GOAL FOUR SUSTAINABLE COMMUNITIES
**SUSTAINABLE COMMUNITIES**

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GOAL FOUR SUSTAINABLE COMMUNITIES

4.1 Urban Expansion: Our Cities and Towns

Proposition

The protection of ecosystem services is integral to our quest for liveability and the sustainability of our cities and towns. To build resilient, thriving communities we need our planning systems to provide a coherent, certain and strategic vision for human settlements. This ‘vision’ will need to reflect environmental protection imperatives, and an understanding of the value of ecosystem services and their integration with our social and economic activities.

‘Allowing us to grow further and further out, to actually perpetuate sprawl, is creating an incredibly unaffordable, unsustainable and impractical future.’

Professor Roz Hansen, Chair of the Ministerial Advisory Committee on Victorian Metropolitan Planning

Bus transit looking east across to Melbourne
Context

Commentary about urban settlements has appeared routinely in Victorian State of the Environment reports since the first report in 1986. Ongoing interest is a function of the increasing importance of cities as:

- population centres
- engine drivers of economies
- centres of social activity and interaction
- contributors to biodiversity loss
- greenhouse gas generators.

Our Water Foundation Paper outlines work being undertaken in respect of integrated water cycle management and water-sensitive urban design and our Climate Change Foundation Paper provides insights into impacts.

Cities are intensely challenging as environmental focal points: ‘approximately one-fifth of all GHG emissions from end use energy consumption can be directly attributed to domestic transport-and-housing-centred activities’.

Melbourne is growing faster than Sydney. Across the country, construction, with all its resource-use intensity, is our third-biggest industry after finance and manufacturing. We know that cities generate 80% of our GDP and that two-thirds of Australia’s population live in our major capital cities.
‘The way that a city, its suburbs and buildings are designed and built can have a large impact on long-term environmental sustainability, how its inhabitants live, work, commute and participate in recreational activities. The potential for urban growth to exceed a city’s capacity and expand into the surrounding natural environment or rural land in the absence of sustainable precinct planning, has been common in the recent past. This has led to widespread, low density urban areas where people are predominantly car dependent to access employment and services. In urban sprawl areas, often there is a focus on road building over improving infrastructure for public transport, cycling and walking. It also results in a loss of the rural land and open space that surrounds a city and is important for its aesthetic, recreational and productive value.’

City of Whittlesea

4.1.1 Integration and alignment: equates to liveable and sustainable

Depending on the criteria used, Melbourne has either the highest city liveability ranking (for three years in a row)\(^3\) or, taking a range of different sustainability indicators, the city can be ranked 17th (Mercer Quality of Living Survey)\(^38\) or 34th (City Infrastructure Ranking).\(^39,40\) We clearly wish to retain the mantle of liveability, which rests upon good environmental quality as much as social and economic foundations.\(^41\) The protection of the environment and the provision of its ecosystem services are fundamental to our aspirations.

If the question is: What to do to engender environmentally sustainable outcomes for our cities? Crudely, the answer is: integration and alignment.
Plan Melbourne

On 9 Oct 2013, Plan Melbourne, the Victorian Government's metropolitan planning strategy for the next 40 years was released for comment.

The strategy is intended to guide Melbourne's development and growth by bringing together for the first time infrastructure, housing, employment, transport and environment in the one integrated plan.

The key aspects of Plan Melbourne include:

- A permanent urban growth boundary will be put in place to curb urban sprawl by distributing population growth to our regions. A ‘State of Cities’ will be created as new major population and employment towns for growth across Victoria. This includes Bacchus Marsh, Ballan, Broadford, Kilmore, Warragul-Drouin and Wonthaggi.

- At least half of Melbourne’s residential zoned land will be protected from high-rise apartment development with a Neighbourhood Residential Zone.

- Driving the growth of the City of Melbourne as Australia’s largest jobs hub by 2040 as major new urban renewal precincts including Fishermans Bend, E-Gate and Arden Macaulay begin and Docklands is completed.

- Implementing the Metropolitan Planning Authority which will play a critical role in managing and delivering Plan Melbourne along with the largest urban renewal pipeline in Victoria’s history. The Authority will be charged with working with local governments, landowners and other stakeholders in delivering many of the initiatives of Plan Melbourne as well as the structure planning of a number of new precincts.

- Investigating a third airport for Melbourne’s South East to serve Gippsland and Melbourne’s South East. The airport would serve one-third of Victoria’s population including the 300,000 residents of Gippsland.

Releasing the plan, the Premier Dr Denis Napthine said:

‘This is an integrated land, transport and economic strategy that will change our thinking about better using city-shaping policies and infrastructure projects to enhance the city’s liveability and attract investment and jobs.’

Submissions and feedback on Plan Melbourne will be accepted until Friday 6 December 2013.

RECOMMENDATION 19

It is recommended that the Victorian Government establish an independent statutory planning authority.

ATTRIBUTES

The proposed planning authority would have statutory powers, functions and accountabilities to:

- strategically integrate land use planning
- issue land release policies in relation to infill and greenfield development
- develop precinct plans for environmentally sustainable land use and development, aligning transport and other infrastructure needs
- develop a Sustainable Development Practice Direction and a Sustainability Policy as a component of the State Planning Policy Framework.
4.1.2 Cities driving change: research, views and exemplars

As Victoria reviews its planning systems, it is instructive, as to the complexity and importance of planning cities, to consider some research and programs already initiated by national, state and local governments.

A time line outlining recent national level cities’ interventions and research illustrates some of the key themes and challenges:

- 2009: COAG agreed to city reporting arrangements and the Major Cities Unit was created.
- 2010: The State of Australian Cities Report was published and the Federal Treasury observed ‘getting it wrong [in relation to cities] is likely to be very costly economically, socially and environmentally’.
- 2011: A Sustainable Population Strategy was developed and Our Cities, Our Future: A National Urban Policy for Australia was developed.
- 2012: The COAG Reform Council produced recommendations in its Review of Capital Cities Strategic Planning Systems, the Urban Policy Forum was convened and SEWPaC developed sustainability indicators.
- 2013: The State of Australian Cities Report advances a cities agenda and notes that the number of heatwave-related deaths in Australia’s major cities is set to quadruple by mid-century.

The governance landscape is complicated. At the federal level 11 ministers, 13 departments, 30 committees and 60 programs deal with city-scale issues, and similar interfaces are found in state and local government operations. The Australian Sustainable Built Environment Council and others have suggested the need for a cities minister.

Agencies and business are exploring sustainability issues. Infrastructure Australia and the Business Council of Australia are leading a growing chorus for a focus on cities.

In this accelerating atmosphere, strategic planning, more than ever, is necessary to arrest environmental impacts and optimise outcomes. A wide range of issues need to be considered, and best outcomes will flow from integration of planning, design, transport and climate change adaptation responses.
4.1.2.1 Performance benchmarking: planning zones and development assessments
The Productivity Commission has reported on the level of complexity and the issues that the growth of cities raises in respect of:

- clarity of strategic city plans
- coherence of laws and regulations
- and jurisdictional multiplicity.16

Many of the Productivity Commission’s recommendations as to fast tracking and relieving the regulatory burden have been supported by the Urban Development Institute Australia and opposed by organisations including the Environment Defenders Office.16

Reflecting environmental concerns, the Australian Institute of Architects in its submission to the Productivity Commission observed:

‘It is clear that our cities are rapidly reaching a critical point in history where the imperative for solid leadership and action is now. Australia is one of the most highly urbanised nations on the planet, we face a growing population, one that is ageing, and we are witnessing many stresses on our cities, from traffic congestion to climate change and environmental impacts, through to housing affordability and infrastructure decline [italics added].’

4.1.2.2 Driving sustainability
The importance of cities in driving and reflecting environmental sustainability is recognised internationally. PlanNYC, the plan for New York City, considers the implications of transportation, housing, energy, parks, brownfield, air quality, waterways, solid waste, water supply and climate change.17 In Europe the Carbon Disclosure Project has reported on the potential in using sustainability to drive competitiveness in its reports Seven Climate Change Lessons from Cities of Europe (2012) and Wealthier, Healthier Cities: How Climate Change Action is Giving us Healthier, Wealthier Cities (2013).
PricewaterhouseCoopers in Cities of Opportunity (2012) reports on the ‘natural environment’, adding this indicator to the list sustainability indicators. Siemens in the Green Cities Index observes:

- urbanisation has environmental consequences
- cities contribute 70% of our greenhouse gas (GHG) emissions
- we must respond in an integrated manner (emphasis added).

The London School of Economics in Going Green: How Cities are Leading The Next Economy discusses, with supporting case studies, how cities can build a greener world from an integrated and aligned platform of actions.

Reflecting this work, the Australian Sustainable Built Environment Council has developed a framework to address the need for a sustainable built environment, examining:

- economic prosperity
- sustainable land use and transport
- natural resources
- ecosystem health
- liveability
- social inclusion
- good governance.
4.1.2.3 Local government leading

At the municipal level there is continued recognition for the need for integration, and of the increasing role of local government in addressing environmental sustainability issues. The Municipal Association Victoria, together with a number of councils, has formed the Council Alliance for a Sustainable Built Environment, with ecologically sustainable development (ESD) as the focus. The MAV’s website carries a list of participants, tools, guides and links that enable networking and promote sustainable change. These include:

- Sustainable Buildings Guide
- Sustainable Design Assessment in the Planning Process
- Sustainable Assessment Framework
- Sustainable Urban Development Framework
- Sustainable rating tools, including STEPS
- Sustainable Design Scorecard
- Music and Storm
- NatHERS
- Green Star
- NABERS.

The work done at Boroondara City Council on a Sustainable Buildings Policy; at the City of Port Phillip on a sustainable design policy; and the City of Melbourne on energy, water and waste policies is instructive. The City of Melbourne joins Yarra and Moreland in attaining carbon neutrality, and it is seen as an example of best practice environmentally, economically and socially and internationally, having just received the C40/Siemens Climate Leadership Award in the category Energy Efficient Built Environment (for which Berlin and New York were shortlisted). In the same awards ceremony Bogota was recognised for Urban Transport and Singapore for Intelligent City Infrastructure.

At Ringwood, the council’s carefully considered Activity Centre Policy describes and authorises better outcomes around:

- high-density dwellings
- car parking that does not preclude public transport or pedestrian movement
- street tree plantings.

Moreland City Council’s Higher Density Design Code (Draft) reflects interest in improvements and illustrates the breadth of issues impacting environmental sustainability.

The complexities are evident. Added to the considerations already outlined, the issues of demographics and travel are also considerations for local governments. The demographics are shifting. Baby Boomers’ housing preferences and requirements are unclear and will need to be researched. Younger people are showing a marked preference for greater-density housing and reduced car ownership.

Trip orientation and employment adds another layer of complexity. Employees and businesses in Pakenham do not necessarily have the same transport needs as those in Frankston or Sunshine, and periphery-to-centre travel requires careful consideration.
Reflecting interface council pressures, the CEO of Cardinia Shire Gary McQuillan told the Outer Suburban/Interface Services and Development Parliamentary Committee that ‘... over the next 15 years interface councils will accommodate 60% of Melbourne’s population growth, so the interface councils will be doing much of the heavy lifting to accommodate the state’s future population.’

Presently burdens and benefits are inequitably distributed (as the Vampire Index graphically illustrates), and planning decisions continue to impact the environment and the ecosystem services the environment provides. We need to organise, implement and consistently and thoroughly evaluate implementation with care. Business-as-usual urban planning processes predicated on the continuing expansion of the city’s footprint do not presently deliver environmentally sustainable outcomes, and conflict and confusion is endemic.
4.1.3 Interventions to date
A range of planning interventions has been occurring since the Victorian State of the Environment report was published in 2008. Instruments including Melbourne 2030 and Melbourne@5 million, the Good Design Guide for medium-density housing and residential, industrial, commercial and rural zoning are all undergoing significant changes. New organisational structures are also being established. At the organisational and structural level, for example, the Victorian Building Authority was launched in July 2013 to replace the Building Commission and the Plumbing Industry Commission. All of these aspects need to be integrated and aligned.

Sustainability and green growth
Expert commentator Professor Roz Hansen, advises ‘... effective spatial planning promoting compact city development is a fundamental support system for green growth [italics added].’35

The Victorian State Planning Policy Framework (Sections 11.04-5 and 6) calls for the protection of ‘non-urban areas’ and the ‘consolidation of new residential development within existing settlements and in locations where planned services are available and Green Wedge area values can be protected’.36 These requirements continue to be highly significant, particularly in an atmosphere of planning reform.

Melbourne and Victoria are at present undergoing a marked shift in planning policy. The Planning and Environment Act 1987 has been amended, changing machinery of planning in relation to referral authorities, time limits on planning permits, applications to VCAT about extensions of time, tribunal proceedings, permits, legal review, the establishment of a planning application committee, Growth Areas Authority powers about declarations, advice requests and provision, and directors’ liability. Further amendments commenced in October 2103 to reduce delays and streamline planning scheme amendments. Ministerial Advisory Council recommendations about planning will also change the planning and development landscape (see below).

We face a range of ongoing and significant environmental, social and economic challenges. Notwithstanding the development of the Biodiversity Conservation Strategy for Melbourne’s Growth Corridors,42 land excised for housing and associated development continues to consume natural assets and undermine the ecosystem services6,43 upon which we all depend.

The social, environmental and economic impacts of a development pattern which is unsustainable include:

- car dependency
- excessive and costly energy consumption
- social isolation
- public health problems
- productivity losses and mortgage vulnerability44
- habitat and native vegetation loss, notwithstanding recourse to offsets45
- ecosystem fragmentation due to a number of factors, including transport corridor construction46
- the erosion of ecosystem services where consumption and waste are elevated, and in some instances the loss of agriculturally productive land.47
Traffic congestion and its impacts are increasing and our greenhouse footprint, even with increased efficiencies in fleet, remain a challenge. Public transport will continue to stretch to meet growing public transport needs and changing usage patterns. Road construction results in the loss of green spaces, noise and emissions, and impacts on habitat and ecosystem services.

In the face of these challenges, governments that plan for sustainable cities will promote resilience and be better prepared for population and climate change eventualities. In developing resilience, cities will be more environmentally and socially sustainable. While the most challenging natural disaster threat in our cities is heatwaves, we will confront other less immediately pressing matters, which will also be better resolved by resilient environmental and social communities.

To be leaders in generating green growth in our cities and regional towns, we need to ensure an integrated and strategic approach to planning.

4.1.4 Strategic urban planning for environmental outcomes

The way cities develop impacts the ecological footprint of residents. Architects, engineers, landscape architects, planners and a range of other professions tell us that we can affect this outcome with strategic planning. Environmental planning policies that are fundamental to better environmental outcomes will:

- involve the public
- involve the whole planning community
- be well understood
- be consistently applied
- reflect informed community choices.

Figure B.4.1.2: Melbourne's outward expansion over time
4.1.4.1 The environmental footprint of urban expansion

Urban development and the natural environment have an inherently contentious relationship due to the impacts of the built environment and infrastructure on the mobility and dispersion of flora and fauna. It has been estimated that 50 per cent of Australia’s threatened species occur on the urban fringe.61

The Victorian Biodiversity Conservation Strategy has been established in an effort to address this issue. Thirty-six conservation areas within the growth corridors are listed to be protected and managed in perpetuity.42 Offsets form part of the strategic response. The challenge is considerable.

As a city extends away from its core, it will impact ecosystem services55 in ways that are not always well understood,62 but in respect of which the scholarship is growing.63 The Convention on Biological Diversity has recognised the important role of cities in impacting biodiversity since the 2008 Ninth Conference of the Parties and that view was reinforced in 2010 with the establishment of the Plan of Action on Sub-national Governments, Cities and Other Local Authorities for Biodiversity.58

Species within urban boundaries will be impacted as a function of consumption and waste patterns. Illustrating the potential impact, cities occupy 2% of the land mass, but consume 75% of the world’s resources.64 Impacts of an expanding city will include:

• the surrounding natural environment and ecosystem services becoming vulnerable through introduction of weeds and vermin along rivers or via cropping,65, 66 generally, and along transport routes67
• travel distances to work, school, recreation and services increasing with commensurate increases in greenhouse emissions which impact biodiversity68
• food and goods being freighted further, with implications as above
• increased infrastructure provision, which without proactive and effective planning, is productive of more impervious surfaces, depleting green spaces, and promoting the urban heat island effect and its impacts on biodiversity.69

Economic and environmental concerns about expansion appear to align. Infrastructure Australia reports that greenfield developments, which contribute to urban sprawl, actually cost more than twice as much as infill in terms of development and transport.70

Arresting the impacts

There is a potential to arrest these impacts. First movers in innovative city planning are adopting new planning methods and seizing opportunities for green growth. The London School of Economics, ICLEI and Global Green Growth Institute have just released a report (2013) complete with case studies and commentary – Going Green: How Cities are Leading the Next Economy35 describing the best of the efforts underway.
4.1.5 Melbourne’s planning machinery

Melbourne’s planning machinery is complex and requires streamlining for better environmental, social and economic outcomes.

Melbourne’s Urban Growth Boundary

Melbourne’s Urban Growth Boundary (UGB), intending to entrench limitations to urban expansion, was established as an amendment to the Planning and Environment Act 1987 in 2002.

Both Houses of Parliament are required to agree to shift the boundary. The boundary has been expanded to subsume open space and farming land. It was expanded in 2010, adding 43,600 hectares.

A Logical Inclusions process, increasing metropolitan land supply, was announced in May 2011. In 2012 the boundary was further expanded by 5,858 hectares. This was the fourth shift of the boundary in 10 years. Approximately 100,000 hectares has been added to Melbourne’s footprint since the establishment of the UGB.

The Logical Inclusions Advisory Committee (LIAC) makes recommendations to the planning minister. Members are appointed on the basis of backgrounds in strategic planning, metropolitan planning and land development.

The UGB is reviewed every two years and private landowners and local councils are asked to nominate land for inclusion. Difficulties and questions have ensued. For example, portions of the Western Grasslands Reserve were nominated for inclusion, even though the land was already committed as an offset for clearing elsewhere.
Growth Areas Authority

The Growth Areas Authority (GAA) is a statutory body, established in 2006.\textsuperscript{78} The GAA manages development on Melbourne’s urban fringe. It is tasked with improving certainty and coordination and expediting decision making about growth area developments.\textsuperscript{79} Growth Area Framework Plans and Growth Corridor Plans accord with the State Planning Policy Framework. The role of the GAA was expanded in 2013.\textsuperscript{80}

Point Cook to Melbourne view

The GAA advises the State Government on land inclusions in any potential expansion of the UGB. Its work, including Precinct Structure Plans and Growth Corridor Plans, is exhibited publicly. Precinct Structure Plans and their role in engendering a commitment to improved water cycle management in new developments were discussed in our water foundation paper.\textsuperscript{6}

In the context of growth area development, the GAA aims to deliver compact and well-connected communities that are economically affordable, while ensuring that the land being developed is used efficiently. VAGO has, however, suggested that access to public transport is not being delivered in growth areas.

Figure B.4.1.4: Percentage of households not within 400 metres of a public transport stop, by growth area council

\textit{Note: Average for metropolitan Melbourne includes growth areas.}\textsuperscript{59}
Figure B.4.1.5: Victoria’s population growth
Source ABS
4.1.6 Biodiversity Conservation Strategy

Work on Growth Areas and Growth Corridors has been informed by the biodiversity studies associated with Delivering Melbourne’s Newest Sustainable Communities Strategic Impact Assessment Report (DSE 2009) and the application of Native Vegetation Management: A Framework for Action (DNRE 2002). The Biodiversity Conservation Strategy, predicated on the work of biodiversity consultants across the four growth corridors, has recently been released. Victoria is leading other states in that a strategy has been developed. Its application and implementation will need to be monitored and evaluated.

The strategy has identified 36 conservation areas within growth corridors that are to be managed in perpetuity. The plan includes establishing new reserves outside the urban growth boundary, the Western Grasslands Reserve, a grassy woodland reserve.

It also involves sub-regional species strategies for the Growling Grass Frog and the Golden Sun Moth, with a Southern Brown Bandicoot sub-regional strategy in preparation. The strategy will involve a range of staggered interventions including long-term data management and storage issues, research, environmental adaptive management, faunal reintroduction, ecological restoration of vegetation, dealing with native pests, ecological quarantine, consideration of the future of grazing, and the role of burning.

Mechanisms for managing planning decisions

Under these planning structures, policies and new interventions sit an array of other instruments and organisational structures. These include:

- multiple local governments with their own planning departments and guidelines
- an administrative review process, which is conducted by the Victorian Civil and Administrative Tribunal.

Final legal oversight about matters of law is the purview of the Supreme Court of Victoria. Victoria does not have a land and environment court, as is the case in NSW.

4.1.6.1 Approaches of local government

Local governments with responsibility for Green Wedge planning have an enormous responsibility to provide public commentary, seek input and consider complex issues in the context of their planning responsibilities.
City of Greater Dandenong
The City of Greater Dandenong has recently drafted and put out for comment its Green Wedge Management Plan (GWMP). This document covers:

- land use
- drainage and water management
- environmental values and biodiversity
- access and movement
- the built form and heritage.

The plan has been developed as reform of zoning is underway (i.e. Residential, Industrial, Commercial, Public Use, Urban Floodway, Special Use) and in the light of the UGB Anomalies Advisory Committee Report (May 2013).

Issues considered in the GWMP 2013 draft include:

- agricultural land (about which there are diverse views)
- pressures for expansion of existing uses
- land fragmentation and degradation
- land banking
- residential rezoning.

City of Kingston
The City of Kingston produced its Green Wedge Management Plan draft in 2012.

The council concerned itself with:

- the ‘chain of parks’
- protecting and improving environmental quality
- landfill management
- declining market garden viability
- promotion of other agricultural uses.

The City commissioned a Kingston Green Wedge Ecological Evaluation to inform this process.

The environment, provision of ecosystem services, and a broad range of ancillary impacts of expansion and sustainability issues persistently challenge local government.

State of the environment reporting has been only one of the mechanisms used to respond to these issues. The City of Whittlesea has developed its draft sustainability report as an illustration of the issues and responses being considered.

The role of local government is further complicated by State Government-inspired revision of policies and strategies, particularly if there are time lines attached to work that is required under planning provisions.

As the Ministerial Advisory Committee on Victorian Metropolitan Planning took submissions from the public and the various instrumentalities with an interest in planning and the environment in urban settings (2013), it became clear that there was great interest in doing things better, protecting the environment and including the community in these discussions. Interest in attaining triple-bottom-line outcomes was a feature of the discussion paper produced by the Melbourne Planning Strategy work.

In the case study that follows, we discuss one representative local government submission, that of the Stonnington City Council.
Case Study: Stonnington City Council

Environmental considerations and inclusive practices in planning determinations

Stonnington City Council raised the following issues as necessary considerations in the development of a Metropolitan Planning Strategy:

- place making or localism
- the need for a collective vision
- the need for design guidelines
- the imperative of ecologically sustainable development
- water-sensitive urban design
- investment in public transport
- distributive networks
- linkages and intra-council partnerships.

Stonnington expressed concern that adaptable design was not considered in the Strategy Discussion Paper. In particular, Stonnington was concerned with the absence of a discussion about air, noise and light pollution.

Stonnington advocated the need for environmental sustainability considerations in driving resilience and providing for first-mover advantage. Particular issues included:

- promoting the potential for walkable urbanism in design
- addressing the ‘urban heat island effect’ by green roofs and walls
- and the increased need for permeable surfaces.

Stonnington and others saw the need for

- a sustainable development practice note
- a specific sustainability policy in the State Planning Policy Framework (SPPF).

Beyond issues of biodiversity and more ‘historical’ pollution problems both Stonnington and the Property Council raised questions of:

- distributed energy
- embedded energy (in construction and other sectors)
- retrofitting
- precinct-wide planning.

The Stonnington submission actively incorporated concerns about carbon pollution, the ‘newest’ pollution issue, with its deep roots in many urban planning issues. In doing so it reflected a growing international concern about these matters at the city scale, and work done by other local government institutions in Victoria, including City of Melbourne and Moreland and Yarra City Councils (to mention only a trio). The Australian Housing Urban Research Institute has consistently raised these issues for consideration and resolution.

Submissions across the spectrum raised the need for environmental protection policies, processes and directives in planning instruments and policies, and the value of collaboration, simplification and clarity in directives.
4.1.7 Strategic planning shifts


The reform agenda reflects government strategies and a number of issues outlined in external reports and discussions. In the BEMP–KPMG report, our overall capital city ranking was not exemplary in respect of how we dealt with budgetary alignment, population management, housing affordability and congestion (see below). On those issues only Perth and Sydney did worse than Melbourne. KPMG’s analysis suggested that congestion cost Melbourne $835 per capita in 2006 and would cost $1,241 in 2020.

Although the KPMG work was undertaken at a time when Melbourne 2030 and Melbourne@5 million operated as the planning framework,83 our current reform agenda is necessary:

Melbourne needs to consider the creation of a program of regular performance monitoring on key national policy issues, given the substantial challenges of implementing large-scale urban renewal to meet growth targets.92

In April 2013 the Victorian Auditor-General reported on issues associated with traffic congestion (principally because of the economic cost associated with this inefficiency), urging the Department of Transport ‘reconsider its initial proposal for the Network and Service Strategy to operate as a stand-alone dedicated transport plan’.93 VAGO’s commentary is based on the understanding that integration through the auspices of a Metropolitan Planning Strategy will optimise efficiencies and promote better environmental outcomes.

4.1.7.1 Melbourne Planning Strategy

The Melbourne Planning Strategy, replacing Melbourne 203094 is scheduled for release in late 2013. From our consultations with experts in planning, this is timely. Our planning machinery requires a significant overhaul to shift Melbourne and our regional cities into the ‘first movers’ arena, where we can protect our ecosystems and ecosystem services even as we deal with population increases and climate change realities.

The strategy offers the chance to link metropolitan developments with regional growth plans and embed environmental protections. An advisory council has been established to formulate mechanisms for adopting this strategy.

Building on the Yarra
4.1.8 Melbourne Planning Authority

A Melbourne Planning Authority (MPA), optimally designed and administrated, would serve as an implementing agent for the Metropolitan Planning Strategy. The establishment of an MPA, necessary to assist in dealing with rapid change and intended to ‘depoliticise’ the planning debate, presents an opportunity for a reconsideration of the environmental impacts of growth and mechanisms to address them. Its establishment is supported by industry and professional groups whose views are most recently echoed in the BEMP 2010 capital city planning audit of COAG reform initiatives.

Preliminary information has indicated that an MPA would:

- be enacted under the GAA legislative framework
- work with local councils on implementing the strategy
- enable a whole-of-government approach to planning
- assist local government to develop strategy-compliant planning schemes, activity centres and growth areas.

Enforcement and other mechanisms associated with the UGB are yet to be determined.

In order for the Melbourne Planning Authority to be an effective organisation and address the gaps and uncertainty in our current planning system, the Victorian Government will need to adopt best practice in planning and facilitate the operation of the proposed planning authority as a ‘dedicated, independent planning authority with permanent analytical capacity tend[ing] towards a more substantial treatment of planning problems and their solutions’. A rigorous and inclusive approach would facilitate the establishment of an evidence base to ensure that maximum environmental, social and economic benefit is generated through the reforms.
Best practice
Best practice would reflect the following:

- Be independent – autonomy avoids conflicts of interest and promotes authority and confidence and ensures public trust in planning, it also promotes the best use of independent and authoritative planning expertise. Portland, Oregon enshrined metropolitan governance in legislation to ensure this.

- Ensure enforcement – the use of a range of instruments including sanctions and incentives can enable and ensure compliance and cooperation. Seattle’s Puget Sound Regional Council addressed an incoherent enforcement strategy by the establishment of targets and also the imposition of penalties for infractions or failure. Fragmentation of enforcement activities among authorities, local governments and agencies is not optimal and should be avoided.

- Promote engagement – involvement of residents, councils, businesses and non-profit organisations must be continuous and responsive. Community awareness, participation and buy-in is critical to the formation, success and future-proofing of an effective strategy and the development and implementation of an environmentally sustainable Melbourne.

- Promote integration – land use, housing development, transport policy and infrastructure provision cannot be viewed as separate challenges. Coordination with other authorities is essential for positive environmental, social and development outcomes. A coordinated approach to determining where – and where not – to provide roads, public transport, drainage, sewerage, utilities and telecommunications can avoid the loss of critical ecosystem services and create a firmer urban edge to Melbourne, reducing unnecessary expansion and adverse environmental outcomes.

- Rationalising revenue arrangements – the development of revenue distribution policies across council boundaries could engender collaboration and greater integration. Globally, most metropolitan governments generate funds from a combination of three main sources:
  - transfers from higher orders of government (44%)
  - local rates and taxes (35%)
  - municipal transfers (21%).

If funding arrangements were streamlined the implications for efficiencies in decision making arrangements might be significant and environmental benefits more coordinated.

Vancouver is held up as a best-practice example of proactively engaging with the community in planning settings – 4% of the population had direct involvement and 20% contributed in some way to the development of the city plan.

Seattle spent nearly three-quarters of its planning budget on engagement as the process commenced.

The Growth Areas Authority works on developing and firming up partnership approaches once growth areas are determined. Early intervention through a Metropolitan Planning Authority in partnership with others could be conducive of improved decision making.
While planning decisions about land development for settlement, education, employment, mobility and infrastructure may be confined to a single council, the implications of these decisions are rarely isolated. In certain circumstances, planning decisions by one council can have adverse environmental, social or economic impacts on surrounding councils. For example, rapid development in one suburb may promote stormwater, drainage and water quality issues in an adjacent suburb.

Collaborative governance models do exist even as they respond to particular contexts. In South East Queensland the Council of Mayors acts to coordinate local interests in a formal way. Peak bodies such as the MAV, VLGA and ALGA and ICLEI provide examples of collaborative processes that promote clarity and consistency, coordination, alignment and integration.

Planning for Melbourne: a model

As all of these discussions and policy formulations take place, the Melbourne and Metropolitan Board of Works continues to be advanced as a useful model of a collaborative and independent planning mechanism that can optimise planning outcomes.
Case Study: Melbourne and Metropolitan Board of Works (MMBW)

At the urban planning and infrastructure scale, the Melbourne and Metropolitan Board of Works (1891–1991) operated as an independent planning authority with representatives from each of metropolitan Melbourne’s councils (as many as 54) prior to council amalgamation.

The MMBW facilitated dialogue and participation and management between the State Government and councils, promoting comprehensive planning outcomes. Planning scheme powers remained the responsibility of councils, but issues of metropolitan significance including land release on the urban fringe, key employment locations and major waterway corridor planning were addressed by the MMBW.96

The MMBW ‘shaped’ the delivery of infrastructure – ‘some of Melbourne’s best planning was delivered under the auspices of the MMBW’, and in some ways it resembled the current Greater London Authority, which is making real shifts to environmental sustainability policy implementation in London.96 The MMBW had the power to rate and also issue infrastructure bonds.

The key differences between land management under the MMBW and the current system are:

- Land release was determined completely independently of government.
- The system provided certainty.
- Decision making was less influenced by short-term political cycles.

An important benefit of the MMBW approach was the integrated management of infrastructure and land-use management and decision making. As the MMBW’s wide-ranging powers extended to the planning, financing and delivery of sewerage and highways,96 development patterns were infrastructure-led, rather than development-led. Development was clustered around infrastructure, manifested through the development corridors that radiated outward from Melbourne.

The MMBW was dismantled in 1991 and its powers were redistributed. However, the model retains its merit and it continues to receive support from urban planning specialists and researchers.100

Comparative examples of good practice include both the Greater London Authority101 and the Greater Vancouver Regional District.96 The Greater London Authority drives changes across the city in carbon accounting, retrofitting, parks management and establishment, street trees, air quality, waste management, climate change mitigation and adaptation, decentralisation of power and traffic management.102

In the current planning reform environment there is the prospect of staging the re-emergence of an whole-of-city planning authority, and careful consideration of this could assist in driving the innovations necessary to generate environmentally sustainable outcomes.96
4.1.9 Planning in the regions

In a review of previous planning strategies prepared for Department of Transport, Planning and Local Infrastructure (DTPLI), it is acknowledged that state-led regional planning has historically ‘been conceived of as [the function of the] “capital city” and remained firmly planted in inner Melbourne.’

This, combined with a need to depoliticise urban development, a need acknowledged by the Victorian Government, justifies the exploration of a regional planning governance structure that is autonomous, non-partisan and independent.

Essential Economics recently reported that the largest 10 Victorian regional cities could grow by almost 300,000 people by 2031. A major concern is that, given current design and development criteria, existing residential land may only meet 75% of the required land to accommodate this growth. From this study it would seem that Victoria’s natural environment and the erosion of ecosystem services in the regions is a risk unless there is coordinated strategic intervention.

We are presented with a once-in-a-generation opportunity to plan for human settlements, which we know will expand and which we know will have poor environmental and social outcomes unless properly provisioned with fit-for-purpose infrastructure.

We can plan for whole-of-state interventions in a coordinated and measured, purposeful way, and in doing so we can protect the environment and the ecosystem services upon which we are so reliant.

Regional cities throughout Victoria do not have formal growth boundaries like Melbourne, and agricultural and open space can be developed through the use of rezoning and amendments to local planning schemes. The recent Rural Zone Conservation controversies give an indication of the level of interest and potential polarisation. The minister retains call-in powers that allow for override of local council decision making and the minister can also exempt decisions from VCAT hearings.

There is a recognition of the need for changes in regional planning processes, arrangements and structural formulas. The Department of Transport, Planning and Local Infrastructure has developed regional growth plans to supersede the regional plans of 2010. The Reformed Zones Ministerial Advisory Council Rural Zones Report recommendations have addressed issues relative to the Rural and Green Wedge Zones. Recommendations support agricultural activity, promote tourism, support rural industry, encourage population retention and promote flexibility for councils.
4.1.10 Alignment, integration and community participation

It has been concluded that there is a need to develop a ‘simple framework for monitoring and evaluating the reformed zones’, which should be continuously applied. The establishment of this framework is endorsed as a mechanism to ensure the continuous evaluation of zoning issues providing it adequately reflects environmental considerations.

As the government has just announced a review of the SPPF to deliver the Metropolitan Planning Strategy and Regional Growth Plans, there is presently a real opportunity for attainment of some of these proposals.151
Case Study: EPA – Integration, Alignment and Community Engagement

A methodology: statutory planning and environmental issues – the EPA–DEPI review of SEPPs

The recent EPA–DEPI review of the Statutory Environmental Planning Policies considers reforming environmental and planning instruments and endeavours to find a new and highly consultative way to effect strategic changes. Mechanisms suggested are organisation-appropriate for environmental protection but show the benefits of clear and purposeful planning and the utility of a staged approach augmented by the use of tools and guidelines.

EPA has been implementing a Planning Strategy, which aims to:

- improve the organisation’s reputation among planners
- improve the organisation’s understanding of its statutory and discretionary role in planning decisions
- build an approach to planning proportionate to risk
- prioritise strategic planning and early application of expertise
- increase and improve published guidance and advice
- promote participation in planning reform within government.

A three-stage approach

The Implementation Program sets out three key stages in this process. The staged approach recognises a necessary shift in resourcing to orchestrate change. Implementation will entail a shift from reactively responding to individual planning referrals to ensuring the development of transformative frameworks, guidance and relationships. A strategic, proactive model is the goal. The three-stage approach will:

1. embed a consistent, coordinated, risk-based and proactive approach to planning across all regions
2. communicate the organisation’s role and priorities to external planners, and focus resources on providing high-quality, targeted advice on the critical planning matters of most importance
3. empower of the organisation’s planners and external planners to build a planning system that addresses critical environmental issues, through the establishment of a reform agenda and relationships.

In 2012–13, the focus of EPA’s activity has been on Stage 1 of the Implementation Program, embedding a consistent, coordinated, risk-based and proactive approach to planning.

This has commenced with the development and implementation of a Planning Referrals Risk Prioritisation Tool, which:

- assists in management of the treatment, prioritisation and response type of planning referrals
- provides a tool to assess the environmental and amenity risk of planning referrals, assess where input is most valuable, and increase early strategic planning decision making.
The policy also provides for the appropriate response for different levels of risk. It has enabled EPA to identify more efficient ways of responding to lower risk referrals and increased the ability to spend time on highest risk issues. In general, priority referrals are those that relate to strategic planning (structure plans, planning scheme amendments), section 55 referrals under the Planning and Environment Act 1987 (EPA has a statutory duty to respond to this) and all statutory and strategic referrals of high environmental risk.

The risk tool will also enable improvements in reporting on the increase in time spent on higher-risk planning work. This structured, practical, strategic and inclusive approach will also help identify:

- training and development needs for staff and external planners
- priority councils for engagement and professional development and education as to EPA's priorities and information needs
- planning system reform needs (for example, having input into proposed changes to Clause 52.10 of the Victoria Planning Provisions)
- policy and guidance needs.

Other actions undertaken as a function of the recalibration of the Planning Strategy Implementation Program will cover a range of strategies, operationalised in an orderly and consistent fashion. Publications, such as the guide outlining the Recommended Separation Distances for Industrial Residual Air Emissions – Guideline (Publication 1518) will be provided.

Identification of top environmental priority actions, such as ‘encroachment’, will present as targeted initiatives promoting work on health and amenity impacts on the community and the impacts on industry viability.

The EPA will consider potential legislative reforms in planning matters on matters such as the proposed changes to Clause 52.10 of the Victoria Planning Provisions requiring planning referrals when areas near industry are rezoned to residential. EPA will commence development of procedures for the management of planning referrals, and this will include an Annual Planning Blueprint setting priorities for planning work for each financial year.

Increasing engagement with Growth Areas Authority and strategic planning divisions of councils will become a specific organisational goal, promoting integration and alignment as well as collaborations where appropriate.

Monitoring and evaluation will become the focus of a specific plan for Planning Strategy Implementation to enable greater understanding of impacts and a capacity to intervene on the basis of evidence-based information.

The sharing of knowledge and resourcing needs will be promoted as a function of a renewal of EPA’s Planning Network.
4.2 The Environment and Sustainable Housing

Proposition

The concentration of urban development is a significant factor in liveability and environmental sustainability, and opinions vary with regard to optimal outcomes. Melbourne has a population density that is less than half that of Paris, a third of London and a twentieth of Hong Kong. Any discussion about environmental sustainability and our built environment and resource use is incomplete without discussing both development density and design – questions of ‘form’ as distinct from the ‘structural’ issues.

Context

Governments and the private building, planning and construction professions have a role in helping the community achieve a greener city and a greener economy through collaborations and knowledge sharing. The involvement of the public and private developers in a wide range of collaborations, including transport corridor developments and other broad-scale eco-developments, are needed to promote better outcomes.

4.2.1 Victoria’s current housing development pattern: the challenge

Housing development presents with its own unique set of challenges. The UN Habitat report State of the World’s Cities 2012/2013 identifies low-density suburbanisation of cities in developed and developing countries as a primary driver of greenhouse gas emissions, climate change and social inequality.

Where, how and in what conditions people live contributes significantly to liveability and sustainability. In a trend expected to continue, housing occupation rates have reduced from 3.0 to 2.6 persons per household between 1981 and 2006 in Victoria. At the same time average house size has increased from 216 m² to 252 m² between 2000–01 and 2008–09.

Studies suggest that housing provision does not appear to match personal and family requirements, demographic trends or even environmental perspectives.
The Property Council in commentary cited by City of Melbourne has expressed the view that ‘the needs of the ultimate occupiers (i.e. renters) are not the primary consideration for developers, purchasers or financiers.’

The Grattan Institute reports a mismatch between the housing that is wanted and that which is actually constructed. The picture is complicated. Multiple stakeholders, a range of factors and formal and informal barriers influence this distribution and polarised positions. Developers point to the barriers that prevent them from building in established areas.

Figure B.4.2.2: Preferred and Actual Housing Stock
Residents, denied a real say in how their neighbourhood develops, often feel they have little choice but to oppose all planning applications and all change. State and local governments are caught in the middle, and no one wins.29

The existing system does not appear to be engendering a proactive interest in urban form or a housing market that promotes a lower environmental impact, community resilience, or the social connectivity required to support more sustainable outcomes. It has been suggested that there is a need to improve our understanding of the barriers to change and the actual ‘mix’ of housing and land-use development which the public/consumer requires.105 Development and urban renewal projects are beginning to address some of the issues, the Fishermans Bend Urban Renewal Project being an example.

Case Study: Fishermans Bend Urban Renewal Project106
In September 2013 the Victorian Government opened the public consultation period on the vision for Fishermans Bend, one of the largest urban renewal projects in Australia.

The approximately 250-hectare area is expected to become home to 80,000 residents and 40,000 high-productivity jobs over the next 30 to 50 years. Three kilometres south-west of the Melbourne CBD, Fishermans Bend will provide an alternative to the continued outward growth of the city, giving more people the choice to live closer to existing jobs, services, public spaces and transport connections.

The Fishermans Bend Draft Vision outlines the overarching strategic directions and key moves needed to transform the existing industrial area into a thriving inner-city environment. The Interim Fishermans Bend Design Guidelines provide guidance to interested developers, architects and planners to encourage good design and provision of adequate public space, facilities and access to public transport. Additionally, there are a number of ways for the community to learn more about Fishermans Bend and provide input into planning for the area’s future, including community information sessions.
In opening the consultation period the Minister for Planning commented that:

‘The Fishermans Bend project will set the standard for urban renewal across Melbourne and Australia over the next three decades, bringing thousands of new residents to areas close to jobs, transport and Australia’s greatest cultural heart.

When looking at the plan it is clear that a number of precincts will develop to include low rise family friendly housing, medium scale development, and high density development around a future transport corridor and new employment hubs.

The plan supports the delivery of a comprehensive open space network, new walking and cycling routes and mechanisms for the delivery of affordable housing.’

Figure B.4.2.3: Fishermans Bend urban renewal map
4.2.1.1 Impacts of location and population on liveability and sustainability

The enormous complexity of the linkages and impacts of urban density and energy and transport use and greenhouse gas emissions were discussed authoritatively in a paper prepared by Gavin Alford and Jeremy Whiteman of the Department of Transport, Transport Policy Analysis and Research Unit in 2008–09. Many of their observations remain relevant today. Recently, in international contexts the World Bank is among those leading the discussion of the need for change for better environmental and other outcomes for cities.

Housing design for environmental sustainability in contemporary Melbourne

Many different mechanisms may promote environmental outcomes in respect of housing developments. As an indication of the interest in ESD, a number of proactive local councils are seeking amendments to local planning policies to facilitate the exercise of sustainability design guides. Examples can be found in the Maroondah City Council and Moreland Council. In response to this interest the Property Council is urging individual council’s ESD design guides to be uniform and standards to be regionally based.

Cities and states are addressing the need for better design outcomes. As the City of Melbourne illustrates in its 2013 publication Future Living, good design is fundamental for a sustainable city. The City of Melbourne also argues that regulation and incentives can assist in achieving this goal. Other examples are found in the Brisbane City Council Residential Design Guidelines, the NSW Residential Flat Design Code and the City of Perth Urban Design Framework. Organisational structures have been used and examples include the East Perth Redevelopment Authority, and Sydney Metropolitan Development Authority. Making Room: New Models for Housing New Yorkers, architectural solutions to address emerging housing needs is a novel initiative.
4.2.2 Design

The Victorian State Architect Geoffrey London suggests a role for a range of mechanisms to produce housing that is both liveable and environmentally sustainable. Sharing design insights across jurisdictions is an important part of the process. Geoffrey London made these comments in the foreword of our 2011 Strategic Audit.

‘It is possible to legislate for better design and sustainability outcomes. The example of SEPP 65 in New South Wales is a compelling instance of legislation lifting the bar on apartment designs in Sydney and specifying a number of performance standards that result in better environmental performance.

The State Environment Planning Policy No. 65 – Design Quality of Residential Flat Development was introduced in 2002 and was intended to elevate design as an important measure in planning decisions.

SEPP 65 sets out levels of amenity which must be achieved, including solar access, cross-ventilation and sound separation between apartments. Included within the SEPP is a process for expert advisory panels to assist local councils with assessments of proposals, bringing informed design judgment to the process.

Achieving high quality architectural outcomes and associated high levels of environmental performance involves processes that require ongoing scrutiny (Geoffrey London, Victorian State Architect 2011).’

Collaboration

The Victorian Government Architect has hosted forums for government and the private sphere, including a ‘Housing Melbourne Symposium’, which partnered with The Prince of Wales’ Trust, as an illustration of the utility of peer-to-peer knowledge sharing.

Sustainability Victoria is rolling out programs which assist and inform the public in a number of ways. The EPA’s efforts to involve the community in its SEPP work is outlined in the section above.
4.2.2.1 Infill in the middle – the greyfields: designing for change\textsuperscript{122, 123}

Research into design and the built environment is increasingly focusing on the bigger picture, on medium density and a precinct-scale approach, in an effort to encourage transition to low-carbon living and reduce recourse to an ever expanding metropolitan footprint for development of population centres and housing.\textsuperscript{110} This work clearly reflects the improved consciousness of our resource-constrained world.\textsuperscript{111}

In response to a commission from the Office of the Victorian Government Architect and in collaboration with Swinburne University, the Monash University Department of Architecture has reported on the potential that architectural design may have for infill development in the middle suburbs at the precinct scale.\textsuperscript{145} This research builds on that being undertaken by the CRC for Low Carbon Living.\textsuperscript{146} An instructive positioning paper, developed under the rubric of AHURI and the aegis of project leader Professor Shane Murray (Monash University), provides stimulating design modelling and specific project outcomes in respect of infill.\textsuperscript{112} In this instance a Commonwealth government initiative, the stimulus plan provided the resourcing for reconfiguring development in a design framework.

Specifically, this commissioned research concluded that there is significant environmental sustainability potential if redevelopment sites are considered for their width, depth and orientation and not simply site area. Best outcomes in infill development in the middle suburbs could be attained if the following attributes existed:

- the site was 7–25 km from the CBD
- the housing to be replaced was 1950s–1970s developments
- proximity to good public transport
- an absence of heritage considerations.

Design briefs, if used effectively in this context, would be able to address constraints associated with site, amenity and regulatory issues by means of:

- flexible compact dwelling design
- improved open space and amenity
- more effective site use and the extension of community benefits
- adaptive housing design
- innovative construction techniques including the take of prefabrication opportunities
- replicable design models.

It was concluded that barriers to middle suburb infill could be overcome with insights provided by design techniques. The following issues could be addressed:

- Where regulated building setbacks acted as a limiting agent, good design and selection of the places to be developed meant that reduced setbacks were not a problem.
- If ResCode, with its focus on neighbourhood character, limited the construction of buildings greater than two storeys, this limiting factor was also capable or being addressed through design.
- In circumstances where excessive overlooking constraints were a community consideration, good design could also limit impacts.

The researchers concluded that to overcome perceptions and market expectations of an en suite in every bedroom and separate double-car garages, good demonstration sites would be necessary.
The research showed that although large redevelopment projects resulted in significant changes to the housing stock, it was smaller projects that generally made up the majority of new or revitalised housing stock. Design presents multiple opportunities, and good examples of practice are found across the state. The Office of the Victorian Government Architect has been instrumental in providing commentary on design briefs, and this has improved outcomes. The OVGA Design Review Panel has played a powerful role in improving outcomes, providing dedicated architects who offer structured reviews, briefings and formal advice to proponents. Site, complexity, context or precedent drive engagement, and oversight can be sought in relation to ‘masterplans, major infrastructure, buildings, streets and public spaces’. Local government is now able to avail itself of the service. The OVGA exercises its discretion in selecting projects.

Since the start of the review process in April 2012, more than 55 design review sessions have been held, $1.9 billion of projects have been scrutinised and more than ‘400 people, including Client Departments, Responsible Authorities and design teams’ have joined the process. Projects have included:

- major transport interchanges
- transport infrastructure projects including level crossing removals
- major housing projects
- hospitals
- parks
- aquatic centres
- cultural and sports buildings
- commercial headquarters
- and town centre masterplan.

Figure B.4.2.4: Environmental outcome
4.2.3 Density

Hong Kong and London, both with population densities significantly higher than Melbourne’s have just been cited in the LSE Green Growth Cities work, illustrating the potential for greening cities of greater population densities. It is clear that liveability can be maintained with greater concentrations of population. A more concentrated settlement pattern can be a means to achieving better environmental and social outcomes. Increased density supports sustainable transport behaviour, as land use and transport are interconnected, if not co-dependent.

4.2.3.1 Market affordable living over affordable housing

After World War II, Melbourne experienced a severe decline in public transport use, although use of public transport is currently increasing markedly. Low population density is one of the most commonly cited reasons for a failure to use public transport. Modelling of integrated transport and land use was undertaken for metropolitan Melbourne by the Victorian Department of Transport, Planning and Local Government in 2008–09. The impact of a growing population under different settlement, development and transport infrastructure scenarios for 2031 was analysed. It was found that urban form and transport infrastructure provision are key drivers of transport-related energy use and greenhouse gas emissions. Consolidating development by decentralisation through new Central Activity Districts (CAD) could minimise impacts single-family housing development on the urban fringe is a key environmental sustainability challenge.

Given these observations, it is apparent that in order to achieve a less environmentally intrusive urban settlement pattern across Melbourne and Victoria and retain ecosystem services on the urban fringe, compact development and other new development should be encouraged along public transport corridors, proximate to jobs and services. New residential development should not take place without first considering travel patterns as transport issues are integral to better urban planning considerations.

In order to ensure potential homebuyers and renters are aware of the cumulative financial and ecological costs of specific housing choices, mechanisms for demonstrating affordability beyond a simple cost-benefit analysis – including environmental impacts – should be more robust.

A potential option would be to develop and market a web-based interactive tool that enables potential new home buyers and renters to evaluate marketed housing and rental units based on actual living costs and environmental impacts. This tool would assist in assessing average energy use and transport costs and other elements that are not apparent at the point-of-sale or lease. This could be valuable in improving housing-related decision making, support better understanding of government policy and planning, and potentially guide investment related to housing.

The EPA and RMIT provided a Greenhouse Calculator for public use in 2012, and a tool such as this could be further developed for broader application.

The US Federal Department of Housing and Urban Development is currently developing metrics to calculate the true costs of housing and transport. Public transport access, residential density and other location efficient factors will be incorporated into scoring grant applications for public housing.
Transport

The Victorian Auditor-General has recently illustrated in Developing Transport Infrastructure and Services for Population Growth Areas that any such guide or affordable/sustainable living tool would only be as good as the actual provision of services on the ground.

The Auditor-General cites the example of the Aurora development, marketed as sustainable living. The community at Aurora still does not have a bus service, even though the bus stops were installed at the time the development was built. The VAGO recommendations are endorsed.
VAGO recommendations

The Victorian Auditor-General’s Office (VAGO) has recommended that:

• the Growth Areas Authority, in consultation with state transport agencies, finalise development of effective arrangements for transparently acquitting the Precinct Structure Plan guidelines and related transport requirements

• Public Transport Victoria develops minimum service standards to guide planning for the frequency and directness of public transport services

• the Department of Transport, Planning and Local Infrastructure, in conjunction with Public Transport Victoria, VicRoads and the Growth Areas Authority develop and implement:
  - a statewide framework for prioritising the delivery of transport infrastructure that reconciles broader statewide priorities against the needs of growth areas
  - an implementation and funding strategy incorporating alternative financing options and innovative solutions to systematically address the transport backlog and meet the future needs of growth areas
  - an associated monitoring and evaluation framework to assess whether the progressive delivery of transport infrastructure and services in growth areas is being achieved as planned and has been effective.
Energy use

Where people choose or are able to live impacts energy use and emissions. A study by the United States Environmental Protection Agency reveals that residents living in conventional suburban developments consume more household and transport energy than similar houses located in transit-oriented developments (TODs). The study also found that in residential areas of very high density, household emissions and energy use were about half of those in very low-density areas. Households with public transport access produce about one-quarter of the emissions of households without good public transport access.

Figure B.4.2.5: Location Efficiency

A US EPA study shows impacts of location and housing type on energy use. A Deakin University study has supported these findings, determining that housing location and housing size are critical factors in determining energy use and greenhouse gas emissions. Medium-density housing in the inner suburbs was found to consume and generate the least operational, embodied and overall energy and emissions of all housing types studied.

Again however, the picture is complex, as other research suggests that ‘high rise dwellings do consume more energy per unit than detached dwellings’ even as suburban dwellings ‘generate much higher levels of automotive energy consumption per capita’. Accepting the environmental impacts of transport issues alone, we need to reconsider the design, type and location of the housing we build to ensure that we build for a greener economy and that the environment is less negatively impacted by the choices we make about the manner in which we live.
4.2.3.2 Targets

Some commentators regard the establishment of targets for construction of greater-density dwellings as a positive mechanism for effecting change. It is notable that the OECD in its compact cities work does not list targets as a mechanism for change. It is argued that the establishment of housing targets would provide greater clarity to developers on what and where they can build to enable local councils to exercise greater authority over the built environment within their jurisdiction provide a higher level of transparency and understanding to the public.

It is also often suggested that the establishment of targets promotes improved data acquisition and ensures better understanding of housing needs at a macro level, by which means targets drive more confident decision making in terms of land supply and zoning.

It is difficult to determine how targets would work in practice in this space. The new residential zoning rules establish density arrangements according to the urban fabric of an area. Targets that define the net increase or decrease in residential units for each council would require considerable work to avoid setting inappropriate and inflexible requirements. To suggest that population projections and regional approval processes overcome these difficulties is simplistic.

4.2.4 Actions and barriers: complexity and simplicity

Concentrating development and human Settlement in existing business and activity centres and inner and middle suburban areas would not only accommodate future growth, but it could also minimise environmental impacts. It has been suggested that quite modest increases in heights and density could increase Melbourne’s population by 3.8 million people while only modifying 7.5% of urban land uses. This new residential capacity could promote the housing types that are actually desired by Victorians, minimise and rationalise transport demand, and reduce housing energy use and emissions.

Barriers to attaining these environmental, social and economic efficiencies and outcomes appear to be found in delays associated with promoting new or different patterns of development, regulatory environments that limit choice, and adverse public perceptions of medium- to high-density living resulting in a lack of support for even slight housing density increases. The question of how best to develop public awareness is discussed at greater length in Chapter 5, but it is important to acknowledge that a great deal of work is being done on this issue in planning, academic and climate change contexts.

The National Climate Change Adaptation Research Foundation submission to the Productivity Commission’s reference on Barriers to Effective Climate Change Adaptation (2011) suggested that public awareness issues required significant research and input. The provision of simple information, as distinct from an engaged process of considering diverse points of view and collaborative problem solving, is not conducive to resolution of complex questions like this.

Communication needs to be an active exercise, organisational barriers need to be eroded, and weak or inapt policies and legislation have to be strengthened or reformed. Incentives, both financial and procedural are a significant part of the solution.
RECOMMENDATION 20

It is recommended that the Victorian Government assume leadership by supporting industry and community in implementing sustainable urban development by developing guides and public awareness tools.

ATTRIBUTES

The scope of the task would involve industry and community consultation leading to guides and tools.

Urban rain garden
4.2.4.1 Financial issues, inefficiencies and externalities

Financial considerations contribute to a lack of enthusiasm for change at both ends of the development spectrum. National reports on affordability suggest developer construction costs feature in this equation.\textsuperscript{129}

Land prices and building application costs are relatively higher for developers in built-up areas than on the fringe. This makes fringe development, where shorter approval times apply, more attractive. Infill multi-dwelling buildings can also require high pre-sale commitments for financing, and this operates as a disincentive for change.

At the other end of the spectrum, developer contributions, including payments, in-kind works and services or facilities provided for infrastructure have historically been under-priced for greenfield development, notwithstanding submissions to the contrary (see the Productivity Commission's reference on Performance Benchmarking of Australian Business Regulation: Planning Zones and Development Assessments).\textsuperscript{130}

Pocket Park, North Melbourne

In its submission to the Productivity Commission the UDIA suggested that other methods of funding infrastructure be considered – including tax increment financing or government borrowing and that infill would be more readily explored if system-wide upgrades to infrastructure were sourced from government borrowings. The ‘under-pricing’ of infrastructure contributions in greenfield sites has been suggested as adding to the financial feasibility of construction in the fringe, but it has also been suggested that greenfield development imposes additional burdens on local government.
Development in the northern suburbs of Melbourne has provided an illustration of the issues. Since the growth areas infrastructure contribution was implemented in 2010, only $33.4 million has been generated. As this contribution was being collected the South Morang rail extension project, which brought public transport services to just a few of these growth areas, cost well over $500 million.\textsuperscript{97}

A study of alternate development paths in Australian cities found that the upfront infrastructure costs for fringe development were actually $86 million more than urban redevelopment and the annualised transport costs over 50 years were roughly $250 million more in the fringe. Another $25 million could be added to the cost of fringe development for the health and wellbeing impacts related to GHG emissions and less active transport.\textsuperscript{98}

There is work underway to review developer contributions in Victoria\textsuperscript{131} and in other jurisdictions to standardise, benchmark and include regional and biodiversity considerations\textsuperscript{132} as the breakdown is complex, and issues require clarification and resolution not just for economic and other efficiencies but also because of the potential benefits that will accrue to the environment. A Reserve Bank discussion paper (2011) remarks that beyond a simple cost-benefit analysis, other ‘private or social benefits’ flow from pricing infrastructure and in directing the developer to pay for this development.\textsuperscript{133}

### 4.2.4.2 Changes to the taxation system: stamp duty and a land tax

Stamp duty arrangements for house and land sales were criticised in the Henry Tax Review as an inefficient tax, distorting the housing market.\textsuperscript{156} It is recognised across the political spectrum that stamp duty adds to Australia’s housing affordability problems and has other negative side effects, such as discouraging people from moving from regions of low employment to places where the job prospects are better. By reducing the transactional costs of moving house, the abolition of stamp duty would remove one significant impediment to downsizing with age. The Henry Review recommendations have not been not implemented. Tax reforms instituted since the review have for the most part not been conducive to increasing housing density or generating commitment to compact city planning.

In 1993 the South Australian government provided a stamp duty rebate for medium-density housing in Adelaide, but this initiative has ceased.\textsuperscript{134} The Intergovernmental Agreement on Tax Arrangements promoted the abolition of stamp duty in NSW this year, but this reform has been deferred. No state or territory has adopted stamp duty changes.\textsuperscript{157} The ACT is moving towards this initiative.

It has been argued that an annual property or land tax replacing stamp duty would reduce a major barrier to relocation from peri-urban areas to suburban and urban areas, providing for greater flexibility in choices of housing type and tenure as personal and family demands, employment location and statewide demographics shift. The data available suggest that shifts in demographics are not well understood but can be expected to impact on the sustainable housing choices.

It has also been suggested that the merits of a location-based tax system are worth exploring. This is reflected in suggestions of the utility of a property or land tax, relative to the amenity provided by the surrounding area. Where housing consumes a greater share of public resources and amenities, the suggestion of a levy or tax has been promoted as having merit. A land tax would also capture some of the windfall gains that accrue to home owners from sitting on a well-located property, and from government investments in civic improvements and better infrastructure. Yates has suggested that ‘the arrival of an annual land tax bill might also prompt some older Australians to ask themselves whether they really want to be paying for the privilege of living in such a large house.’\textsuperscript{135}
4.2.4.3 Incentives

Infrastructure Australia in its June 2013 National Infrastructure Plan calls for the use of incentives to improve land-use planning decisions and reduce costs and inefficiencies. If used to effect, these changes will promote improved environmental outcomes. It is clear that the residents and the state, represented by the government, make significant funding contributions to the development of the growth areas. Incentive programs for different development programs and choices may in fact turn out to be cost-efficient.

An example of intervention is found in Seattle’s Priority Green Incentive Program, which offers expedited review for projects that meet specific thresholds for energy, water and waste reductions. The 2–4 weeks expedited process is important in keeping building and other costs down.

Consideration could be given to creating a ‘priority green expedited’ permitting program to provide priority and expedited building permit review for developments that meet specified green building and environmentally sustainable standards. This sort of expedited response is presently being considered in London, with ‘permitted development rights’ under the National Planning Policy Framework being amended to drive residential builds in business premises, providing ‘opt-out’ provisions for councils. Transparency is essential.

The standards required to obtain expedited outcomes should be stringent and promote meaningful environmental sustainability outcomes. Standards for determining priority should build on established voluntary certification programs such as the Green Building Council Australia’s Green Star building rating and community rating tools. The co-benefit for the development industry of an expedited process with clear and concise environmental standards is the potential for reducing time frames and costs for sustainable housing design.

The business case for EnviroDevelopment Technical Standards illustrates co-benefit potential. The benefits for developers are said to be:

- recognition
- marketing
- corporate image
- nil financial disadvantage
- greater sustainability and liveability.

The benefits for government are:

- increasing community awareness
- supporting the efficient use of resources
- reducing the pressure and demand upon infrastructure
- generating awareness of sustainability strategies.

Benefits for the public or consumer include reduced operating costs and streamlined access to and eligibility for rebates. A focus group canvassed about the benefits reported an 88.6% buy-in on the basis of reduced costs alone. A total of 50 projects have been rolled out across Australia meeting EnviroDevelopment certification processes. While the business case is outlined as providing positive economic outcomes for consumers, ASBEC formed a different view in its zero-emission development assessments in 2012 (Net Zero Emission Homes: An Examination of Leading Practice and Pathways Forward), where it was suggested that low and zero net emissions homes were ‘not yet cost-effective’. The issues continue to be scale and ambition.
Case Study: Walkability research

The extent of the walkability challenge in designing at the precinct level is illustrated in the novel walkability research conducted by the Place, Health and Liveability Program team at the University of Melbourne in conjunction with the University of Western Australia’s Centre for the Built Environment and Health and the Australian Urban Research Infrastructure Network which provides a highly instructive picture of the walkability in urban settings. This work should, over time, form the basis of responsive policy decisions.

Walkable environments produce a range of health and environmental co-benefits, including increased physical activity, social interaction, sustainable living and environmental protection.\(^{141}\)

This research developed, trialled and validated a ‘Walkability Index Tool’: an automated geospatial tool capable of creating walkability indices for neighbourhoods at user-specified scales (i.e. suburb, Australian Bureau of Statistics (ABS) Statistical Areas (SA) and road network buffers generated around user uploaded points) for any Australian urban area. The tool is based on open-source software architecture, within the Australian Urban Research Infrastructure Network (AURIN) framework. Using this tool, user-specified areas can be compared using three key sub-components of walkability (street connectivity, dwelling or population density and land-use mix) as well as a composite index of walkability.

Figure 4.2.4 shows levels of walkability, adjusted for the land area (i.e. area of the SA1, which was the unit at which walkability was measured). It was created using three data sets: roads from the 2011 PSMA transport and topography dataset, dwellings from the 2011 Australian Bureau of Statistics mesh block data, and land-use categories from the 2010 Victorian Valuer-General's Office valuations database. In this map, the more walkable areas in Melbourne NW Region are indicated in shades of green, with the most walkable areas darkest green. Low walkable areas, on the other hand, are shown in shades of orange (i.e. less walkable) to red (i.e. least walkable). As can be seen, most of the outer growth areas of Melbourne generally exhibit low walkability, while inner Melbourne is generally shown in shades of green, indicating much higher levels of walkability. This suggests that for many outer suburban areas, consistent with the evidence\(^{142}\) one would expect that compared with high walkable areas, the odds of walking and public transport use would be lower, while the odds of obesity and vehicle miles travelled would be higher. Previous research has shown that these areas are also mortgage- and oil-vulnerable suburbs. This is because when fuel prices rise in response to peak oil, these suburbs have very poor access to public transport increasing their vulnerability to mortgage and oil-related stress.\(^{143}\) Hence, outer suburban areas are doubly disadvantaged: residents have no public transport, nor are they easily able to walk to local shops and services. They have no choice but to drive, hence their vulnerability when fuel prices rise.
Figure B.4.2.6: North West Metropolitan Region walkability index

The Principal Pedestrian Network currently being trialled to improve transport planning around train stations, involving a partnership between the Australian Government, the Department of Transport, Frankston City Council, City of Boroondara, Shire of Yarra Ranges and City of Greater Geelong, is also offering some indication of improved sustainability possibilities.
Interventions to deal with the issue of split incentives

In many cases where the homeowner is not present and does not pay for energy and water services there is little incentive to undertake energy-saving and water-saving improvements. In the Strategic Audit of 2012 we published a commentary on a social housing development in which government designed the development to reduce its own and its tenants’ exposure to energy and other costs. The process requires commitment, leadership and active planning at the local and precinct level.

RECOMMENDATION 21

It is recommended that the Victorian Government review taxes and incentives applying to the development industry, and based on this review, introduce a framework to support and promote sustainable housing design and development.

ATTRIBUTES

The review, and resulting framework to support and promote sustainable development would give consideration of the following:

- broad community consultation
- innovative tax and incentive arrangements
- split incentives
- current regulatory barriers, including ‘red tape’.

4.2.5 Existing policy framework for sustainable development

The objectives of Clause 16 (Housing) of the State Planning Policy Framework (SPPF) are supportive of integrated, affordable and sustainable housing. The clause states that ‘planning should provide for housing diversity and ensure the efficient provision of supporting infrastructure’.

New housing should have access to services and be planned for long-term sustainability, including walkability to activity centres, public transport, schools and open space. Planning for housing should make provision for land for affordable housing.

The SPPF is vague about how to effect change, leaving the management of change to those whose role it is to orchestrate planning decisions. The framework does not appear to provide certainty with regard to its objectives and strategies. Despite relevant strategies with regard to ‘increased residential densities’ and ‘redevelopment opportunities within the established urban area to reduce the pressure on fringe development’, it would seem that the provisions of Clause 16 are underutilised and unenforceable.
4.2.5.1 Delays
Organised and individual community opposition to medium-density housing proposals can significantly slow progress compared with low-density greenfield proposals. In metropolitan Melbourne, referrals to VCAT occur for 42% of multi-dwelling residential developments compared to 23% for single-family units. The administrative review system itself is also systemically problematic in generating delays, as the Property Council suggested in its submission on the discussion paper on the Melbourne Planning Strategy.

Changes to the Neighbourhood Residential Zone announced in August 2013 will provide greater certainty as to developments that can proceed in certain areas, but the argument is already being mounted that in Glen Eira (for instance) the new zoning provision will reduce the number of available infill developments by 7000.

4.2.5.3 Public perception: improving understanding of the potential and necessity of sustainable design features
Residents in established low-density suburbs are frequently unsupportive of even slight density increases. This opposition is not well understood and the issue requires more research and commentary. The public perceptions that targeted density increases are not conducive to living well and that poor social and other outcomes will spill over into residential neighbourhoods are a real challenge in advancing a planning agenda promoting greater density.

Case studies and visualisation exercises can be used to demonstrate that medium density does not equate to ‘high-rise’ living, thereby working to overcome some adverse perceptions. The Office of the Victorian Government Architect provides facts sheets on good design that assist in increasing understanding of the role of design in generating better housing development outcomes.
### Figure B.4.2.7: Reformed Residential Zones for Victoria, July 2013

*Source: DTPLI.*

<table>
<thead>
<tr>
<th>Zone</th>
<th>Role Description</th>
<th>Resilience Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUZ</td>
<td>Enables new housing and jobs growth in mixed use areas.</td>
<td>Respect and preserve urban character while enabling moderate housing growth and housing diversity.</td>
</tr>
<tr>
<td>RGZ</td>
<td>Enables new housing growth and diversity.</td>
<td>In most residential areas where moderate growth and diversity of housing is provided, it is consistent with existing neighbourhood character.</td>
</tr>
<tr>
<td>GRZ</td>
<td>In areas with a mix of residential and non-residential development.</td>
<td>In appropriate locations near activity areas, train stations and other areas suitable for increased housing activity.</td>
</tr>
<tr>
<td></td>
<td>In local neighbourhood centres undergoing renewal and around train stations, where appropriate.</td>
<td></td>
</tr>
<tr>
<td>Does Rescode Apply?</td>
<td>Yes (up to and including 4 storeys)</td>
<td>Yes</td>
</tr>
<tr>
<td>What Sort of Housing Can Be Expected?</td>
<td>High and medium density housing <em>(A mixture of townhouses and apartment style housing up to three storeys, and higher where appropriate)</em></td>
<td>Single dwellings and some medium density housing <em>(A mixture of single dwellings, dual occupancies with some villa units and in limited circumstances town houses, where appropriate)</em></td>
</tr>
<tr>
<td>Does the Zone Set a Maximum Building Height for Housing?</td>
<td>No but a maximum building height can be specified.</td>
<td>Yes, 13.5 metres but a higher or lower maximum building height can be set by a council.</td>
</tr>
<tr>
<td>Can a Permit Be Granted to Exceed the Maximum Building Height?</td>
<td>Yes when approved by a council.</td>
<td>Yes except when a higher or lower maximum building height has been set which cannot be exceeded.</td>
</tr>
<tr>
<td>Is a Structure Plan or Design Framework Required for the Zone to Be Applied?</td>
<td>No the preferred future use of land and built form may be specified if necessary.</td>
<td>No the preferred future built form may be specified if necessary.</td>
</tr>
<tr>
<td>NRZ</td>
<td>TZ</td>
<td>LDRZ</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>NEIGHBOURHOOD</td>
<td>TOWNSHIP ZONE</td>
<td>LOW DENSITY</td>
</tr>
<tr>
<td>RESIDENTIAL ZONE</td>
<td>IMPROVED</td>
<td>RESIDENTIAL ZONE</td>
</tr>
<tr>
<td>NEW</td>
<td></td>
<td>IMPROVED</td>
</tr>
</tbody>
</table>

- Restricts housing growth in areas identified for urban preservation.
- Provides for residential and other uses in small towns. Enables moderate housing growth.
- Enables low density housing.

- In areas where single dwellings prevail and change is not identified, such as areas of recognised neighbourhood character or environmental or landscape significance.
- In townships.
- On the fringe of urban areas and townships where sewerage may not be available.

<table>
<thead>
<tr>
<th>NRZ</th>
<th>TZ</th>
<th>LDRZ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>

- Single dwellings and dual occupancies under some circumstances
- Single dwellings and some medium density housing
- Single dwellings

A mixture of single dwellings, dual occupancies, villa units and town houses.

- Yes, 8 metres mandatory
- Yes, 9 metres
- No

Can be varied by council with approval from the Minister for Planning.

But a higher or lower maximum building height can be set by a council.

- No

Except when a higher or lower maximum building height has been set which cannot be exceeded.

- Yes

Except when a higher or lower maximum building height has been set which cannot be exceeded.

- No

- No

- No

Department of Transport, Planning and Local Infrastructure
4.2.5.4 Increasing the take-up of built environment sustainability solutions

Establishment of density thresholds
Establishment of clearly defined development corridors with density thresholds through the use of planning overlays in established public transport areas has the potential to ease concerns about medium-density spill-over into low-density areas. It would appear that the new residential zoning provisions may provide some clarity on this even as they foreclose on some of the potential opportunities (see above).

Neighbourhood Development Corporations (NDCs)
Large-scale brownfield and greyfield redevelopment projects have been managed by organisations such as the Growth Areas Authority and Regional Development Victoria. There is, however, a role for community and neighbourhood scale organisations to manage and deliver smaller projects that are contained within specific councils or neighbourhoods. The Port Phillip Houseing Co-operative provides an example.

Neighbourhood Development Corporations (NDC) have successfully delivered housing and development projects in communities worldwide29 and have a demonstrated ability to ensure that council objectives and targets are met, while maintaining the local vision and character at the neighbourhood scale.160

By creating a funding mechanism through State and Federal governments (similar to the Living Victoria Fund), community housing arrangements, with prudential oversight, could be mandated to act in the best interest of the natural environment and the community and consumers. Because NDCs based on regulatory mechanisms such as Small Redevelopment Codes are represented and often run by members of the neighbourhood they can be a useful way to ensure that both macro- and micro-level goals are met.161

Public inner urban investment
More sustainable urban housing and development can be provided through public investment in inner urban areas to offset some of the developer risk. The development of The Nicholson by VicUrban/PlacesVictoria demonstrates the potential for this sort of development even though this development met with significant community opposition as a function of the failure to consult or inform the community and local residents of the proposed development.121
RECOMMENDATION 22

It is recommended that the Victorian Government include efficiency requirements in its design, development and refurbishment of all its social housing and other community buildings.

ATTRIBUTES

Efficiency considerations, in addition to affordability, could include:

- green lease arrangements
- green building design, including open space
- decentralised energy.
4.2.6 Getting to change: guides and toolkits, enforcement and oversight

Guides and tools

Design tools, guides and processes as illustrated in the EnviroDevelopment Technical Standards162 and Green Star (Australian Green Building Council)164 and internationally in such processes as LEED-ND163 are pivotal to changing the way we import environmental issues into planning decisions for better environmental outcomes. Strategic and regulatory tools, subject to independent verification and supported by business cases such as those outlined for the EnviroDevelopment Technical Standards, are necessary to generate interest in take-up of sustainable development and housing opportunities.

Multiple tools and complementary efforts will produce the changes needed. In its three-point plan for sustainable change, the Australian Green Building Council applies visionary leadership, retrofitting and improving buildings, and moving beyond buildings to communities and cities.165

Partnerships and cost sharing will also provide potential as the Smarter Resources Smarter Business – Energy Efficient Office Buildings program shows. Sustainability Victoria has opened the scheme to applications and the Victorian Government has committed $3.59 million to improve the energy efficiency of Victoria’s commercial office buildings to support owners of mid-tier commercial office buildings who invest in energy efficiency upgrades.166

ClimateWorks Low Carbon Growth Plans at national, regional and sectoral levels illustrate the breadth and depth of our capacity to achieve environmentally sustainable, low-carbon, outcomes, even in an atmosphere of growth.167

In addition to the potential offered through formal design processes, other instruments can provide guidance. A wide range of tools and guides to facilitate better urban planning and design outcomes and promote environmental sustainability is developing. Portland (USA) has a Buildable Lands Inventory, Japan has a Guideline for Building Low Carbon Cities and a range of other efforts are discussed by the OECD in its Compact City Policies: A Comparative Assessment report.168

Achievements are proliferating in respect of energy and greenhouse issues where clear cost-benefits can be shown. The list of voluntary initiatives includes the NatHERS rating tool, Green Star and NABERS, and other best practice including the Energuide Rating System, the HomeEnergy Rating System Index, the UK Guide for Sustainable homes, Passivhaus Standard,169 Swiss MINERGIE standards, the Canadian R-2000 and super-e standards, Climate Positive Development Program, and extends to include the work of the WBCSD.
Case Study: Toolkits for transition planning

Centre for Transit-Oriented Development: mixed-income transit-oriented developments

MITOD.org is an online action guide to assist with the creation of mixed-income transit-oriented developments. The guide and tools were developed by Reconnecting America and the Center for Transit-Oriented Development for American Cities and Regions.

MITOD is designed to work with communities through early visioning stages. It establishes existing conditions, collects data, identifies opportunities, transforms opportunities into strategies, and compresses the entire process into an implementable MITOD plan. A critical element of the MITOD tool is that it recognises and responds to the need to maintain affordable living, which is a key challenge of growth management and increasing density.

Reflecting on comments made in the previous sections, any transition planning toolkit should be developed in coordination with not-for-profit groups, architects, planners, landscape architects, engineers, lawyers and local councils. Toolkits should contain a multitude of strategies for encouraging affordable housing, smart growth, and appropriately scaled development in core transport and activity areas. Strategies could include:

- density incentives
- fee-waivers or fast-track programs for affordable and energy efficient housing and development concentrated around public transport
- incentives for providing public amenities such as open space, parks, schools and other community facilities
- smart growth zoning overlays or structure plans which focus mixed-use and medium-density development in appropriate areas
- design guidelines
- explanatory memorandums regarding regulations for energy supply, use and efficiency
- sustainability requirements for affordable housing

In the commercial building arena the City of Melbourne 1200 Buildings Program is working on delivering improved outcomes. The Cbus superannuation fund involves itself in property developments and reports on a number of its 6 star and 7 star Green Star developments. While green lease information can be difficult to source, there is evidence that commercial green lease arrangements are becoming more attractive and delivering co-benefits. To facilitate change, a Green Lease Guide for commercial buildings has been published under the aegis of COAG and the National Strategy on Energy Efficiency (2012).

Regulation

A great deal of confusion plays out in the community’s understanding of the planning arrangements for higher-density, high-density, medium-density and low-density housing. An effort was made to describe the differences in a publication called Save Ivanhoe. ‘High’ and ‘higher density’ required discussion for their relativities of scale. Regulatory requirements associated with medium-density (5–6 storey) developments are a found in many planning systems.

The planning system that operates in Melbourne is arguably presently more enabling of lower density housing typologies and less so of medium-density housing. A recent Reserve Bank discussion paper referring to the work of the Grattan Institute accepts the comment that:
In the case of Melbourne, Kelly et al (2012) note that there have been significant amounts of greenfield development on the fringe and of new inner-city high-rise apartments, but that development in established areas (outside the inner city) has been constrained by planning complexity and high construction costs for apartments.\textsuperscript{175}

A planning system with clearly defined strategic goals (suggested by the OECD), as distinct from targets, could mitigate some of this difficulty. The formal planning used to effect changes to height limits along the Swanston Street tram corridor provided clear direction, authoritative guidance produced minimal impact on adjacent residential streets.\textsuperscript{85}
Enforcement

A key aspect of all standards and codes is administrative or judicial supervision. This is envisaged as one of the foundations of the adoption of a MMBW-type planning authority mechanism in some of the literature. A supervisory and enforcement role could be assumed by the proposed regional planning authority.

If adopted, codes that guide processes need to be prescriptive and succinct in order to ensure certainty for developers and residents and provide for an efficient review process.

Such standards could be more rigorous than the Green Star system, requiring specific elements for each facet of building design and construction such as energy, water use, materials, run-off, waste, connectivity and access to be addressed. This process could also be extended to introduce targets that support the environmental sustainability of buildings and neighbourhoods.

Docklands streetscape
4.3 Transport and the Environment

Proposition

Public and active transport as viable environmentally friendly transport modes are often of limited availability as a direct function of geography and the provision of services and infrastructure. Nevertheless it is important to improve Victoria’s mobility and travel behaviour for better environmental outcomes.

Context

While public transport systems and networks will need to undergo significant change to promote sustainable outcomes, the effort will be well worth it for the co-benefits. The concern about these issues is intergenerational and across sectors.

At a Victorian parliamentary inquiry the Youth Affairs Council of Victoria said young people wanted a sustainable environment with walking and bike paths and park lands. Transport solutions were raised ‘repeatedly’, as were recycling, reducing energy use, ethical consumption and awareness campaigns.

An absence of a clear discussion of the investment framework necessary to deliver on public transport was observed as a major sustainable-cities issue in a number of submissions to this parliamentary inquiry.

A range of mechanisms can be used to address these issues, including planning, regulation and design. The use of toolkits, guides and incentives is pivotal. Multiple policy levers should be explored. There are responses that can cut through the complexity, as the International Energy Agency has recently shown in its 2013 Tale of Renewed Cities: A Policy Guide on How to Transform Cities by Improving Energy Efficiency in Urban Transport Systems.
4.3.1 Considered views

A study undertaken for the Reserve Bank tells us that: ‘It is noteworthy that reports on the development process for Australian cities have pointed to transport problems being a major issue for development at the city fringe (e.g. Applied Economics (2010)’.178, 179

The Victorian Auditor-General has reported the shortfalls in providing transport infrastructure for growth areas (2013) and made a number of recommendations about strategic planning and monitoring as well as reporting on congestion issues.

Transport as an efficiency, productivity and environmental sustainability issue is exercising the minds of international policy think tanks. The International Energy Agency has recently published a Policy Pathway report on energy and transport exploring these issues and confirming the growing view that technological advances will not be enough to address transport provision issues.147
The State of Australian Cities Report (2013) makes the following observations about public transport, bicycle and active travel in Melbourne:

‘... consistent with [other capital cities] the share of journeys to work by public transport, bicycle or on foot declines with the distance from the city centre – 29.5% of inner city and 9.1% of outer suburbs commuters use public transport.

In keeping with this commentary, in the inner and middle suburbs Melbourne has the highest bicycle use to get to work – 5.5% and 1.9% respectively – compared with 0.3% in the outer suburbs. While use of public transport is not optimal it is clear there is an increasing appetite for it. After upgrades of the SmartBus network (Public Transport Victoria) ‘the number of passenger boardings is now at 40 year highs.’

The RACV canvassed the public about outer suburban concerns in 2012 recorded these responses:

• There should be more frequent and more reliable bus services.
• We need more frequent buses and longer hours of operating.
• There is a need for better planning of transport routes.
• Trains and buses need to be better maintained and they need to be serviced and replaced more often.

Strategic transport planning followed by implementation is crucial for the attainment of environmental sustainability outcomes.

The Victorian Auditor-General recently reported that congestion costs were rising and that congestion was a pressing issue. In the VAGO report on congestion the work of the VCEC (2006) was cited in which it was estimated that the economic cost of congestion in Melbourne ranged from $1.3 billion to $2.6 billion per year, and this figure was likely to double by 2020. The Auditor-General remarked that there ‘is a need to explore more fiscally sustainable strategies [to meet this challenge] and it is not evident that agencies are actively exploring strategies’. These comments are reinforced by VAGO’s more recent report on transport infrastructure for growth areas (2013).
Remarkable as it may seem, Infrastructure Australia calculates potential congestion tax revenue for Sydney at $5 billion per year.\(^3\)

In Melbourne, illustrating the range of issues and trade-offs involved in this issue:

> ‘... the ABS has estimated that the avoidable social cost of congestion for Melbourne’s statistical division alone is $4.447 billion. [And by way of contrast] bus patronage is up by 9% and demand for public transport is expected to grow by 70% in the next decade.’\(^{187}\)

The Department of Climate Change and Energy Efficiency reported in 2011 that:

> ‘Transport emissions accounted for 14 per cent of Australia’s total domestic emissions in 2009 at 83 Mt CO\(_2\)-e. Baseline transport emissions are projected to average 85 Mt CO\(_2\)-e per year in the Kyoto period, 37 per cent above 1990 levels. In 2020, transport emissions are projected to be 97 Mt CO\(_2\)-e, 29 per cent higher than in 2000. Road transport accounts for the largest proportion of emissions in this sector, averaging 73 Mt CO\(_2\)-e per year over the Kyoto period and 83 Mt CO\(_2\)-e in 2020. Indicative modelling suggests baseline transport emissions will be around 104 Mt CO\(_2\)-e in 2030.’\(^{206}\)
4.3.1.1 Savings
The environmental and other savings of active transport have been calculated.

‘A study commissioned by the Queensland Government in 2011 found that, for a typical off-road path in an inner urban area, economic benefits per kilometre walked or cycled are: decongestion (20.7 cents per kilometre walked or cycled), health (up to 168.0 cents per kilometre), vehicle operating costs (35.0 cents per kilometre), infrastructure savings (6.8 cents per kilometre) and environment (5.9 cents per kilometre).

The aggregate result is that:
- 1,000 pedestrians per day will generate discounted benefits of around $7 million per kilometre over a 30-year appraisal period ($2.12 per kilometre walked, per person)
- 1,000 bicycle riders per day will generate discounted benefits of around $15 million per kilometre over a 30-year appraisal period ($1.43 per kilometre cycled, per person).

‘This means that, for each person who cycles 20 minutes to work and back, our economy benefits by $14.30; and each person who walks 20 minutes to work and back benefits our economy by $8.48. The same study found that the average cost of a typical off-road path is around $1.5 million per kilometre, depending on the location and extent of planning and construction work required.’"
4.3.2 Environmental impacts of transport

In 2011, Stanley, Hensher and Loader reported ‘transport is Australia’s third largest and second fastest growing source of greenhouse gas emissions’ and that ‘major behavioural and technological changes would be necessary to deliver significant reductions’.193

Positioning for both the economic and environmental benefits and triple-bottom-line outcomes industry leaders such as Linfox with its Eco-Drive Training Program194 and local governments such as the C40 City of Melbourne with its Transport Strategy195 are making changes. Internationally, first movers have seen the benefits of acting early and positioning themselves for a wide range of perceived improved outcomes.

Initiatives can be multi-scale and multi-sectoral. For example, a small regulatory change in Chicago is driving change with the institution of a city ordinance to punish vehicle idling beyond 3/60 minutes.196

4.3.2.1 Impacts of private vehicle use

Notwithstanding improved vehicle emissions standards, personal motor vehicle use, particularly in circumstances of congestion, adversely impacts air quality, produces greenhouse gas emissions and is inefficient.197

The Australian Bureau of Statistics (ABS) tells us that we are a ‘car nation’.198

![Figure B.4.3.2: Number of passenger vehicles per 1,000 people Australia-wide](image)

**Figure B.4.3.2: Number of passenger vehicles per 1,000 people Australia-wide**

**Notes:**

1955 Motor Vehicle Census data are at 31 December, Population data are at 30 June 1954. 2013 Motor Vehicle Census data are at 31 January and Estimated Resident Population data for 2013 are at 31 December 2012 and are based on 2011 Census of Population and Housing (Australian Demographic Statistics 3101.0 Dec 2012).

### Figure B.4.3.3: Passenger vehicles and population

<table>
<thead>
<tr>
<th>State</th>
<th>2006 no.</th>
<th>2013 no.</th>
<th>Average annual increase %</th>
<th>2006 no.</th>
<th>2013 no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>New South Wales</td>
<td>3,395,905</td>
<td>3,877,515</td>
<td>1.9</td>
<td>499</td>
<td>528</td>
</tr>
<tr>
<td>Victoria</td>
<td>2,997,856</td>
<td>3,446,548</td>
<td>2.0</td>
<td>586</td>
<td>607</td>
</tr>
<tr>
<td>Queensland</td>
<td>2,138,364</td>
<td>2,556,581</td>
<td>2.6</td>
<td>526</td>
<td>554</td>
</tr>
<tr>
<td>South Australia</td>
<td>915,059</td>
<td>1,016,590</td>
<td>1.5</td>
<td>585</td>
<td>612</td>
</tr>
<tr>
<td>Western Australia</td>
<td>1,205,266</td>
<td>1,476,743</td>
<td>2.9</td>
<td>588</td>
<td>597</td>
</tr>
<tr>
<td>Tasmania (b)</td>
<td>271,365</td>
<td>305,913</td>
<td>1.7</td>
<td>554</td>
<td>597</td>
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<tr>
<td>Northern Territory</td>
<td>73,302</td>
<td>91,071</td>
<td>3.1</td>
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<td>Australian Capital Territory (c)</td>
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<td>229,060</td>
<td>2.6</td>
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<td>603</td>
</tr>
<tr>
<td>Australia</td>
<td>11,188,880</td>
<td>13,000,021</td>
<td>2.2</td>
<td>542</td>
<td>568</td>
</tr>
</tbody>
</table>

Notes:

(a) Estimated Resident Population for 2006 is as at 31 March 2006, Estimated Resident Population data for 2013 are at 31 December 2012 and are based on 2011 Census of Population and Housing (Australian Demographic Statistics 3101.0 Dec 2012).

(b) Excludes vehicles with registration less than one month before the census date.

(c) Vehicles for which registration expired prior to 31 March were removed by processing systems used before Motor Vehicle Census 2008. Approximately 2% of ACT registrations have been omitted. The error has little impact on ACT annual fleet growth rates.


### Figure B.4.3.4: Main form of transport used to get to work or full-time study, 2009 and 2012

The youth/older person split in car travel is very illuminating. In 2012, people aged 55–64 years were the most likely to drive to work or full-time study (78%), while young people (aged 18–24 years) were the least likely age group (63%). Young people were the most likely to take public transport (28%) to work or study, compared with older age groups.198

Figure B.4.3.5: All methods\(^{(a)}\) of travel to work\(^{(b)}\) by state or territories, 2011
Notes:
(a) More than one form of transport may be specified.
(b) Of those who travelled to work.

In 2011, Sydney had the lowest passenger vehicle use to get to work (70%) and the highest public transport use (25%). Conversely, Adelaide had the highest passenger vehicle travel to work (84%) and the second-lowest proportion of people walking to work (2.9%).

Figure B.4.3.6: All methods\(^{(a)}\) of travel to work\(^{(b)}\) by capital city, 2011
Notes:
(a) More than one form of transport may be specified.
(b) Of those who travelled to work.
Having regard to the Victorian and Melbourne ABS data presented above, as a community we have some choices to make about our funding preferences in respect of transit.

4.3.3 Choices for decades to come

The Victorian State Budget 2013–14, Building for Growth, reflects the choices a developed industrial nation will be making in the coming years and decades.\(^{199}\) The choices we make now will be with us for a very long time.

**East-West road link and the alternative**

At present $294 million has been committed over two years for planning, initial procurement and works on the East-West road link. This link has been under active consideration for years, and as early as 2008 the Eddington Report built on earlier proposals.\(^{200}\) By way of contrast, $10 million has been allocated for developing the Melbourne Metro train tunnel.

Infrastructure Australia, our pre-eminent Commonwealth infrastructure organisation, lists the Melbourne Metro rail project (IA) as ready to proceed and the East-West road link as requiring project development funding.\(^{201}\)

The rail tunnel has been described by the Department of Transport Planning and Local Infrastructure as the only way to boost capacity of Melbourne’s urban rail network.\(^{202}\) This capacity boost is considered to be imperative. It is suggested that 95% of Melbourne peak-hour trains will be overcrowded by 2020 if the rail tunnel is not constructed. A total of $520 million has been committed to public transport infrastructure, including contributions to develop the suburban precincts of Ringwood and Syndal, upgrade the Frankston line, and build two new regional stations at regional centres Grovedale (Geelong) and Epsom (Bendigo). Regional rail is increasingly seen as a component of metropolitan Melbourne rail systems.

Again by way of contrast, it is suggested that a lot more could be done to make the train system more efficient, including adopting braking and scheduling changes which are increasingly possible as a function of moving block in-cab signalling.\(^{207}\)

There is a real need to start building business cases for public transport systems that extend beyond the conventional, traditional methodologies. The KPMG and Department of Transport (UK) High Speed Two (HS2) rail proposal report (High Speed Two Limited Regional Economic Impacts Report) illustrates the changes taking place.\(^{208}\) In that report conventional project appraisal inputs are used as analytical tools but, instead of conventional analysis, ‘overall economic productivity and the location of economic activity’ have been used to gauge the economic viability of the project. While this is a high-speed rail project in another jurisdiction, and it does not expressly incorporate environmental considerations, it illustrates the potential for change.
In our recent 2011–2012 Strategic Audit, Co-benefits: The Rise of Environmental Profit and Loss,\(^2\) we discussed the manner in which the sports good company Puma, using PricewaterhouseCoopers as its consultant, was developing environmental profit and loss to frame its corporate responses to environmental sustainability challenges.\(^3\) Changes in accounting practices and analysis are occurring across private enterprise and they are accelerating.

Over time we have developed a number of strategies to deal with these issues, none of which were conceived in circumstances of the population growth or climate change scenarios that we now confront.

It is, however, recognised that it is possible to plan for transport changes by promoting avoidance by changing our growth patterns, shifting modes and improving technology. Whatever we chose to do, we will have to plan, implement, monitor and then evaluate our actions. Government has the pivotal role in planning for efficient and effective 21st century transport modes. This should be supported by business cases, which reflect best practice.

### 4.3.4 Emissions reduction strategies: the ‘improvement paradigm’

There are a number of actions, some of which are currently being supported by state and federal governments across Australia, that seek to reduce emissions from the private vehicle fleet. These include:

- improving vehicle technology to burn petrol cleaner
- improving fuel efficiency of vehicles
- investigating less polluting sources such as biodiesel and electric vehicles.

In respect of technological advances, Australia has moved to introduce Euro 5 and Euro 6 air pollutant emission standards.\(^4\) It should be noted, however, that while all OECD countries and some significant non-OECD countries such as China and India have fuel economy standards/targets in some form, Australia is alone among developed economies in not having a regulated fuel economy standard/target. A federal government draft regulatory impact statement (RIS) is in preparation but has not been released.\(^5\)

Improvement has been effected across a range of modes, and where this has occurred clearly better outcomes have been reported. Most of the studies that examine this issue point to a mix of measures being the most effective methods of attaining change. The IEA in its recent report Tale of Renewed Cities actively promotes recourse to a mix of measures.\(^6\)

While these efforts can reduce the range of travel impacts on the environment, they do not affect changes to existing travel behaviour. Often these efficiencies prove to be systemically ineffectual given the size and scope of issues to be addressed.\(^7\)\(^,\)\(^8\)

On the issue of mixed measures driving both technical and behavioural change, the Victorian Electric Vehicle Trial has resulted in the publication of a report examining the environmental sustainability of electric vehicles and guidance has been published on how vehicle operators can ensure they reduce greenhouse gas emissions when using electric vehicles. Energy used by vehicles in the trial itself was matched by additional Green Power or Renewable Energy Certificates through one of the trial partners.\(^9\)

Given the outcomes of this trial, it is important that the Victorian Government consider measures that provide incentives or simply ensure by other measures that operators of electric vehicles use clean energy to power their vehicles.
4.3.5 Getting ‘shift’ in transport choices

It is clear that reliance upon a private vehicle can be structural. Whittlesea residents who want to use the train have to get to the station at Wallan, kilometres to the west of the town. In circumstances where new suburbs are created without public transport infrastructure, time lags in obtaining services may be considerable. The recent development at Aurora is still without bus services notwithstanding bus stops were installed.215

All 10 of the interface councils that ring Melbourne are ranked in the bottom third of councils with access to public transport, and every one of the 189 census sites without public transport are in the Interface Council Zone.6

Commuters’ explanations for travel choices are detailed in the ABS data.

Figure B.4.3.7: Selected reasons(a) for not using public transport(b) to work or full-time study, 2012

Notes:
(a) A person may report more than one reason for not using public transport.
(b) For people who drove to work or study, as a driver or passenger.


Even in that seemingly discouraging scenario, there may be some capacity to shift modes of travel. We do know that 55% of all car trips are less than 5 kilometres and 68% of car trips are less than 10 kilometres, and that people are expressing the desire to act more sustainably.205

Data shows that there has been strong growth in public transport patronage since 2000 for all modes of public transport. Growth has been strongest in train travel but the use of trams and buses has also increased markedly.224 A recent surge in the take-up of bus services has also been reported.217

‘New research shows that the number of passenger trips on Melbourne buses has risen by more than 15 per cent. In the year ended December 2011, an additional 15.3 million bus trips were taken in Melbourne – a total of more than 117 million trips. Public Transport Victoria (PTV) research shows the increase in patronage is a result of new bus routes, route upgrades, population and employment growth in Melbourne’s outer suburbs, as well as the strategy and investment focused on routes 401 and 601, SmartBus and Doncaster Area Rapid Transit (DART).’218
Shift in transport use will occur if a number of things align. Public awareness of the benefits of some of the other forms of transport will only occur if options are available, attractive and convenient.

4.3.5.1 Improving public transport access, frequency and coverage

Environmental sustainability can be advanced by the application of many modest initiatives, at lower costs, and with fewer environmental trade-offs than typical capacity-building projects. Sir Rod Eddington is recently reported as observing that the ‘pursuit of “icon” projects at the expense of smaller projects’ is not optimal.219 Co-benefits in health and economic outcomes frequently attend smaller initiatives.251

A majority of services radiate out from the Melbourne CBD, and service frequency is based on peak commuting times. This mode of transport has inured us to service frequency decisions that reflect peak-hour travel in particular directions. Public transport provision, given the changing nature of the outer urban population, its different needs and aspirations, its different travel patterns, has to be deconstructed.

Two particular examples of travel system inefficiencies were provided to the Parliamentary Inquiry into Interface Councils.6

A trip in the City of Casey could take 56 minutes by an indirect public transport route or 21 minutes if streamlined. The lack of direct cross-suburb connections for the Mornington Peninsula Shire resulted in a trip taking half a day as the traveller had first to go into Frankston before then taking public transport out of Frankston to the chosen, otherwise relatively proximate, destination.

Beyond the need to plan transport options in a place-based way to deal with local conditions, we also need to shed a century-long commitment to fixed-rail methods of conveying multiple passengers. There are other, cheaper, highly efficient methods that do not require the heavy fixed infrastructure of rail networks, at least in suburban settings.

Stonnington (and other councils) have been making this point for some time. Most recently in its submission to the Metropolitan Planning Strategy inquiry Stonnington provided a list of features that would address transport issues in the middle-outer suburbs. These included a bus service that:

- ran more frequently
- started earlier
- stopped later
- ran on Sundays
- complied with schedules
- provided real time bus information
- followed more direct routes
- ran faster times between locations.

Services had to be made available in growth areas as residents moved into housing developments.
4.3.6 SmartBus services

Public Transport Victoria (PTV) has been rolling out SmartBus routes for some time (collaborating in this work with VicRoads to gain road priorities for bus services), and other Bus Rapid Transit (BRT) possibilities are regarded by many commentators as fit for purpose for both intra-suburban travel and travel from the fringe to the centre. Each expansion of the SmartBus network has been carefully studied and is based upon a sound business case.

Expansion and integration of the bus network throughout Victoria could be a cost-effective way to improve public transport options between outer suburbs and new activity centres, providing quick links to train stations. When planned and operated optimally, bus systems can be more effective people movers than train systems.

The momentum created by the development of the Smart Bus network, operated by PTV, could be a catalyst for BRT across Victoria.

4.3.6.1 Bussing it – Bus Rapid Transit (BRT): nimble but needs to be nice

Bus Rapid Transit (BRT) systems operate on designated and integrated laneways in which buses can perform as high-functioning public transport solutions, but with the accessibility and low cost of traditional bus use. Tickets are prepaid, and service and provision can be hierarchical as to size of bus and level of service, with different sizes of buses and different levels of service. Hubs operate to generate efficiencies and reliability.

Sunshine bus shelter refurbishment
The National Bus Rapid Institute in the US reports:

‘Bus Rapid Transit (BRT) is an innovative, high-capacity, lower-cost public transit solution that can achieve the performance and benefits of more expensive rail modes. This integrated system uses buses or specialised vehicles on roadways or dedicated lanes to quickly and efficiently transport passengers to their destinations, while offering the flexibility to meet a variety of local conditions.’

To put the use of BRT into perspective, well-established rail systems around the world are frequented by those on foot, by bus or by tram. BRT systems now operate all over the world.

**Case Study: Mexico City Bus Rapid Transit system**

Mexico City has a population of 8.8 million people and it established its BRT in less than three years. Its Metrobus BRT system, launched in 2005, has been so successful in efficiently transporting daily commuters that the city is considering expansions.

The Metrobus has ‘contributed to the reduction of commute time from 1.5 hours to 1 hour for the same route and reduced CO₂ emissions by 35,000 tons annually’.

The service covers nearly 20 kilometres of ground with 36 stations and two terminals and has condensed 350 standard operating buses to 97 BRT vehicles.

London, Canada is working on establishing a BRT after commissioning a report from AECOM and putting together the business case which suggests that for every dollar spent $1.80 will be recouped (London Transit).

On the other side of the world in Nigeria the Lagos Metropolitan Area Transport Authority is commencing an e-ticketing system for its BRT.

In Burma the Greater Yangon Strategic Development Plan is instituting a BRT to run every three minutes along the primary route with ‘modern comfortable buses’.

Geary, Richmond, USA cannot get its BRT going as quickly as Mexico City. It will be up and running by 2018, but it is intended to carry heavy passenger loads, and the business case stacks up.

Mumbai in is also delivering BRT to its commuters. Demonstrating the power and importance of ‘badging’ an iBus BRT has been established in Indore, also in India.
Case Study: Curitiba Bus Rapid Transit system

Curitiba is the largest city in Brazil’s southern region with a dense population of 1.8 million (4,200 inhabitants per square kilometre). Its BRT system was the first of its kind. Features include: a bus every 90 seconds, exclusive priority lanes, free transfers between routes, pre-board fare collection, information displays and traffic signal priority.

In 2009 Curitiba upgraded one of its bus lines to run a 100% biodiesel articulated bus, further reducing the city’s greenhouse emissions. In October 2011, ICLEI produced a report as part of its Ecomobility campaign, reporting that approximately 2.1 million passengers use the BRT’s 2,000 vehicles every day.

Perth’s BRT is said to be working well at Ellenbrook. One of its important attributes was that the system was installed as the community took up residence in the development. It has been described as ‘hugely successful’.

The Adelaide O’Bahn, on specially built tracks combining both roadways and tracks, is also successful. The service runs for 12 kilometres, can travel at up to 100 kilometres, carries 7 million passengers a year (18,000 an hour) and it is 50% cheaper than rail. It travels local roads and dedicated busways.
4.3.7 Integrating service provision: interchange hubs

The Melbourne Transport Forum regards interchange hubs as a fundamental element of an effective BRT transit system, as the hub provides the physical node for the interconnectivity of the system. Hubs provide for synchronisation and reliability.

The Bus Association of Victoria argues that BRT is quicker to establish than fixed rail, it is cheaper, and requires relatively little outlay on infrastructure, costing 10% of the outlay necessary for heavy rail. Improved local bus networks organise linkages. Opportunities exist to establish rapid bus services for Mernda, Epping North and Broadmeadows.

In supporting the ‘promotion of improved connectivity’ the Outer Suburban/Interface Services and Development Committee of the Victorian Parliament articulated the attributes of BRT systems as:

- regularity
- higher capacity
- better performance
- good access, wide operating hours
- scalable – both up and down

The inquiry observed the need for different marketing, branding, defined rights of way, separation of traffic streams, and clearly designated stops at greater spacings than usual bus routes.

Using the ABS data there would appear to be some opportunity to improve the bus-feeder and pedestrian access to train travel. Integration requires a broad commitment to synchronisation across the public and private transport sectors and practical applications on timetabling.
Figure B.4.3.8: Transit mode to train stations

<table>
<thead>
<tr>
<th>Mode</th>
<th>Passengers</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>87,216</td>
<td>61.3</td>
</tr>
<tr>
<td>Feeder bus or tram</td>
<td>26,718</td>
<td>18.8</td>
</tr>
<tr>
<td>Car driver</td>
<td>20,208</td>
<td>14.2</td>
</tr>
<tr>
<td>Car passenger</td>
<td>6,041</td>
<td>4.2</td>
</tr>
<tr>
<td>Bicycle</td>
<td>1,282</td>
<td>0.9</td>
</tr>
<tr>
<td>Other (mainly taxi)</td>
<td>888</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Source: ABS Train station access mode on Census day, 2006.233*

It is worth highlighting the large proportion of people who walk to train stations. This means provision of priority walking networks to train stations should be a significant element of local transport planning around train stations. DTPLI has developed a method for identifying and developing priority networks for pedestrians called the Principal Pedestrian Network. This method is currently being applied by a selection of local governments around Victoria.257

Many strategic planning and policy documents in Victoria have discussed the need to integrate transport and land-use decisions and improve connectivity between transport modes.234–238 There are, however, limited examples of these strategies transformed into action.

It is anticipated that we will see an increase in public transport use of 71% by 2021.258 Private bus companies, of which there were 16,259 will have a role to play in meeting this increased demand.

In 2011, PTV reported that additional bus routes for the SmartBus system were ‘under consideration’.260 Presently the SmartBus system, which has been tendered to Transdev Melbourne from August 2013,261 is working to provide integration and connectivity.239

The SmartBus network includes three orbital SmartBus routes and four Doncaster Area Rapid Transit SmartBus routes that run from Manningham to the city.

‘SmartBus has been designed to complement Melbourne’s radial train and tram network by providing ‘cross-town’ connections to train stations, tram lines, schools, universities, hospitals and shopping centres. Services run along major arterial roads, making journey times shorter and journeys more direct for passengers.

SmartBus services run more often and for longer hours than most bus services. On weekdays services run:

- every 15 minutes between 6.30 am and 9.00 pm
- on average every 30 minutes between 5.00 am and 6.30 am
- on average every 30 minutes between 9.00 pm and midnight
- On weekends and public holidays:
  - on average every 30 minutes between 6.00 am and midnight on Saturdays and public holidays
  - on average every 30 minutes between 7.00 am and 9.00 pm on Sundays, Good Friday and Christmas Day.239

Case Study: Integration – Toronto

The Greater Toronto Area ensures the provision of supportive uses and infrastructure through its Mobility Hub policy. These are defined as public transport stations surrounded by walkable communities and offering a range of services and transport options.240

Importantly, the policy acknowledges that one size does not fit all circumstances.

Integration of emerging transport systems such as car share and bike share form a part of the solution to our transport problems and these should also be considered to reduce reliance on private vehicles,241 expand the catchment areas of public transport stations and also free up public transport spaces.242 This would require strategic planning and the strategic use of land adjacent to train stations.

More work is needed on communicating the ease, availability and benefits of using linked travel modes. More needs to be done to brand and promote the transport system as a linked, accessible and useful system. The bus network could be more overtly incorporated in travel mode information than is presently the case. A Bus Tracker information service would form part of any changes.242 Research has suggested that a range of other e-technologies is also important for making the transport system more efficient.263
RECOMMENDATION 24

It is recommended that the Victorian Government expand implementation of the SmartBus system throughout Victoria to improve public transport access.

ATTRIBUTES

Expansion of the system will require:

- high-speed trunk services on key routes
- strong local transport systems
- flexible, efficient, regular, safe, clean and reliable local transport systems.
4.3.8 Improving transport options

Recognising geographical, social and other limitations, walking and cycling are the most sustainable forms of transport, producing effectively zero emissions.

There are barriers to these modes. Some are easily surmountable and others are not. Homogenous and spread-out land uses restrict walking and cycling adoption due to distance, and can take years to correct. Concerns over safety and feasibility in well-connected places can be overcome with incremental infrastructure and urban form improvements and education programs.

Active transport serves an increasingly critical function for certain travel patterns freeing up public transport and reducing the need for parking provision. Active transport uptake can be achieved by:

Committing to a steady stream of funding – funding the bike and the bike path

A potential barrier to active transport in Victoria is intermittent or limited funding. Funding for the VicRoads Bicycle Program continued into the 2012–13 state budget and additional funding has been committed in the 2013–14 budget. A total of $30 million is being provided to increase cycling uptake. However, only 42 of the 79 Victorian councils met or exceeded the recommended local bicycle expenditure threshold of $5 per capita in 2011.

Bicycle commuting (to work) has grown by 5 per cent per year from 2001 to 2011. The Cycling into the Future: 2013–23 Victoria’s Cycling Strategy, identifying strategic directions for improving cycling data, safety, accessibility, breadth, education and coordination was recently launched.

The Darebin Creek Trail bridge and bike path link has also recently received a funding boost that will promote increased bicycle commuting.

Incorporating the consideration of active transport infrastructure in all road projects and new developments developing ‘complete streets’

Some best-practice examples in retrofitting streets for active transport emerge from across the United States. Federal, state and local governments are actively developing and enacting Complete Streets policies and legislation. The Living Street work being done in the UK is instructive as is the work done on the New York City Plaza.

Complete Streets ensure that transport agencies incorporate space for pedestrians, cyclists and public transport users into roadway design and reconstruction.
The Transport Integration Act 2008 and VicRoads’ Smart Roads policy provide a foundation for Complete Streets legislation and policy. The Transport Integration Act 2008 is an overarching framework that guides transport and land-use decision making in Victoria. The Act requires all agencies to partner in delivering a sustainable and integrated land-use system. It also seeks triple-bottom-line decision making. However, the weight given to each objective (environment, society, economy) is determined by the transport body proposing the change. Smart Roads is VicRoads’ method for comprehensively assigning road space to competing users and ‘connecting communities’. The policy factors in all road users, considers fluctuating time of day requirements, accounts for differences in activity type and intensity, and manages roads as a network rather than individually.

The work that Yarra Trams and VicRoads are doing on the Route 86 tramline provides an illustration of how change can be effected. The works are awaiting a determination of merit in the 2013 Melbourne Design Awards. Sustainability attributes include permeable paving, tree planting, recycling of construction materials and water-sensitive urban design. Active transport is encouraged and safety is a major consideration. The community was actively involved in the work to develop the streetscape.
Strengthening behaviour change and education programs

Habitual recourse to inefficient transport modes can be shifted by other mechanisms, including:

- public information campaigns
- branding that makes the very prospect of using public transport attractive
- simple efforts to ensure the service is used as well as recognised
- improving safety, security and end-of-trip facilities for walkers and bicycle riders
- improving priority for active travel participants
- policy direction
- costing mechanisms, including congestion changing
- incentive programs.

Case Study: Examples

In Portland, USA travel demand management, public awareness, education and free central district public transport have changed the transit mode model. In Singapore, a stronger approach including the adoption of congestion charging and enforced restrictions on car use has been adopted.

Importantly, both of these cities have influential metropolitan governance systems that marry transport provision and land-use decisions and whose policies that extend beyond the city limits to the suburban commuting areas.

Cambridge Municipal Code (USA) reduces vehicle trips and traffic congestion in the city by requiring parking and transportation demand management (PTDM) plans for commercial projects that propose parking. The ordinance calls for a single-occupancy vehicle mode-share commitment of 10% below the 1990 Census data for the project location.

PTDM plans must include a comprehensive set of transport demand measures, and annual monitoring and reporting to the city is mandatory. According to the city, the ordinance has contributed to a 24% reduction in vehicle miles travelled and contributed to a reduction in 38 million vehicle miles in 2011 and 62% of the monitored projects in 2011 met their mode-split commitments for 2011.

The city offers technical assistance for non-compliant projects to identify and promote additional measures that reduce travel. This mutually reinforcing process has avoided the use of the enforcement provisions contained within the PTDM ordinance.
4.3.9 Pricing the car

The Victorian Auditor-General’s Office (VAGO) makes the point that there is scope to leverage SmartRoads for better transport outcomes, including in relation to congestion, and that this should be done. VAGO’s congestion recommendations are endorsed.

VAGO recommendations

The Victorian Auditor-General’s Office (VAGO) has recommended that:

• the Department of Transport reconsiders its initial proposal for the Network and Service Strategy as a stand-alone dedicated transport plan.

• the Department of Transport and Department of Planning and Community Development establish arrangements that assure comprehensive public consultation on transport issues, preferably in a stand-alone transport plan, but otherwise in the context of the Metropolitan Planning Strategy.

• the Department of Transport, in collaboration with other transport agencies, develops a congestion management plan within the context of broader transport and land-use strategies which sets out statewide objectives, priorities, targets and agency responsibilities.

• Public Transport Victoria develops explicit mode shift strategies and targets that are demonstrably aligned with defined statewide congestion management priorities.

• the Department of Transport, in consultation with stakeholders, reviews its governance arrangements and establishes mechanisms for systematic monitoring and reporting by agencies on the progress and outcomes of statewide congestion management initiatives.

• the Department of Transport, in consultation with transport agencies, develops and systematically implements a portfolio-wide decision making framework for congestion related infrastructure expansion projects that:

  - includes clear standards and procedures for assessing both the congestion benefits and disbenefits of proposed initiatives, including induced demand, relative to defined statewide congestion management priorities.

  - assures the nature and scope of proposals is adequately informed by sufficient consideration of statewide demand management options and initiatives.

• the Department of Transport, in consultation with other stakeholders, develops and regularly updates a statewide travel demand management strategy that:

  - includes initiatives and targets for moderating the use of private vehicles and the associated demand for road travel across the network during congested periods is informed by a review of the likely cost-effectiveness and feasibility of road pricing options and regimes.

  - includes targeted initiatives offering practical, sustainable transport alternatives to car use during peak periods, particularly for trips originating in car-dependent areas

  - is informed by a review of the lessons learned from previous statewide demand management initiatives, and leverages the opportunities identified by the Department of Transport in 2011

  - identifies clear agency responsibilities and accountabilities for contributing to road congestion and related travel demand management initiatives, and for updating the strategy.
VicRoads:
- improves the frequency and targeting of its traffic signal reviews by leveraging available congestion data from SCATS (Sydney Coordinated Adaptive Traffic System)
- develops a strategy, including time frames, for implementing Network Operating Plans and activating SmartRoads priorities across the metropolitan road network
- develops a strategy, in consultation with local councils, to better leverage the potential of clearways for managing congestion along the arterial road network
- systematically reviews the efficiency and effectiveness of its operational management of the road system
- develops measures and targets for network efficiency and congestion management initiatives in consultation with stakeholders. 274

The cost of car use is subsidised at a high rate in Victoria. Only one-sixth of the total costs of driving are upfront costs. The remainder are external costs. These external costs – called externalities – are largely assumed by the community, in the form of accidents, diminished environmental quality, delay and time loss, road maintenance costs and free and subsidised car parking. 276

Governments have attempted to shift some of these costs onto road users. A congestion levy is imposed on car park owners in and around Melbourne CBD. 277 However, research shows that the levy does not meet its objective of relieving congestion by increasing long-stay parking costs, because the full costs are often deferred. 278 Recent work of the Committee of Melbourne again raises the utility of levies. 275

Rather than pricing car parking, pricing road use can both reflect the burden that private vehicle use places on the environment and society and provide an upfront inducement not to drive.

**RECOMMENDATION 25**

It is recommended that the Victorian Government investigate road-transport pricing and payment measures.

**ATTRIBUTES**

The independent transport working group could be engaged to consider the following:
- a peak direction, peak time congestion charge cordon around inner Melbourne
- expanding distance-based tolling to all major highways
- tolling for heavy vehicles based on peak/off-peak periods.
WHAT IS CONGESTION CHARGING?

In traffic management, congestion charging, or congestion pricing, is the practice of charging motorists a fee in order to enter areas where congestion is a problem during certain times of the day.

CONGESTION PRICING TYPICALLY AIMS FOR THREE GOALS:

1. **The Reduction of Congestion** in busy urban areas by encouraging motorists to reconsider their travel habits.
2. **Raising Money** for the maintenance and improvement of transport infrastructure.
3. **Reducing the Amount of Local Air Pollution** caused by high volumes of traffic and thus promoting public health.

SUCH PRICING SCHEMES ARE CURRENTLY IN PLACE IN A HANDFUL OF MAJOR CITIES:

**London - Congestion Charge**

- Began in **Feb 2003** as a £5 charge for entering central London, increasing to £8 in 2005, £10 in 2011.
- Previously vehicles emitting less than 100g/km of CO₂ have been exempt.
- TfL have proposed reducing the exemption threshold to 75mg/km.
- The charge remains in effect between 7am and 6pm Monday to Friday.
- London’s network of Automatic Number Plate Recognition (ANPR) cameras check a car’s registration against a central database to establish whether the driver has paid the charge.

**Stockholm - Congestion Tax**

- Was instituted on a trial basis between **3rd Jan and 31st Jul 2006**.
- Initially, cars running on alternative fuel sources were exempt from paying the charge, but this was abolished in 2012.
- The charge is levied both on entering and exiting the city per day, up to a maximum of €6.
- Fees charged vary depending on the time of day, with 7:30-8:30am being the most expensive time of day.

**Milan - Ecopass / Area C**

- Began as a one-year trial in **Jan 2008** and was then extended until the end of 2009, then again until the end of 2011.
- Ecopass allowed free travel for vehicles meeting low-emissions standards.
- Charged either €2, €5 or €10, depending on the size and type of vehicle.
- In 2012, Ecopass was replaced with 'Area C' which abolished exemptions only for all traditionally fuelled vehicles.
- The entrance also completely bans entrance for petrol vehicles not meeting at least Euro Emission Standard 1.
- The charge is in effect 7:30am to 7:30pm Monday, Tuesday, Wednesday and Friday, and 7:30am to 6:00pm on Thursdays.

Figure B.4.3.9: Congestion Charging

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218: Figure B.4.3.9: Congestion Charging
Stockholm’s congestion charge represents global best practice with regard to impact on private vehicle use. Traffic volumes have been consistently reduced since 2006, despite a relative decrease in the price of the charge. Support for the congestion charge grew from 36% in the first year (2006) to 70% in 2011.

**How the congestion charge operates**

Launched in 2003 in London, the original cost was set at £5 per day. This was increased to £8 per day in 2003 and £10 per day in 2011.

Payment can be made on the day of travel or subsequently, incurring a small surcharge. The penalty for non-payment is £130. People who can prove that they live within the congestion zone receive a 90% discount, while those with a disability receive a 100% discount on the charge. The congestion charge runs from Monday to Friday during peak hours.

In February 2013 incentives were factored in for electric car use. The Ultra-Low Emission Discount (ULED) offers a 100% discount to electric and ULED cars and vans.

**Criticisms**

Some commentators have argued that the congestion tax was a tax on the poor, because the charge incurred was a flat rate and did not account for type of car and the user. The flat rate is also charged to key workers, nurses, teachers and professionals who must work within the CBD but whose salaries do not allow them to live within the zone.

Small businesses remain concerned that the charge has affected business due to traffic being deterred and seeking business outside the taxable area.

While the congestion tax appears to have been successful at reducing traffic, critics have argued that:

- it was very costly to introduce
- revenues from fines were much lower than expected
- there were serious technical problems with the number plate recognition software
- it is unfair on those low paid that have to drive into London to work, such as key workers, such as nurses, ambulance drivers, and the police
- the charge is regressive in its impact, which means the poor pay proportionately more of their income on the charge than the rich
- many businesses have suffered as people stop shopping in London.
Outcomes

It has been reported that a small number of embassies refuse to pay the charge under the Vienna Convention, which exempts staff from paying local taxes. This estimated revenue owed from these embassies is £50 million.281

Transport for London estimated that the impact on traffic flow was a reduction of 50,000 cars per day.283 The London School of Hygiene and Tropical Medicine produced a report outlining a modest impact on air pollution and life expectancy since the introduction of the congestion charge.284

According to TfL’s Travel in London, Report 5:

- Bus usage reached a 50-year high in 2011, with 30 per cent more services and 20 per cent less waiting compared to 2000-01
- Bike trips increased 79 per cent from 2001 to 2011, after having stagnated between 1993 and 2001.283

Emerging research from cities around the world suggest some benefits from seasonal and temporal road pricing, which incorporates the likelihood of ecosystem services cleansing the air and diluting emissions.285

Social and economic co-benefits of congestion charging include:

- significant reductions in congestion
- dedicated revenue for sustainable transport improvements (a deficiency of the current levy)
- environmental and economic savings through the ability to forgo road expansion and new road projects
- improved travel times and efficiency of public transport
- improved public health and fitness as a direct result of increases in public and active transport use.
According to a survey by the National Transport Commission in 2011, Victorians were unhappier about their public transport fare payment system than residents of any other state or territory. Improvements to and alignment of public transport payment and pricing can establish cohesion between modes of transport. This sort of alignment can:

- increase cost recovery for public transport operators
- increase public transport use and
- improve travel times by reducing stoppage time at stops and stations.

E-ticketing has been problematic in Victoria but it is plainly the way the public transport system ticketing systems are moving. Further, e-ticketing is an essential component of a successful rapid bus transit system.

Periodically the issue of providing free public transport is raised as a mechanism for increasing public transport use. Staggering a free service for very early morning travellers has increased take-up. Tallinn, the capital of Estonia has commenced a free public transport service in the city this year (2013), and it will be one to watch.
4.4 Climate Change and the Built Environment

Proposition

Much of our social and economic activity depends on infrastructure that was built for a climate that is now subject to significant change. All of our cities and all our rural infrastructure networks are challenged by climate change eventualities. Current construction must respond to present and future needs, and present and future climate conditions.

Context

Flexibility and robustness manifest themselves in a variety of ways depending on the setting. There is no one-size-fits-all approach to ensuring our complex built environment, in all its diversity, is resilient to impending changes. The realities of climate change have ensured there is no more status quo. There is no longer an option of not changing. Now we must, as a community, consider how we might change. The discussion in Section 4.4 provides some ideas of what we might consider to ensure our quality of life – its social, cultural, economic and environmental facets – is protected as the world around us changes. For a further discussion of the susceptibility of our built environment see Foundation Paper One, Climate Change Victoria: The Science, Our People and Our State of Play.

4.4.1 Extremes and consequences

Weather extremes are a part of life in Victoria. Such events have always happened and they always will. Climate change is projected to increase the intensity of such events.

In Melbourne on 6 March 2010, roofs collapsed, houses were flooded, trains failed to run, and 100,000 houses in the city lost power. The insurance bill was calculated to be over $1 billion – essentially the same as the Black Saturday bushfires. All this was caused by 26 mm of rain and hail falling in less than an hour.

An event of this intensity is considered a one-in-10-year storm. Put another way, it has a 10% chance of occurring every year. Yet, a similar storm occurred in Melbourne in February 2011 and resulted in insurance claims of $384 million.
4.4.1.1 The economic strain

The effects of more frequent extreme weather events have been recognised by the financial industry, particularly the insurance sector. The sector recognises that mechanisms must be developed to manage and compensate for the consequences of these events. Insurance has a key method for businesses and individuals to manage financial risk.

Economic losses amounted to some US$ 380 billion in 2011, making it the most expensive natural disaster year to date, multiples more than the previous record (US$ 220 billion) set in 2005. At US$105 billion, insured losses also were at new high. The loss figures were dominated by the 2011 earthquakes – in addition to Japan, above all the devastating event in New Zealand. However, the year also included the floods in Australia, Thailand, France and Italy and the tornado outbreak in the USA.

The re-insurer, Munich Re, in reporting these figures states that weather-related risks in the USA and Canada are constantly changing as a result of anthropogenic climate change and natural climate cycles like La Niña. Munich Re was considering the potential impact of climate change on business as early as the 1970s.

4.4.2 Infrastructure: a driver of development, not an afterthought

Our level of knowledge is improving about the impacts of climate change is constantly improving even in the context of uncertainties. Cities will be at the forefront of adjusting to these challenges. Strategic adaptive management that enables targeted and responsive changes to the built environment is a powerful tool for promoting resilience.

These impacts can be depicted in the following ways.
Beyond these direct impacts there are cascading impacts, as each climate change scenario has the potential for multiple impacts – sea-level rise, heatwaves, intense storms – and this necessitates an ‘all-hazards’ planning ethos.304

Figure B.4.4.1: Climate Change impacts36
Damage to transmission lines

Entire towns destroyed

Burnt catchments, reduced water quality

Overheating at water purification plants

Less water for hydro power plants

Faster degradation of construction materials

Powerlines destroyed by fire

Cracking underground pipes

Less water for coal power station cooling towers

Excessive demand causing blackouts

Homes and businesses inundated

Flooding of exchange stations, manholes, underground pits

Flooding of sub-stations

Damage to distribution lines

Burning of sub-stations
The potential costs are imposing. In 2009 during the heatwave, one-third of all metropolitan train services were cancelled and the total financial losses were $800 million. Our built environment will have to be resilient and responsive to climate change impacts. We will have to adjust and adapt and we will have to both plan for all hazards to maximise our capacity to respond and design our built environment to reduce the impacts.

Figure B.4.4.2: Cascading Impacts
4.4.3 Victoria’s Climate Change Adaptation Plan

The Victorian Government has published its Climate Change Adaptation Plan 2013 in accordance with the requirements of the Climate Change Act 2010.

The Adaptation Plan outlines the need to:

- manage risks to public assets and services
- manage risks to natural assets and natural resource based industries
- build disaster resilience and integrated emergency management
- improve access to research
- support private sector adaptation
- strengthen partnerships with local government and communities.

Existing adaptation responses are detailed, as are roles, responsibilities, strategies and management efforts.

Victoria has joined with all other governments in the COAG Select Council on Climate Change and adopted a Statement of Common Understanding on the Roles and Responsibilities for Climate Change Adaptation in Australia (November 2012). The priorities outlined in this statement are:

- water resources
- coasts
- infrastructure
- natural ecosystems
- agriculture
- emergency management
- vulnerable communities

In the Victorian context the Adaptation Plan observes that:

‘... loss or damage to Victoria’s transport, water supply, health, human services and education infrastructure ... is a major risk.’

Rebuilding, replacement and disruptions all have the capacity to impact the economy and the community. While certain of our critical infrastructure is privately owned and will be privately insured, this is not the case for all infrastructure.

In particular, Victoria is exposed in relation to health and education facilities, public housing, water infrastructure, government buildings and transport. The Victorian Managed Insurance Authority (VMIA) conducted a roundtable for the public sector in 2012 to discuss the implications for physical facilities, supply chains, information technology services and communication networks. The VCCCAR is also providing policy makers with advice about scenario planning and flexible decision making. An example of this engagement is a VCCCAR convened ‘Think Tank’ in February 2013 dealing with government risk management.
4.4.4 All-hazards planning

Reflecting concerns about the implications of hazards, work has been done to engender resilience and insulate critical infrastructure services from loss. This work is intimately connected with concerns about loss of infrastructure from emergencies that are not necessarily associated with climate change; hence the focus on ‘all-hazards’ planning.

We began with the Evans review of Part 6 of the Terrorism (Community Protection) Act 2003,\textsuperscript{293} and have now produced a Green Paper Towards a More Disaster Resilient and Safer Victoria (2011) and the White Paper Victorian Emergency Management Reform. This work has led to the Roadmap for Critical Infrastructure Resilience, which will in turn produce the Strategy for Critical Infrastructure Resilience, which is under development.

What we derive from all this work is, in the words of Lieutenant General Evans AO, DSM, the clear understanding that the current arrangements need to be improved and transformed into a ‘legislative and policy framework that captures the strategic intent of an “all hazards and all agencies” approach’.\textsuperscript{294}

The outcome of this collection of reports will include the establishment of a State Crisis and Resilience Council (late 2013), an inspector-general for emergency management (with a co-regulatory role), and in the Department of Transport, Planning and Local Government a range of Sector Resilience Plans. This outcome is consistent with international trends and the work done in both the regional Critical Infrastructure Protection and Resilience Network and, at the Commonwealth level, the Trusted Information Sharing Network for Critical Infrastructure Resilience (TISN for CIR).

Even as we plan in this way for all-hazards responses, it also makes sense to undertake maintenance and proactive, anticipatory planning, dealing with the things we can do now. While we know that the future climate will be different to what it is today, to what extent and how climate change will impact Victoria is uncertain. Despite significant scientific research and analysis, this uncertainty is the new norm as future atmospheric greenhouse gas concentrations are inherently difficult to forecast.\textsuperscript{295}

Questions such as ‘When, and how much, will the sea level rise?’; ‘Could temperature increases impact the life of this infrastructure project?’; or ‘How frequently will storm surges occur?’ must be factored into future planning and development decisions.\textsuperscript{327} This climate uncertainty creates an additional challenge to the already complicated task of predicting the infrastructure needs of Victoria’s future population and economy 20, 60 or 100 years into the future.
4.4.5 A multitude of stakeholders

The decisions about how Victoria’s built environment is designed, constructed, managed and improved are influenced by a wide variety of stakeholders, reflecting an even broader range of interests.

The state and federal governments play a critical role in guiding and governing the built environment through legislation, policy frameworks and funding models.

Although state and federal action may influence behaviour, it is important to note that the multitude of owners, operators and users of the built environment presents an added challenge to adaptation and resilience planning. This is particularly evident with buildings, due to the high level of private ownership and changing tenancy.

4.4.5.1 Strategy types

In Foundation Paper One, Climate Change Victoria: The Science, Our People and Our State of Play, we provide a discussion of the variety of strategy types for improving climate resilience:

- no regrets
- flexible
- safety-margin
- soft and reducing decision making horizons.

A climate-resilient approach to infrastructure provision would consider all strategies and incorporate multiple strategies in a phased and continuously monitored delivery approach. What is not recommended from a decision making perspective is choosing and designing infrastructure that is optimised to perform well under a single, specified future climate scenario. All-hazards planning is the optimal methodology to address the issues.
Figure B.4.4.3: Risks to Victoria’s built environment

Climate change has the potential to impact Victoria’s built environment in a variety of ways.\textsuperscript{298}

<table>
<thead>
<tr>
<th>Climate change impacts</th>
<th>Primary built environment impacts</th>
<th>Flow-on impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Environmental damage</td>
<td>System damaged/ shutdown</td>
</tr>
<tr>
<td>Water</td>
<td>Extreme weather</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>increased daily rainfall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ground movement</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>Extreme weather</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Sea-level rise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ground movement</td>
<td></td>
</tr>
<tr>
<td>Telecom</td>
<td>Extreme weather</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Bushfires</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>Extreme weather</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Sea-level rise</td>
<td></td>
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<tr>
<td></td>
<td>Increased temperature</td>
<td></td>
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<tr>
<td></td>
<td>Heatwaves</td>
<td></td>
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<tr>
<td></td>
<td>Ground movement</td>
<td></td>
</tr>
<tr>
<td>Buildings</td>
<td>Extreme weather</td>
<td>*</td>
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<tr>
<td></td>
<td>Sea-level rise</td>
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<td></td>
<td>Increased temperature</td>
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<td></td>
<td>Heatwaves</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ground movement</td>
<td></td>
</tr>
</tbody>
</table>

Figure B.4.4.4: Thermal imaging of Melbourne at night shows the impact of public infrastructure on urban temperatures
4.4.6 Planning for climate resilience

The impacts of climate change mean that there is an increasingly urgent need to re-evaluate the way infrastructure is analysed, prioritised and provided in Victoria. The traditional approach of making decisions primarily from an economic perspective prioritises projects based on their short-term efficiency. However, this efficiency can only be realised if the pressures remain largely unchanged throughout the years between concept, delivery and use of the infrastructure.

We know from current studies of climate change that this assumption no longer holds true. The question then becomes, how do we plan for the future of our human settlements while ensuring this uncertainty is accounted for? The answer, at this stage, appears to be a swift change in the way infrastructure is defined, analysed and provided.

As emphasised in a recent World Bank working paper, there is a need to transition away from cost-benefit analysis of infrastructure projects that identify ‘optimal’ solutions for a specific future scenario and develop a system that recognises the need for flexibility and ‘robustness’ in infrastructure planning.229 We must therefore develop robust solutions to enhance the resilience of our infrastructure and built environment.

The development of these interventions must also move beyond the use of historic data to determine our needs and responses, as argued in Chapter 4 of Foundation Paper One, Climate Change Victoria: The Science, Our People and Our State of Play.

4.4.6.1 Different decision making

Proactive decision making and planning can also enable better environmental and socioeconomic results. An example of this would be requiring new water infrastructure to incorporate triple-piping (the purple pipe) to accommodate non-drinking water delivery to buildings.

Case Study: Purple Pipes in Googong

Developers of the new township of Googong, south of Queanbeyan in southern New South Wales, have unveiled a $90 million plan to recycle water. The new town will recycle about half of its waste water, including sewerage, contributing to an overall water saving of 60 per cent. The system will enable the township’s 16,000 residents to use less water than 7,000 residents would in an average Australian community. While the recycled water will be at a drinkable standard, it will be pumped back into homes through a separate main to be used for secondary purposes, such as washing cars and flushing toilets.297

The purple pipes will contain recycled water to be pumped back into homes
Source: Robert Herrick, ABC News.
The planning system and infrastructure

Once the decision making process is improved, the planning system also needs to be adapted to ensure that analysis and prioritisation results in more resilient infrastructure and urban design.

Planning coordinated at the regional level and better aligned with built and natural systems can enable consistent climate resilience approaches across Victoria.

New infrastructure provided by developers for the further development of urban areas and new development in greenfields must be climate resilient. This is especially true in areas that are already vulnerable to climate change, such as coastal and river-adjacent areas susceptible to flooding, and grassland suburbs (e.g. Melbourne’s west) susceptible to urban heat island impacts.

**RECOMMENDATION 26**

It is recommended that the Victorian Government establish an independent, statutory authority to analyse Victoria’s priority infrastructure needs and make recommendations.

**ATTRIBUTES**

The primary objectives include:

- projects that are prioritised on the basis of environmental, social and economic benefits
- an audit and review of completed infrastructure projects
- promoting the use of green infrastructure
- the use of incentives to deliver environmental, social and economic benefits.
4.4.7 Green infrastructure solutions

Emerging examples from within Victoria and around the world are demonstrating the ability to do more with less, reuse and retrofit existing systems, utilise ecosystem services in design, take advantage of development clusters and achieve co-benefits for people and nature. These projects can be referred to as ‘green infrastructure’.

The key benefits of green infrastructure systems over traditional ‘grey infrastructure’ approaches is their ability to regenerate, enhance (as opposed to just limit the damage to natural and environmental systems), and cope well with changing pressures and demands. A related benefit is the ability to implement green infrastructure projects at a variety of scales – a local project in one jurisdiction can link to an adjacent project, or spur a region-wide or statewide effort.

The adoption of green infrastructure, such as street trees, green roofs, green walls, permeable pavements and other landscaping elements can help to decrease local temperatures and reduce the need for cooling. This, in turn, can lessen the burden on the energy grid, mitigate the need for new and costly energy capacity and help protect communities as temperatures increase. The added benefit of increased energy performance and potential cost savings for buildings makes these types of improvements ‘no regrets’ strategies.

The following is a brief summary of benefits and savings that green infrastructure projects can provide.

### Figure B.4.4.5: Green infrastructure solutions

<table>
<thead>
<tr>
<th>Environmental outcome</th>
<th>Stormwater reduction</th>
<th>Urban heat island reduction</th>
<th>Energy saving</th>
<th>GhG reduction</th>
<th>Air quality improvement</th>
<th>River pollution reduction</th>
<th>Coastal flooding resilience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention type</td>
<td>Street trees</td>
<td>Green roofs</td>
<td>White roofs</td>
<td>Porous pavement</td>
<td>Road configuration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* indicates the presence of a co-benefit or environmental outcome for each intervention type.
4.4.7.1 Achieving co-benefits for environment and society

Green infrastructure can lead to significant cost savings for governments, developers and residents, as well as assisting to mitigate future climate change by storing carbon in new vegetation and soils. If implemented thoughtfully, green infrastructure can reduce heating and cooling costs, water use and water treatment costs. Additionally, it can reduce the need for very costly grey infrastructure systems to accommodate population increases in urban areas.

Green infrastructure projects typically include the provision of natural systems in urban areas. This can increase the exposure of residents to biodiversity, vegetation, and water; creating an opportunity for people to obtain an appreciation for the services these natural systems provide as well as their aesthetic value.

The success of local initiatives such as the City of Melbourne’s Urban Forestry Strategy and City West Water’s Greening the West are testament to their utility and the ability of local communities and organisations to deliver such projects.
4.4.8 Integrating infrastructure

Internationally, cities, states and nations are considering how to maximise the function of their infrastructure by taking a strategic and integrated approach to infrastructure provision.

One example of how this is being achieved is by the creation of independent ‘infrastructure boards’ with the purpose of analysing infrastructure needs, prioritising projects in a comprehensive manner and identifying and monitoring appropriate financing and delivery approaches. These boards can improve the way infrastructure is delivered and ensure that a coordinated approach to the development of transport, drainage and energy infrastructure is taken.

If such a board were to be created in Victoria, it would be essential that sustainability and green design be built into the enabling legislation to ensure that the maximum environmental, economic and social benefit is realised through infrastructure projects. In addition, infrastructure provision in Victoria needs to return to its former legacy as a driver of development, rather than an afterthought. For this to occur, coordination with any proposed regional planning authorities should be mandatory.

**RECOMMENDATION 27**

It is recommended that the Victorian Government establish a Statewide Urban Forestry Strategy.

**ATTRIBUTES**

The Department of Environment and Primary Industries should be the responsible department and the Victorian Adaptation and Sustainability Partnership could be considered as the delivery mechanism.
Case Study: VicRoads

Roadway design is standardised across Australia through Austroads. However, VicRoads has developed supplements to address specific areas and issues in Victoria.

Prominence can be given to green infrastructure practices in Victoria through developing a supplement that requires the use of certain practices to reduce stormwater run-off and urban heat island impacts in new and restorative road projects.

At a minimum, the adoption of techniques that divert a certain percentage of stormwater from entering the sewer system through incorporating landscaping and permeable pavement into new roads and the use of high-albedo (heat absorption reducing) pavements to reduce heat retention and local temperature increases should be a mandatory consideration during the design process.

A more prescriptive process would require certain levels of stormwater diversion and heat reflectivity for roads in problem areas across Victoria. It is acknowledged that VicRoads only has jurisdiction over a portion of Victoria’s public roads, however, this policy could serve as justification to amend the State Planning Policy Framework to require the use of green infrastructure in the design and construction of roads maintained by local councils as well.
4.4.9 Protecting Victoria from the long-term impacts of sea-level rise

While the strategies and approaches outlined here have benefits and can generally be more affordable than other intervention types, they have limitations as well. For example sea-level rise above a certain threshold may be beyond the coping levels of green infrastructure, or other engineering solutions.

Some controls and policies do already exist, including the Victorian Coastal Strategy (VCS) 2008, which sets the policy and strategic direction for responding to coastal hazard risks in the context of climate change. It states that planning for climate change should incorporate sea-level rise of 0.8 metres by 2100. The combined effects of tides, storm surges, coastal processes and local conditions also require consideration. The strategy is incorporated into the Victoria Planning Provisions.

However, the VCS is targeted at one impact of climate change, and in isolation does not represent a coordinated approach. As noted by the Climate Institute – gaps, inconsistency and conflicts across and within jurisdictions exist within climate change regulation and planning across Australia.

Early strategic planning and regular review of policies and targets as circumstances evolve or change can help reduce the long-term impacts of climate change, and help local communities to increase their adaptive capacity.
Although likely to be publicly and politically unpalatable, decisions such as planned retreat of coastal and bushfire prone communities, or moratoria on building permits, the reality is that these actions will need to be considered. These approaches can save lives, investments and possessions in the long term. They can also delay or eliminate the need for permanent and costly infrastructure investments by the State Government, and they are the decisions we need to be making now.

Continued development in at-risk areas places many Victorian households at risk from coastal and river flooding due to the combination of long-term sustained sea-level rise and storm surges from increases in extreme weather.

It is critical that Victoria adhere to the planning strategies stated in the Victorian Coastal Strategy 2008 and relevant sections of the Victorian Planning Provisions. In addition to a planning benchmark, specific triggers based on modelling, which mandate certain development regulations in coastal areas are desirable. For instance, if projected sea-level rise for a coastal area reaches 0.2 metres, specific flood protection building regulations must be applied to new and redevelopment (e.g. an ‘x’ centimetre rise in floor height for new buildings and renovations). If projected sea-level rise reaches 0.8 metres, a moratorium on all development must occur and if sea-level rise reaches 1.1 metres, retreat and relocation must begin to take place.

Strategic Adaptive Management (SAM) can be employed as a method for engaging government (including local government), science communities and residents in the climate change discussion. This would allow for mutually agreed thresholds for sea-level rise action and clearly defined responses for each threshold. Importantly, SAM also acknowledges uncertainty by establishing a process for continued engagement and enables a dynamic response to climate change.

Local geography, development and topography will also influence impacts of sea-level rise across Victoria, so flexibility to allow for variance by each council should be incorporated. The evolution of the Victorian Coastal Strategy into an effective long-term adaptation solution, will necessitate the continued review of thresholds and regulatory responses, taking into account the most up-to-date scientific knowledge.

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**Release of Draft Victorian Coastal Strategy 2013 for consultation**

The Victorian Coastal Council preparing the next iteration of the Victorian Coastal Strategy. The first stage in preparing the next VCS was the release on 11 September of a draft for public consultation. The draft strategy outlines a proposed approach for planning and managing Victoria’s coast and marine environment.

The release of the draft is an opportunity for all Victorians to comment on how our coast is managed. The Victorian Coastal Council would like to know if its draft strategy reflects the community’s aspirations for the Victorian coast and if it provides effective guidance for decision making.

Public submissions are due on 4 December 2013*

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Case Study: WA State Planning Policy 2.6

In July 2013 the State Coastal Planning Policy, which provides for the long-term sustainability of WA’s coast, was released.

There are pressures on the coastal zone for land use and development for a variety of purposes including a mix of recreational, residential, industrial and commercial uses. The policy provides a balanced approach to these often competing needs and desires in a way that takes into account the values of the coastal zone. The policy ensures that current and future generations of Western Australians can benefit from opportunities presented by the values and resources of the Western Australian coast

The coastal policy recommends notices be placed on title for properties likely to be affected by sea-level rise, sets out four adaptation measures and more than doubles the expected rise over the next 100 years. The policy must be given ‘due regard’ in preparing local planning schemes and is required to be considered when deciding coastal planning approval applications. The planning minister can require a local government to amend a local planning scheme to make it consistent with the policy.

Rise could erode sandy coast

As recommended by the WA Planning Commission in 2010, the policy raises the allowance for sea-level rise by 2100 from 0.38 metres to 0.9 metres. The policy states: ‘The allowance for erosion caused by future sea-level rise should include consideration of the potential reduction in wave attenuation by reef and the resulting impacts on shoreline stability.’

Disclosure on title

On consideration of approval for subdivision and/or development current and/or future lot owners should be made aware of the coastal hazard risk by providing the following notification on the certificate on title: ‘VULNERABLE COASTAL AREA – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years.’

The policy lists in order of preference four adaptation measures when an ‘unacceptable’ level of risk is identified to a community or a proposed development:

1. Avoid the presence of new development within an area identified to be affected by coastal hazards;
2. Planned or managed retreat or the relocation or removal of assets within an area identified as likely to be subject to intolerable risk of damage from coastal hazards over the planning timeframe;
3. Accommodation of the risks through design and/or management strategies that render them acceptable; and
4. Carry out coastal protection works if it can be justified in cases where there is a need to preserve areas, access or property ‘that is not expendable’.

The policy says new coastal protection works and significant upgrades of existing works are only permitted ‘after all other options for avoiding and adapting to coastal hazards have been fully explored, as part of a comprehensive coastal hazard risk management process’.

Onus on the proponent

The policy also includes a reference to the precautionary principle, stating that ‘lack of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation’.

‘The onus is on any proponent to show that development does not pose any likelihood of serious or irreversible harm to the environment,’ If the proponent can’t demonstrate that such harm doesn’t exist, the onus is on them to show that the harm can be managed.
4.5 Review and Reduce Non-Regulated, Distributed Emissions

Proposition

Mechanisms to improve air quality in Victoria have been largely successful. Impacts from major industries are generally well managed, and exhaust emissions from motor vehicles are expected to reduce over the next two decades, despite growing populations. However, these measures mean that a range of non-regulated emissions from distributed sources, such as wood heaters and off-road engines, will be responsible for a greater proportion of pollution impacts than in the past.

Context

Particles and ozone will be the pollutants of greatest concern arising from both distributed sources and major natural events (bushfires and dust storms). Additionally, climate change is expected to further increase pressures on air quality.

Although emissions from non-regulated sources are not currently well represented in national inventories, state inventories include reasonable estimates, and further research in this area is underway. This proposal discusses potential methods for limiting the impacts of non-regulated sources in the future.
4.5.1 The policy framework for air particle emissions

Victoria

In Victoria, the Environment Protection Authority (EPA) has responsibility for administering the Environment Protection Act 1970, which includes requirements for air quality.

- There are three critical statutory polices, developed by the EPA, that oversee air quality management:
  - the State Environment Protection Policy (Ambient Air Quality), which sets ambient air quality targets
  - the State Environment Protection Policy (Air Quality Management), which establishes the framework for managing emissions into the air environment in Victoria from all sources of air pollutants

The Vehicle Emissions regulations are due to expire January 2014. A regulatory impact statement and draft revised regulations were released for public consultation in August 2013.

Commonwealth

- The Commonwealth Government administers a number of important pieces of legislation, including:
  - the Motor Vehicle Standards Act 1989 and the Australian Design Rules, which set standards for vehicle design, including exhaust emission limits
  - the Fuel Quality Standards Act 2000, which controls the chemical content of all vehicle fuels sold in Australia (for example, the amount of lead or sulphur).

The Council of Australian Governments (COAG) is currently developing a National Plan for Clean Air, due in late 2014. This will involve a number of stages of work, with the first stage focused on particles (PM$_{10}$ and PM$_{2.5}$). Particles have been chosen as the initial focus because exposure rates are high and significant health benefits can be realised by reducing particle emissions, making actions more likely to be cost-effective.

4.5.2 Why non-regulated emissions are a critical gap in our air quality management

4.5.2.1 Sources and impacts of major air pollutants

There are several common pollutants that have serious, detrimental impacts on human health and ecosystem function in Victoria (Figure B.4.4.6). High levels of air pollution in Melbourne are associated with increases in daily mortality$^{310}$ and hospital admissions$^{311}$ (see Part A, for further discussion of health impacts).
**Figure B.4.4.6: The effects and sources of common atmospheric pollutants**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Toxic effects on human and ecosystem health</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particles</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| (particles smaller than 10 microns: PM$_{10}$ and smaller than 2.5 microns: PM$_{2.5}$) | Respiratory tract infection and irritation  
Increased mortality from cardiovascular disease  
Increased infant mortality | Burning fuels (wood, diesel, coal)  
Industry  
Bushfires and planned burning activities  
Wind-blown dust from land erosion and vehicle movement on unpaved roads  
Mining activities  
Agricultural activities |
| **Ozone (O$_3$)**              | Eye and throat irritation  
Exacerbation of respiratory disease  
Reduced plant growth | Ozone is not emitted directly but forms as a product of reactions between other pollutants (e.g. NO$_2$, CO and volatile organic compounds such as xylene) |
| **Nitrogen dioxide (NO$_2$)** | Harmful for children, the elderly and people with asthma  
May pollute water and soils | Burning fuels (natural gas, diesel, coal, petrol) |
| **Carbon monoxide (CO)**      | Toxic to humans, can cause coma and death | Petrol exhaust  
Wood smoke  
Bushfires and planned burning activities |
| **Sulphur dioxide (SO$_2$)**  | Throat irritation  
Exacerbation of respiratory disease  
May cause acidification of water and soils | Coal-fired power stations  
Metal smelting |
| **‘Air toxics’**              | Eye irritation  
Lung cancer  
Asthma | Motor vehicles  
Industry |
4.5.2.2 Air pollution inventories and management

Nationally, the major sources of air pollutants are recorded in the National Pollution Inventory (NPI).\(^{314}\) The NPI is a publicly accessible database that provides free information to the community, government and industry on the emissions and transfers of substances to our environment.

The NPI shows the approximate locations of emission sources, and emission rates for each substance, although it does not specify the exact location of industrial stacks or their height above ground. The NPI database provides direct emissions from large point sources as reported by industrial emitters; it also provides limited information on diffuse emissions (e.g. from motor vehicles), although these data are not always up to date. State-based emissions inventories, such as the one prepared by EPA, include NPI information plus further details about the exact location, timing and chemical profile of pollution emissions, as well as more detailed information on diffuse emissions.

In Victoria, the major sources of air pollutants are subject to regulations administered by the EPA. Current standards and frameworks are set out in the state environmental protection policies (see above). New industry proposals for emissions to air are subject to rigorous review (which may involve background monitoring, emission estimation, impact modelling and review of best practice) and considerations of practical emissions control. For major industrial sources, the EPA controls offsite impacts by requiring relevant industries to operate under a licence which sets emissions limits.

Significant improvements have been made to Victoria’s air quality since the 1970s, through application of state and commonwealth legislation. Pollutants related to vehicle exhaust are continuing to improve, despite the pressures of a growing population, due to improvements in vehicle design and fuel standards.
4.5.3 Addressing future emissions

While air pollution has been successfully managed over recent decades, the patterns of air pollution are changing, and new issues are emerging. The EPA has been working in partnership with CSIRO to identify how air quality impacts might change in the future.\(^{315}\)

The key points of its Future Air report were:

1. Emissions from motor vehicles will decrease as tighter national regulations are introduced.
2. The impacts of large industrial sources of pollution are being managed effectively through legislation, and this situation is expected to continue in the future.
3. The main influence of climate change will be to increase ozone pollution, largely through more frequent days of hot, still conditions in summer.
4. The pollutants of greatest importance in the coming decades will be ozone and particles.
5. It is expected that, as population and density increase, business operations and residential activity will form an increasingly larger proportion of pollutant sources.

The increasing importance of non-regulated, distributed emissions

Point 4 (above) highlights the future significance of particles and ozone as pollutants – both of which have well-documented health impacts. Because ozone is not directly emitted, but forms as a product of reactions between other pollutants, any measures to limit levels will need to address sources of ozone-forming compounds (such as NO\(_2\) and volatile organic compounds (VOCs), which are emitted from a wide range of human activity as well as from natural sources.

Point 5 (above) raises the issue of an emerging suite of emissions sources that are not currently directly regulated and potentially not well represented by estimates in the NPI. These are primarily emissions of particles and ozone-forming compounds produced by domestic sources or small businesses. These sources are small individually but numerous – and as historically large emissions (heavy industry, traffic) decline or remain steady these sources can play an increasingly substantial role in reducing air quality. Because these sources are often located close to where people live, growing urban populations will have greater exposure leading to greater health impacts.

Examples of such non-regulated, diffuse sources are:

- wood heaters
- small engines (generators, lawnmowers, etc.)
- surface finishing (spray painters, etc.)
- commercial and domestic fuel use for heating, hot water and cooking.
- other activities that generate particles (e.g. construction, demolition, soil transport)

As well as these sources, bushfires, planned burns and dust storms can also result in very high levels of particulate air pollution. The frequency of these events in coming decades may be influenced by climate change. Understanding these trends will require advanced modelling as well as rigorous monitoring over long time scales.
4.5.4 The National Plan for Clean Air

The importance of air quality is recognised at a federal level and in 2011 COAG identified air pollution as a ‘Priority Issue of National Significance’. As a result, the COAG Standing Council on Environment and Water has been tasked with developing a National Plan on Clean Air by the end of 2014, with the first stage focusing on particle emissions.

The purpose of a national plan is to:

- coordinate Commonwealth, state and territory actions
- integrate air quality standard setting with actions to reduce pollution and exposure to pollution
- modernise standards and respond to the latest science
- prioritise measures that achieve a net benefit to the community, and
- respond to emerging trends.

In its first stage, the national plan will involve development of an exposure reduction framework for particles, and will consider potential cost-effective actions for particle reduction measures. This includes assessing options such as emission standards for specified products sold across jurisdictions for some currently non-regulated, diffuse sources. These are:

- wood heaters
- non-road spark ignition engines (e.g. garden equipment - see boxed text)
- non-road diesel engines (e.g. generators and outboard motors).

While the particle emission reduction projects are at varying stages of development, similar assessment processes are being applied for all three projects and all have included the drafting of regulation impact statements (RIS).

The above devices have been identified by COAG as the emissions sources of greatest concern. There has not, as yet, been a comprehensive review of emissions from non-regulated, distributed sources on air quality and human health in Australia.

Unregulated emissions from garden equipment

The United States regulates exhaust emissions from all non-road engines, including petrol and diesel lawnmowers. There are no Australian regulations that limit air emissions from non-road engines, although the use of tools such as lawnmowers, leaf blowers and generators is likely to increase in future in line with population growth.
RECOMMENDATION 28

It is recommended that the Victorian Government fund multi-sectoral research into the potential impacts of emissions from emerging sources and review the current status and projected change of the emissions.

ATTRIBUTES

The proposed research would:

- include quantification of concentrations, population exposure and health risk
- include the study of direct and indirect climate change impacts
- include quantification of air pollutant exposure and consequent health effects
- include social and activity surveys and local monitoring studies to verify predicted impacts
- identify emerging issues not covered by the National Plan for Clean Air.

RECOMMENDATION 29

It is recommended that the Victoria Government address emissions standards to reduce exposure to particles and ozone.

ATTRIBUTES

Standards for exposure to particles and ozone (via the EPA) would be addressed by:

- tighter PM$_{10}$ standards for wood, wood fuel standards (e.g. moisture content is regulated in Western Australia$^{318}$)
- improved regulations for emission of ozone forming compounds from surface coatings and non-road engines
- ozone being brought into alignment with the development of the National Plan for Clean Air.

The introduction of new regulatory measures would be supported by:

- education and incentives specifically for small business which might be impacted by any regulatory changes
- clear guidelines for communication and clarification of enforcement responsibilities between relevant agencies (such as EPA and local councils).