounding land development.

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Recommendation 66

Construct an outer metropolitan road and rail corridor

Within two years, determine staging for the outer metropolitan rail and road corridor. Subject to detailed business cases, start construction of priority sections, starting with the E6 motorway by the end of this decade. Progressively stage corridor development for completion in the next 30 years. Provide a freight rail link to coincide with the opening of the Western Intermodal Freight Terminal.

Victoria's economic diversity means it can generate jobs using many different skills, helping counteract shocks in one industry sector with strengths in others. Large plots of land for industry, logistics and manufacturing, with efficient transport connections to major international and interstate freight gateways, help Victoria's economy expand, especially in growing communities to the north and west of Melbourne and in regional Victoria.

The road network carries most of Victoria's freight, but rail serves some important markets, such as transporting bulk commodities and containers interstate. This growing freight task will see truck movements balloon, with freight truck numbers having already increased by more than a third in the 10 years to 2017.[57] Rail freight movements are also expected to grow, especially on interstate rail corridors. The COVID-19 pandemic further accelerated demand for industrial land for logistics and revealed deficiencies in local manufacturing capability for critical industries, accentuating low vacancy rates in industrial sites across Melbourne. Greater certainty about the future development of freight networks will build investor confidence in financing the development of the planned freight network and nearby industrial precincts.[58]

The proposed outer Metropolitan Ring Road and E6 transport corridor aims to support economic development and support jobs growth in Melbourne's outer north and west. The proposed E6 motorway runs from the Metropolitan Ring Road at Thomastown, up to Beveridge. From there, the corridor runs south-west through Mickleham, Diggers Rest and Rockbank, to west Werribee. The project also involves constructing a road link to connect the outer ring road with Melbourne Airport and a connection to Deer Park Bypass. The corridor provides the backbone of the transport connections between current and future industrial and logistics precincts with international and interstate transport terminals, including the proposed Bay West Port (see recommendation 64), the proposed western and Beveridge intermodal freight terminals (see recommendation 65), Melbourne and Avalon Airports, and the Port of Geelong. The corridor is also planned to have a rail line to connect the western intermodal freight terminal to the interstate rail freight network, including the new Inland Rail project, and allow for a future extension to the Bay West Port.

Melbourne's outer north and west could become home to over 800,000 more people from 2018 to 2051. Some places are particularly dependent on the development of this corridor, such as in Donnybrook. These parts of Melbourne have an underdeveloped road network, without equivalent road options compared with the well-developed system of arterials, motorways and freeways in the city's established areas. As a motorway, the corridor would provide strong traffic flow, producing better travel times for motorists and more reliable freight movements, helping keep supply chains efficient. Regional freight also benefits by bypassing Melbourne's suburbs, allowing more direct access to major international and interstate gateways.

Our strategic assessment focused on the road component, progressively developed from the eastern to western end. It produced a positive case for the project with strong private vehicle and road freight efficiency benefits. Road sections attracting higher levels of demand include:

- The E6, particularly the southern end with the opening of North East Link
- Sections linking the north and western growth areas to the growing Melbourne Airport area
- A section to the north-west of Werribee that would provide connectivity to WIFT and surrounding industrial areas.

These sections addressed critical network constraints, especially over significant river crossings or through geographical barriers, where the arterial road network is constrained.

Initial planning work for the outer metropolitan road and rail corridor is complete, with a public acquisition overlay in place since 2010. Since the planning overlay was put in place, significant planning developments have occurred, including identifying the Bay West Port site, and significant major project commitments such as North East Link and Inland Rail. Planning and project business case development is underway, including the project's staging, timing and costs. This should include a program review of the whole corridor, used to determine sections of greatest benefit.

Our modelling found that a pricing approach, such as congestion management tolls (see recommendation 51), should be considered to manage the road's use and potential flow on effects to the broader motorway network. This could help the project better achieve its outcomes and prevents new constraints appearing elsewhere.

The Victorian Government should construct the E6 motorway soon after the opening of North East Link, which ends at the Metropolitan Ring Road. It should determine the timing and detailed design of future stages of the corridor, and reflect this in an updated corridor planning and acquisition overlay, securing additional land that the corridor alignment may require. The rail freight link should be delivered to broadly coincide with the proposed timing for the western intermodal freight terminal. Project planning should include considering better public transport connections to La Trobe NEIC and Melbourne Airport, the appropriate treatment of Aboriginal cultural heritage areas such as river and major creek valleys,[59] and contribution to open space connectivity, tree canopy improvements and native vegetation off-sets, including accelerating the acquisition and preservation of the Western Grasslands Reserve.[60]

3.3

Align social infrastructure with better service delivery

All Victorians need education and health services during their lives, and many will need social housing, hospitals and emergency services. Efficient justice services help keep the community safe and ensure people are treated fairly. Largely government funded, Victoria's social services are especially important in helping to address disadvantage, and foster healthy, safe and inclusive communities. This includes helping achieve social policy goals, such as self-determination and Closing the Gap for Aboriginal Victorians.

Social services require infrastructure: buildings, spaces and other assets that connect people to service providers, in person and increasingly online.[1] This helps Victorians attain better education, health, social identity, inclusion and community cohesion, directly impacting people's wellbeing.[2] But insufficient, poorly targeted, or ageing facilities can hinder access to timely, quality services. Social infrastructure enables services that meet multiple community needs. Integrating these can help achieve better outcomes, although doing so can make planning and asset management more complex.[3] The quality and accessibility of different types of social infrastructure varies, including in different places and for different groups of people.

The Victorian Government has the lead responsibility for planning, regulating, funding and operating the state's largest and most expensive social infrastructure assets, including schools, hospitals, social housing stock and correctional facilities. It shares funding responsibilities for social services and infrastructure with the Australian Government and local councils.

Victoria's social services are especially important in helping to foster healthy, safe and inclusive communities and good, targeted social infrastructure enables services that meet multiple community needs.

A growing and increasingly diverse Victoria needs more social infrastructure

Victoria's social infrastructure needs to grow and change with its people. Drivers of demand differ across sectors,[4] with the most significant long-term factors including population growth, changing demographics, and evolving community expectations. Social infrastructure also needs to be able to meet fluctuating and sometimes large surges in demand from unexpected developments and emergencies, as clearly demonstrated during the COVID-19 pandemic.[5] The way Victorians use infrastructure to deliver services itself will need to continually change and adapt, a fact underlined by the sweeping reforms recommended by Royal Commissions into the state mental health and national aged care systems. Appropriately located, well-designed and flexible social infrastructure can help meet spikes in demand, support the most vulnerable and disadvantaged, and promote fairness and opportunity for all Victorians.

Demand for infrastructure is growing across social services. Victoria will need many thousands of new social housing dwellings each year to meet demand.[6] Demand for hospital inpatient services could grow by over 80% by 2042.[7] More people are seeking mental health assistance, with mental illness disproportionately affecting young people, people experiencing disadvantage, residents of remote areas, Aboriginal Victorians, people from non-English speaking backgrounds, and people who are lesbian, gay, bisexual, transgender, intersex and queer (LGBTIQ+).[8] These groups have different and specific needs, and social infrastructure needs to respond to these diverse needs.

Managing demand on infrastructure and making the most from existing assets means building new infrastructure only when an identified need exists. The sheer scale of projected demand for many social services means more infrastructure will be needed, combined with innovations in service delivery and upgrades to existing assets. Access to social infrastructure is particularly challenging for fast-growing communities in outer suburbs of Melbourne as these usually have few or no existing facilities.[9] The next section of this strategy (section 3.4) discusses priorities for these new growth areas in more detail.

Short-term, reactive approaches are inefficient and unsustainable

Best practice social services often focus on prevention and early intervention that strengthens individual and community resilience and pre-empts people reaching crisis.[10,11,12] This is usually more equitable, effective and cheaper than allowing problems to get worse, requiring more complex and expensive services. Investing in infrastructure that supports early interventions can similarly reduce the complexity of new infrastructure or can delay the need for new facilities.

In health, outreach programs, primary services, rehabilitation and day services can divert patients from expensive specialist and acute care, while integrated health infrastructure can support earlier, consistent support for patients through the physical health, mental health and aged care systems. For example, community hospitals that provide 'everyday' services can meet some early intervention needs, reducing burdens on acute care.[13] Similarly, early childhood services and schools can improve the life chances of students and help people to have productive, healthy lives.[14] Social housing can reduce people's reliance on more costly services in the long run.[15]

Total Victorian Government expenditure growth in social services has outpaced population growth, highlighting the pressure to keep spending sustainable and efficient. But social infrastructure planning and funding approaches are often reactive and short term. 'Just in time' approaches can generate a 'lumpy' investment profile, and make long-term infrastructure planning difficult. Service providers often respond by adopting short-term responses, focusing on crisis management and meeting acute need. This can result in a siloed approach that makes joint planning challenging and reactive, and which produces expensive infrastructure projects that struggle to meet long-term service needs.[16]

Aligning service planning and infrastructure supports early intervention

New infrastructure can take years to plan, design, pass regulatory approvals and be built. This renders it relatively slow to react to rapid changes in demand. It also means infrastructure planning and design is best when it is flexible, with the capacity to help manage spikes in demand, including from social or legislative changes or from natural disasters, economic recession or pandemics. Decision-makers need to plan now for future needs, not just those experienced today, and be informed by evidence-based service planning.

Identifying long-term service needs, and then aligning infrastructure planning – and funding – with those needs, can generate better value for taxpayers and better services. Evidence-based service planning should inform priority investments, including projections of infrastructure demand, and aim to address people's needs as early, quickly and inexpensively as possible. Regular reviews of demand projections and service planning would allow these to reflect the best current data, including innovation and research, project evaluations and developments in best practice. Critically, service planning should be done before infrastructure planning.

Social infrastructure usually has a long lifespan, meaning it can struggle to adapt to technological change and service delivery developments. Inflexible facilities risk becoming prematurely redundant, unable to provide modern, safe services. Victoria needs social infrastructure that can be easily maintained, upgraded and expanded over time. Delivering new buildings that are flexible and multipurpose where possible, and with technological foundations that are easily updated, will enable faster and less expensive upgrades. Planning and design can consider the potential for new infrastructure to be built to enable expansion and shared use by co-located or integrated services.

Case study

Planning school infrastructure for growing communities

The Department of Education and Training (DET) uses projections of demand to better understand future service need. Service planning helps to identify the most appropriate infrastructure responses for different areas, the amount of funding required, and the efficient sequencing of investment. This approach informed $3 billion in new funding in 2020 for school upgrades and new schools, plus the previous $1.8 billion investment in 2019 to build 100 new schools by 2026.[17]

DET's projections, service planning and relatively consistent funding allow it to use a mixture of measures to manage and respond to increasing demand for schools. These measures go beyond building new infrastructure, and include expansions, upgrades and modernisations – sometimes using relocatable or modular buildings – and policy approaches to manage demand, such as the application or amendment of school zones.[18]

Of the 100 new schools the Victorian Government is planning to deliver from 2019 to 2026, approximately three quarters are in, or proposed to be in, metropolitan growth area councils. Of these 100 schools, 25 have already been delivered and 13 more growth area schools will be constructed by 2023–24.[19] Funds have also been allocated to purchase land for more schools in five growth area municipalities. To inform its service planning and confirm appropriate sites for new schools, DET works with the Victorian Planning Authority and other government agencies to prepare Precinct Structure Plans (PSPs). PSP processes also help secure funding from Growth Area Infrastructure Contributions levied from developers.[20]

Importantly, DET provides transparency of its project pipeline via a website.[21] This provides parents, school managers, government agencies and the broader public with better, more timely information relevant to their decisions and greater awareness of how investment is being prioritised. It also provides the opportunity for more collaborative planning with local government to deliver education and community hubs on school sites.

Effective social infrastructure is adaptable and targeted to communities

Successful new social infrastructure works for the people it supports, with few 'one size fits all' approaches working effectively in all of Victoria's diverse communities. Infrastructure planning and delivery should account for local community needs, including its demographics, existing infrastructure capabilities, and the community's capacity to use and operate new infrastructure.

Local, collaborative approaches can help communities deliver local solutions to community needs by bringing government, service delivery organisations, local people, community organisations, and businesses together.[22] Where appropriate, government agencies can benefit from working with each other, local government and service users to co-design and deliver adaptable infrastructure that delivers better outcomes for local residents. Local knowledge, community engagement and cooperation with service users can also make infrastructure more fit for purpose and reduce risks of potential problems.[23]

The *National Agreement on Closing the Gap* recognises the importance of local partnerships between government and Aboriginal representatives to improve the provision of essential services to Aboriginal communities.[24] Aboriginal community ownership and control of social infrastructure delivers quality services, and demonstrates better outcomes are achieved when Aboriginal people have a genuine say in the design and delivery of services that affect them.[25] Aboriginal self-determination should be embedded in service planning,[26] with communities empowered to plan, own and operate infrastructure that delivers culturally appropriate services.[27, 28]

Transparent priorities reflect the best possible evidence

Clear priorities and targets can help drive long-term planning and funding beyond annual budget cycles. They can also promote innovative and more efficient approaches to service delivery, in some cases reducing the quantity of infrastructure required or deferring the need for new assets. Using demand projections and best practice service delivery models to inform planning will help Victoria transition from a 'just in time' approach of one-off investments to a long-term social infrastructure program that provides required services in an appropriate, systematic and sustainable way.

Priorities and targets are most useful when they are transparent and supported by detail on supporting infrastructure programs. Transparency supports better planning, certainty and efficiency across Victoria's social service systems. Better visibility across government agencies and with other stakeholders can identify opportunities to share infrastructure that delivers better outcomes for service users and promote more integrated land use and infrastructure planning. Public, long-term infrastructure planning would also promote more transparent, streamlined and effective procurement practices, saving taxpayers' money and delivering projects with fewer disruptions to services.

The needs of Victorians will continue to evolve, driven by changing demographics, social expectations, technology, and developments in best practice service and infrastructure delivery. Social infrastructure must continue to evolve too.

Recommendations to better support services with infrastructure

Infrastructure Victoria makes the following recommendations to support better long-term alignment between service and infrastructure planning. These reflect the need to adopt a more proactive, long term and transparent approach to new social infrastructure to support Victorians with timely, modern and high quality services. Publishing long-term infrastructure plans for priority sectors (see recommendation 32), embracing innovative ways to connect people to services (see section 1.4) and upgrading and renewing existing assets to meet changing needs (see section 2.4) will help to meet this goal. Infrastructure Victoria has recommended specific responses to the social infrastructure needs of new growth areas (see section 3.4) and Victoria's regions (see sections 4.2 and 4.3).

Recommendation 67

Co-design an Aboriginal community-controlled infrastructure plan

In the next year, start a co-design process with Aboriginal Victorians to develop a plan to guide investment in Aboriginal community-controlled infrastructure to meet current and future social, economic and cultural needs.

Victoria's Aboriginal population is projected to grow more than twice as fast as the general population in the decade to 2028.[29] The Aboriginal population's age and geographic distribution is different from other Victorians,[30] and Aboriginal people experience disadvantage at a higher rate on almost all indicators.[31] This means the service needs of Aboriginal Victorians will likely expand rapidly, in different places, and require a similarly rapid expansion of supporting infrastructure.

The Victorian Government has made self-determination the cornerstone of its Aboriginal policy.[32] It has formally legislated a Treaty process between the Victorian Government and Victoria's First Peoples,[33] and committed to supporting self-determination in decision-making in the *National Agreement on Closing the Gap.*[34] Applied to infrastructure, self-determination empowers Aboriginal communities to own, design and control infrastructure for their social, economic and cultural needs. Aboriginal community-controlled organisations adopt holistic approaches to delivering services and infrastructure, incorporating cultural safety, flexibility, diverse services, prevention, promotion, advocacy and the empowerment of individuals, families and community.[35] However, historical dispossession and a lack of recognition means they have had limited opportunities to acquire infrastructure,[36] which has left many existing facilities insufficient and not fit for purpose.

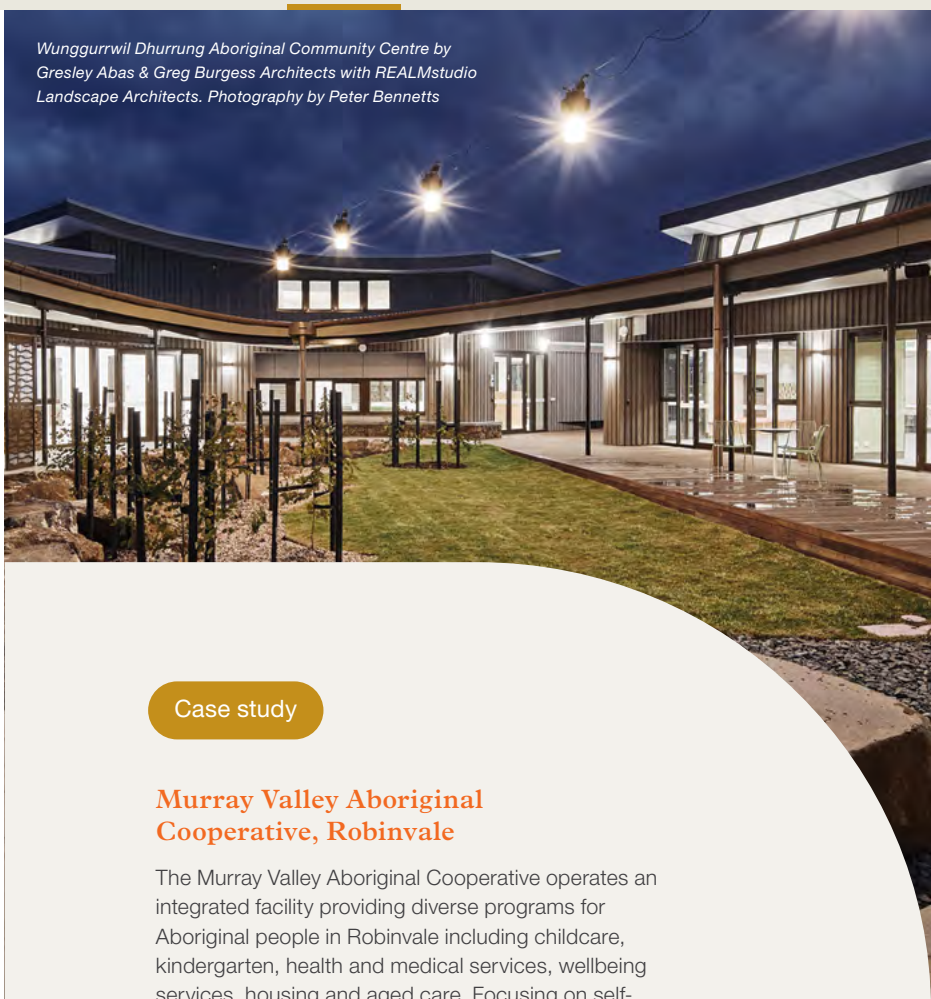
The Victorian Government has taken steps to bolster Aboriginal community-controlled organisations' ownership of infrastructure. It transferred ownership of 1448 social housing properties to Aboriginal Housing Victoria,[37] allowed the removal of restrictive `first mortgages' on property owned by Aboriginal organisations,[38] and established and partially extended an Aboriginal Community Infrastructure Fund.[39]

It has also committed to working with Aboriginal community-controlled health organisations to deliver more culturally appropriate mental health and wellbeing services.[40] However, there is currently no overarching needs analysis or strategy to guide infrastructure investment. Current funding supports individual Aboriginal organisations to develop business cases on a project-by-project basis.[41]

The Victorian Government should start co-designing an Aboriginal community-controlled infrastructure plan collaboratively with Aboriginal Victorians in the next year. The plan should identify current and future infrastructure needs, appropriate locations for facilities and delivery of services, and suitable funding, design and procurement approaches (potentially informed by Infrastructure Victoria's regional and metropolitan infrastructure needs profiles).[42] It can include more accurate data and information about the living circumstances of Aboriginal people,[43] build in co-governance and accountability mechanisms,[44] and align with budget processes.[45]

This plan should acknowledge and be informed by the Victorian Treaty process,[46] reflect self-determination principles and priorities in the *National Agreement on Closing the Gap,* and the *Victorian Aboriginal Affairs Framework.* It can build upon existing plans, agreements, and reports for specific sectors, including for health,[47] mental health,[48] family violence,[49] education,[50] children and families,[51] justice,[52] economic development,[53] and housing and homelessness.[54] The co-design process will require a strong governance structure. In designing this, the Victorian Government could consider incorporating examples from existing governance structures, consider the relationship with the First Nations People's Assembly, and include diverse representation, including from Aboriginal community-controlled organisations, peak bodies, Traditional Owner groups, and drawing upon the lived experience of Aboriginal people.

In co-designing the plan, consideration can be given to how it might account for the many different infrastructure sectors, and its emphasis on different locations in Melbourne and regional Victoria. It may be that the preferred approach is to plan region by region, such as in the Loddon Campaspe and Mallee regions,[55] or by focusing on priority sectors first, in an iterative manner. The plan could be expanded to include other diverse priority infrastructure such as integrated facilities, sporting infrastructure, and facilities that protect the heritage, learning and practising of traditional language and culture. It could also recognise economic and cultural tourism opportunities (see recommendation 82).



Wunggurrwil Dhurrung Aboriginal Community Centre by Gresley Abas & Greg Burgess Architects with REALMstudio Landscape Architects. Photography by Peter Bennetts

Case study

Murray Valley Aboriginal Cooperative, Robinvale

The Murray Valley Aboriginal Cooperative operates an integrated facility providing diverse programs for Aboriginal people in Robinvale including childcare, kindergarten, health and medical services, wellbeing services, housing and aged care. Focusing on self-determination, empowerment and resilience, the Cooperative encourages the involvement of the Aboriginal and wider community to promote understanding of the challenges facing indigenous people in the region.[56]

Wunggurrwil Dhurrung Centre, Wyndham Vale

The Wunggurrwil Dhurrung Centre will provide a dedicated space for the Aboriginal community to strengthen community and cultural development. People will learn about culture just by being in the building. It will also facilitate improved coordination and delivery of services and programs.

The Integrated Family Centre will provide early years and family support to local families, including family and early intervention services for vulnerable groups. It will include community spaces, kindergarten rooms, maternal child health consulting rooms, office space, and consulting rooms to cater for the growing needs of the Wyndham community.[57]

The co-located Wyndham Aboriginal Community Centre, Koling Wada-Ngal, provides an inclusive space for Aboriginal people managed by a community-led committee. The purpose of the centre is to strengthen community and cultural development and facilitate improved coordination and delivery of services and programs for the Aboriginal community in Wyndham.

Recommendation 68

Set targets to grow social housing

In the next year, set a transparent statewide social housing growth target to reach and maintain at least the national average of 4.5 social housing dwellings for every 100 households by 2031.

Social housing infrastructure meets a basic need of low-income Victorians for secure, affordable and appropriate housing, which the private market is not supplying.[58] Homelessness in Victoria increased by more than 40% in the decade to 2016, reaching about 25,000 on any given night.[59] Low-income households in rental stress has grown by nearly 60% in the decade to 2018, to more than 140,000.[60] Only 11.4% of new Victorian rentals are affordable to someone receiving Centrelink benefits.[61] Aboriginal Victorians experience worse housing outcomes than other Victorians on multiple indicators.

Social housing is effective at preventing homelessness[62] and its income-linked rents prevent housing stress. Social housing, like other infrastructure, needs long lead times for careful design, planning, regulatory approvals, and procurement. Delivering social housing at scale requires a rolling construction program planned over several years. Like other infrastructure spending, social housing can have stimulatory economic effects, especially for the residential construction sector.

We estimate Victoria had 3.2 social housing dwellings for every 100 households in June 2020,[63] compared with the national average of 4.4.[64] The Victorian Government commits to developing a 10 year strategy for social and affordable housing and made a significant investment in social housing as part of its $5.3 billion Big Housing Build program, including more than 9300 new social housing dwellings.[65] In the past, Victorian capital expenditure on social housing was less than 60% of the national average.[66] The Australian Government has compounded the problem by steadily reducing real funding per capita over time.[67]

All estimates, including our own,[68] indicate more social housing is required to meet Victoria's needs. Estimates vary from 1700 each year – just to keep pace with population growth[69] – to 8300 annually to cover all evident need.[70] Reaching a statewide provision rate of 4.5 social housing properties for every 100 households by 2031 would require around 4900 extra properties each year, or as little as 3900 with lower population growth.[71] More homes should be provided to meet demand in accessible locations which provide residents ready access to the health, social and economic support and services they need.[72]

The Victorian Government should publicly set long-term targets for social housing growth beyond the Big Housing Build program. The targets should be broken down to identify provision for Aboriginal people and other applicant groups on the Victorian Housing register. Targets should clearly define Victorian Government expectations, drive longer-term planning involving local government and partnering organisations, provide funding certainty beyond annual budget cycles, help maintain accountability for results, and consider needs of specific groups, such as Aboriginal Victorians.

Public debate has often been distracted by complex financing mechanisms for social housing, which merely change the funding profile, or at best achieve marginal cost reductions. However, one study suggests direct government capital investment could reduce social housing costs by up to 24% compared with offering operating subsidies.[73] The cost of this recommendation depends on the target, location and timing, the funding or financing mechanism, and population growth.

Investing in new social housing can also provide new facilities for existing tenants to be relocated to while existing social housing assets are undergoing renewal (see recommendation 55).

Recommendation 69

Build new hospital capacity

In the next five years, reserve land for future hospital sites. Over 30 years, build new public hospital capacity to meet Victoria's future needs, especially increases in demand from Melbourne's rapidly growing outer northern and western suburbs.

Every day, Victoria's public hospitals provide acute emergency and critical care, outpatient services and longer stay support. Large specialist facilities in metropolitan Melbourne provide highly specialised trauma and other services statewide. Hospitals also provide unique capabilities during major disasters or other contingencies, as demonstrated by their central role in responding to the COVID 19 pandemic.

Demand for hospital services continues to grow, driven by population growth and an ageing population, and increasing prevalence of complex and chronic conditions.[74] Almost 20% more inpatient services were delivered in 2018–19 than five years earlier,[75] and projections indicate demand for inpatient services could grow another 80% by 2042.[76] Melbourne is likely to generate most of the new demand, and as Figure 23 shows, the rapidly growing outer suburbs and new growth areas will generate the greatest share of this demand.[77]

Meeting this demand could require more hospital capacity equivalent to hundreds of extra beds every year.[78] Promoting prevention, early intervention and better models of care (recommendation 25) and the proactive upgrade and renewal of ageing facilities (recommendation 56) can moderate some demand, but significant investment in new hospital infrastructure will still be required.

The Victorian Government will need to increase hospital capacity across much of the state, by expanding existing sites as well as delivering new hospitals with transport access for those areas most in need. Within five years, and informed by service planning, it should publish a public plan for health infrastructure that sets out priorities, sequencing, and locations (recommendation 32). This plan needs to address the pressing need to provide more services to Melbourne's outer north and west,[79] building on existing commitments to a new Melton hospital and the expansion of Werribee Mercy Hospital.[80]

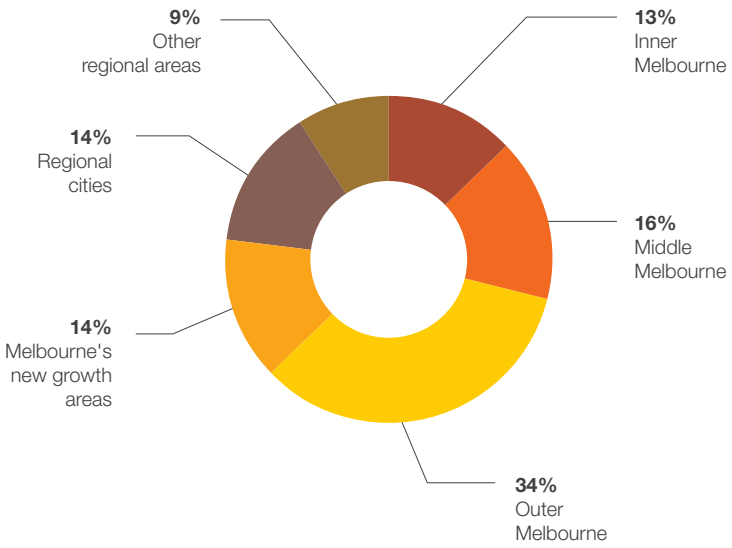
When building and upgrading hospitals, the Victorian Government should plan and deliver well designed infrastructure that can be easily maintained, upgraded and expanded, and which meets modern standards for accessibility, energy efficiency and sustainability. This would allow facilities to be readily adapted to changing need, technology and best practice to deliver modern, safe and improved care. Progressive modernisation and upgrades will also support hospital efficiency, slowing the need for new builds. Preserving options such as larger footprints or the ability to build extra wings or storeys could support future upgrades and result in fewer interruptions to services.[81]

Delivering hospital infrastructure is expensive and time-consuming, particularly when it involves building new facilities. The new 504-bed hospital in Footscray, for example, is expected to cost $1.5 billion.[82] Upgrades can be faster and more cost effective, and capacity could be increased through improving and expanding assets at existing sites where this is possible and appropriate. However, new hospitals will still be necessary. Forward planning can secure land early, potentially reducing costs, and present opportunities for collaboration between government and industry.

Figure 23: Demand for hospital services will grow fastest in Melbourne's outer suburbs and growth areas

The diagram shows the share of projected new hospital inpatient service demand growth by urban area[83] from 2018–19 to 2041–42.

Source: Infrastructure Victoria analysis of Department of Health and Human Services, *Inpatient Projection Model 2018*



Recommendation 70

Deliver infrastructure for a more responsive and integrated mental health system

In the next year, establish a dedicated infrastructure fund to support more responsive and integrated mental health and wellbeing services, consistent with the recommendations of the Royal Commission into Victoria's Mental Health System.

The Royal Commission into Victoria's Mental Health System is a catalyst for generational reform. It delivered a blueprint for a profound redesign of a 'depleted and broken' and 'overly complex, fragmented and inconsistent' system,[84] and the Victorian Government committed to implementing all of its recommendations.[85] Peak bodies, health services and the community are providing considerable support for change.[86]

Around 20% of Victorians experience mental illness each year, and almost 50% experience a mental illness during their lifetimes.[87] Over 200,000 Victorians live with severe mental illness,[88] and more than twice as many die from suicide than in road accidents.[89] Demand has overtaken all types of care provision.[90] Publicly funded, community-based specialist services respond to less than a third of estimated need, and almost 100,000 Victorians cannot access the specialist care they require.[91] Under-investment, inadequate planning, and stigma means the system reacts to crises rather than preventing them.[92] Young people, regional Victorians, Aboriginal people, those who are LGBTIQ+, and people living with poor physical health, homelessness, disability or substance dependence can find it particularly hard to access care.[93] Poor mental health is estimated to cost Victoria $14 billion a year.[94]

The Royal Commission envisions a mental health system providing more community-based services and better quality hospital and residential care.[95] Alongside implementing sweeping changes to service planning, governance, and workforces, the Victorian Government must invest in infrastructure that supports safe and effective services. More and different types of fit for purpose facilities are needed, including for inpatient, acute and emergency care, and residential rehabilitation. Ageing infrastructure should be replaced or updated,[96] and innovative alternatives to hospital treatment better supported.[97]

The Victorian Government has committed to a new levy to support reform to Victoria's mental health system[98] and begun to deliver recommendations to fast-track more mental health beds, new mental health services, innovative residential services, design work for a new Victorian Collaborative Centre for Mental Health and Wellbeing, and better support for young and Aboriginal people.[99]

These commitments includes least 100 more mental health beds;[100] more 'hospital in the home' and community rehabilitation services;[101] more services for adults, older adults, children and youths that operate with extended hours and in a variety of settings;[102] technology upgrades to support digital services and information sharing;[103] new 'safe spaces' and crisis respite facilities;[104] gender-based separation in facilities;[105] and major upgrades to the Thomas Embling Hospital.[106] The Victorian Government should now establish a dedicated fund for further mental health infrastructure required to fulfill the Royal Commission's recommendations.

Infrastructure investment must align with service planning for maximum integration and effectiveness. The Royal Commission recommended a new statewide mental health and wellbeing service plan from late 2022 to 2023.[107] In this plan, the Victorian Government should consider future priorities across the spectrum of care and set out the infrastructure investment required to deliver them. It should also foster innovative design and models of service delivery, better connect and align mental health and related services to support people with complex needs, and be informed by further research and evaluations of new programs over time.

Recommendation 71

Plan and consistently deliver corrections and youth justice infrastructure while managing demand with policy settings

Plan and consistently deliver corrections and youth justice infrastructure while managing demand. By 2023, undertake long-term corrections and youth justice infrastructure planning, alongside policy measures that reduce short-term volatility and demand. In the next 15 years, consistently deliver a program of corrections and youth justice infrastructure projects to meet long-term demand.

Victoria's prison population has grown rapidly, driving greater demand for corrections infrastructure. Prisoner numbers increased by 33% from 2014 to 2019,[108] driven by an increase in people on remand,[109] population growth, and sentencing and parole reforms.[110] While the COVID-19 pandemic reduced demand, it did so only temporarily and has also caused delays in sentencing that mean many people on remand are spending more time in custody awaiting their day in court.[111]

Building infrastructure is not the only way to address demand for correctional and youth justice facilities. Any investment must be considered alongside policy changes that can reduce long-term demand, avoid short-term volatility, deliver treatment (including for mental illness), and help address the over-representation of Aboriginal Victorians in custody. Best-practice early intervention and prevention programs, in and outside of corrections facilities, can divert some demand by reducing the likelihood of offending.

A history of irregular, 'just in time' funding makes it challenging to plan for the long-term or respond rapidly to capacity shortfalls driven by changes in policy and practice. In 2019, the Victorian Government announced $1.4 billion in funding to accommodate 1600 extra prisoners[112] to ease short-term infrastructure pressures but this will be exhausted by 2023. Unreliable capital funding also contributes to a growing maintenance burden,[113] affects the efficiency of prison services,[114] and contributes to high costs.[115] The yearly cost to fund each Victorian prisoner rose by over 25% from 2011 to 2017,[116] and annual prison running costs have tripled since 2009.[117]

When caught short, the system has historically relied on adding extra permanent beds to existing facilities, or resorting to temporary beds and double bunks. These measures can be cheaper up front, but their long term use can contravene standards and risk health, safety and rehabilitation outcomes.[118] Prisons can only accommodate so many extra prisoners and remain effective.[119] In some cases, capacity has been pushed beyond the maximum utilisation rate of 95%. This results in overcrowding, an increase in serious prison incidents, a reduction in specialised services to vulnerable cohorts, less flexibility to move prisoners, and diversion of police resources to oversee prisoners in police cells.[120]

The Victorian Government needs a more considered, long-term approach to planning for corrections and youth justice infrastructure. By 2023, its planning should be informed by projections of long-term demand, including scenarios under alternative policy settings that would allow government to consider options for policy reform and infrastructure responses. Investment should align with long-term demand under desired policy settings, and aim to maintain facility capacity below 95%. The annual capital budget can vary drastically; for example from $70 million in 2017–18 to $970 million in 2021–22.[121] More consistent capital funding would support a long-term program of projects that meets demand in a more sustainable way, promoting more robust and cost effective procurement and resulting in fewer disruptions. Reviews of funding and priorities every three to five years would allow updates to reflect developments, including changes to projected demand and policy settings.

Photography by Chris Matterson

3.4

Plan for growth areas

The populations of the seven designated growth areas, on the outskirts of Melbourne are experiencing rapid population growth, encouraged by relatively affordable housing for residents.[1] Including parts of Cardinia, Casey, Hume, Melton, Mitchell, Whittlesea and Wyndham local government areas, these growth areas are projected to be home to over 930,000 more people by 2036. This is roughly equivalent to adding the population of around 10 cities the size of Bendigo, and represents over 40% of projected statewide growth.[2] These growing populations are often more diverse, with a higher proportion of Aboriginal Victorians and migrant communities than other parts of Victoria. While the COVID-19 pandemic temporarily slowed population growth, many more Victorians will continue to call designated growth areas home.

These extra people will require new homes, and that means building many thousands of new dwellings. Unlike in established suburbs, almost all this construction is in areas that were previously rural with little existing infrastructure and small starting populations.[3] To provide residents with access to employment, services and amenities, considerable new investment is needed in many types of infrastructure, including utility connections, roads and

Figure 24: New growth areas grow rapidly from 2018 to 2036

This graph shows the minimum and maximum average annual population growth rates in different parts of Melbourne and regional Victoria from 2018 to 2036, across the different population growth scenarios modelled by Infrastructure Victoria.

Source: Infrastructure Victoria analysis of Arup Strategy modelling outcomes, 2021.

public transport, schools, hospitals, community infrastructure and telecommunications.[4]

Governments are responsible for funding most of this infrastructure, in full or in partnership with others, and delivering it is expensive. Greenfield development infrastructure is estimated to cost the Victorian and local governments tens of billions of dollars over the next two decades,[5] although the exact quantum will depend on how quickly these areas are settled. As the single greatest expense, transport requirements are likely to account for over half this amount.[6]

On average, the Victorian Government spends about $50,000, and local councils $38,000, on infrastructure to support each new home in Melbourne's growth areas.[7] This is significantly more than the norm in established suburbs where up to 80% of new homes have been built.[8] Building non-transport infrastructure for extra homes in new estates is typically around two to four times more expensive than in established areas, where existing infrastructure has the capacity to support development.[9] Developer contributions in new growth areas averaging around $23,000 for each home assist, but neither level of government recovers the full cost of infrastructure provision.[10]

More effectively aligning infrastructure and land use planning in new growth areas would provide the Victorian Government and local councils with a more integrated and accurate view of infrastructure requirements, promote collaboration between government agencies on delivery and sequencing, support transparency, and – most important of all – help deliver better outcomes for residents and communities.

Effective alignment of land use and infrastructure planning will allow for a more integrated and accurate view of what is required to deliver better outcomes for growing communities.

Infrastructure sometimes does not meet the needs of growth area residents

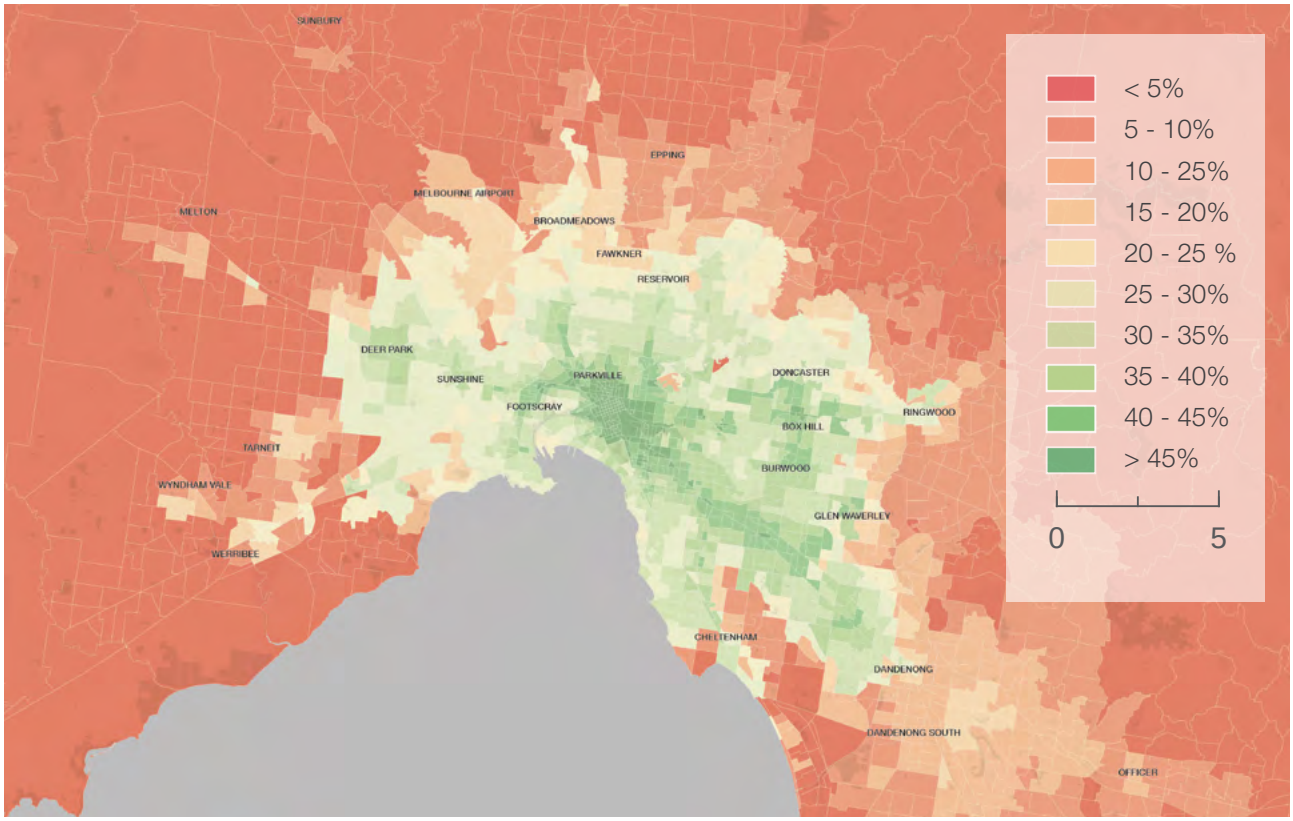
While the need for infrastructure in new and developing communities is pressing, in some cases there are some types of infrastructure arriving long after they are required.[11] Outer suburbs and new growth areas offer the most affordable homes to purchase, but are not necessarily affordable living because they are less connected to the rest of Melbourne and associated opportunities. These residents face more obstacles in finding jobs that suit their qualifications and can find it more difficult to access services.[12] They are also more likely to be Aboriginal Victorians or from migrant communities, and the infrastructure may not meet their specific cultural and service needs. The built form of new suburbs creates new problems for the environment and amenity, while a lack of social infrastructure can limit engagement with sport, recreation, and cultural expression.

Transport connections within growth areas, and to the rest of Melbourne, are underdeveloped, leading to congestion, high car dependence and inefficient network use. Many outer suburbs do not have suitable, high capacity public transport options, with services less frequent the farther people live from the city centre, especially in the outer west and south-east.[13] As many growth areas are along interstate road corridors, road congestion can also delay freight movements.

Even with more Victorians working more frequently from home, transport options in growth areas remain limited.[14] With few public transport options, many commuters rely on their cars, increasing congestion on underdeveloped road networks that are already under pressure. Without enough arterial roads, more people use the city's motorway network for shorter trips, and this makes it less resilient to disruptions because motorists have few alternative routes.

Figure 25: Outer suburbs and new growth areas are projected to have lower access to jobs by public transport

This diagram shows the projected percentage of jobs accessible within 60 minutes of homes by public transport in 2036, under a lower infrastructure investment scenario using the official population distribution projection.



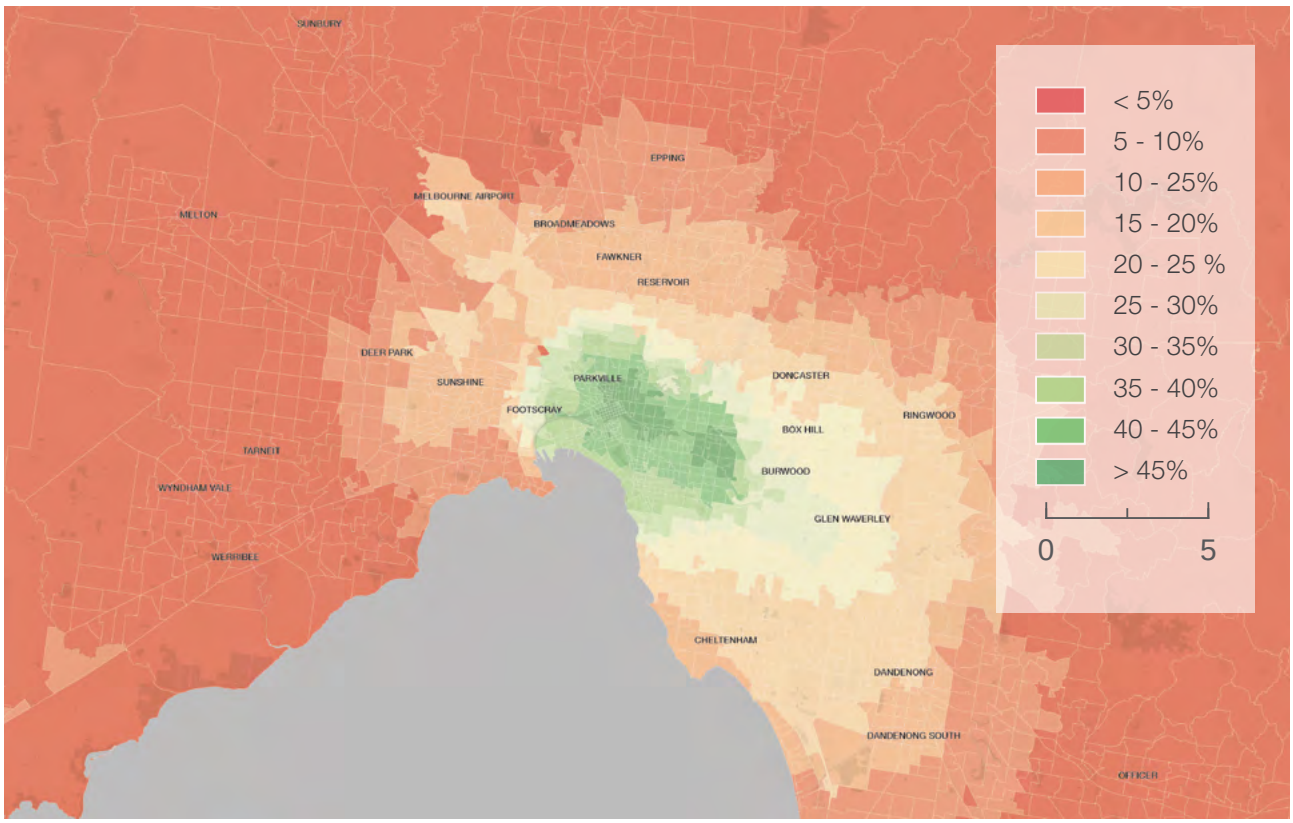
Source: Arup, *Strategy update: Problem definition modelling outcomes,* report for Infrastructure Victoria, November 2020

While the Victorian Government has committed to road projects in the growth areas and corridors,[15] the forecast growth in these areas means these projects are unlikely to meet the scale of demand.

New growth areas offer fewer jobs than inner and middle suburbs, even as their populations grow more quickly. Many available jobs in growth areas primarily serve local needs, such as in education, health care and retail, rather than more highly paid, specialised roles.[16] While these jobs are more available in other parts of Melbourne, limited transport options to, within and from growth areas make these opportunities difficult for many to access.[17] Lower job access contributes to lower labour force participation, higher unemployment and the underutilisation of workers, especially as those working in outer suburbs are more likely to be overqualified for their jobs than residents elsewhere in the city.[18]

Figure 26: Outer suburbs and new growth areas are projected to have lower access to jobs by private vehicles

This map shows the percentage of jobs in Greater Melbourne that can be accessed within 30 minutes by private vehicles in 2036, under a lower infrastructure investment scenario using the official population distribution projection.



Source: Arup, *Strategy update: Problem definition modelling outcomes,* report for Infrastructure Victoria, November 2020

Converting land from agriculture and other uses contributes to habitat loss and biodiversity decline, as paddocks and grassland are turned from natural environments into roads, buildings and other development.[19] Small lot sizes and residents' preferences for large homes means a lot of residential land in growth areas are covered by detached houses, driveways and other constructed surfaces – particularly in Melbourne's north and west.[20] These leave little space for vegetation, including canopy trees, on private property and may limit opportunities for future land use change.[21] Growth areas are particularly vulnerable to heat, but have fewer trees to provide shade and support evaporative cooling.[22] More vegetation on public and private land would help reduce water run off, air pollution and ultraviolet radiation,[23] and encourage biodiversity, active transport and neighbourhood amenity.

Like all Victorians, residents of growth areas also have a right to expect social infrastructure that meets their health, education, sport and recreation needs, but many rapidly growing areas lack sufficient social infrastructure to meet demand. This will require new infrastructure and the better integration of social infrastructure into the planning of new suburbs. In some cases, only minor changes would be required to allow existing facilities to provide multiple services, or to deliver infrastructure in a way that supports joint use. For example, there is potential to leverage the Victorian Government's delivery of many new schools in growth areas, including the shared community use of competition-sized sports courts provided in all new schools.

Better planning can help provide the right infrastructure, at the right time

A unique opportunity exists to build modern and better integrated infrastructure that can meet the needs of rapidly growing and diverse communities in growth areas, but planning infrastructure for new suburbs on the urban fringe is complex. The Victorian Government, local governments, landowners, private developers, utility companies, service providers and other stakeholders must collaborate to promptly deliver the infrastructure communities need.[24]

To guide the process, the Victorian Planning Authority (VPA) coordinates the development of Precinct Structure Plans (PSPs) for new growth area suburbs. Each PSP covers an area expecting up to 30,000 residents and as many as 10,000 jobs, and considers infrastructure needs including roads, schools, shops, parks, transport and services.[25] In so doing, the PSP process aims to encourage more integrated decisions about land use patterns, transport, the environment and other investments.[26]

The PSP process encourages forward planning, but it is not flawless. While the VPA can encourage cooperation, no one entity is responsible for providing leadership or is accountable for the delivery of timely infrastructure and services.[27] Individual government agencies can choose the extent to which they include their own infrastructure and service planning in PSPs. Utility providers undertake their infrastructure planning on fixed, three to five-year time horizons, and their budgets are not coordinated with the PSP process. This means the Victorian Government can find it difficult to deliver infrastructure and services in a timely, coordinated sequence.[28]

Future governance arrangements could provide greater clarity on stakeholder responsibilities and support monitoring that identifies gaps and systemic issues. Clearer policy direction would also support government agencies, councils, the private sector and local communities to make complementary investments.

Overall, a more collaborative approach would better support people, businesses, utility companies and service providers in growth areas, helping to drive productivity, enhance social benefits and improve environmental outcomes.

Transport is the most expensive element of infrastructure provision in new growth areas. No single intervention will address all transport challenges in these areas, but careful investment can better connect residents in new outer suburbs with jobs, education and services. New road links and upgrades can help keep traffic moving and provide a foundation for high quality bus, cycling and walking networks.[29] Buses can be rapidly deployed to provide flexible, inexpensive services to growing populations, helping prevent 'locked in' car travel patterns, and complementing the other public transport modes in the long term.[30] Rail network upgrades can be prioritised in areas where population growth is greatest, road networks are underdeveloped and access to existing train services is difficult – as is the case in Melbourne's outer north and south-east.[31]

Planning and delivering social infrastructure within walking distance of the Principal Public Transport Network would also help achieve the *Plan Melbourne* goal of '20-minute neighbourhoods' in which people are able to meet most of their daily needs within a short walk from home.

Feasibility studies and business cases should continue to assess the economic, social and environmental impact of different options and an effective and efficient sequencing of investment. Transport modes, routes and infrastructure should continue to evolve with the communities they support. Reserving land for future transport corridors can also save time, complexity and money in the long-term, and support the development of more sustainable new communities.[32]

Recommendations to improve planning for growth areas

Infrastructure Victoria makes the following recommendations to improve planning for growth areas. These build on recommendations relevant elsewhere in this strategy, and would be most effective if complemented by a more integrated approach to land use and infrastructure (see section 2.1).

Recommendation 72

Prioritise and oversee infrastructure delivery in growing communities

In the next year, empower a government body to monitor infrastructure delivery in Victoria's new growth areas and priority urban renewal precincts, and proactively advise on delivery sequencing and funding. In the next five years, develop program business cases for growth areas and precincts that consider timing, sequencing and funding of infrastructure.

Victoria is accommodating population growth in new growth areas, and in urban renewal precincts such as Fishermans Bend and Arden. These different types of residential areas face particular infrastructure opportunities and challenges in accommodating growing populations. Growth areas need new infrastructure to support rapid creation of communities, while urban renewal precincts need infrastructure for residential uses in areas that once supported large-scale industry.

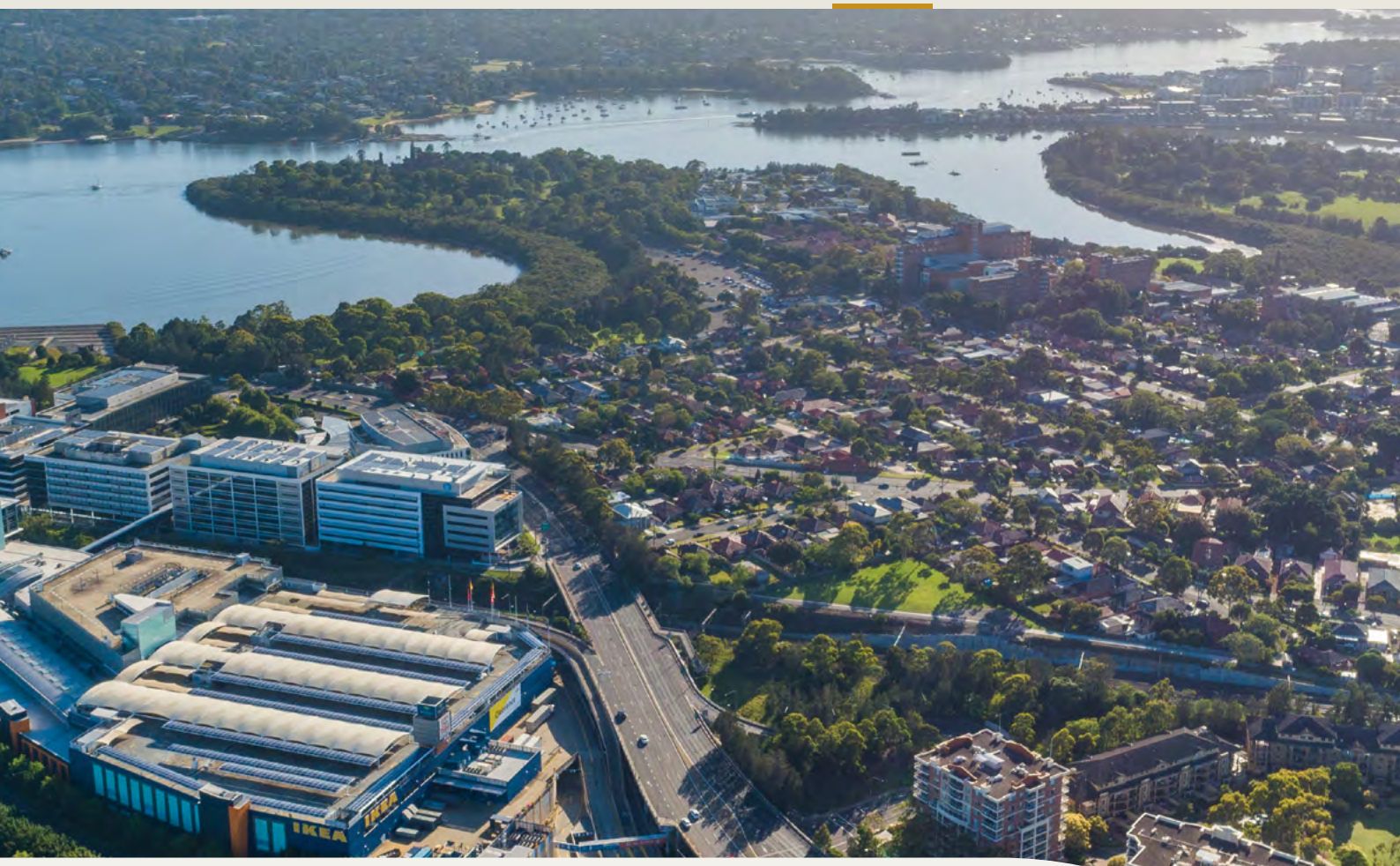
Some infrastructure for new and developing communities is being delivered after communities require it.[33] Excluding transport, infrastructure capital costs in greenfield areas can be two to four times higher than in established areas, where existing infrastructure has the capacity to support growth.[34] These areas also have diverse populations, and may need particular social infrastructure, such as for Aboriginal community-controlled organisations. Service planning is important to identify appropriate infrastructure responses in different areas (see section 3.3).

Plan Melbourne requires sequencing of growth areas – staging land releases to better link with infrastructure delivery.[35] This can help minimise infrastructure costs. But no clearly identified agency is responsible for providing ongoing leadership, responsibility and accountability for timely, coordinated and sequenced delivery of infrastructure and services.[36]

The Victorian Government should empower an appropriate entity to monitor infrastructure delivery[37] in greenfield growth areas and priority urban renewal precincts in the next year.[38] The entity would initially monitor and publicly[39] report to the Victorian Government on infrastructure delivery in precinct plans. This role can then be extended to identifying sequencing of investment and appropriate funding amounts. Improving the infrastructure contributions system to cover gaps and be more consistent and efficient will assist in providing necessary funding and actually delivering infrastructure when it is required by growing communities (see recommendation 34). The selected entity should advise on whether sequencing land release might result in better outcomes and reduce infrastructure pressures. This leadership can help manage large new growth fronts across Melbourne and regional Victoria[40] by better prioritising infrastructure, based on the Victorian Government's funding capacity.

Lessons can be drawn from approaches to urban renewal and major infrastructure projects, such as the New South Wales Place-based Infrastructure Compacts (see breakout box), Fishermans Bend and Arden. Other jurisdictions use program business cases that manage change with a strategic vision and a roadmap for delivery. Program business cases combine related projects and activities, including across different sectors, that achieve a desired outcome together and help articulate the interdependency and coordination of investment decisions.[41]

A clearly identified and empowered body can prioritise infrastructure that best meets current and future demand. This supports people, employment and industries in their location choices, which delivers higher productivity, and better social and environmental outcomes. By more clearly identifying priority places for investment, and the timing of infrastructure provision, the private sector, local government and the community can make complementary investments. The infrastructure contributions made by developers can also be used more effectively to meet the needs of growing communities. An oversight entity can also help to reduce duplication of effort (and subsequent cost) across government by helping create shared priorities.



Case study

Learning from the New South Wales Place-based Infrastructure Compacts

New South Wales is piloting a new collaborative approach to place-based infrastructure planning and provision. Overseen by the Greater Sydney Commission, Place-based Infrastructure Compacts (PICs) bring together the many types of infrastructure needed to achieve better place-based outcomes. The pilot focuses on the Greater Parramatta and Olympic Precinct, one of the fastest growing areas in Greater Sydney.[42]

This PIC set out different scenarios for the precinct's future, from a 'business as usual' scenario with minimal change, to a 'visionary' scenario where the precinct experiences a step change and becomes part of a '30-minute city'. Crucially, short, medium and long-term projections of population, homes and jobs were completed for each scenario. The Commission worked collaboratively with relevant agencies to identify all the necessary services and infrastructure needed to support each scenario. This included documenting the most cost-effective timing and sequencing of growth, and the responsible agencies, costs and potential funding sources for the supporting infrastructure.

Infrastructure types included transport, justice, housing, education, cultural infrastructure and green infrastructure.

The PIC provides a blueprint to guide development of the precinct, transparently setting out the costs associated with achieving different outcomes. It uses collaboration and rigorous evaluation to identify places where growth can be accommodated cost-effectively and provides greater certainty and better coordination. Building on the findings of the pilot, a draft Strategic Business Case was prepared, proposing 10-year service and infrastructure priorities to respond to current, emerging and future needs within budgetary limits.

Victoria can learn from the ideas in the PICs and adapt them for use here. Service planning needs to be advanced to inform infrastructure requirements, and how growth occurs needs to be continuously monitored to inform service and infrastructure planning. Critically, they require a credible body who can facilitate collaboration across the many different stakeholders in a place.

Recommendation 73

Fund libraries and aquatic centres in growth areas

In the next five years, increase funding to support local governments to plan and deliver libraries and aquatic recreation centres in Melbourne's seven growth area municipalities.

Aquatic recreation centres and libraries operate every day, providing many different health and education services for people of all ages. Libraries help build literate, productive and engaged communities, earning $4.30 in economic and social benefits for every dollar invested.[43] Aquatic centres improve physical and mental health and wellbeing, and help build strong social networks.[44] Each swimming pool visit generates $26 in health benefits, collectively totalling $1.82 billion each year in Victoria.[45]

Victorians visit libraries more than 30 million times each year,[46] public pools attract more than 70 million visitors,[47] and aquatic centres can exceed 1 million yearly visits.[48] Visitors to these facilities also often spend money at nearby local businesses, such as retailers and cafes, supporting local jobs. Evidence shows growth areas have fewer libraries and aquatic centres than the rest of Melbourne and this will likely worsen over time as populations increase.[49] The challenge is demonstrated by the rapid growth in families with young children. Growth area councils contain 35% of all of Melbourne's 0 – 4 year old children, and by 2036 this will increase to 40%.[50] As these children grow up, existing libraries and aquatic centres will be unable to provide them the same access as their peers elsewhere.

Libraries and aquatic centres have large upfront capital costs. New libraries can cost from $20 million to $30 million and new aquatic centres $50 million to $70 million.[51] Historically, the Victorian Government provided substantial funding for these facilities.[52] The Victorian and Australian governments sometimes provide sporadic funding for regional aquatic centres.[53] More recently, metropolitan local governments typically fund the majority of capital costs for new aquatic centres and libraries, while the Victorian Government only contributes small amounts. Current funding does not adequately account for the high need to provide new regional-scale infrastructure in growth areas,[54] which cannot be funded by development contributions.[55] Growth area councils need to prioritise limited funding to provide infrastructure across multiple rapidly growing communities and upgrade older infrastructure in their often disadvantaged established suburbs.[56]

Figure 27 shows that growth areas have fewer libraries per person than other areas. Figure 28 shows that many residents in new growth areas will not have access to local library services.

Casey, Cardinia, Hume, Melton, Wyndham, and Whittlesea will likely each need a new library in the next five years, and planning for a new library for Mitchell's growth areas should start now. A new aquatic centre is likely to be required in each of Casey, Melton, Whittlesea and Wyndham in the next five years, and planning should start immediately for timely delivery of new aquatic centres in each of Cardinia, Hume, and Mitchell.

The quality of existing aquatic centres varies across these municipalities, with some being older seasonal outdoor pools. For example, in the Shire of Mitchell, planning for new facilities will need to address the projected rapid growth expected in the south that will be disconnected from the Shire's existing older infrastructure located in the rural townships to the north. Shared planning with adjoining councils and the Victorian Government can help ensure new facilities do not affect the viability and sustainability of neighbouring ones.[57]

Each municipality should receive up to $200,000 for aquatic centre planning and $100,000 for library planning. The Victorian Government should fund up to one-third of the cost of new facilities, capped at $20 million for aquatic centres and $10 million for libraries, with councils to provide funding for the remaining capital costs and operational expenses. Flexible funding could support staged approaches to delivery, where preferred by councils.[58] This investment supports growth area councils to address provision, service and access gaps for this essential infrastructure.

The return on investment can be even higher when facilities are integrated with other services. More transparent sector infrastructure plans (see recommendation 32) could allow the Victorian and local governments to undertake joint service planning to deliver integrated facilities.

Figure 27: Growth areas have fewer libraries per person

This figure shows there are generally fewer libraries per person in new growth areas than in established areas. This disparity will become more pronounced as the population in growth areas increases.

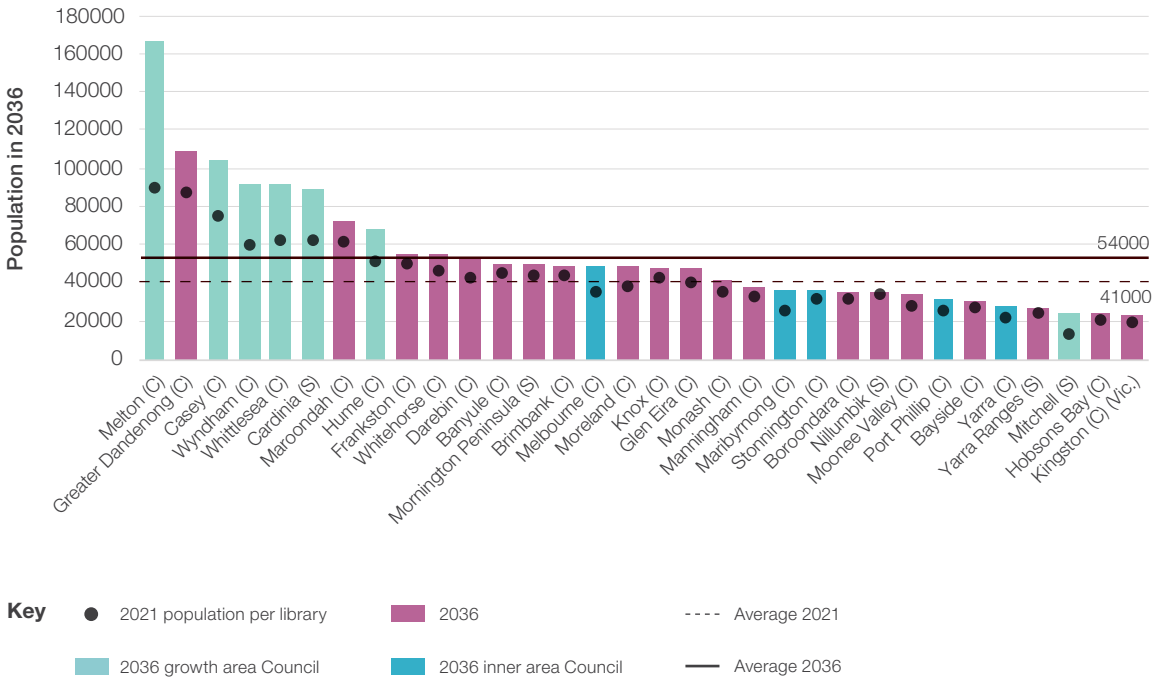
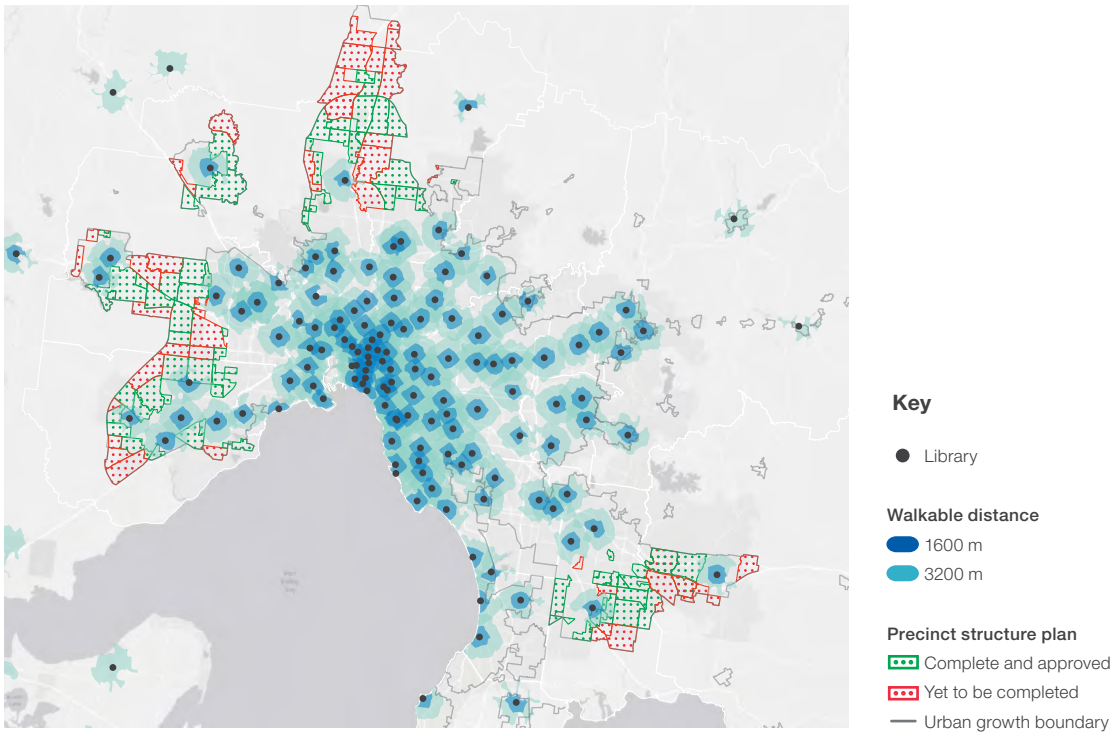


Figure 28: Access gaps for libraries in new growth areas

The map shows the locations of existing libraries, and identifies planned new growth areas. It shows that people in many new residential areas will not have local access to an existing library.



Recommendation 74

Extend rail services in Melbourne's western and northern growth areas

In the next two years, develop business cases to extend electrified metropolitan train services from Sunshine to Rockbank, from Craigieburn to Beveridge, and on the Wyndham Vale corridor, to be delivered by 2031. Deliver extra services to south-east Melbourne by running Rockbank services to Pakenham via the Melbourne Metro Tunnel. Consider adding extra stations on the Wyndham Vale and Melton corridors, and secure remaining land required for stations and stabling.

New growth areas in Melbourne's west and north are projected to grow rapidly and collectively accommodate hundreds of thousands of new people by the mid-2030s.[59] They have underdeveloped road and public transport networks. Public transport options are few,[60] often infrequent, and increasingly overcrowded. An absence of good transport choices forces commuters to rely on driving cars using sparse road networks. This causes congestion, greenhouse gas emissions,[61] and compromises access to jobs, education, services and social connections. Workers using public transport in Melbourne's new growth areas and outer suburbs are much less likely to be able to access jobs within reasonable travel times than counterparts in inner and middle suburbs.[62] Limited transport access to good jobs may force people into lower paid, lower skilled work.[63]

Infrastructure Victoria has identified the possibility that Melbourne's new growth areas could grow much faster than standard projections suggest. Our scenario modelling reveals that new technologies and behaviours, such as electric and automated vehicles, or increases in working from home, could stimulate faster population growth in Melbourne's outer suburbs and new growth areas.[64] This is because lower cost travel, or less need to travel, can make living further from central Melbourne more attractive. The Victorian Government is also fast-tracking more precinct structure plans in new growth areas, potentially stimulating faster settlement there.

Many people use regional train services in these new growth areas, as it is their closest service. This adds more suburban passengers to regional trains, resulting in increasing overcrowding and unreliability, especially on the Geelong, Ballarat, and northern regional line toward Seymour. Ballarat and Seymour V/Line services are forecast to be over capacity by the end of this decade. The Victorian Government is developing a Western Rail Plan, including options for the Melton and Wyndham Vale lines,[65] has indicated the Suburban Rail Loop includes a future western section, and has committed to upgrading the Geelong line. Upgrading these regional lines to allow electrified metropolitan trains can expand their capacity.

Our project modelling and strategic assessment showed that extending suburban services along regional rail lines makes some areas more attractive. We also found staging these extensions can help to encourage a more sequenced settlement pattern and can expand train service capacity sequentially as it is required.

Infrastructure Victoria's strategic assessment indicates there is a compelling case to introduce electrified suburban services along the western corridor as far as Rockbank, or alternatively to a new station at the proposed Mt Atkinson activity centre. Assuming higher capacity regional trains continue to service Melton, terminating a new electrified service at Mt Atkinson encourages more gradual westward housing growth, compared with complete electrification to Melton. The project should include better bus connections to nearby areas, such as Rockbank North and Plumpton.

Services on this newly electrified line can operate a continuous service to Pakenham, using the Melbourne Metro Tunnel. This extension of the electrified rail service primarily meets demand from population growth in the western and south-eastern growth areas. Our modelling indicates it has the extra benefit of improving the attractiveness of established suburbs along the corridor, such as in Deer Park, from Noble Park to Dandenong, and from Narre Warren to Berwick. These places can be priority locations for denser

housing (see recommendation 35). The extension of electrified trains to the west also means V/Line trains no longer need stop at many of these stations, producing more reliable regional services to Ballarat. Our modelling suggests that strong underlying population growth may require later electrification of the western line to Melton in the 2040s.

Our modelling also shows that Seymour line regional services and Craigieburn metropolitan services will become overcrowded towards the end of this decade, driven by population growth in Melbourne's northern growth corridor. Our strategic assessment found that V/line services will be able to meet demand at Wallan for many years, but peak services then become prone to overcrowding. Instead, the Victorian Government should extend electrified metropolitan train services to Beveridge, and determine whether there is a further need to extend to Wallan in the future. This project is also contingent on the reconfiguration of the City Loop (recommendation 60). The project should include better bus connections to nearby areas, such as Wollert and Merrifield.

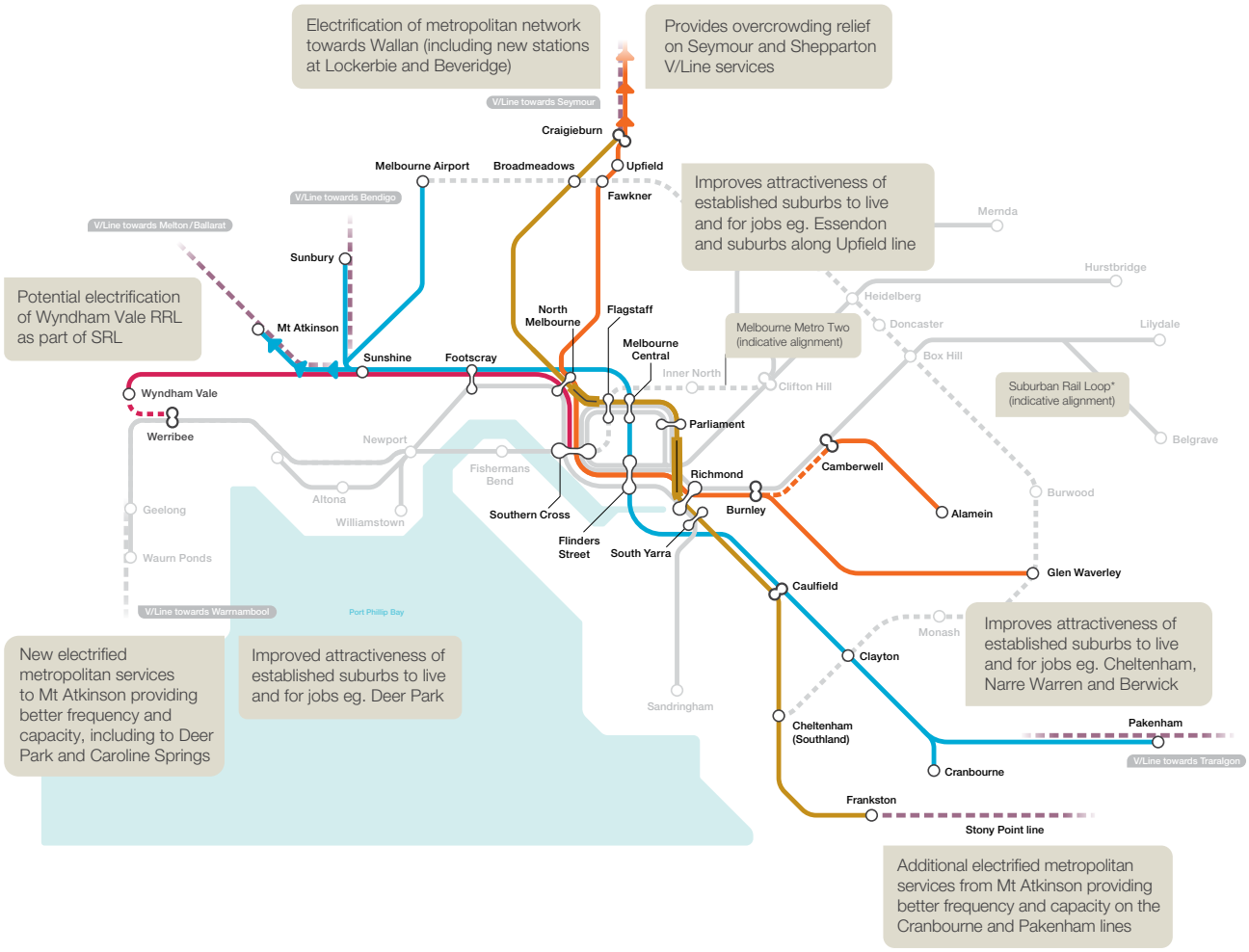
This would result in better integrated land use transport outcomes, particularly at the future Lockerbie Metropolitan Activity Centre. With delivery of the Beveridge extension, our modelling shows that more modest capacity improvements to V/Line services, such as extra carriages, could continue to meet demand at Wallan until the 2050s. This project could also catalyse more intense residential development along the Upfield corridor in Moreland, potentially in preference to fast tracking development in the northern growth corridor. A decision to electrify the rail line beyond Craigieburn coincides with a decision on reconfiguring the City Loop (see recommendation 60). Our modelling suggests doing these projects together improves outcomes for both.

In finalising the Western Rail Plan and the western section of the Suburban Rail Loop, the Victorian Government should include electrification of the Wyndham Vale rail line, noting the potential use of the Melbourne Metro Two project for Geelong trains (see recommendation 61). Any plan should include new stations on the newly electrified line.[66]

Within two years, the Victorian Government should complete detailed feasibility studies and business cases to determine the best approach to provide more train service capacity in Melbourne's northern and western growth areas. They should include options to electrify the lines in stages, consideration of regional service impacts, and include better bus connections, active transport improvements, and continuous tree canopy cover. The Victorian Government should then secure the necessary land, including for stations and stabling.

Figure 29: Growth area rail extensions — Potential concept

Specific upgrades and benefits related to growth area rail extensions



Recommendation 75

Link outer suburbs to rail with 'next generation' buses

In the next year, introduce 'next generation' bus services towards Clyde, Mornington Peninsula, Wollert and Armstrong Creek. In the next five years, complete feasibility studies to plan the ultimate development of public transport services on these corridors and secure remaining land required.

Melbourne and Geelong's outer suburban areas have underdeveloped transport networks. Public transport options are few,[67] and are often infrequent, and may be distant from people's homes. Limited transport choices forces commuters to rely on cars, causing more congestion, and compromising access to jobs, education, services and social connections. Limited access to good jobs may result in people settling for lower paid, lower skill work.[68]

Public transport demand is projected to soar in outer-suburban areas as their populations grow. Driving and parking at train stations is already challenging. Our modelling suggests that public transport use in Victoria will increase 65% by 2036.[69] Community feedback calls for rail electrification and extensions.[70,71] While this may be a long-term solution as rail can take some time to be built, proper connections need to be provided much sooner. The Victorian Government can connect these areas to the rail network using high quality 'next generation' bus services (see recommendation 57), as part of network expansion and reform as part of *Victoria's Bus Plan.* These buses could provide a similar type of service and features as a rail service. For instance, it could have fewer but high quality stops, similar to a stations, and facilities to interchange with other modes, including cycling, other buses and potentially private vehicles.

For instance, the Victorian Government has improved bus services to Mornington Peninsula.[72] A preliminary business case considered different rail and bus options for more extensive public transport improvements between Frankston and Baxter.[73] The Victorian Government allocated funds to undertake network reform in the Mornington Peninsula. This network reform should consider the role of 'next generation' bus services.

Our modelling of selected rail extensions to other outer suburban growth areas found they can encourage more people to move further out. An extension of the Frankston line could create extra pressure for new housing developments in environmentally sensitive and agriculturally important places on the Mornington Peninsula.

Instead of progressing a rail extension to Baxter, the Victorian Government should investigate rolling out 'next generation' bus services around Frankston and the Mornington Peninsula in the next year. The Frankston Station Precinct is a designated multi-modal transit interchange.[74] This should be the hub for better bus connections to the Frankston metropolitan activity centre, railway station, Chisolm TAFE and Frankston Hospital. As the station precinct develops, it will require an inter-modal terminal upgrade and more bus services to help manage traffic flow and congestion. This would build upon the Victorian Government's funded improved bus services to the Mornington Peninsula.

The Victorian Government is currently investigating the feasibility of a Clyde rail extension and planning for the Armstrong Creek Transit Corridor. A Clyde rail extension may be a future solution for rising public transport demand in south-east Melbourne. In the short term, the Victorian Government should use 'next generation' buses to connect the rapidly developing area to existing rail services (see recommendation 57). It should take a similar approach in Armstrong Creek, which is expected to accommodate the bulk of Geelong's immediate growth.[75] Stakeholders also emphasise this need.[76,77]

Within five years, the Victorian should also complete a detailed feasibility study to determine the best approach to provide public transport services on the Wollert to Lalor public transport corridor, including the consideration of next generation bus services. The Victorian Government should protect remaining land parcels to secure these corridors, including the remaining 5% of land at Wollert.[78] The Wollert feasibility study should be coordinated with the Melbourne Metro Two business case (see recommendation 61), and consider the option to also connect Wollert to Craigieburn station with buses, using existing roads to take advantage of the proposed City Loop reconfiguration (see recommendation 65).

While rail may be a future solution for these corridors, our modelling shows that far more people would use extended metropolitan rail services towards Melton or Wallan. These services would also have network-wide flow-on benefits, including for regional train services which share the corridor with metropolitan services. This suggests the extensions towards Melton or Wallan are higher priority (see recommendation 74). However, these communities need connections to rail sooner. The Victorian Government should connect these areas to the rail network using high quality 'next generation' bus services (see recommendation 57).

Recommendation 76

Expand and upgrade Melbourne's outer suburban road and bus networks

In the next 15 years, deliver a program of upgrades to Melbourne's arterial road, freeway and bus networks beyond what is currently funded, focusing on congested roads and corridors in outer metropolitan and growth suburbs council areas.

Melbourne's arterial road network forms the major connections to move people and goods between the city's major regions, activity centres, freight terminals, tourist areas and population centres. Arterial roads are high capacity two-way roads that are primarily designed for higher vehicle speeds and volumes, with intersections to regulate traffic flow. Arterial roads help funnel traffic to motorways and are also movement corridors for other transport modes, including freight, buses, cyclists, and pedestrians.

Melbourne's outer suburbs include the four fastest growing councils of Wyndham, Casey, Melton and Whittlesea.[79] More people living in these places will strain an already congested, under developed road network. The sparse road network is causing congestion and is less resilient to disruptions, making travel times more variable. Outer suburbs already have fewer jobs, with higher rates of unemployment and more workers in jobs for which they are overqualified. Some investment in better transport connections is required.[80]

Existing interstate and intrastate road corridors, particularly the Western, Calder and Hume highways, pass through rapidly growing communities on the city's outskirts. These are a mix of freeways and highways, with some sections having busy intersections, driveway access and lower speed limits, reflecting previous highway standards when these roads served rural settings. To effectively serve regional Victoria and interstate travel, and meet increasing travel demands, these road corridors need to be progressively upgraded.

The Victorian Government is delivering road upgrades in the northern, south-eastern and western growth corridors.[81] In the past five years, the Victorian Government has invested $28 billion in building and improving roads in Melbourne, including funding for growth area roads. However, arterial roads will become increasingly congested as the population grows, requiring further investment after the current program is completed.

New road links and upgrades in the outer areas of Melbourne where the network is underdeveloped will help keep traffic moving, improve safety and provide a foundation for a high quality network for buses, cycling and walking.[82] There are also opportunities to improve connections to train stations and activity centres with more effective bus routes and active transport connections. It is estimated 29% of public transport users achieve 30 minutes of daily physical activity solely by walking to and from public transport.[83] Bus networks operating on main roads could also save outer suburban residents up to 15 minutes travel time[84] (see recommendation 57).

Road upgrades could include the construction of safety improvements, new links, extra traffic lanes, widening and upgrades of bridges and structures, intersection upgrades, bus lanes and priority measures, better walking and cycling paths and technology improvements.[85] These improvements would also help provide better access to industrial and freight precincts in outer suburban areas, particularly along major freight routes and in areas where public transport does not work well, providing residents better access to jobs, services, recreation, and cultural and social opportunities.

Recommendation 77

Target 30% tree canopy coverage in new growth areas

Over the next 30 years, achieve 30% tree canopy coverage in new growth areas by mandating coverage during precinct development, funding relevant Victorian Government agencies and local government to plant, replace and maintain canopy trees, and work with utility providers to remove barriers to tree planting.

Tree canopies and vegetation help dissipate heat trapped in urban environments, provide shade, support evaporative cooling,[86] and reduce water run-off,[87] air pollution[88] and ultraviolet radiation.[89] Mature trees encourage walking and cycling,[90] enhance safety perceptions, and support biodiversity.[91]

Melbourne's established suburbs' parks and gardens create a tree and vegetation network, helping cool them and enhancing their amenity. But new designated growth area suburbs have less room for trees. They are increasingly dominated by very small lots.[92] With Australia building some of the world's largest houses,[93] and denser housing meaning more driveways and crossovers, land for canopy trees in new suburbs has dramatically reduced.[94] Some utility and road safety standards may limit tree planting. Trees may pose a safety risk, including contact with overhead powerlines causing fires, blackouts or power surges.[95] Underground electricity, telecommunications, gas, water, drainage and sewers require tree root clearances to prevent damaging pipes and conduits.[96]

The socio-economic[97] and environmental characteristics of Melbourne's growth areas contribute to heat vulnerability, especially on former grasslands in the city's north and west.[98] With little natural vegetation cover, enormous land use changes have significant environmental and social effects, requiring more trees than previously existed. Protecting existing vegetation, planting new trees,[99] and better tree maintenance helps make them safer and more sustainable.

Currently, land developers must 'offset' native vegetation removal during urban expansion.[100] Although helping prevent a net loss of native vegetation,[101] the replacement vegetation is typically far from newly built communities.[102] And Victoria is yet to deliver the Grassy Eucalypt Woodland Reserve north of Melbourne to offset native vegetation loss within the extended urban growth boundary.[103]

The Victorian Government should mandate that new growth area precincts achieve a minimum 30% tree canopy cover by 2050, as proposed in new draft guidelines for greenfield precinct structure plans and forthcoming Land Use Framework Plans.[104] It should include using permit requirements and developer contributions. Public land should accommodate a maximum of 70% of that required canopy cover.[105] Existing trees can count towards a minimum of 30% canopy cover on private land, also preserving biodiversity.[106]

The Victorian Government should develop clear compliance guidelines for planning approvals and Precinct Structure Plans and undertake monitoring and enforcement.[107] Guidelines could require planting appropriately mature trees, consider species diversity, support new trees' maintenance on private land for at least two years, watering trees on public land (see recommendation 14), and accommodating underground utilities.

For the public land tree canopy contribution, the Victorian Government should deploy targeted funding for planting, maintenance, and replacement. This can fund local governments to maintain canopy trees on local and connector streets, boulevards and parks after developer maintenance periods have ended. It can also fund agencies to manage trees on public land. For example, funding could support Parks Victoria to manage three new growth area parks in Casey, Melton and Wyndham, if these are designated as priorities, and for tree planting and maintenance on roads managed by VicRoads and the Department of Transport. The Victorian Government should also work with utility providers to remove unnecessary barriers to tree planting. Mechanisms to use open space contributions and direct funding can also be used to expand tree canopy in already established parts of new growth areas (see recommendation 37).

Develop regional Victoria

Section 04

Victoria's regions contain a diversity of experience, strengths, opportunities and challenges. From Gippsland to the Mallee, and Great South Coast to Ovens Murray, communities are adapting to uncertainty and an accelerating pace of change.

Transitioning local economies, population fluctuation, demographic changes, increasing urbanisation and climate change affect diverse communities differently, across and within regions. Drought, bushfires and the COVID-19 pandemic have caused major disruptions.

Each region of Victoria has its own unique character and diverse needs, and solutions must suit local conditions and be flexible.

For example, more people moved to regional areas during the COVID-19 pandemic, while migration from Melbourne increased by a factor of eight in the September 2020 quarter compared with the previous year.[1] Each region is responding to these shared drivers of change in unique ways.

In developing this strategy, Infrastructure Victoria has built a deeper understanding of regional infrastructure needs and their impacts. Our work demonstrates the unique character of each district, and the diversity of their experiences, strengths, opportunities and challenges. We have also found that many infrastructure needs are shared. Consistent and recurring themes include inadequate digital connectivity, improvements needed for freight, public transport and the condition of roads, gaps in basic infrastructure, inadequate access to affordable housing, and the need for fit for purpose health and community facilities.

Regional Victoria's infrastructure needs are very different to Melbourne's. Solutions must suit local conditions and be flexible enough to cater for different communities within and across the regions — including fast growing regional cities, peri-urban areas, small towns and rural communities. They must also consider the different demographics of different places. For example, the regions have higher proportions of Aboriginal Victorians and older people.

Infrastructure can boost economic development and strengthen the resilience of economies and communities. Regional development is more than simply generating construction activity. It can encourage economic growth by removing barriers to industry investment, support job creation and encourage businesses to expand. Infrastructure can also support the needs of regional communities, helping people adapt to change, enhancing their quality of life, and lessening the socio-economic disadvantage experienced by some of Victoria's most vulnerable communities.

Regional communities face complex, intertwined opportunities and challenges. Infrastructure Victoria has worked with regional stakeholders to determine ways to better maintain, manage and develop infrastructure. We have used an evidence-based approach to identify which investments deliver better economic and social outcomes for regional Victorians.

We have focused on infrastructure investments which build on a region's competitive strengths to help drive economic growth, or which improve local economic, human and social capital assets to reduce disadvantage.

Regional Victoria is home to relatively dispersed populations with large distances between them. This means these communities cannot always sustain the same range and diversity of services as metropolitan areas. This makes connectivity a priority for infrastructure – linking businesses to markets, transferring information and knowledge, and connecting people to services and opportunities.

Good infrastructure can support innovative solutions to connect people to jobs, goods and services, and each other. Equally, it can improve connections between businesses, producers and customers, lifting productivity and enable regional industries to access domestic and global markets.

Insight

Building a better understanding of regional infrastructure

In developing this strategy, Infrastructure Victoria committed to examining regional infrastructure needs more closely to develop stronger evidence that supports better regional infrastructure planning and investment.

We undertook a three year process that involved research, data gathering, consultation and engagement to produce our *Regional Infrastructure Needs* reports. These explored the economic, social and environmental strengths and challenges of Victoria's nine regions: Barwon, Central Highlands, Gippsland, Goulburn, Great South Coast, Loddon Campaspe, Mallee, Ovens Murray, and Wimmera Southern Mallee.

As part of our consultation we hosted stakeholder workshops in each region. We talked with over 200 regional representatives, including participants from Regional Partnerships, councils, regional-based government agencies, regional and community organisations, and representatives from business, health and education providers. We released individual economic, social and environmental profiles for each region. We also produced an inter-regional report presenting a large suite of data to form a comprehensive view of regional Victoria.

As part of the strategy consultation, more than 470 participants attended at least one of 34 online events including focus groups, workshops, roundtables, sector dialogues and forums. The regional roundtables had the highest number of participants with 192 people attending one of nine sessions.[2] We received many submissions from stakeholders in regional Victoria. This extensive regional perspective documented in detail each region's economic, social and environmental strengths and challenges.

Following this, we analysed specific infrastructure investments that could benefit regional Victoria. Our *Infrastructure Priorities for the Regions* research developed two frameworks specifically to identify and assess regional infrastructure priorities: one to build on regions' comparative strengths, and one to address regional disadvantage. An expert panel and an advisory group informed the development of the frameworks.

We used the frameworks to select infrastructure solutions to meet regional needs. We undertook research, data analysis, and drew upon local knowledge – calling for submissions for infrastructure solutions that addressed comparative advantage or disadvantage in each region.

These resources are available at *infrastructurevictoria.com.au*, and include:

- A detailed report on infrastructure priorities for Victoria's regions
- Individual regional profiles identifying infrastructure needs
- An inter-regional assessment reflecting common needs across regional Victoria
- Individual industry profiles for each region
- Regional disadvantage fact sheets for each region
- The complementary frameworks for assessing regional comparative advantage and addressing regional disadvantage
- A background paper on the role of infrastructure in addressing regional disadvantage.

4.1

Enhance regional market access and economic growth

Regional and rural Victoria play a vital role in the Victorian economy. Collectively the regions contribute almost 20% of the state's overall economy and produce a third of Victoria's exports.[1] Victoria is Australia's largest food and fibre exporting state, accounting for over 28% of the nation's food and fibre exports.[2] The sector supports around 200,000 jobs, with 76% of agricultural employment concentrated in regional areas.[3] But regional economies have been hit hard by a succession of extreme events, including drought, bushfires and the COVID-19 pandemic. More than ever, a focus on sustainable long-term economic growth and development is needed to benefit businesses and communities.

Each region has unique attributes that can grow economies, create jobs and transform industries. Infrastructure investments that build on existing industry strengths or advantages are most likely to effectively deliver economic growth.[4] Agriculture, related manufacturing industries and tourism are economic strengths, capable of driving wider regional growth and development. New opportunities are emerging in sectors such as mining and renewable energy.[5]

Industry specialisations differ from region to region. For example, in agriculture, the Mallee specialises in broadacre cropping and irrigated agriculture,[6] Gippsland[7] and Great South Coast[8] have strong dairy industries, and the Goulburn region is a major producer of processed and fresh fruit.[9]

But our investigations found the associated infrastructure opportunities and potential constraints are often shared across Victoria's regions. Adaptable infrastructure interventions can help link regional and rural businesses to domestic and export markets and unlock wider economic growth.

Better freight networks can lift regional Victoria's productivity

Regional economies can only operate and grow if they can efficiently move goods between primary producers, manufacturers, wholesalers, importers and customers.[10] Transporting agricultural produce, mineral products and manufactured goods from the regions to markets requires safe, reliable and efficient freight connections. Transport accounts for a significant share of overall production costs. For example, road and rail costs average 10% of overall farm production values,[11] affecting the profitability and competitiveness of Victorian agriculture.[12] Victoria needs efficient and fit for purpose road and rail freight networks to help regional businesses minimise transport costs and remain competitive.[13]

Freight volumes in regional Victoria are forecast to grow an average 1.5% each year until 2051.[14] As the freight task grows, demands on the road network are increasing. In the last two decades, people and freight travelling on Victoria's major country roads have increased by 20% and this growth is expected to continue.[15] An increasing proportion of the regional road network is in very poor condition, presenting a growing risk to public safety and increasing the costs of travel through increased fuel use, vehicle maintenance costs and travel times.[16] Regional or rural roads already account for three out of every five fatalities on Victoria's roads, despite accounting for less than a quarter of the state's population.[17] Accommodating growing road freight movements while ensuring safety for all road users requires well-maintained roads, designed and managed to keep road freight productive and efficient.

Rail freight moves many agricultural and mining exports from regional areas to ports.[18] For these industries, rail freight can be more cost-effective than road freight when transporting bulk commodities over long distances.[19] Carrying more freight by rail can reduce the number of vehicles on regional roads. Rail freight also helps reduce road damage caused by heavy vehicles and congestion, traffic accidents, greenhouse gas emissions and noise impacts.[20] However, Victoria's share of freight on rail has not changed significantly for more than two decades and has gone backwards in some markets.[21] The regional rail freight network's efficiency is hampered by many factors, including different rail gauges, axle load restrictions, permanent and temporary speed restrictions and maintenance backlogs.[22] Its relatively poor condition and lack of investment[23] further impedes rail freight uptake.

Reviews have criticised Victoria's road maintenance strategy, prioritisation processes and failure to optimise the maintenance program.[24] Similarly, there is currently no transparent, sustainable maintenance plan for the state's rail freight network. Despite significant one-off funding allocations, particularly for regional roads, neither network has clear long-term funding for maintenance and upgrades, making strategic and efficient management difficult.[25]

Infrastructure limitations can constrain economic growth

Businesses need solid access to basic infrastructure to operate,[26] such as power, water, waste, transport and, increasingly, information and communications technology. Economic growth can be constrained by unreliable or expensive infrastructure access. For example, agriculture and manufacturing industries in the Ovens Murray, Loddon Campaspe, Central Highlands, Great South Coast and Barwon regions report outdated power supply infrastructure preventing business expansion, a constraint shared with Wimmera Southern Mallee's growing mineral sands industry. Manufacturing businesses in Barwon, Central Highlands, Loddon Campaspe, and Ovens Murray report needing better water and waste disposal infrastructure to expand. In every region, tourism businesses flag problems with transport infrastructure or amenities at tourist sites.[27]

Victoria's regions can face extra barriers to secure basic infrastructure upgrades compared with Melbourne. For example, upgrade costs may be prohibitive in places with fewer businesses to share them.[28] This can affect regional and rural areas' ability to attract new business investments or facilitate business expansion.[29]

Regional tourism has potential for future growth

Before 2020, global tourism had seen continuous growth during the past six decades, and was one of the largest and fastest growing economic sectors.[30] Tourism was worth $9.4 billion to regional Victoria's economy and generated around 110,000 jobs in 2018–19.[31] For every $1 spent by visitors to regional areas, an extra 92 cents was created through supporting sectors, such as local small businesses.[32] Tourism helps create jobs and diversifies regional economies from their traditional agricultural base. It can also enhance environmental conservation, preserve cultural history and heritage, and stimulate investment in transport and other infrastructure.[33]

Regional Victoria offers a diversity of natural assets such as alpine forests, deserts, coastal areas and rainforests. It contains important Aboriginal cultural and heritage assets.[34] Across Australia, nature-based tourism has been an area of particularly strong growth, emerging as an important motivator for travel.[35] In 2019, nature-based experiences drew 22% of visitors to regional Victoria.[36] These natural and cultural attractions combine with a wealth of food and wine experiences, cultural festivals, local museums and galleries, and make tourism a strong candidate for regional growth.[37]

However, visitor expenditure in the regions trailed Melbourne in 2019. International visitors accounted for 40% of tourism spending in Melbourne, compared with just 5% in the regions. International tourists spent the most per person, but made up only 1% of visitors to regional areas, compared with 8% in Melbourne.[38] Similarly, regional Victoria received fewer interstate visitors compared with other states and territories.[39] Day trippers comprised over two-thirds of visitors to regional Victoria, but this group did not spend very much, accounting for just one-third of visitor spending.[40] More than 75% of international visitors to the Great Ocean Road only visit for a day.[41]

In 2020, tourism spending in regional Victoria outstripped Melbourne for the first time. However, this was in the context of extended lockdowns in Melbourne during the COVID-19 pandemic. Despite strong performance relative to Melbourne, visitor expenditure in regional Victoria was 44% lower in 2020 compared with 2019,[42] and the impact of the pandemic has been devastating for many segments of the tourism industry.[43]

In the long term, regional tourism's challenge is to attract more overnight visitors from outside Victoria. Converting even a small proportion into overnight stays could have a significant impact.[44] To achieve this in a fiercely competitive industry, Victoria's regions need to develop the tourist experiences visitors increasingly expect.[45] Inadequate tourist infrastructure can limit growth.

In the short term, Victorian regional tourism's heavy reliance on local tourists may be a strength, being less affected by travel restrictions, and offering options to all Australians unable to travel overseas. Prior to the pandemic, Victorians accounted for around 80% of tourism spending in the regions. More than half of Victorians had not travelled for an overnight stay in regional areas in the previous year, but half of these people would consider doing so.[46]

Early signs in 2021 indicate that regional tourism is starting to recover, as tourism has been booked solid during holiday peaks.[47] This suggests local tourism can help the wider economic recovery of regions and there is capacity for the sector to grow, acknowledged in the Victorian Government's $465 million tourism recovery package.[48]

Recommendations to enhance market access and regional economic growth

Infrastructure Victoria is making the following recommendations to enhance market access and unlock economic growth opportunities in regional areas. These interact with other recommendations to improve freight efficiency (see section 3.2) and to better connect regional Victoria (see section 4.2). Other regional growth opportunities include renewable energy generation (see recommendation 4) and recycling and resource recovery (see section 1.5).

Recommendation 78

Deliver long-term funding certainty for regional road maintenance and upgrades

Within two years, specify clear levels of service for each type of regional road and bridge. Following this, dedicate a 10-year funding program to sustainably fund Victorian Government regional road and bridge maintenance and upgrades to meet these service levels. Funding should be prioritised based on improving safety, decreasing vehicle emissions, and lifting productivity.

Regional roads support workers and freight, transport regional goods and produce to market, link tourists with regional attractions, and help keep communities connected. Keeping roads and bridges in good condition reduces fuel consumption, tyre wear, and vehicle maintenance and repairs, which in turn reduces vehicle greenhouse gas emissions and their environmental impact.[49]

Of the 23,000 kilometres of arterial road and freeway lanes in Victoria,[50] 19,000 are in the regions.[51] Victoria has more than 3180 bridges, 3500 other structures, and more than 3400 sets of traffic signals and other electrical systems.[52] A large proportion of the road network is old and made from materials not intended for current truck loading and vehicle requirements.[53] Roads and supporting infrastructure are also vulnerable to extreme weather, which is exacerbated by the impacts of climate change.[54] The quality of regional roads is declining,[55] but keeping communities connected and their economies functioning means regional roads must be properly maintained and upgraded.

Road and bridge maintenance is most cost-efficient when undertaken on roads in a 'fair' condition. Roads worn beyond this point require more costly and disruptive rehabilitation work.[56] Unpredictable road upgrade and maintenance funding hinders road managers' ability to prioritise investment across the network from year to year, impedes good road network planning, and focuses on roads and structures in the worst condition. Current annual maintenance funding is inconsistent,[57] meaning maintenance is left until it is most expensive, and ultimately inflates costs.[58]

The Victorian Government should provide a transparent framework that defines the level of service, or desired condition, of each type of regional road and bridge in a hierarchy based on defined criteria. Not every road needs to be maintained at the same standard but should be maintained to meet its intended purpose. For example, a regional freeway needs to be maintained at a much higher standard than a narrow backroad serving a few rural properties. The level of service could define the desired speed, volume, safety and types of vehicles the road is intended to carry.

Assigning roads to these levels of service needs to match local and regional requirements, catering for a region's growth, local travel, freight, through traffic, industry, and emergency access needs. As they change, the quality and condition of roads may need to change too. Establishing the desired condition of regional roads, and maintaining roads and bridges to that standard, is also necessary to introduce more efficient freight vehicles, like high productivity and automated vehicles, because predictable conditions and clear markings will help make best use of their safety features.[59]

The Victorian Government should dedicate a 10-year funding program to regional road maintenance and upgrades. Building on existing commitments,[60] this should provide road managers the long-term certainty they need to prioritise investments more efficiently, invest in upgrades to support economic and social outcomes and undertake proactive maintenance. After specifying road service levels, funding should be allocated to priority maintenance and upgrades, determined by desired safety, vehicle emissions, productivity outcomes, and existing road condition.

Recommendation 79

Fund and plan for ongoing regional rail freight network development and maintenance

In the next year, fund a 30-year periodic regional freight rail maintenance program, informed by a publicly available network development and asset management plan. Using the plan, thoroughly determine the feasibility of the next major regional freight upgrade within five years.

Rail freight has a basic cost advantage over road freight,[61] especially in transporting bulk commodities over long distances. A freight train can carry as much as 110 trucks.[62] But rail's share of Victorian freight is stagnant or in decline,[63] meaning the freight rail network is underused, especially on freight-only regional lines.

Compared with the regional passenger network, rail freight has significantly more assets in average, poor, or end-of-life condition.[64] A badly maintained regional rail freight network has lower performance and reliability, reduces asset longevity, and increases catastrophic failure risk. Several Victorian freight trains have derailed in the last five years.[65] Despite occasional funding boosts, routine and major periodic maintenance has historically not kept pace with the required investment.[66] An asset management plan announced in 2018 is still underway, with no indication of its completion or publication date.[67]

The Victorian Government should fund a 30-year periodic maintenance program to improve rail freight's competitiveness, akin to the four-year program begun in 2017.[68] Rail freight benefits arise in the long-term and need sustained maintenance investment to materialise. An ongoing fund, at approximately $70 million each year, provides the funding stability to maximise efficient maintenance. The program should include assessing the rail freight network's current state and fund immediate, high priority works. It will boost industry confidence in the Victorian Government's long-term commitment to maintaining quality freight infrastructure. This supports the complementary industry investments required to grow the rail freight industry and means maintenance spending can be optimised in the long term.

A long-term network development and asset management plan should inform the program. For the maximum benefit, the plan should consider incorporating the excluded parts of the revised Murray Basin Project, and consider a new rail freight line on the outer metropolitan road and rail corridor (see recommendation 66).[69] The plan should:[70]

- Determine the long-term rail gauge in different network sections, the sequence of projects, and ways to prepare for cost-effective gauge conversion[71]
- Identify opportunities to realise efficiencies, particularly at ports[72]
- Set maintenance standards and overcome constraints, such as critical track sections with lower loading limits[73]
- Inform rolling stock and locomotive investment decisions[74]
- Consider options for new intermodal terminals, and support connections between rail terminals and the main rail line[75]
- Consider the interactions and access arrangements with passenger services and network plans.[76]

Many stakeholders expressed major concerns about the reduced scope of the Murray Basin Rail Project, particularly for businesses.[77] Publishing a plan can help address these concerns and should include a program of projects. The Victorian Government should then commence thorough feasibility and business case work on the next major rail freight project within five years. In doing so, it should improve governance, project and contract management, practices in project planning, scoping and cost estimation, and stakeholder engagement.[78]

The Victorian Government should develop and publish the plan to provide certainty and confidence to investors and producers.[79]

Recommendation 80

Upgrade power supply for agriculture and regional industry

In the next five years, contribute toward strategic power supply infrastructure upgrades for agriculture and regional industry, where an independent assessment demonstrates significant potential for increased productivity, competitiveness and growth.

Reliable and cost-effective energy supply helps farms and businesses in regional Victoria improve productivity.[80] In some areas, older electricity infrastructure is no longer fit for purpose,[81] limiting potential business investment and expansion opportunities.[82]

Changes in industry practice have caused different and escalating energy demands. For example, farm consolidation has created economies of scale in production, driving investment in more energy intensive farming equipment. However, voltage problems and electricity supply outages can limit production and damage equipment. For example, modern milking equipment that allows more cows to be milked has higher energy demands than older electricity networks can manage.[83] Challenges finding suitable sites for regional businesses that meet modern energy requirements also limit potential growth.[84]

In places with fewer customers sharing costs, electricity distribution networks are more expensive and less reliable.[85] Upgrading power networks can provide solutions. Upgrades can be to individual business power supply, or shared infrastructure, such as replacing single wire earth return lines with three phase power lines or installing grid utility-scale electricity storage. Upgrading power supply to regional manufacturing precincts can attract new businesses to share infrastructure costs, but the risks mean private providers may be unwilling to invest. On-site power generation and storage, such as solar panels and batteries, can be an alternative solution.

The benefits of better power supply can be significant. For instance, an $8.7 million proposal to upgrade a single wire earth return backbone to three phase power in Great South Coast could deliver benefits of over $2 million each year in gross regional product.[86] Similarly, a $2.1 million power upgrade grant for Burra Foods allowed the company to increase production, creating 40 full time jobs.[87]

Regional businesses may be willing to share upgrade costs because of the productivity benefits provided. Benefits can include encouraging business expansion, attracting new investment, and supporting regional communities.[88] A financial incentive can overcome initial capital costs to allow existing businesses to work together to share part of the remaining cost, and new businesses could help repay it. Previous Victorian Government programs, like the Regional Electrical Access Program[89] and On Farm Energy Grants Program,[90] subsidised upgrade costs that electricity distributors could not include as regulated returns.

The Victorian Government should help fund power supply infrastructure upgrades for agriculture and industry in regional Victoria where an independent assessment demonstrates significant benefit to existing users and potential to unlock investment. Strategic power supply upgrades can deliver wider benefits beyond a single sector or area. Investment can proceed with appropriate cost sharing arrangements between the Victorian Government, power distribution companies (representing all electricity users) and regional businesses. The Victorian Government should also explore options to recoup costs, such as through user charges, where it is making an investment on the expectation of growth. Upgrading power supply will complement the existing Agriculture Energy Investment Plan, which helps agricultural businesses to improve energy efficiency and explore alternative energy options.[91] The new fund should be allocated $30 million over four years.

Recommendation 81

Plan for and facilitate regional nature-based tourism investments

In the next two years, develop a Victorian nature-based tourism strategy to guide industry development and prioritise further investments. During the next 15 years, support regional tourism investment by allowing more site-specific leases for up to 49 years for infrastructure proposals that meet strict criteria and complement environmental and cultural values.

Tourism is one of regional Victoria's largest industries. It has been acutely affected by the 2020 bushfires and the COVID-19 pandemic.[92] Victoria's regions captured only 37% of the state's tourism spend in 2019 – the lowest proportion in Australia – indicating many opportunities for a larger share.[93] Compared with Melbourne, tourism supports a larger share of regional Victoria's jobs and gross regional product.[94] Rebuilding regional Victoria's tourism industry can help the regions recover, with room for growth in the long term.[95]

With its diverse landscape and unique cultural sites, regional Victoria has a comparative advantage in nature-based tourism.[96] Victoria's regions offer a multitude of natural experiences, including more than 40 national parks,[97] alpine mountains, rainforests, deserts, gardens, parks, beaches, lakes, and waterways. Previous tourism strategies sought to leverage these natural assets by diversifying nature-based visitor experiences.[98] Providing new tourism experiences helps guarantee longer-term industry success, including by investing in better tourist facilities.[99] To help secure regional economic recovery and build on this potential, the Victorian Government introduced a Victorian Tourism Recovery Package in 2020.[100]

Investors seeking to establish a forest-based tourist experience on national park land are currently limited to a maximum lease period of 21 years (with some exceptions).[101] This is shorter than offered in other states,[102] and investors say this period is not long enough to realise a financial return.[103] A previous inquiry found allowing private tourist facilities in national parks can generate a net public benefit if they complement environmental and heritage values.[104]

To guide longer-term industry development and growth, and prioritise investments, the Victorian Government should develop a statewide nature-based tourism strategy within the next two years. The strategy should take account of nature-based tourism investments, investigate public land near national parks and provide a framework for infrastructure funding by the Victorian and Australian governments, re-examine existing policies, balance increased tourism with its environmental impacts,[105] and consider localised risks (like bushfires and flood), accessibility and planning regulations.

The strategy should complement a Victorian Aboriginal tourism strategy (see recommendation 82) and be informed by the *Victorian Visitor Economy Strategy*[106] and the *Marine and Coastal Policy,*[107] support and work with Traditional Owners,[108] and incorporate requirements for accessible tourism.[109]

The Victorian Government should extend exemptions to allow more site-specific lease periods for up to 49 years in national parks, for suitable infrastructure proposals that are consistent with environmental and cultural values. This process should begin within two years of proposals being identified and brought forward for legislative change.

So only suitable developments are granted long leases, the Victorian Government should evaluate each proposal against strict criteria so that national parks continue to be managed in a culturally sensitive and ecologically appropriate way.[110] Consistent with the *Crown Land (Reserves) Act 1978,* these should include whether proposed facilities are significant enough to justify the longer lease, and whether land development is in the public interest, including assessing benefits to the community, economy and environment.[111] Criteria should also include: the proposal is supported by the community[112] and Traditional Owners; it meets the government's *Protecting Victoria's Environment — Biodiversity 2037* guidelines;[113] it addresses localised risks, such as bushfires; and it is accessible and adheres to universal design principles.[114]

Recommendation 82

Develop a Victorian Aboriginal tourism strategy with Aboriginal communities

Support and partner with Aboriginal communities in the next two years to guide future investments in Aboriginal tourism and cultural heritage, including through Joint Management Plans.

Aboriginal people have lived here for more than a thousand generations, maintaining complex societies with many languages, kinship systems, laws, polities and spiritualities. Their millennia of history, knowledge and traditions are unique cultural assets.

Aboriginal tourism experiences are increasingly attracting interest and align with efforts to preserve and promote Aboriginal cultural histories and heritage sites.[115] International visitors taking part in Aboriginal tourism activities, such as visiting an Aboriginal site or community, have increased by over 40% since 2013.[116] Victoria has many significant Aboriginal sites, such as the World Heritage listed Budj Bim Cultural Landscape. Investing in these sites will help strengthen and maintain Aboriginal cultural heritage and create more diverse tourism offerings. These investments can also create jobs for Aboriginal Victorians and support Aboriginal communities to build assets – an important element to help Close the Gap in outcomes for Aboriginal Victorians.[117]

Joint Management Plans between Traditional Owners and the Victorian Government recognise and use traditional knowledge and culture to manage some national parks and other protected areas. Existing Joint Management Plans include those for Dja Dja Wurrung Parks,[118] Gunaikurnai,[119] and Yorta Yorta (Barmah National Park).[120] Traditional Owners are also authoring a *Victorian Cultural Landscapes Strategy* which will provide direction to the Victorian Government on enabling Traditional Owner self-determination in land management.[121] The Victorian Government should continue to develop Joint Management Plans with Traditional Owners, and provide funding support for tourism infrastructure identified within the plans.

The Victorian Government should further support and partner with Aboriginal communities to develop an Aboriginal tourism strategy. This can preserve and promote Aboriginal cultural histories and heritage, and help drive sustainable economic activity and employment. The strategy should align with approved Joint Management Plans, consider localised risks (such as bushfires or flooding) and planning regulations, and enable safe access for tourists with disabilities. The strategy should guide Victorian Government investment in Aboriginal tourism infrastructure to meet Aboriginal cultural and economic development needs and improve growth in tourism. It can also support further investment in cultural infrastructure facilities, to strengthen and maintain community and culture.[122]

The strategy should be developed with Aboriginal communities, including Traditional Owner Corporations and the Victorian Aboriginal Employment and Economic Council, so investments in economic development are consistent with the Victorian Government's commitment to Aboriginal self-determination.[123] It would build on existing reforms towards improving social, cultural and economic outcomes for Aboriginal Victorians, such as the *Self Determination Reform Framework,*[124] the *Victorian Aboriginal Affairs Framework,*[125] and the *Victorian Government Aboriginal Affairs Report.*[126] Further, it would build on *Tharamba Bugheen: Victorian Aboriginal Business Strategy 2017–2021*[127] and the *Victorian Visitor Economy Strategy.*[128]

4.2

Better connect the regions

Regional Victoria's longer distances make it more difficult for people to access the services and supports that underpin their wellbeing, and for businesses to connect with customers, compared with those in Melbourne. A better road and freight rail network can improve physical connections between regional businesses and markets and improve safety for all road users. But further opportunities remain to improve regional connectivity.

In regional Victoria, most people work and access services within their local area or nearby.[1] But local public transport often does not provide the connections required to do this easily. Around a third of people living in regional and remote areas have reported difficulty accessing services.[2] As jobs and services increasingly concentrate in regional hubs, this is only likely to continue. Fit for purpose transport solutions which allow regional Victorians to access essential services and employment opportunities are therefore a priority.[3]

Digital connectivity can also break down the barriers of cost and distance for regional Victorians, and open up new markets and opportunities for regional businesses.[4] The COVID-19 pandemic dramatically illustrated the importance of reliable digital technologies, triggering a surge in internet use as people turned to digital alternatives to remain connected to work, education, services, family and community. At the same time, there was a change in digital demand from central Melbourne to suburban and regional areas that revealed areas with inadequate internet access.[5]

People living in regional areas still have less access to education, health and community services than those in Melbourne, compounding inferior outcomes for vulnerable and disadvantaged Victorians.[6] Infrastructure interventions alone cannot remove the underlying causes of disadvantage. But infrastructure can reduce the impact, by improving access to jobs, education, health and social services, for example through transport and digital connectivity. It can also improve access via new or better facilities or by supporting new service models.[7]

Infrastructure can reduce the impact of disadvantage caused by a lack of connectivity in the regions by improving access to jobs, education, health care and services through transport and digital technology.

Limited transport connectivity affects opportunities and outcomes for regional Victorians

Traditional scheduled public transport services perform best when moving many people to a shared destination. This makes it ideal in urban areas, but creates challenges in regional areas with dispersed populations, large distances and disparate travel patterns. Regional Victoria's diversity means challenges accessing transport are not uniform, varying by regions, sub-regions, towns and rural areas. Public transport is stretched in areas of rapid population growth in regional hubs while in rural areas, smaller populations combined with longer travel distances mean that traditional public transport services can be infrequent, unreliable and potentially unviable.[8]

As a result, transport disadvantage – difficulty accessing public transport due to cost, availability or accessibility of services – is high in Victoria's regions, where owning a car is often the only means of transport. However, car ownership can lead to financial stress, particularly among low income households.[9] The lowest 20% of income earners are much more likely to experience transport disadvantage than the highest income earner (at rates of 9.9% and 1.3% respectively), and low income families living in regional areas face particular difficulties.[10]

Transport disadvantage is linked to social exclusion, where some people cannot fully participate in social and economic life.[11]

The groups most likely to experience social exclusion include young people, single parents and families with young children, older people, Aboriginal communities and people with a disability.[12] Regional Victorians most in need of public transport are being left with either poor quality or non-existent transport services.[13]

The local transport system in regional areas can be designed to better meet the needs of residents. Responding to the different access needs and challenges of diverse local communities requires a flexible and adaptable transport system, and different models of delivery to those in Melbourne.

Improving digital connectivity in the regions will help break down the barriers of distance

Digital connectivity is increasingly fundamental to people's lives.[14] Digital technologies are changing how people live, work and interact with each other, and opening up new opportunities to access previously unavailable information and services.[15] High speed and reliable internet connections can create regional jobs through telework,[16] and allow businesses to expand beyond their local market.[17] However, these benefits are not being shared equally across Victoria.

People living in regional Victoria often have slower internet speeds, fewer connection choices, and worse mobile coverage from fewer providers compared with Melbourne.[18] In some regional areas, inadequate connectivity can make it harder to do business, access information, engage with remote services or even make mobile phone calls.[19] The quality of regional mobile services is significantly and persistently worse than in Melbourne.[20] For example, regional Victoria contains more than 94% of Victoria's 2609 identified mobile black spots.[21]

Better quality, more reliable digital services can support innovative remote service delivery models and remote working, and reduce community vulnerability in emergencies. Better online access can help reduce the disadvantage experienced by people with lower levels of digital inclusion or skills.[22,23] Agriculture, tourism, manufacturing and service industries across Victoria's regions have advised us that better mobile and internet connectivity would support business opportunities.[24]

The combined impact of the 2019–20 bushfires, which damaged existing telecommunications infrastructure, and the COVID-19 pandemic has exacerbated digital inequality for some regional communities as unreliable internet connectivity has made home schooling, work and access to online services difficult.[25] The 'digital divide' is evident not just between metropolitan and regional areas, but also within regional cities, towns and localities.[26] Without the full benefits of new technologies, regional communities are likely to experience further inequality and reduced quality of life, especially as services continue to shift online,[27] and regional businesses will continue to face barriers to growth and development.

The Victorian Government can support targeted interventions to boost digital connectivity in regional Victoria, where the digital divide is most pronounced and where the market is less responsive.[28] The Victorian Government is improving regional mobile coverage and broadband access through its Digital Future Now initiative,[29] but there are further opportunities to provide more equitable access to affordable and reliable digital technologies, so regional businesses and communities can reap the full benefits.

Case study

Improving agricultural productivity via an on-farm Internet of Things trial

The Victorian Government's $12 million on-farm Internet of Things (IoT) trial is exploring the agricultural industry's digital needs. Agriculture is Australia's least digitised sector. Digital technology could lift agricultural production values by as much as $20 billion[30] by improving productivity, sustainability, profitability and resilience to weather and climate challenges.

IoT enables devices embedded with sensors to connect to and interact with each other via the internet. IoT devices can measure information such as soil moisture and livestock health, and monitor fences, vehicles and weather, to help farmers make more informed decisions and improve farm performance. The trial will establish up to 600 IoT-enabled farms across regional Victoria, partnering with farmers to evaluate the impact.[31] Trials are still underway, and Infrastructure Victoria will continue to monitor the evidence being generated.

Insight

Is there a need for Very Fast Rail for the regions?

It is sometimes argued that Very Fast Rail services, operating over 200 kilometres per hour, can improve employment and education connections from regional centres to Melbourne, and from major regional centres to surrounding towns and the outer suburbs of Melbourne. Others have suggested that Very Fast Rail services encourage people to move out of Melbourne to help reduce congestion. However, little evidence suggests Very Fast Rail could significantly induce many people to move to regional Victoria from Melbourne.[39]

The COVID-19 pandemic has demonstrated the importance of reliable internet connectivity in the regions, a potential substitute in some instances for fast public transport access into central Melbourne. Likely costs and future demand suggest Very Fast Rail will also not be an appropriate solution for addressing Melbourne's growth challenges.

The Victorian Government is already making significant rail investments under the Regional Network Development Plan[40] to improve service quality and capacity between Melbourne and large regional centres, including on the Geelong, Ballarat, Bendigo, Shepparton and Traralgon lines. The Regional Network Development Plan aims to deliver a modern commuter-style service for major centres and service improvements across the state, including through:

- A minimum frequency of a train every 20 minutes at peak times and every 40 minutes in off-peak periods for services to Geelong, Bendigo, Ballarat, Seymour and Traralgon
- Five services every weekday on the outer regional rail lines of Warrnambool, Bairnsdale, Albury-Wodonga, Echuca, Swan Hill and Shepparton.

However, the growth of Melbourne's outer suburbs is placing pressure on some regional services as residents of these areas also use regional services. The capacity of services, rather than their speed, is the biggest challenge.[41] For instance, building the Melbourne Metro Two tunnel (see recommendation 61) helps improve public transport access from Geelong. Similarly, reconfiguring the City Loop (see recommendation 60) and capacity improvements in the outer metropolitan rail corridors (see recommendation 74) will help regional access on those lines.

Rather than investing in Very Fast Rail services, the Victorian Government can cater for more capacity by planning and monitoring how well current connections are being used, particularly between major regional centres and Melbourne, and improving services as required. The Regional Rail Link project is an example of this approach, as it responded to identified regional and suburban train capacity issues. Very Fast Rail is very expensive and does not necessarily result in a net benefit for regional areas. It may also lead to unintended consequences, such as further strengthening the ability of industry and education providers in Melbourne to compete with regional areas.[42]

While Very Fast Rail would lead to faster travel times from regional centres to Melbourne, this would contrast to travel times for residents in outer metropolitan Melbourne, who have lower levels of access to employment than other parts of the city. Current travel times from regional Victoria are already similar to, and in some cases faster than those in Melbourne's outer suburbs.[43]

Connecting people to essential resources at major life stages can have a more profound impact

Different people and communities have different resources and experiences, meaning the advantages and opportunities they face in life vary. In general, people with fewer advantages have fewer resources, and can access fewer services, influencing their life opportunities and outcomes.[32]

Regional Victorians tend to have less access to services, resources and opportunities because of distance. This can compound other types of disadvantage they may experience, such as poverty or social exclusion.[33] For example, an estimated 15% of regional Victorians live in poverty, rising to 23% in children, compared with 13% of people in Melbourne, and 17% of children.[34] The impact of bushfires, followed by the COVID-19 pandemic, may cause these levels to rise.

Young people in regional areas are less likely to finish school, find work, or undertake tertiary study.[35] By age 16, nearly one in six young people in regional Victoria have left full-time secondary education compared with one in eight in Melbourne. At age 24, a third of regional Victorians are not engaged in education, employment or training.[36]

For some, poverty or disadvantage can become entrenched. Interventions which help break the cycle of persistent disadvantage can deliver enduring benefits for the individual, for local communities and Victoria.[37] Infrastructure which connects people to services and supports at major life stages – including early years, the transition from school to work, family wellbeing and ageing – are likely to have bigger positive impacts.[38]

Recommendations to better connect the regions

Infrastructure Victoria is making the following recommendations to improve connectivity in regional Victoria. These interact with other recommendations to align social infrastructure with better service delivery (see section 3.3), unlock economic growth opportunities (see section 4.1) and improve the resilience of communities (see section 1.3).

Recommendation 83

Redesign regional public transport to meet local needs

In the next five years, redesign existing regional transport services so they are integrated, based on regional needs assessments, and sustainably funded. Use significant technological and reform opportunities to deliver innovative service models that meet local needs.

Transport disadvantage – difficulty accessing public transport due to cost, availability or accessibility – is high in Victoria's regions. Around 30% of residents in outer regional and remote areas have reported difficulty accessing services.[44] Limited transport options reduce access to work, education, health care, shops, services and social connections.

Regional Victorians depend heavily on owning their own car for transport. Owning a car often leads to financial stress, especially amongst people with low incomes, who are also much more likely to experience transport difficulties than people with high incomes.[45] Better public transport access means everyone can stay connected to their communities and access employment, education and services.

Regional Victoria's relatively low population density and long travel distances make regional public transport challenging and expensive to operate. Excluding fare recovery, the Victorian Government spent $807 million operating regional public transport in 2019–20.[46] This is a quarter of Victoria's public transport operating spend but supports only 6% of trips. Of this regional expenditure, only around 20% goes to local bus services, despite these carrying nearly 40% of regional passengers.[47] Opportunities exist to redirect committed regional public transport funding to modes and service models that best meet local needs, before considering whether more funding is needed.

Victoria's regions have a patchwork of transport services, including local and regional scheduled public transport, school buses, local community transport services, subsidised taxis, and specialist transport funded by the National Disability Insurance Scheme[48] and Commonwealth Home Support Program.[49] At present these services are largely funded and delivered independently, without coordination, and often overlap or leave gaps in coverage. For instance, many regional school buses currently lay idle outside of school travel times.[50,51] Removing existing regulatory barriers and deploying new technologies potentially allows existing bus fleets to be used for new innovative service models (see recommendation 22) and better use the existing bus fleet.[52,53] A number of these reforms are proposed in *Victoria's bus plan.*

The Victorian Government must continue to design regional public transport for regional circumstances, and not simply replicate city-style models. The four-year Flexible Local Transport Solutions Program demonstrates some alternative possibilities. The program provides financial support to help seed small-scale initiatives that address transport disadvantage, integrate with other local transport options and improve transport access across regional Victoria.[54] However, funding is time-limited, and imposes a heavy burden on communities to demonstrate feasibility, innovation, and social, economic and sustainability benefits. ConnectU is another example of a small-scale demand responsive travel service for people in need around Warrnambool.[55]

To respond, the Victorian Government should work collaboratively with local transport providers and communities to determine local transport needs,[56] using regional needs assessments focused on disadvantaged groups, including a common measure of access to services, as well as adopting a clearer classification of regional routes as provided for in *Victoria's bus plan.* Local collaborative governance and planning arrangements can give communities a voice and help coordinate local transport options, including bus services, community transport, school buses, commercial passenger vehicles and car-sharing. It can also guide development of an integrated and flexible service mix that meets community needs, and for services to seamlessly connect.

Technology also provides opportunities for better coordination. New flexible transport services ultimately need to move away from short-term trial funding to recognise the value of access to services for disadvantaged regional Victorians, with ongoing funding to be determined following a successful pilot. Integrated governance can also link with service planning for integrated facilities (see recommendation 88), so people can access local services.

Insight

Improving education access in Gippsland

When the Wonthaggi campus of Chisholm TAFE closed its building and construction program in 2017, Bass Coast and South Gippsland students needed to travel to Korumburra to enrol in the only regionally available course. The Flexible Local Transport Solutions Program funds charter buses so students can travel to vocational education providers in Korumburra and Leongatha. The services run several days each week, picking up vocational education students from Phillip Island, Leongatha, Wonthaggi and Inverloch. With local contributions, a weekly community bus service from Mirboo North has been added.[57]

The service allows many local students to attend training. There is no other public transport service available to transport students to the region's vocational education providers, including for building and construction courses such as carpentry and plumbing. Access to these training opportunities improves young people's employment prospects and opens career pathways which would otherwise be unavailable.

The service currently runs on Victorian Government funding of $107,000, with other contributions from partner organisations. However, as a pilot program, funding is set to cease in 2021.

Recommendation 84

Address regional Victoria's digital connectivity gaps

In the next five years, continue delivering regional digital connectivity improvements, and monitor and review the need for further government investment following the roll-out of the Digital Future Now initiative.

Digital access is increasingly indispensable for everyday life, underpins the economic and social development of communities and provides a virtual alternative to face-to-face contact.[58] The COVID-19 pandemic has starkly illustrated the importance of reliable, high speed internet. People now more frequently use digital technologies for work, education, health care and other service delivery, and to maintain social connections.[59] It reveals the need for all Victorians to have the same opportunities to remain digitally connected, wherever they live.[60]

Communities distant from Melbourne and major centres have most to gain from reliable digital connectivity, but currently have the worst connections. Inferior digital connectivity is a significant problem throughout regional Victoria.[61] It affects community safety, access and business productivity.[62] All Victoria's Regional Partnerships have identified poor mobile coverage in their region.[63] They also show an unmet need for reliable and cost-effective business-grade broadband in many regional cities, towns and localities.[64]

Access to high speed internet benefits communities and businesses by supporting remote access to health and education, and by improving access to markets and workers. It can support new jobs and businesses,[65] and increase productivity in industries like agriculture by helping farmers adopt smart technologies.[66] High speed internet can influence where businesses locate, and improve local economic performance.[67] Businesses without access are disadvantaged, and those operating in regional Victoria identify inadequate digital services as a barrier to business growth.[68]

Limited internet competition in some regional areas means businesses and communities do not have the same access to fast, reliable, and affordable broadband as those in city centres. High upfront costs can discourage individuals and businesses from paying for extensions to high speed internet infrastructure, and they may experience more detriment by restricted access to future technologies.[69]

The Victorian Government's $626 million Digital Future Now initiative aims to improve mobile coverage and broadband access in regional areas, and deliver upgrades in communities with only satellite and fixed wireless access.[70] Running until 2025, it includes business-grade broadband upgrades for certain suburbs and regional towns, to address gaps in reliable high speed business broadband. It also incorporates a six-year mobile black spot eradication program for populated areas of regional Victoria. Both initiatives are co-funded by the Australian Government. The Australian Government's Regional Connectivity Program also funds telecommunications infrastructure projects aiming to deliver fast, affordable, and reliable digital connectivity in regional and rural Australia.[71]

The Victorian Government should continue to monitor the state of digital connectivity across regional Victoria and review the need for more government support after the term of Digital Future Now. The review should consider broadband and mobile coverage, speed, and reliability, and whether available technologies meet changing business and community needs. It should evaluate the impact of service upgrades, focusing on those places which did not benefit, or which experience ongoing connectivity issues, and on any ongoing barriers to digital access for vulnerable Victorians.[72] A review is merited because digital technologies will continue to evolve, and community expectations of connectivity will increase in future.

Case study

Horsham's enhanced broadband project

In 2018, the Victorian Government's Connecting Regional Communities Program funded a $1.7 million pilot scheme in Horsham to demonstrate new ways of delivering high speed broadband in regional areas.

After a competitive tender process, Spirit Telecom was awarded the contract to construct five towers across five districts in Horsham. Each tower transmits fixed wireless broadband at 5G standard with speeds up to one gigabit per second in both directions. Each tower covers a 10-kilometre radius throughout Horsham, including the Horsham Central Business District, Horsham Enterprise Park, aerodrome and freight terminal precincts.

These increased broadband speeds will also be available to homes across Horsham to give the entire community access to internet services on par with metropolitan Melbourne.

Horsham-based farm equipment machinery franchise Emmetts is one of the first businesses to sign up to Spirit's new broadband network, functioning as an 'anchor tenant' to help the project succeed. The business operates across Horsham, Swan Hill, Rupanyup, Warracknabeal and parts of South Australia, and now has dramatically faster broadband speeds with fewer dropouts, boosting their business across regional Victoria and beyond.[73,74,75]

Recommendation 85

Improve regional telecommunications infrastructure resilience

In the next five years, develop more resilient regional telecommunications infrastructure so communities can stay safe during emergencies, including better mobile coverage, back-up systems and power supply, and emergency mobile roaming.

Telecommunications services keep communities safe, connected and informed during emergencies.[76] Victorians can access emergency information and warnings via VicEmergency and other online services,[77] allowing them to stay informed and take appropriate action.

People most commonly access the internet using mobile devices.[78] However, regional Victoria experiences significant problems with mobile coverage.[79] Victoria's Regional Partnerships identify particular problems with poor mobile coverage near tourist attractions,[80] along transport corridors,[81] and in smaller settlements and farming areas.[82] This confirms our own research into regional infrastructure needs.[83]

The 2019–20 bushfire season starkly demonstrated the vulnerability of Victoria's regional telecommunications infrastructure, beyond patchy mobile coverage. Thirty-eight towns lost communication, mostly caused by power outages, and impassable roads cut off 17 of these towns.[84] In emergency situations, communities expect to be able to make calls for emergency assistance, access relevant mobile apps, receive text-based emergency alerts, and communicate with family and loved ones. The Australian Government has established a program to improve mobile connectivity in bushfire prone areas on the fringe of Australia's cities,[85] but more can be done. Telecommunications services are essential for public safety during natural disasters, and to transmit urgent information to emergency response workers.[86]

The Victorian Government should co-invest with the Australian Government, telecommunications companies, and energy providers to develop more resilient telecommunications infrastructure so communities can stay safe during emergencies. High emergency risk areas should be the priority, as well as road and rail routes, population centres, tourist attractions and areas of agriculture and other economic activity. More resilient communications will need a comprehensive approach across fixed, mobile and Wi-Fi networks. This can include more co-investment to improve regional mobile coverage (see recommendation 84), stronger power supply back-up systems and greater telecommunications network continuity, potentially including third-party use of mobile towers.[87] The Victorian Government should also work with the Australian Government and telecommunications providers to require emergency roaming between mobile network operators, to provide backup coverage for mobile users out of range of their own network during an emergency.[88]

Preparing for emergencies can also include educating communities on residential power back-up options, including alternative charging methods or battery powered communication devices. For example, the Australian Government's Strengthening Telecommunications Against Natural Disasters package is improving community awareness about access to telecommunications during national disasters, so people consider a communication plan as part of their bushfire preparation.[89] Better community awareness complements improved telecommunications infrastructure resilience to reduce the impacts of emergencies.

Recommendation 86

Fund regional libraries to provide better internet access

In the next year, start a five-year funding program for libraries in regional towns and rural areas to improve community access to fast, free internet services, leveraging existing library infrastructure.

In an increasingly digital age, Victoria's public libraries are evolving to support lifelong learning, community engagement and wellbeing.[90] They provide greater – and free – access to digital technologies such as computers, software, broadband and Wi-Fi, and training in using them.[91] A higher proportion of regional households lack access to the internet, particularly those in remote communities, on low incomes, or in social housing.[92] All Victorian households and businesses should have equal access to reliable internet services (see recommendation 84).

Many people use libraries to access digital services, participate in social networks and use online public services,[93] as they are often the only source of free internet access and Wi-Fi in regional areas.[94] Local libraries also support business needs, with start-ups, small businesses and workers using them for research, access to technology, digital training, co-working spaces and training rooms.[95] These digital services can be especially critical during and following emergencies, for example libraries may be places of refuge during high heat days and bushfire smoke events (see recommendation 90).

Libraries in rural areas are often efficient and effective.[96] They do, however, face greater financial challenges than their metropolitan counterparts. Many rural and regional councils have limited resources to invest in libraries, as they have a smaller number of rate payers and fund multiple services to geographically dispersed towns with small, but often high-need, populations.[97] Local community impact is likely greater, as public Wi-Fi is usually only available at libraries in regional areas during restrictive opening hours, while extended hours and other options are more common in Melbourne.[98] To continue to provide free and reliable access to digital services, libraries in rural and regional Victoria need more investment.

The Victorian Government should provide new dedicated funding to help regional libraries provide access to secure, fast, scalable, resilient, and reliable free internet services. To meet local community needs, libraries would be invited to propose solutions for enhancing internet access, leveraging existing facilities and infrastructure. Specific investments may include: upgrades for reliable, modern digital infrastructure; security systems and layout upgrades to support out-of-hours access; extending library Wi-Fi to surrounding public spaces outside normal library hours; and installing Wi-Fi technology in mobile libraries. Out-of-hours access would not be a condition for eligibility, though upgrades may support extended hours.

The new funding stream should be established, with a budget of $7 million to $10 million over five years. An investment of $6.5 million to $7 million would support upgrades to half of the 140 public libraries in regional and rural Victoria over this period[99] at up to $100,000 each.[100] Smaller sums could also support the technical fit-out of the fleet of 24 mobile libraries.[101] An evaluation should inform funding beyond the first five years.[102]

This funding should complement that already provided through the Living Libraries Infrastructure Program, which funds library infrastructure upgrades and is already oversubscribed.[103] The Victorian Government could provide this funding through a new library technology fund, with local government retaining responsibility for ongoing operational costs.

Case study

Foster Library, West Gippsland

Foster, in Victoria's Gippsland region, has a population of fewer than 1200 people. The town's library serves as a gathering point for the community. Foster Library is the first in Victoria to open 24 hours a day, seven days a week. From August 2019, approved library members have been able to swipe to enter the library after hours, giving them secure access to books, workspaces and free Wi-Fi (those under the age of 18 years cannot enter unless accompanied by an adult with a valid family pass).

West Gippsland Libraries first envisaged the model in response to community requests for increased opening hours. During community consultation, they determined that round-the-clock access would best suit community needs because over half of the community work more than 35 hours a week and a quarter of people do not have internet access at home.

The library extended its opening hours, beyond its normal staffed hours. Security systems, alarms and video cameras have been installed for safety and security. The Victorian Government funded the upgrade cost of $92,000, with $20,000 from West Gippsland Libraries, and $3000 from the Friends of the Foster Library.

As at the end of March 2020, Foster Library has seen a 14% increase in active memberships and a 54% increase in visits compared with the prior year. Following the success of the trial in Foster, West Gippsland Regional Library Corporation plans to roll out 24/7 access to more libraries across its network.[104]

Recommendation 87

Use rural schools for children's specialist and allied telehealth services

Retrofit or better use selected rural school infrastructure for children's specialist and allied telehealth services to improve children's health and development. In the next year, begin a trial in a remote region, such as Wimmera Southern Mallee, to demonstrate the value of adopting the approach in other rural locations.

Children's health and development milestones in regional and remote areas are consistently behind those in urban areas, with paediatricians struggling to meet their emerging needs.[105] More children have developmental or behavioural concerns in disadvantaged regional communities.[106] Those families experiencing the greatest disadvantage have the most to gain, but are least likely or able to engage with health and education services. Better quality and easier access to health care and support services for families can help children before and during school.[107] This includes the need to Close the Gap in life outcomes and support Aboriginal children and families to connect with Aboriginal and other services in a culturally competent way.[108]

Victoria's regions face a critical shortage of skilled health and support workers. Allied health workers in rural and remote areas service a population at least five times greater than their metropolitan counterparts. Greater use of telehealth services could help. While not appropriate for all health needs, telehealth services can complement in-person services by using digital infrastructure to provide access to specialist and allied health services (for example, paediatricians).[110] Specialist telehealth services have substantial capacity for expansion. For example, in the Wimmera Southern Mallee region from January 2017 to August 2019, only 77 out of 2315 specialist outpatient appointments at the Royal Children's Hospital were delivered by telehealth.[111]

Current government funded health and education services vary widely in quality and effectiveness, and are often not well coordinated.[112] Government schools across Victoria already have technology and facilities for e-learning.[113] This technology could also be used to deliver paediatric and allied telehealth services, with a focus on prevention and early intervention for all children 0–18 years. Some Victorian secondary schools already deliver health services such as consultations with doctors[114] and mental health practitioners.[115] As schools are not set up for patient monitoring and diagnostics, these types of telehealth services should remain on health sites. However, extending health services on school sites to paediatrics and allied telehealth would improve access to appointments with health professionals, reducing the need to travel long distances.[116]

The Victorian Government should fund a trial to develop and run a range of paediatric and allied telehealth services from selected rural schools, as part of moving to a more integrated service model.[117] These services would complement a greater focus on improving models of care (recommendation 25).

Victoria's Wimmera Southern Mallee region is among those most able to benefit. Families travel long distances from this region to access specialist support and health care. Families also experience difficulties receiving the right information, education, health care support and expertise once children start school.[118] This region already has willing partners in place, a pre-requisite for successful delivery of local responses.[119]

Trialling this approach in the Wimmera Southern Mallee region can show its potential benefits and find improvements through an evaluation before any decision to expand the service. The choice of sites and delivery models should be informed by local service planning, and address any regulatory, transport or other barriers to effective delivery. Minor infrastructure upgrades may be needed on some sites, such as more video screens.

4.3

Foster regional Victorians' health, wellbeing and inclusion

Health, education and community services need supporting infrastructure, such as suitable facilities, to enable effective service delivery. Transport and digital services can improve access to services in regional areas, but many services also require personal interaction and face-to-face care and support, and often need to be locally delivered.

Fit for purpose infrastructure can also help foster local participation and improve community amenities. This includes infrastructure to help communities connect – from community facilities to parks, volunteer emergency services or civic infrastructure.[1] Affordable, appropriate and well located housing supports social inclusion by improving access and proximity to services, facilities, jobs and transport.[2]

Diverse regional communities have complex needs

Every Victorian community includes some people experiencing poverty and socio-economic disadvantage.[3] But regional Victoria has higher levels of disadvantage, exacerbated by many complex factors including industry restructuring, an older population, and greater exposure to climate change impacts.[4] Eight of the top 10 most disadvantaged local government areas are in regional Victoria.[5]

People with complex needs require multiple and often overlapping services, such as health care, mental health services, disability support, homelessness services and early intervention and support for children and young people. The higher proportion of regional Victorians experiencing disadvantage translates into a higher potential demand for health and social services, compared with Melbourne.[6]

For example:

- 19% of regional Victorians are aged over 64 years compared with 14% in Melbourne[7]
- 15% of regional Victorians have asthma compared with 11% in Melbourne[8]
- 19% of regional Victorian adults smoke tobacco compared with 14% in Melbourne[9]
- An estimated 19% of regional Victorian adults have potentially harmful levels of alcohol consumption compared with 13% in Melbourne.[10]

Regional Victoria's diverse and changing demographic mix is likely to alter future service demand. Ageing populations, most notably in small rural communities, will affect the scope and mix of services needed.[11] Conversely, some regional cities and peri-urban areas are experiencing rapid population growth, placing pressure on services and facilities.[12] Strong Aboriginal population growth across regional Victoria will need to be matched by provision of culturally safe Aboriginal community-controlled services.[13] The COVID-19 pandemic has further stimulated population growth in the regions, although it remains to be seen whether this is a long-term trend.[14]

Climate change is forecast to bring higher temperatures, more days of extreme heat, declining rainfall and more frequent catastrophic bushfires conditions to regional Victoria,[15] further complicating the challenges facing local communities. Extreme heat, heatwaves and prolonged bushfire smoke exposure can have significant health impacts. For example, heatwaves cause more deaths each year than any other natural disaster.[16] Risks are higher for regional Victoria's older, more disadvantaged population.[17]

For these reasons, 'cookie cutter' infrastructure approaches will not work in regional Victoria. Solutions must account for local differences and adjust to changing circumstances, such as changes in climate and community needs, over time. Local, collaborative approaches tailor investment to different places, coordinate effectively across different levels of government and create opportunities for meaningful engagement with local communities — making them more successful in helping to address disadvantage.[18]

Infrastructure solutions and investment in regional Victoria must take into account the local and unique differences and be able to adjust to changing circumstances to promote thriving communities in our regions.

Delivering and accessing regional services is challenging

Local governments deliver many social and community services to regional communities, including child and family services, aged care, health care services and programs to foster social inclusion and improve wellbeing.[19] But many regional councils, particularly in rural areas, have budgets constrained by small numbers of ratepayers with lower average incomes.[20] They also need to fund multiple services to geographically dispersed towns with small, often high need populations.[21]

Victoria's councils manage assets worth over $115 billion.[22] They spend about $2 billion on infrastructure each year.[23] Regional councils can struggle to afford the facility upgrades for accessible, safe infrastructure to support the many services their communities need. Selling assets can be difficult because they have few potential purchasers, and communities often feel strongly attached to facilities.[24]

Relatively dispersed populations and infrastructure can lead to higher service delivery and asset maintenance costs,[25] often unattractive for private sector providers.[26] Regional cities such as Ballarat, Bendigo, Geelong and Wodonga have higher population growth and may be more financially sustainable than the smaller rural shires, but also have high and growing numbers of residents experiencing disadvantage, and consequent service demand.[27]

Growth pressures in parts of regional Victoria are being made worse by a population shift triggered by the COVID-19 pandemic.[28] Regional Victoria recorded its highest quarterly net population gain on record during the pandemic, a majority coming from Melbourne.[29] However, longer-term population trends, and the implications for regional Victorian communities, are not yet clear.

Access barriers can compound service delivery challenges. Limited public or community transport options constrain service access in many places.[30] Inadequate communications infrastructure and limited transport options make it harder for regional Victorians to reach employment, education, health and community services that help to address disadvantage.[31]

To respond to these pressures, local governments must innovate and flexibly manage service provision facilities. Despite each local area's different challenges, all councils will need to better use and adapt their infrastructure to match the changing needs of their communities.

Well-located, affordable housing improves job and service access

As house prices have risen, fewer Victorians own their homes, especially those with lower incomes.[32] Rents have also increased.[33] The COVID-19 pandemic triggered a further increase in median rents in regional Victoria combined with a decline in vacancy rates, as more people have moved to the regions.[34] Average weekly rents in regional Victoria are now closer to those in Melbourne, meaning very few properties are affordable and appropriate for most households on income support, with single people faring the worst.[35] Well-located social housing, with good transport access, allows people to live close to jobs and services,[36] and can provide access to housing where private local rental markets are unaffordable for very low income households.

Existing social housing supply does not meet current demand, let alone future growth. More than 16,000 regional Victorian households are waiting for social housing, and the majority (59%) require urgent assistance.[37] Demand for social housing, compared with the number of existing social housing dwellings, is higher in regional Victoria than in Melbourne,[38] and yet regional Victorians more commonly face many of the difficulties which drive social housing demand. The most frequent reasons Victorians seek homelessness support are financial difficulties, family violence, and experiencing a housing crisis.[39] Regional Victorians are more likely to experience rental stress and are overrepresented in instances of family violence. For example, 30% of regional Victoria's renting households experience rental stress, compared with 26% in Melbourne,[40] while 19 out of the top 20 local government areas for rates of family violence are in regional Victoria.[41] Homelessness is increasing in the regions, rising by 4% from 2011 to 2016. Barwon and the Great South Coast have seen homelessness increase by 23% and 24% respectively over the same period.[42]

The type and size of social housing dwellings do not match either the current or future tenant need. For example, one-bedroom homes would have to nearly double to meet demand.[43] Social housing is also inadequately adapted to help tenants cope with the impacts of climate change. Social housing tenants, many with multiple and complex needs, are particularly exposed and vulnerable to extreme heat.[44]

Recommendations to improve health, wellbeing and inclusion

Infrastructure Victoria considers the following recommendations would improve regional Victoria's health, wellbeing and inclusion. These link with recommendations to better connect Victoria's regions (see section 4.2) and align social infrastructure with service delivery more generally (see section 3.3).

Recommendation 88

Deliver multipurpose shared social service facilities in the regions

In the next year, start regional planning for social services to identify opportunities for multipurpose shared services facilities, then deliver them where appropriate over the next five years, in partnership with local governments and community organisations.

Victoria's regions are geographically and demographically diverse. Some towns and places are highly disadvantaged, showing lower health and education outcomes relative to others,[45] and 15% of regional Victorians live below the poverty line.[46] A broader group is vulnerable to more severe disadvantage because of their distance from and reduced access to services.[47]

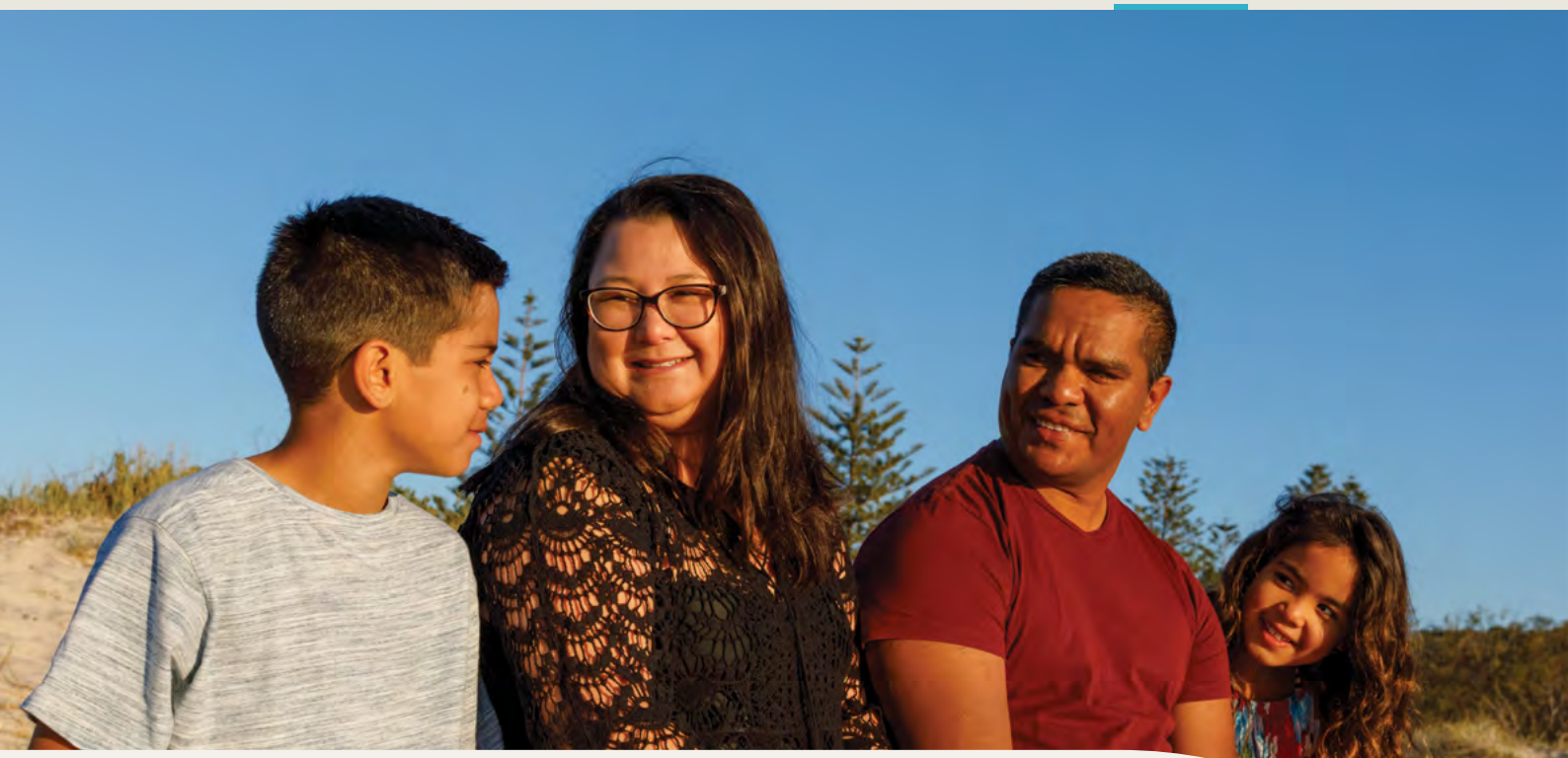
Regional social service sites are often smaller in scale than in metropolitan areas, while on average, regional Victorians have higher levels of disadvantage, and often require multiple and inter-linked services.[48] Co-locating services such as the Victorian Government's GovHubs[49] in a shared facility benefits individuals and groups with complex needs, because they support smoother transitions between services and create opportunities for access to a wider range of services.[50] Alternatively, fully integrated models may be required, such as The Orange Door[51] family violence support hub networks currently being established. Shared facilities improve access to a range of services including primary and allied health, education, child and family, housing, mental health, aged care, sport and recreation, libraries, legal and financial support services. When services are located together it can also improve service quality,[52] by bringing together diverse skills and staff capabilities, reducing the professional isolation of practising in rural areas,[53] and providing opportunities for collaboration and innovation. Shared service facilities can be easier to access in the regions because people need only travel to a single place, especially if transport planning aligns with these locations (see recommendation 83).

Planning, delivering and managing shared facilities is more complex than for single purpose facilities. For example, the asset ownership, accountabilities and risk can be more complicated. Shared facilities will not work in all circumstances and must incorporate an appropriate mix of complementary services. Firstly, the Victorian Government should undertake shared service planning to identify service need, the facilities and services suitable for shared use, the location and facility design for infrastructure delivery. This requires a substantial change from usual governance arrangements and will require the Victorian Government to facilitate shared planning and decision-making across its agencies and partners such as local government and community organisations.[54] The *Framework for Place-Based Approaches*[55] provides a starting point for departments and agencies to proceed.

The Queensland Government has developed a new approach to whole-of-government social infrastructure planning which could be applied in the Victorian context (see Box).

Upfront building costs of shared facilities can be more expensive than single purpose facilities but can generate efficiencies through scale and shared maintenance. With flexible design, shared facilities can adapt more readily to changing needs compared with single purpose facilities.

Across regional Victoria, there is support for shared facilities to improve service delivery for disadvantaged Victorians. Stakeholders support delivering shared service facilities and suggested locations for integrated health, community and wellbeing hubs and precincts in regional Victoria.[56]



Case study

Queensland Social Infrastructure Strategy

The Queensland Government has a new approach to whole-of-government social infrastructure planning which could be applied in the Victorian context. The strategy assumes that human services planning has already occurred before local infrastructure responses are developed.[57]

The strategy provides a framework for the planning, design, location and use of Queensland's social infrastructure. It aims to achieve more integrated, accessible, well-located, multi-functional and cost-effective social infrastructure. It requires departments and agencies to:

- Make better use of existing infrastructure to deliver broader services and community benefits
- Use every new infrastructure investment as an opportunity to deliver more integrated outcomes for inclusive communities.

Effective cross-government systems and governance are essential to support the strategy and to achieve broader outcomes. The main components of the strategy include:

Enhanced cross-agency collaboration

The Queensland Government is adopting a place-specific approach to social infrastructure in identified priority areas. These are areas where multiple agencies have identified infrastructure needs that may realise improved social infrastructure outcomes through strategies such as co-location, sharing facilities, or coordinating delivery.

Flexible land management

The Queensland Government is investigating a more flexible whole-of-government approach to land acquisition and management to help maximise capital investment and foster innovative partnerships to achieve better outcomes.

Overarching governance

The strategy establishes a place-specific social infrastructure champion in the Infrastructure Minister and a Social Infrastructure Ministerial Committee to prioritise place-specific social infrastructure investment. A champion drives a partnership-first approach to the provision of social infrastructure, responsible for rallying for changes to business-as-usual approaches across government and calling for what might otherwise be lost opportunities. Establishing a champion at the most senior level of government will help drive the understanding that change is required to drive even better social infrastructure outcomes for Queensland communities.

Early engagement in strategic planning

A place-specific approach to social infrastructure planning improves existing processes. Through early coordination of strategic planning across providers, services are more likely to be well located in relation to transport and aligned services, or co-located in flexible, future-focused buildings that provide a range of human services.

Recommendation 89

Update community infrastructure

Fund regional councils in the next five years to update, repurpose or retire outdated community infrastructure for better service delivery.

Victoria's councils spend about $2 billion on infrastructure annually to manage a sprawling asset base.[58] Services for children, youth, families and the elderly are delivered from these facilities. They are important in Victoria's regions because regional areas are over-represented in statistical rankings of socio-economic disadvantage,[59] and their smaller populations mean viable private sector alternatives are limited.[60]

Many regional council facilities are no longer fit for purpose, limiting service quality. Councils face complex challenges in managing these facilities well. Often, communities have strong attachments to old assets, and some have heritage value, even when they are no longer meeting wider community needs.[61] This can result in resistance to selling old assets, particularly where sale proceeds are not reinvested in the area, even when it can help fund higher quality services.

Many regional councils struggle to afford the facility upgrades required for efficient service delivery. They spend more on facilities per person than Melbourne councils, having smaller populations, larger land areas, and their costs are growing faster than inflation.[62] Short of revenue, regional councils rely on grants,[63] but few can be used for maintenance and renewal of ageing assets.

The Victorian Government should establish a new fund to provide support for regional councils to update, repurpose and retire community infrastructure. After undertaking service planning demonstrating their facilities are no longer fit for purpose and inhibit quality service delivery, regional councils could apply for up to $2 million. Grants could reflect a council's ability to sustainably fund, promote co-investment, leverage other grants and encourage shared facilities where possible. Separately, the fund would allow smaller contributions of up to $50,000 for smaller rural councils to develop service plans that inform infrastructure requirements. Funding guidelines should recognise the importance and time needed to engage with the community to gain their support for updating community facilities.

The Victorian Auditor General suggested regional grant funding can be allocated based on measurable indicators of disadvantage.[64] Funding applications should prioritise facility upgrades in, or serving, disadvantaged communities. Other priority criteria should include: evidence that facilities limit service quality, asset maintenance cost reductions, climate resilience,[65] energy efficiency,[66] and consolidation of updated, multipurpose shared facilities (see recommendation 88) that meet contemporary accessibility standards.[67] In some instances, the selected infrastructure could be repurposed as a climate-adapted facility (see recommendation 90). Councils will need to show their communities have the skills to manage, staff and deliver services from the facilities, and evaluate investment outcomes. Revenue from any asset sales should be directed back to the community by upgrading local facilities.

The fund should be established as soon as possible, with a budget of $100 million for the next five years. Representing $20 million a year, these funds would allow up to 10 successful applications for the $2 million maximum, or a larger number of smaller grants – enough for the most disadvantaged councils. This type of expenditure is also stimulatory, helping create and maintain jobs in the regions. The fund should be evaluated at the end of the five years.

Recommendation 90

Create climate-adapted facilities for rural communities

In the next five years, fund local governments to plan and help deliver a network of designated, accessible climate-adapted community facilities, to manage the health impacts of extreme heat and bushfire smoke.

Extreme heat can have serious impacts on communities, including increasing illness and death, particularly for the most vulnerable. Without adaptation efforts, more days of extreme heat could cause 400 deaths each year in Victoria by 2050.[68] Extended bushfire smoke events can severely impact the health of many vulnerable regional Victorians. An estimated 11 million Australians were exposed to bushfire smoke during the 2019–20 bushfires,[69] leading to health costs of approximately $1.95 billion.[70]

Regional Victorians are more at risk to extreme weather.[71] They are, on average, older,[72] less healthy,[73] more disadvantaged,[74] more exposed to the impacts of extreme heat,[75] and more sensitive to smoke.[76] Unlike cities, in many rural areas there are relatively few privately provided places to escape the heat on hot days, such as shopping centres or cinemas. Projected changes in temperature are also expected to be higher in rural inland areas, magnifying the impacts of climate change.[77]

Many vulnerable regional Victorians live in low quality private and public housing. Upgrading all rural housing to become more energy efficient and resilient during extreme heat would help people live more comfortably,[78] but will take considerable time and investment. During these events, people need to remain indoors to stay cool and have cleaner filtered air. The Victorian Government should ensure that regional social housing is suitable for the climate (see recommendation 94). As a complementary response, climate-adapted community facilities can provide a safe place to avoid exposure.

The Victorian Government should help establish a network of accessible climate-adapted community facilities to reduce the health impacts of exposure to heat, and prolonged smoke from bushfires. These would not duplicate emergency relief centres,[79] but instead provide safe places for temporary respite for people whose homes are without cooling or air filtration during the worst parts of hot days and bushfire smoke events.[80]

The Victorian Government should allocate funds and determine criteria for local governments and other eligible community facility owners to plan and deliver these facilities within the next five years.[81] Facilities should at least be in safe locations, have suitable air conditioning and filtration, back-up power, and comfortable amenities like cooking facilities and internet access. Existing community facilities can be retrofitted to be climate-adapted and fit for purpose. In most instances, these are likely to be existing local government facilities in town, such as libraries, community centres, neighbourhood houses, and town halls. Suitable facilities owned by others, such as bush nursing hospitals, not-for-profit facilities, or community health centres, should also be considered.

Funds to retrofit infrastructure could be as small as a few thousand dollars to major refurbishments over $500,000,[82] requiring approximately $50 million over five years. It is not feasible for every town in rural Victoria to be included, so local governments should lead the identification of priority places with their communities. Areas already identifying as vulnerable and in need of these facilities – such as Macedon Ranges, Central Goldfields, Mount Alexander and Gippsland shires – are candidates for early funding.[83]

Recommendation 91

Build regional residential alcohol and drug rehabilitation facilities

Within five years, build residential detoxification and rehabilitation facilities in regional Victoria to provide equitable access to alcohol and other drug treatment.

Problem alcohol and other drug use continues to affect the health, productivity and wellbeing of individuals and communities in Victoria. Regional areas face particular challenges, as drug and alcohol abuse is growing faster than in Melbourne,[84] and people in regional areas are more likely to have used an illicit drug[85] or consumed alcohol at dangerous quantities.[86] The rate of unintentional drug-induced deaths per capita in rural and regional Victoria was more than 50% higher than Melbourne in 2018.[87]

Some people can be treated with regular appointments with doctors or detoxification at home. These options do not work for everyone, including those who need longer-term or more structured care, or who face poverty or domestic violence.[88] In these circumstances, residential rehabilitation and detoxification facilities providing 24-hour staffing and treatment programs are more likely to be effective – especially in the long term.[89] New South Wales research has found residential rehabilitation facilities are vital to treating the highest severity cases[90] and are particularly effective in addressing methamphetamine addiction,[91] for which there is currently no pharmacological treatment.[92]

The Victorian Government is expanding the number of residential rehabilitation beds,[93] but regional residents face barriers to accessing treatment.[94] The regions have too few facilities to meet demand, and services are unevenly distributed and often scarce.[95] While private facilities have filled some of the gap, they can be prohibitively expensive.[96] Regional services also struggle to treat people in a timely manner, with waiting lists commonly over six months.[97] Travelling to Melbourne is the only option for many,[98] but the distances and costs involved can be a barrier to seeking treatment, partly because many areas have no public transport.[99] Without affordable and accessible services, more people can end up in emergency departments, hospitalised, or in prison,[100] contributing to entrenched social disadvantage in some areas.[101]

Within five years, the Victorian Government should build new residential rehabilitation and detoxification facilities in regions where they are not currently available or planned – including the Great South Coast, Mallee, Goulburn and Wimmera Southern Mallee.[102] Communities in the Great South Coast and Mallee regions have particularly urgent needs,[103] given their distance from other centres. Facilities should have no fewer than 30 beds, to support a suitable model of care and allow for economies of scale.[104]

New facilities should be designed and delivered in consultation with local communities, service providers, and people with lived experience of addiction and mental illness.[105] Treatment and rehabilitation services must be culturally safe and appropriate for Aboriginal Victorians. The Victorian Government should consider Aboriginal-specific residential detoxification and rehabilitation facilities, co-designed with Aboriginal communities and based on the principles of self-determination[106] (see recommendation 67).

Every $1 invested in alcohol or drug treatment can return $7 in benefits.[107]

Recommendation 92

Fund more Youth Foyers in regional Victoria

Fund at least six new Youth Foyers in regional Victoria by 2026, to better use existing education infrastructure and support vulnerable young people.

Many young regional Victorians experience disadvantage.[108] While vulnerable young people need support in every part of Victoria, pockets of regional cities are some of the most disadvantaged in the nation, and have become more disadvantaged over time.[109] Regional Victoria's smaller job market can also make it extremely difficult for young people to gain employment without experience.[110] The Victorian Government can better support vulnerable people in regional areas to navigate crucial life transitions and help break cycles[111] of disadvantage.[112] Interventions to help a successful transition from school into work or further study help vulnerable young Victorians thrive in later life.[113]

Youth Foyers provide young people aged 16–24 years with stable accommodation for up to three years while they undertake education or training. They offer supported medium-term accommodation, usually co-located with an educational institution like a TAFE campus, acting as a nexus between homelessness and independent or semi-independent living.[114] Youth Foyers provide the time, personalised attention, mentoring, coaching and access to opportunities needed to assist young Victorians to lead fulfilling, independent and productive lives.

Youth Foyers provide a practical strategy for dealing with homelessness among young people in regional areas,[115] and can contribute to Closing the Gap outcomes by supporting education and employment opportunities for young Aboriginal Victorians.[116] A Victorian Parliamentary Inquiry found that Youth Foyers are beneficial for many disadvantaged young people at risk of, or experiencing, homelessness.[117] An evaluation into program outcomes found that Year 12 or equivalent completion rates increased from 42% at entry to 67% at exit and 75% a year later.[118] Delivering more Youth Foyers aligns with the education-focused direction of Victoria's existing youth reforms, like the Home Stretch[119] and Raising Expectations[120] programs.

Youth Foyers demonstrate some cost efficiencies by centralising social workers and services and avoid significant costs to government in employment welfare, housing, health and policing.[121] One economic assessment estimated higher benefit-to-cost ratios over a 20-year period, compared with transitional housing services,[122] and determined that program benefits far outweighed capital and operational costs.[123] Compared with other models, 40-bed Youth Foyers appear to have the lowest service delivery costs.[124] Youth Foyers require enough funding to deliver a high quality service to vulnerable young people. Partnerships with local community services, businesses and local government are important components of their success.

The Victorian Government should fund at least six new 40-bed Youth Foyers in regional Victoria in the next five years. This can reduce young people's experience of homelessness and increase those achieving a qualification and becoming productively employed. We have identified Bendigo, Geelong, Mildura, Morwell, Wangaratta and Wodonga as possible locations for Youth Foyers in regional Victoria, due to high levels of school disengagement and youth unemployment, good public transport links, and easy access to community services and tertiary education opportunities.[125] Expansion need not be limited to these locations if demand and opportunity are demonstrated elsewhere. These sites can be evaluated, potentially supporting further locations in the future.

Recommendation 93

Expand social housing in regional centres, in locations with good access

Focus social housing investments in regional centres, near transport and services, for better access to health, social and economic support.

Regional Victoria is experiencing deteriorating housing affordability, with the proportion of new rentals affordable to lower income households falling from around 60% to 35% in five years.[126] Social housing infrastructure is central to the Victorian Government's response. It provides a safety net for people on low incomes, or those experiencing other challenges that prevent them accessing appropriate housing via the private market.[127] Living in social housing can reduce subsequent homelessness[128] and health service use.[129]

Far more people need social housing in regional Victoria than the current supply can accommodate. Over 16,000 regional Victorian households were on the waiting list for social housing in December 2020, with 10,000 requiring urgent assistance.[130] In contrast, just 4780 new social housing allocations were made for the entire state in 2018–19.[131] Social housing demand, compared with the number of social housing dwellings, is higher in regional Victoria than in Melbourne.[132] This reflects, in part, the higher proportion of people experiencing disadvantage in regional areas.[133]

The Victorian Government should expand the supply of social housing in the regions to better assist disadvantaged and vulnerable Victorians. Infrastructure Victoria recommends a statewide target of at least 4.5 social housing dwellings for every 100 households by 2031 to improve access to social housing in Victoria (see recommendation 68). However, the statewide target should not be evenly applied in every region or local area. Instead, greater numbers of homes should be provided in accessible locations which can give residents ready access to the health, social and economic support they need.[134]

Outside Melbourne, the Victorian Government should primarily construct new regional social housing stock in regional centres. These places are best situated to provide access to the transport, services, and jobs which are increasingly concentrated in regional hubs. The Victorian Government should prioritise centres according to unmet demand and forecast population growth, with priority for growing cities such as Geelong, Ballarat and Bendigo.[135,136] It should select specific social housing development sites to maximise good access to services by walking, cycling and public transport, and collaborate with local governments and housing providers so available housing better meets local demand.[137] The Victorian Government should address Aboriginal Victorians' housing needs in partnership with Aboriginal community-controlled organisations (see recommendation 67), informed by *Mana-na woorn-tyeen maar-taarkoort,* the Victorian Aboriginal Housing and Homelessness Framework.[138]

The Victorian Government is investing $1.25 billion of its 'Big Housing Build' in regional Victoria, to construct an estimated 2300 social housing dwellings in four years.[139] It should carefully target this investment so housing is made available in the right locations, accessible to transport and services. Beyond this timeframe, regional Victoria will require more social housing construction to meet the needs of regional communities.

Recommendation 94

Make social housing suitable for changing local climates

Continue to deliver a long-term program of modifying social housing to be climate-resilient by improving the energy efficiency and energy affordability of residences.

Climate change is projected to cause temperature increases of 0.8°C to 1.9°C across Victoria by 2030.[140] Northern Victoria already experiences frequent extreme heat events, and their frequency is likely to double by 2050.[141]

Exposure to extreme heat can increase health risks, especially for older people, pregnant women, young children, people with a disability and chronic health conditions, people on low incomes or who are socially isolated.[142] Children may experience disrupted sleep in hot conditions, affecting their learning and health.[143] The standard of housing in which low income households live can also increase heat-related health risks.[144]

In current conditions, many homes are unable to maintain a comfortable, healthy temperature during summer without air conditioning. In particular, social housing is often older and less energy efficient, meaning homes heat up faster and stay hot for a prolonged time.[145] For some tenants, heat related discomfort can be worse inside than outdoors.[146]

Social housing tenants are often unable to modify their homes. They often cannot afford improvements, or the higher energy bills and extra maintenance costs, and must navigate a cumbersome approval process to make any changes to their home.[147] Energy hardship – a lack of affordable, renewable and reliable energy services – affects an estimated 40% of rental households. Low income renters, Aboriginal households, and culturally and linguistically diverse groups are among those most affected.[148] The Victorian Government's Social Housing Energy Efficiency program provides $112 million for targeted energy efficiency upgrades for 35,000 social housing properties, which includes installing air conditioning in the north and west of the state.[149]

The Victorian Government should continue these efforts in a long-term statewide program[150] to retrofit social housing to be energy efficient, maintain thermal comfort and reduce energy costs. The program should include installing reverse cycle air conditioning, energy efficiency improvements and photovoltaic solar panels. This should improve energy affordability and help offset any extra costs of increased electricity use, such as from air conditioners.

Not all modifications will be necessary or possible in all homes, but they should be selected for best value after an energy assessment, such as the Victorian Government's Residential Efficiency Scorecard.[151] Some improvements take as little as three years to pay back their costs in energy savings.[152] Infrastructure Victoria estimates an upgrade could cost on average $10,000 for each home, but newer homes or more limited modifications would be cheaper. We estimate the cost to be around $23 million each year for 30 years, but broader renewal of ageing stock (see recommendation 55) would reduce this estimate.

The program should prioritise areas and upgrades which have not been covered within the Social Housing Energy Efficiency program,[153] focusing on the hotter areas of Victoria and expanding statewide over time. More energy efficient social housing contributes towards Closing the Gap for Aboriginal Victorians by improving access to appropriate and affordable housing,[154] and helps achieve Victoria's 2050 zero emissions target[155] by reducing residential energy consumption.

Delivering infrastructure policies, reforms and projects

Publishing this strategy is a new beginning, not an ending. We hope its strong, evidence-based ideas and recommendations influence the public discussion and government, business, and community decisions for many years. For more detail on each recommendation, we have produced a strategic estimate of its potential cost range, stipulated the recommended timing for delivery, and considered funding options for major policies, reforms and projects (see Appendix C of Volume 2).

We have deliberately made recommendations that the Victorian Government can implement. We also recognise that other governments, businesses, organisations and the Victorian community can also take action to achieve the strategy's objectives. For example, we have noted some specific recommendations where the Australian Government can contribute in our funding options.

Most immediately, the Victorian Government has 12 months to respond to this strategy's recommendations and publish a new five-year Victorian Infrastructure Plan. Even after this response and the Victorian Infrastructure Plan's publication, the more detailed tasks of planning and delivery will continue. Infrastructure Victoria has a continuing role in monitoring delivery of the Victorian Infrastructure Plan by publishing regular assessments each year in our Annual Report.

Our consultations revealed many delivery aspects needing close attention to produce the best results. These include:

Integrating land use and infrastructure planning

Each policy change, reform and infrastructure project provides a new opportunity to better integrate with land use changes and other infrastructure sectors. This helps maximise the benefits of change, achieves better land use outcomes, and helps deliver the aspirations of *Plan Melbourne.*

Achieving climate goals

Achieving the Victorian target of net zero emissions by 2050 will require change in all infrastructure sectors. Each policy, reform and project should consider its climate impacts, resilience to a changing climate, and opportunity to reduce greenhouse gas emissions.

Deep consultation and engagement

Almost unanimously, communities, industries, local governments and organisations called for governments to consult with them more genuinely and thoroughly, when implementing infrastructure policies, reforms, and projects. Thorough consultation and engagement can reveal more detailed local community and industry impacts of decisions, help facilitate support, and identify opportunities to produce better outcomes. Given their traditional custodianship of the land and right to self-determination, genuine consultation with Traditional Owners and Aboriginal communities is especially critical.

Detailed planning and assessment

For this strategy, we have made recommendations based on strategic and high-level evidence. Before policies, reforms and projects are announced and implemented, they should be further interrogated and refined, such as with detailed business cases or regulatory impact statements. This will improve their ability to deliver benefits with greater confidence and lower costs.

Collaboration in delivery

Apart from the Victorian Government, other parties may bring knowledge and resources to achieve the strategy's recommendations. The Victorian Government can fully explore all sources of funding and potential delivery partners in progressing the recommendations.

Achieving broader social and economic goals

Changes to infrastructure can include an examination of the way they can also contribute to broader Victorian Government social and economic goals.

Helping empower Aboriginal Victorians

Infrastructure projects can help advance the goals of self-determination, Closing the Gap in outcomes for Aboriginal Victorians, and enhancing the visibility of Aboriginal culture. For example, building on existing social procurement requirements giving Aboriginal Victorians jobs constructing infrastructure, helps further strengthen their employment outcomes. Similarly, new infrastructure can incorporate Aboriginal cultural symbols, artwork, totems, stories and languages to reflect and promote Victoria's Aboriginal heritage and culture, helping increase its visibility and prominence.

Good design

Well-designed infrastructure maximises benefits and minimises impacts. Good design includes considering functionality, life-cycle infrastructure costs, energy efficiency, resilience and accessibility. Attention to aesthetics can help reduce community concern about preserving their neighbourhood character. Good design also explores opportunities for other benefits, such as creating and connecting open spaces.

Industry capacity and capability

Victoria has a significant pipeline of funded or committed infrastructure projects. The volume is challenging the capacity of the construction industry to deliver. This includes sourcing raw materials and maintaining a skilled workforce of professionals to build, operate and maintain the infrastructure. Industry capacity and capability should be a major consideration in planning and design of infrastructure polices, reforms and projects.

Job creation and social procurement

Infrastructure projects can create employment during their construction, and from their operation and maintenance, which may be especially important during economic downturns. Procurement can be used to help maximise the benefits of job creation, including by requiring local content, and ensuring jobs are offered to local communities, or to specific groups experiencing disadvantage, such as young people. Procurement can also help achieve environmental objectives, such as by requiring a minimum proportion of recycled materials.

The *Infrastructure Victoria Act 2015* does not envisage a role for us in delivering this strategy. But our work continues, including by providing periodic advice to the Victorian Government, conducting research into infrastructure matters, and monitoring delivery of the Victorian Infrastructure Plan.

In three to five years, we will again update this strategy so it remains current, relevant, and incorporates the latest evidence. We thank everyone involved in helping create this strategy, and look forward to continuing our dialogue with communities, industries and governments.

Acronyms

Term	Definition
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
AoD	Alcohol and other Drugs
CBD	Central Business District
COAG	Council of Australian Governments
COVID-19	Coronavirus Disease 2019
DET	Department of Education and Training
GW	Gigawatt
ICT	Information and Communications Technology
kW	Kilowatt
MM2	Melbourne Metro Two
MtCO2-e	Megatons of carbon dioxide equivalent
NABERS	National Australian Built Environment Rating System
NatHERS	National House Energy Rating Scheme
NBN Co	National Broadband Network Corporation
NEIC	National Employment and Innovation Cluster

Term	Definition
NEM	National Electricity Market
NSW	New South Wales
PSP	Precinct Structure Plan
RACV	Royal Automobile Club of Victoria
SDGs	Sustainable Development Goals
SWRRIP	Statewide Waste and Resource Recovery Infrastructure Plan
TAC	Transport Accident Commission
TAFE	Technical and Further Education
TEU	Twenty-foot equivalent units
VITM	Victorian Integrated Transport Model
VLUTI	Victorian Land Use and Transport Integration
VNI	Victoria – New South Wales Interconnector
VPA	Victorian Planning Authority
VPP	Victoria Planning Provisions
Wi-Fi	Wireless Fidelity

Endnotes

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1.2 Respond to a changing climate

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