

CHAPTER 09

SUSTAINABILITY AND RESILIENCE



Plan Melbourne Outcome 6:
Melbourne is a sustainable and resilient city

Plan Melbourne aims to create a resilient and sustainable city. It recognises the need to mitigate greenhouse gas emissions, reduce exposure to natural hazards, undertake whole of water cycle planning and design, and protect local waterways. It also encourages resource efficiency and promotes the benefits of urban cooling and greening.



Photo credit: Craig Moodie Photography

While heatwaves have a greater negative effect on population health than any other climate-related issue, the Southern Metro Region will also experience lower rainfall and more extreme rainfall events. Valued coastal environments, coastal suburbs and infrastructure will be increasingly under pressure from tidal inundation and sea level rise.

Coupled with urbanisation, increased temperatures and lower annual rainfall will place additional pressure on natural assets and marine ecosystems such as Port Phillip Bay and Western Port, Ramsar wetlands, creeks, river corridors, parks and other valued vegetation. These changes will also put pressure on agricultural production and drive the importance of whole of water cycle planning.

The Southern Metro Region has significant challenges to overcome to create a resilient, sustainable region. Key priorities include supporting existing metropolitan and regional waste and water treatment facilities, delivering better environmental services in green wedges and effectively adapting and reducing climate risk.

Urban heat environments

By 2050, the average annual temperature in the Southern Metro Region is forecast to increase between 0.7° Celsius and 2.8° Celsius under a medium emissions climate change scenario (JM, et al., 2019). As our climate warms the number of people exposed to the risk of mortality from heatwaves will increase. It is estimated around 53,000 residents in the Southern Metro Region were exposed to high urban heat conditions in 2018, particularly in growth area communities (Urich Hardy, 2019).



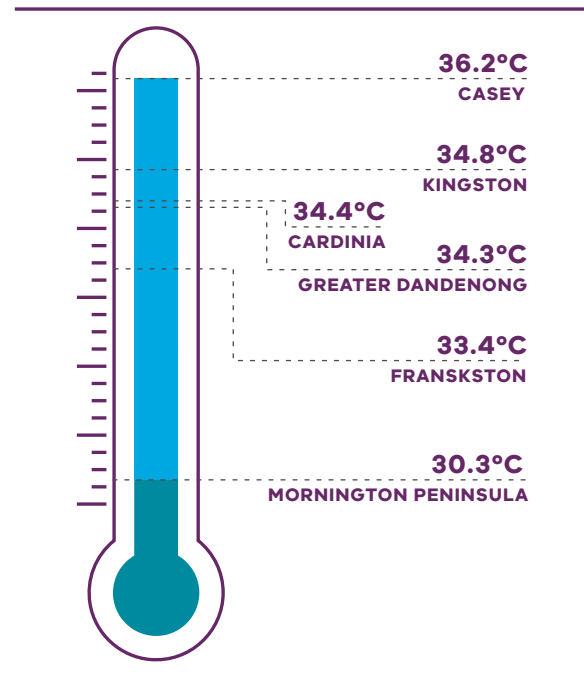
Photo credit: Tim Bell Studio

In 2018, the average land surface temperature (LST) in the Southern Metro Region was 33.6°Celsius. LST was highest in Casey LGA and coolest in Mornington Peninsula LGA (Figure 24). Growth areas have more people exposed to higher urban temperatures during periods of hot weather. Children, seniors, people with pre-existing illnesses and those with fewer resources to adapt are at greater risk on hot days and in prolonged periods of hot weather (Figure 25).

Urban environments that stay cooler on hot days are more physically comfortable to humans and animals and continue to support movement and recreation. As the number and duration of hot days increases, these environments will be important to reduce the likelihood of heat-related illness. Cooler urban environments are characterised by more tree cover, less hard surfaces, more water infiltration into the ground and fewer heat absorbing building materials.

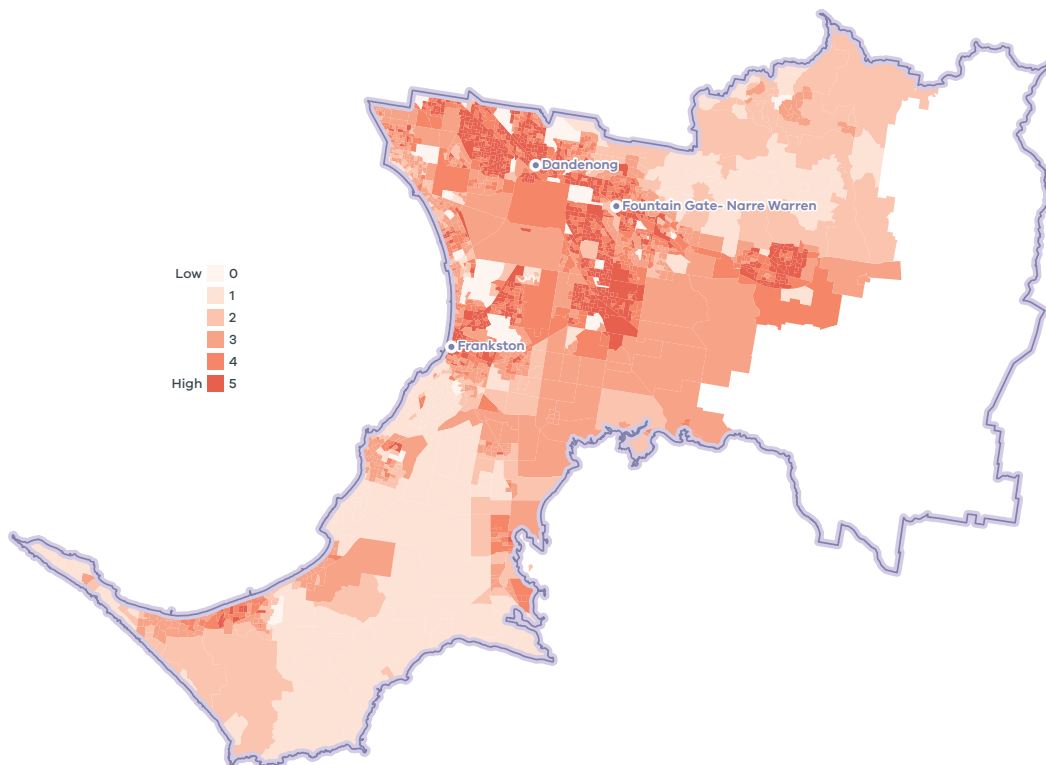
There are large areas of urban heat across the Southern Metro Region including from Springvale to Pakenham in the east and Cranbourne and Clyde in the south-east. These areas have less trees and more hard surfaces, including new communities converted from agricultural land to urban purposes. Conversely, the region also features grasslands, agricultural areas, green wedge areas and coastal environments with higher levels of tree canopy. This means individual suburbs offer different levels of amenity on hot days.

FIGURE 24. Average land surface temperature by LGA, 2018



Source: Department of Environment, Land, Water and Planning (2018) Land Surface Temperature Data, State of Victoria, Melbourne, Australia.

FIGURE 25. Heat vulnerability index map for the Southern Metro Region, 2018



Flooding risk and waterway health

While overall annual rainfall will decrease, the Southern Metro Region is predicted to see more frequent and intense rainfall events due to climate change. More intense rainfall will increase the risk of flooding in areas such as the Dandenong Creek Valley and the Mornington Peninsula, and contribute to existing inter-regional flooding issues that extend from Mordialloc to Caulfield North (Inner South East Metro Region) (DELWP, 2018b).

Currently a significant proportion of the Southern Metro Region is subject to flooding. Large expanses of land from Clyde and Pakenham in the growth areas, and east across the green wedges to the edge of the Southern Metro Region, are governed by flooding controls in planning schemes.

Continued urban consolidation and resultant increases in impermeable surfaces will exacerbate this situation, presenting a greater risk of stormwater inundation to both private and public property.

Sea level rise and coastal inundation risk

Almost 30 per cent, or 90 kilometres, of Port Phillip Bay's coastline and 145.5 kilometres of Western Port's coastline, is in Melbourne's Southern Metro Region (DELWP, 2017b).

Coastal flooding occurs along the Mornington Peninsula where approximately 40 per cent of the coastline is designated as flood prone.

Much of Western Port's coastline is low tidal mudflats and mangrove thickets. Former swamplands of Koo Wee Rup and low-lying coastal settlements around Tooradin and Blind Bight are highly susceptible to flooding (Map 9).

The coastline and bays have significant value to the Victorian community for a range of cultural, recreational, environmental and economic values (DELWP, 2017b, p. 20). The bays have pressures from urbanisation and changing land use throughout the Port Phillip and Western Port catchments. Rainfall intensification will exacerbate current impacts including increased stormwater and pollutant runoff. Marine and coastal environments will be impacted by water temperature and sea level rise. Storm surges will also become more frequent, exposing the coastline to erosion and inundation (DELWP, 2017b).

As projected average temperatures continue trending upwards through this century, so too will global mean sea levels as oceans partially absorb atmospheric heat and glaciers and polar ice caps continue to melt.

State planning policy recognises the need to plan for anticipated sea level rise to Port Phillip Bay and Western Port, with Western Port expected to experience greater levels of sea level rise than Port Phillip Bay. Given the uncertainty of our climate change future, planning policy will need to be responsive to future recalibration of sea levels (Melbourne Water, 2017).

Coastal acid sulfate soil risk

Acid sulfate soils have been identified around both Port Phillip bay and Western Port bay (Victorian Government, 2009). While these soils are naturally occurring in coastal and inland settings, modification of the landscape such as draining swampland, excavation and development can trigger the release of toxic elements that can contaminate drinking water and food. Future disturbance of low-lying coastal soils must be prevented.

Bushfire risk

In the eastern parts of the Southern Metro Region, green wedges provide non-urban landscapes interspersed with urban interfaces. While providing an important non-urban buffer, these areas have large urban and rural interfaces with identified bushfire risk in all LGAs in the Southern Metro Region. The bushfire risk extends to a significant number of suburbs and non-urban areas, with a mix of grassland and areas of high vegetation cover. Key areas of bushfire risk, high vulnerability and other sustainability factors across the Southern Metro Region are shown in Map 9.

Eastern Treatment Plant

The Eastern Treatment Plant, located in Bangholme, treats almost half of Melbourne's sewage at 350 million litres a day. It uses innovative treatment processes to treat all sewage received at the plant to a very high quality which both protects the receiving marine environment at Boags Rocks on the southern Mornington Peninsula as well as meeting the requirements for Class A recycled water. The plant currently generates around 30 per cent of its own energy supply needs. Recycled water is used to irrigate crops, parklands and sporting fields (DELWP, 2018b). As Melbourne grows the amount of treated water generated by the plant will grow.

Urban tree canopy

Across the Southern Metro Region the tree canopy plays an important role of providing habitat and contributing to the character of parks and the green wedges. In urban areas, trees also provide cooling, amenity, recreation and respite for residents (Figure 26).

The Southern Metro Region has 15.2 per cent of urban tree canopy cover which is about the same as the metropolitan average of 15.3 per cent (Hurley, et al., 2019a). Tree canopy varies across the region.

There are areas of greater coverage in southern coastal areas along Port Phillip Bay and Western Port and in the northern part of the region, north of Cardinia Reservoir. Mornington Peninsula has the highest urban tree canopy coverage of almost 22 per cent while Greater Dandenong has the lowest urban tree canopy of 6.6 per cent (Figure 27).

Across the Southern Metro Region, most of this urban tree canopy is on residential land, parkland and linear infrastructure such as streets (Figure 28).

FIGURE 26. Urban tree canopy cover by land use, 2018

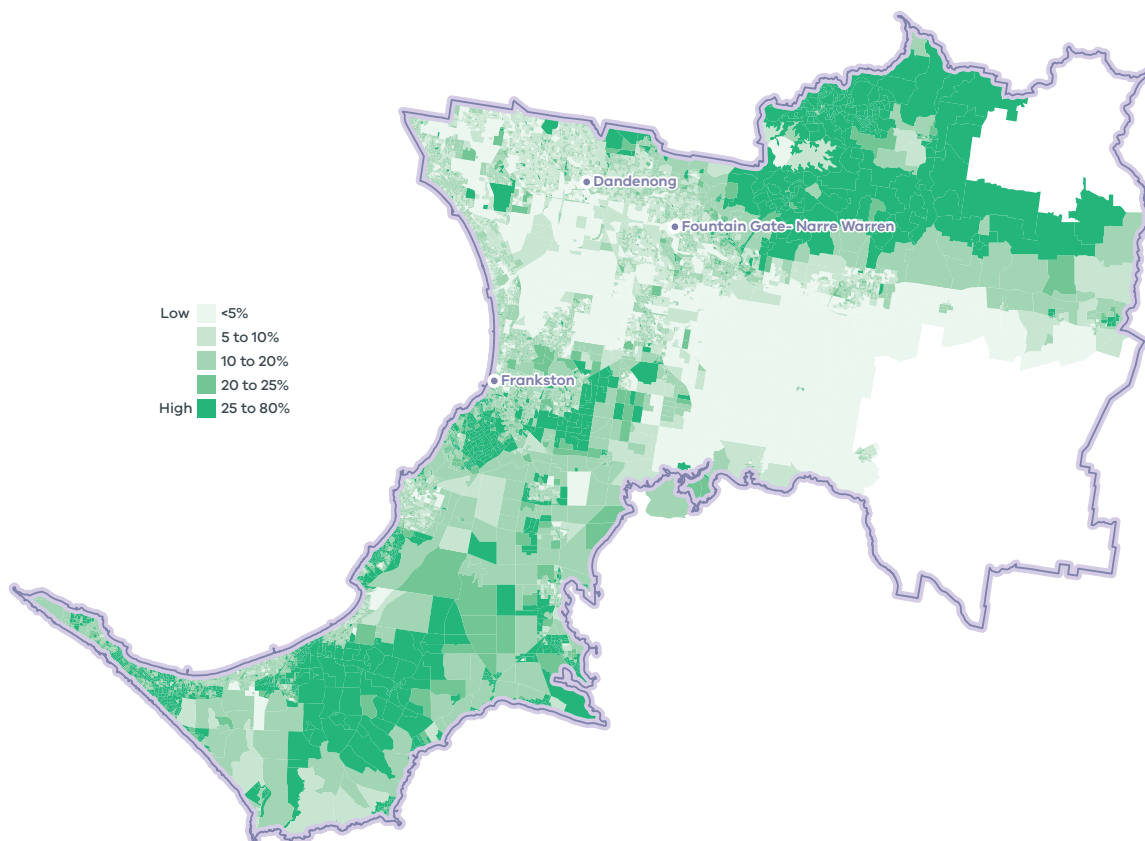
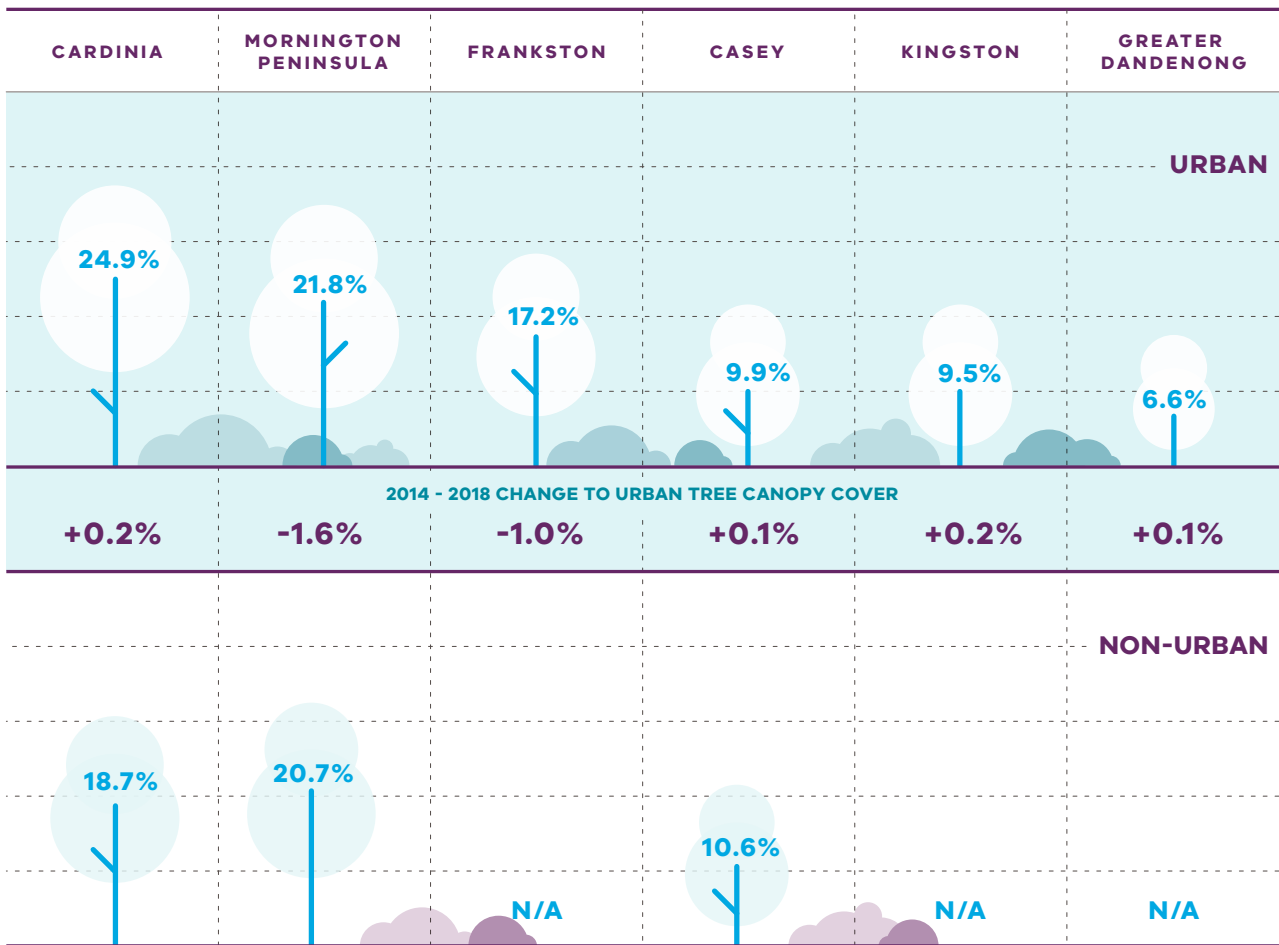


FIGURE 27. Tree canopy cover 2018, and tree canopy cover change 2014 to 2018, by LGA



Source: Hurley, J., Saunders, A., Amati, M., Boruff, B., Both, A., Sun, C., Caccetta, P., and Duncan, J. (2019) *Melbourne Vegetation Cover 2018, Southern Region*, Department of Environment, Land, Water and Planning, Melbourne, Australia.

Hurley, J., Saunders, A., Both, A., Sun, C., Boruff, B., Duncan, J., Amati, M., Caccetta, P. and Chia, J. (2019) *Urban Vegetation Cover Change in Melbourne 2014 - 2018*, Centre for Urban Research, RMIT University, Melbourne, Australia.

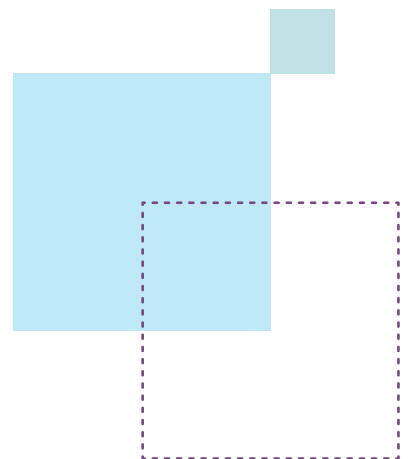
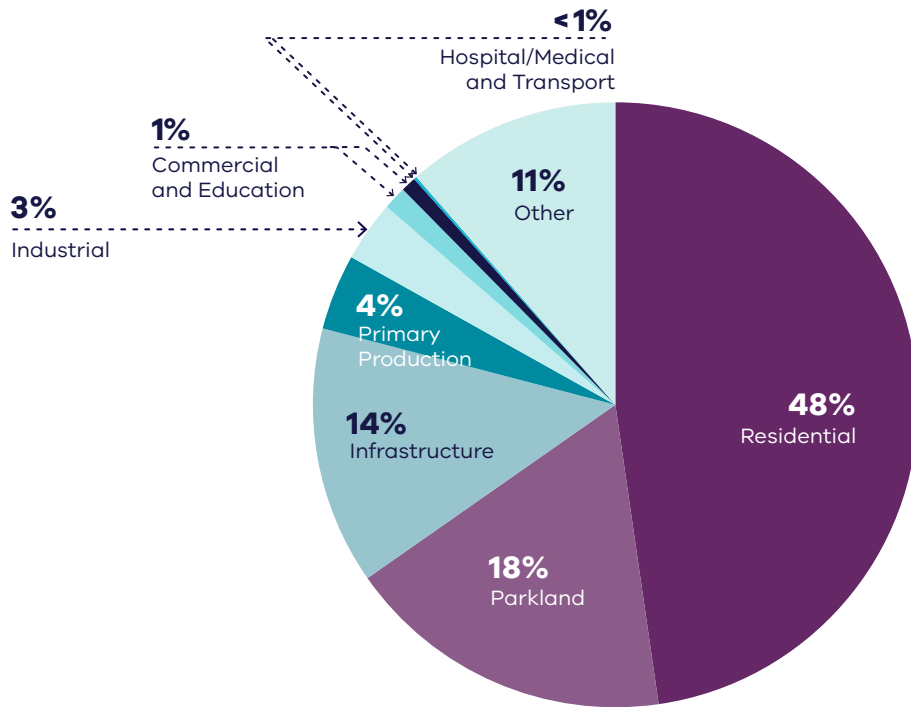


FIGURE 28. Urban tree canopy cover by land use 2018



Source: Hurley, J., et al. (2019) Melbourne Vegetation Cover 2018, Southern Region, Department of Environment, Land, Water and Planning, Melbourne, Australia.



Photo credit: Tim Bell Studio

Resource efficiency and waste and resource recovery

In 2013-14 Greater Melbourne had a 73 per cent resource recovery rate, with 805,000 tonnes of food and garden waste sent to landfill. By 2042 it is projected waste volumes will grow by 63 per cent to 16.5 million tonnes each year (Metropolitan Waste and Resource Recovery Group, 2016).

Even with greater levels of waste and resource recovery, Melbourne will not have enough land filling capacity in any of its significant landfills. The most significant landfills, designated as hubs of state importance in the Southern Metro Region, are SUEZ Hallam and SUEZ Lyndhurst. SUEZ Hallam is likely to close by 2040 and SUEZ Lyndhurst has the potential to operate beyond 2046 (Metropolitan Waste and Resource Recovery Group, 2016).

Sustainability in the built environment

In 2013, residential buildings were responsible for nearly 12 per cent of Australia's national greenhouse gas emissions, and commercial buildings contributed just over 11 per cent. The majority of these emissions were generated through the consumption of grid-supplied electricity to power appliances, lighting, and predominantly heating, ventilation and cooling systems (Australian Sustainable Built Environment Council, 2016).

As average temperatures rise due to climate change, greater numbers of people are expected to seek comfort indoors during high heat conditions. This, combined with population growth and overall poor-performing building stock, means our city lacks energy efficiency and resilience on hot days. Maximising opportunities to incrementally improve the performance of buildings will reduce our reliance on appliances to cool buildings and contribute to a lower likelihood of blackouts during periods of hot weather.

Local councils within the Southern Metro Region are active in adopting policies and strategies to reduce carbon emissions and improve the sustainability of the built environment. Many are innovators and leaders in environmentally sustainable development (ESD) and are implementing practices to improve the energy efficiency of civic buildings and reduce emissions from operations.

Several LGAs are members of the Council Alliance for a Sustainable Built Environment (CASBE), an association committed to designing and applying a range of practical methodologies to increase sustainability outcomes for new buildings. The Built Environment Sustainability Scorecard (BESS) is an online tool developed by CASBE that assesses the sustainability of proposed developments. It aims to reduce waste and improve energy efficiency from the outset of the construction phase, through to occupation. As well as onsite energy generation, BESS promotes the use of energy-efficient appliances, thermally-efficient glazing, wall cladding and insulation, water-efficient fittings and fixtures, thermal comfort and overall environmentally sustainable performance.

Other rating systems increasingly used by the building design industry to measure and assess the performance of ESD principles include Green Star (Green Building Council of Australia, 2021), NatHERS (Nationwide House Energy Rating Scheme, 2021) and MUSIC (MUSIC Auditor, 2021).

Energy networks

Melbourne's energy grid is transforming. The city's future grid will have a greater ability to export energy from individual properties or a local area, presenting a more flexible approach to energy production. It will be smarter, more reliable and provide greater energy security. Regional energy generation and storage is also a potential option, and the region's green wedge areas could provide an opportunity to support these facilities subject to environmental and landscape considerations.

Regional strengths

- Increasing volumes of treated wastewater from the Eastern Treatment Plant can be used for urban cooling and greening, agriculture and industry.
- There are opportunities for increased use of recycled water from several locations within the region.
- A strong tree canopy exists in parts of the region and can be extended to assist with urban greening and cooling.

Regional challenges

- Coastal inundation and sea level rise pose significant risk to population, ecosystems, infrastructure and property.
- Environmental hazards are significant considerations in planning for growth, such as large expanses of land subject to flooding, and bushfire risk to the community, infrastructure and high-value native forests, grasslands and ecosystems.
- Areas of high urban heat and heat vulnerable communities exist in parts of the region.

Directions and strategies

The directions identified to achieve the 2050 vision for the Southern Metro Region in terms of Sustainability and resilience and Outcome 6 of Plan Melbourne are:

Direction 24	Manage the impact and risk of sea level rise
Direction 25	Better plan for land use to use forecast recycled water across the region
Direction 26	Increase the retention and reuse of water in the urban environment
Direction 27	Respond to the transformation of the energy supply network
Direction 28	Minimise and reduce risk from bushfire
Direction 29	Increase the network of cool places, particularly in areas with communities vulnerable to urban heat and areas with high urban heat
Direction 30	Increase urban tree canopy across the Southern Metro Region to achieve 30 per cent coverage by 2050
Direction 31	Protect sites of strategic importance for recycling and plan for the expansion of key sites for future resource recovery needs

Each direction is implemented through regionally-specific strategies identified in this LUF.





Map 10 shows how sustainability and resilience will be enhanced across the Southern Metro Region by 2050 as a result of these directions and strategies, together with Plan Melbourne and other strategies and initiatives as outlined in Appendix 01.







Photo credit: Tim Bell Studio

MAP 9. Southern Metro Region sustainability and resilience state of play

Precincts and Activity Centres

-  National employment & innovation cluster (NEIC)*
-  Metropolitan activity centre
-  Major activity centre
-  Major activity centre (future)

Transport






-  State-significant road corridor
-  Road network
-  Train station
-  Rail network

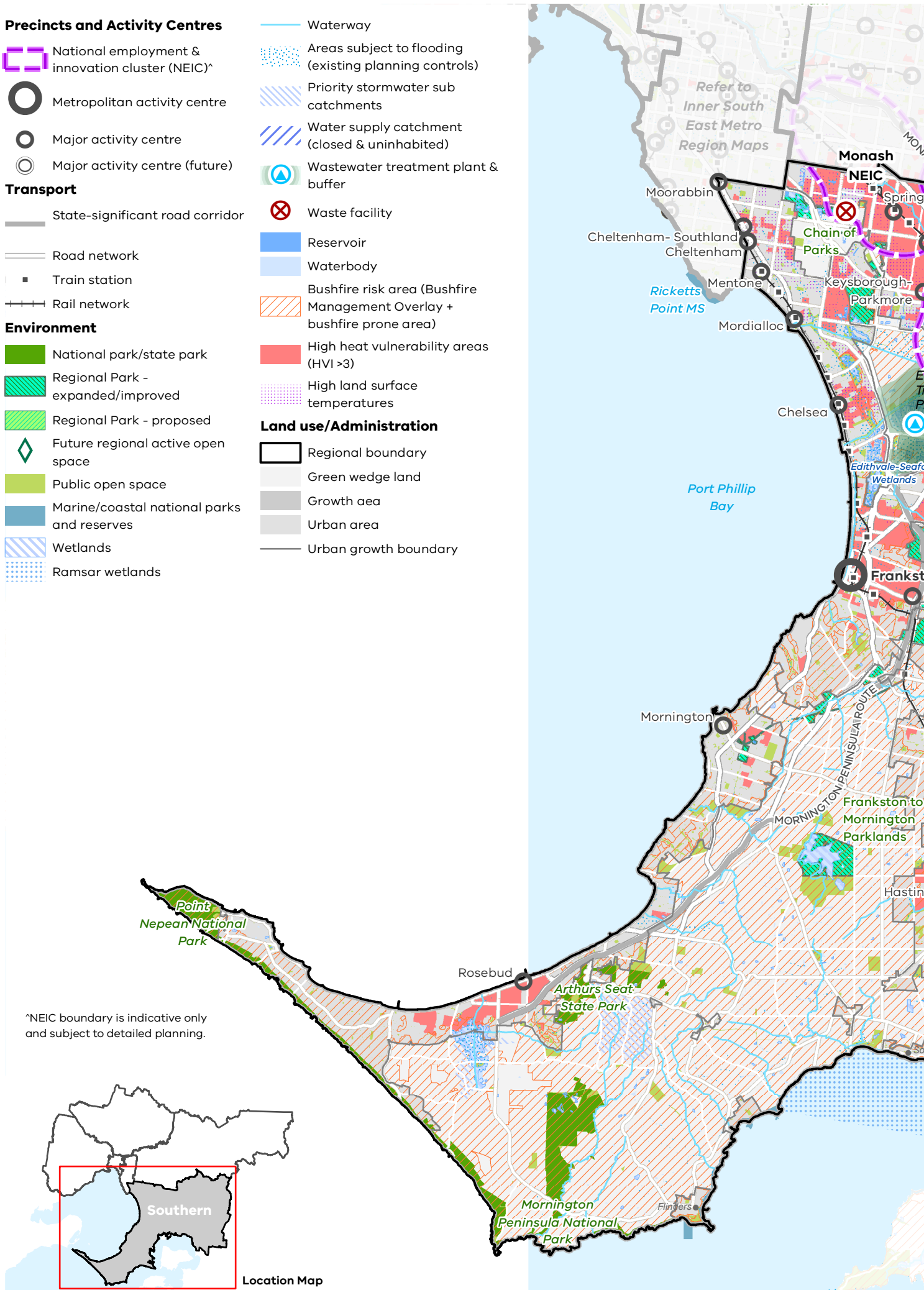
Environment

-  National park/state park
-  Regional Park - expanded/improved
-  Regional Park - proposed
-  Future regional active open space
-  Public open space
-  Marine/coastal national parks and reserves
-  Wetlands
-  Ramsar wetlands

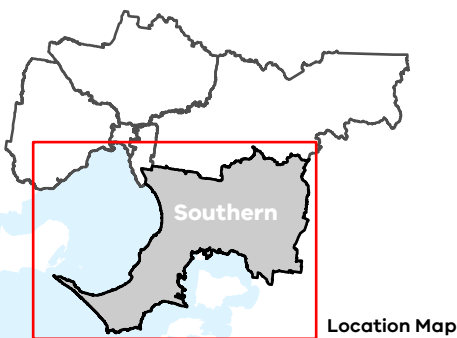
-  Waterway
-  Areas subject to flooding (existing planning controls)
-  Priority stormwater sub catchments
-  Water supply catchment (closed & uninhabited)
-  Wastewater treatment plant & buffer
-  Waste facility
-  Reservoir
-  Waterbody
-  Bushfire risk area (Bushfire Management Overlay + bushfire prone area)
-  High heat vulnerability areas (HVI >3)
-  High land surface temperatures

Land use/Administration

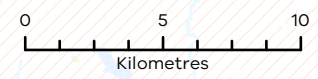
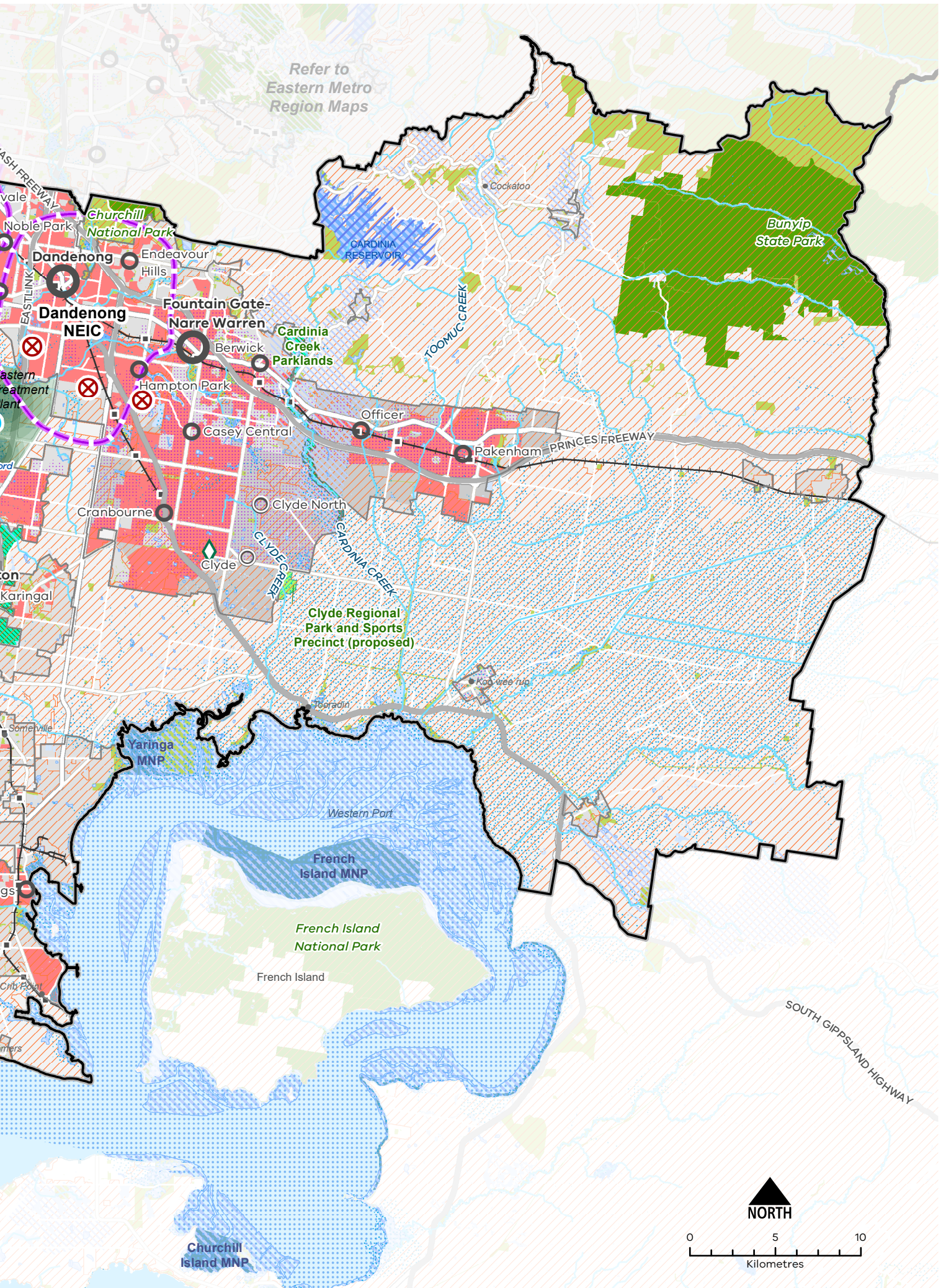
-  Regional boundary
-  Green wedge land
-  Growth area
-  Urban area
-  Urban growth boundary



*NEIC boundary is indicative only and subject to detailed planning.






Refer to Eastern Metro Region Maps

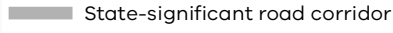

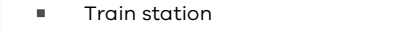



MAP 10. Southern Metro Region sustainability and resilience 2050


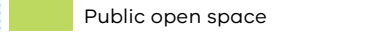




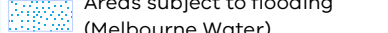

Precincts and Activity Centres

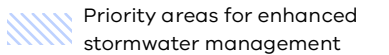
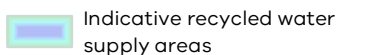
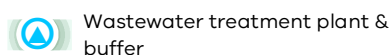
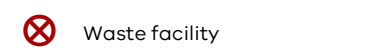
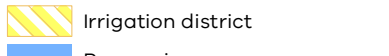
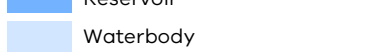
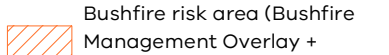
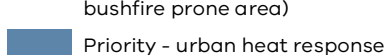


-  National employment & innovation cluster (NEIC)*
-  Metropolitan activity centre
-  Major activity centre

Transport

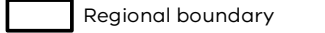
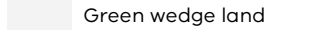
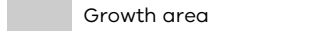
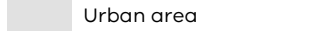
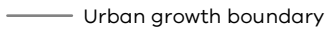
-  State-significant road corridor
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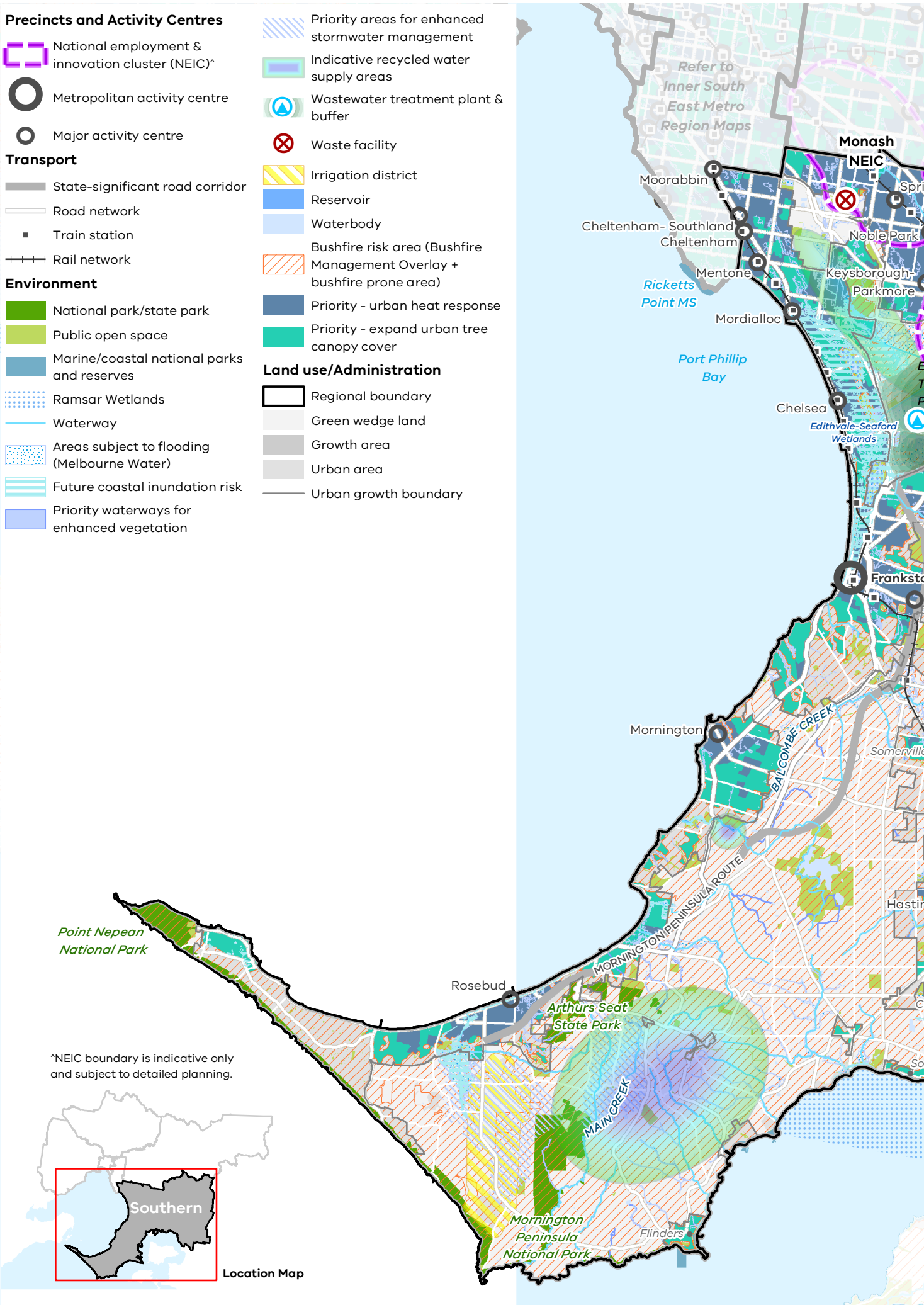
Environment

-  National park/state park
-  Public open space
-  Marine/coastal national parks and reserves
-  Ramsar Wetlands
-  Waterway
-  Areas subject to flooding (Melbourne Water)
-  Future coastal inundation risk
-  Priority waterways for enhanced vegetation

-  Priority areas for enhanced stormwater management
-  Indicative recycled water supply areas
-  Wastewater treatment plant & buffer
-  Waste facility
-  Irrigation district
-  Reservoir
-  Waterbody
-  Bushfire risk area (Bushfire Management Overlay + bushfire prone area)
-  Priority - urban heat response
-  Priority - expand urban tree canopy cover

Land use/Administration

-  Regional boundary
-  Green wedge land
-  Growth area
-  Urban area
-  Urban growth boundary

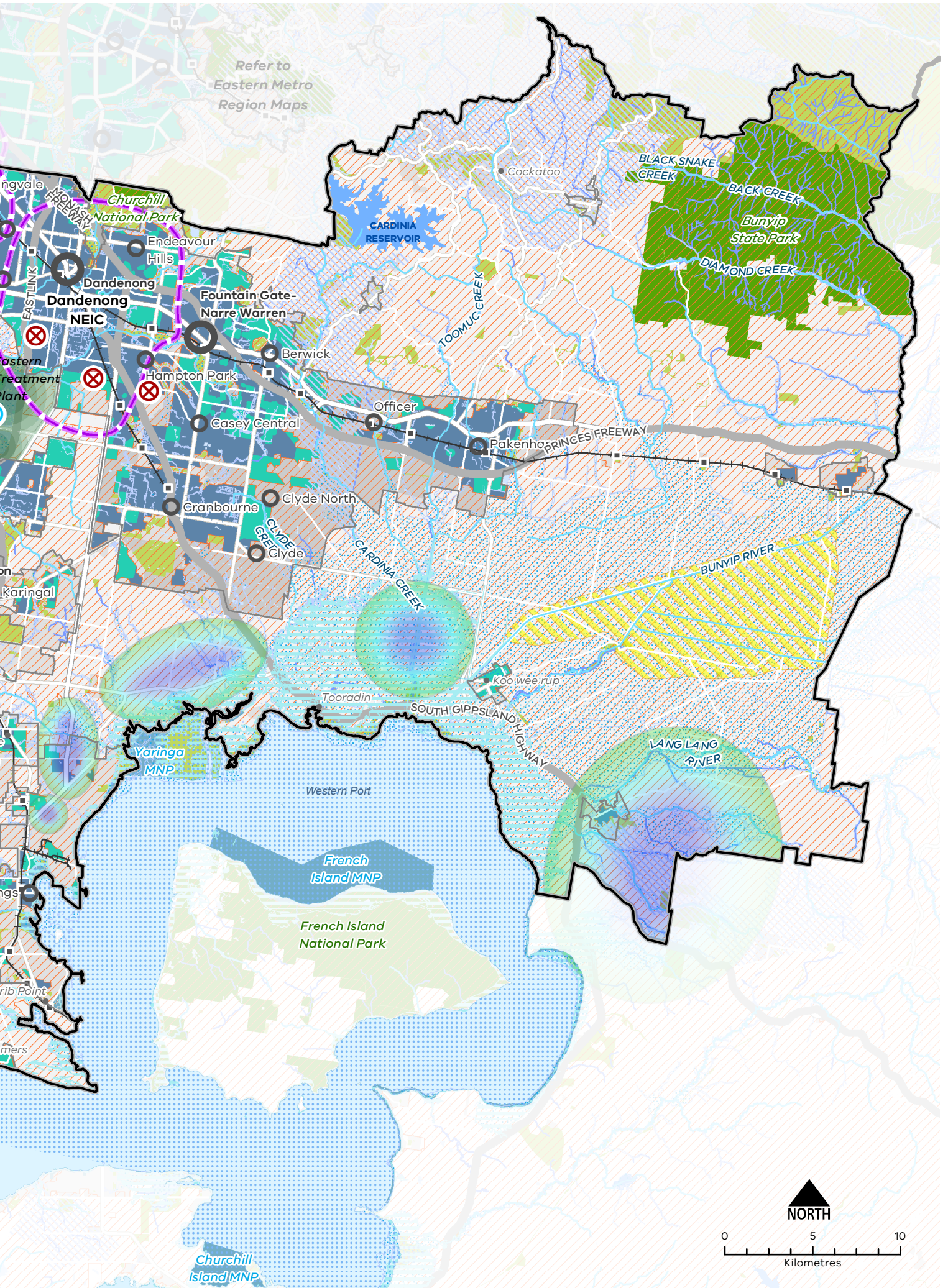


*NEIC boundary is indicative only and subject to detailed planning.



Location Map

Refer to
Eastern Metro
Region Maps



DIRECTION 24.**Manage the impact and risk of sea level rise**

Rising sea levels caused by climate change are expected to impact urban settlements, infrastructure and coastal and marine ecosystems in the Southern Metro Region, with the potential for major disruption.

More than half of the Southern Metro Region's boundary, or almost 300 kilometres, is coastline, with half of this coastline featuring urban settlements and suburbs.

Various economic, community and environmental assets are located adjacent to the shorelines of Port Phillip bay and Western Port and lie at relatively low elevations making them vulnerable to inundation associated with sea level rise.

Land around Frankston, Chelsea, Mordialloc, Hastings, Koo Wee Rup, Warneet, Cannons Creek, Tooradin and South Gippsland Highway, including coastal wetland environments, has been identified as at risk of sea level rise and storm surge from coastal waters, drains and creeks. It is expected that mature mangroves and the establishment of mangroves on the fringe of Western Port will also be impacted by rapid erosion and increased sediments from sea level rise (Water Technology, 2014).

The impacts of storm surge and coastal inundation must be planned for (Water Technology, 2014). Regional planning can help integrate and manage land use and infrastructure change to reduce the risk to settlements and natural assets from coastal inundation and storm surge.

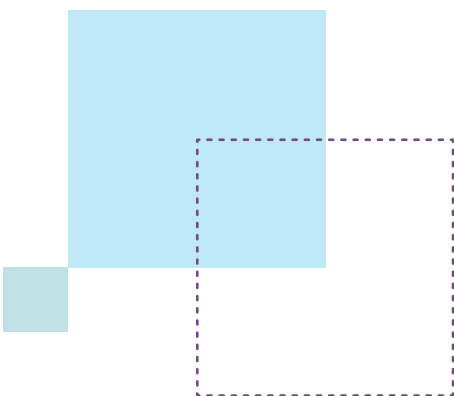
DELWP is undertaking a Local Coastal Hazard Assessment for Port Phillip Bay. The Local Coastal Hazard Assessment will provide better information about the expected impacts of coastal hazards such as saline groundwater intrusion, erosion and inundation that are exacerbated by the effects of climate change. This information will better inform planning decisions in public coastal areas around the bay.

Current work underway by DELWP and LGAs for the Western Port and Mornington Peninsula green wedges has identified a number of climate change issues. This includes managing the impacts of sea level rise, flooding and stormwater on coastal towns and rural areas (Victorian Government, 2021). They also identify the need to prevent further contamination from coastal acid sulphate soils.

Given the uncertainty of the impacts of climate change and sea level rise into the future, a flexible and adaptive approach to planning approach across government, agencies and LGAs is required to manage and mitigate risks holistically for the region.

STRATEGY 79. Encourage settlement planning for coastal environments and communities to respond to sea level rise and natural hazard risk.

STRATEGY 80. Limit major land use change in locations with future coastal inundation.



DIRECTION 25.**Better plan for land use to use forecast recycled water across the region**

Plan Melbourne supports the use of all water sources including recycled water, to ensure the city remains liveable and sustainable and to reduce reliance on drinking water. By 2050, Plan Melbourne identifies a greater contribution of recycled water to Melbourne's water supply mix.

Recycled water is produced at water recycling plants across the Southern Metro Region, the largest being the Eastern Treatment Plant (ETP). The advanced tertiary treatment applied at ETP produces some of the best quality and lowest risk recycled water in Victoria. Recycled water not used by existing customers is discharged via the 56 kilometres South East Outfall to Bass Strait at Boags Rocks. The *Melbourne Sewerage Strategy 2018* includes goals about how the use of recycled water can be optimised and contribute to Victoria's circular economy.

Some areas of land within the Southern Metro Region are already using recycled water such as the Boneo Recycled Water Irrigation Scheme. South East Water has also recently committed to establishing a new recycled water scheme in the Bunyip region while a number of additional opportunities to expand recycled water have been identified, which if realised, could significantly increase agricultural productivity and job creation for the region.

Recycled water could also be used to irrigate open spaces, improve vegetation health and reduce the risk of bushfire. Access to recycled water could provide opportunities for a broader mix of uses, including community uses in Southern Metro Region green wedges.

As Melbourne grows the need to treat wastewater and the potential need to discharge significant amounts of water into Bass Strait will increase. The projected increase in recycled water is a major opportunity for the Southern Metro Region. Planning should support the delivery of recycled water, including diverting recycled water from the South Eastern Outfall, to agricultural and urban use.

STRATEGY 81. Support land use that will utilise and facilitate the expansion of recycled water access.

STRATEGY 82. Protect and buffer the Eastern Treatment Plant through appropriate planning zones as a waste water management hub.

STRATEGY 83. Support the use of recycled water on open spaces, including in Frankston, Mornington Peninsula and Cardinia LGAs (where appropriate).

STRATEGY 84. Support recycled water access to Gippsland irrigators and agricultural uses.

DIRECTION 26. **Increase the retention and reuse of water in the urban environment**

Integrated stormwater management, reducing runoff into waterways and wetlands, and water recycling will improve climate resilience and liveability across the Southern Metro Region.

Parts of the Dandenong, Port Phillip and Western Port catchments will continue to undergo significant land use change for housing, diversification of activity centres, and new industrial, health and education precincts. This will increase rapid runoff and flooding and negatively affect water quality and waterway health for aquatic life. Responding to this change and supporting the health of the region's waterways, wetlands and bays will be an ongoing challenge.

While some areas of the Southern Metro Region are subject to flooding overlays, such as the Special Building Overlay (SBO) and Land Subject to Inundation Overlay (LSIO), there is an opportunity to increase stormwater and floodwater harvesting capabilities. Improved stormwater storage capabilities and stormwater harvesting and management across the region, could reduce the risk and cost of major rainfall events and minimise impacts, such as pollution to the bay's marine environments (DELWP, 2018b).

Local capture of stormwater, water recycling, restoration and revegetation of urban waterways and greywater systems will improve the region's hydrological and ecological systems.

Harvesting stormwater and increasing water infiltration is important in dense suburbs to reduce runoff and service vegetation. Harvested stormwater can help maintain water-reliant facilities and amenities such as sporting fields and gardens, contribute to more resilient vegetation and reduce demand on drinking water. Open spaces, pedestrian and cycling networks and new subdivisions can all use WSUD to improve urban amenity and retain water in the urban environment (DELWP, 2018b).

Development also increases the quantity of wastewater generated in urban areas, which provides another opportunity to diversify water sources. For example, wastewater can be recycled and used to irrigate public open space and sporting grounds. This will help improve water security as the climate warms and overall rainfall decreases. Further, wastewater contains nutrients and organic matter that could be used to create valuable products such as fertilisers and energy sources. Given increasing limits in resource availability, this creates an opportunity to expand the benefits of wastewater management by exploring different options for resource recovery.

The Victorian Government's strategies *Water for Victoria* and *Integrated Water Management Framework for Victoria* provide the strategic framework for water management in Victoria. At the regional scale, options to increase the retention and reuse of water in the urban environment should be based on the actions contained in the Dandenong and Western Port Catchment Scale Integrated Water Management Plans (IWMs), Monash NEIC IWM strategy, Fountain Gate-Narre Warren Metropolitan Activity Centre IWM strategy, flooding strategies, relevant sub-catchment IWM plans and local government IWM plans.

These plans should be used as the basis to support governments and relevant agencies to prioritise and align water infrastructure needs and deliver integrated water management outcomes. This may include the preparation of an appropriately scaled IWM Plan (that is sub-catchment, precinct or local scale) by the lead planning authority in collaboration with relevant referral agencies to guide sustainable water design and development decisions.

- STRATEGY 85.** Retain and harvest stormwater in priority sub-catchments.
- STRATEGY 86.** Retain and harvest stormwater at a range of scales throughout the region and places designated for high levels of change.
- STRATEGY 87.** Encourage development to design for permeable areas, include green spaces, avoiding paved areas and passively irrigating vegetation.
- STRATEGY 88.** Encourage all urban and rural land use to effectively control stormwater and runoff impacts, and that controls are in place to manage increases in nitrogen and sediment loads.
- STRATEGY 89.** Improve regional water outcomes by aligning sub-catchment and local IWM planning with opportunities and directions identified at the catchment scale.

DIRECTION 27.**Respond to the transformation of the energy supply network**

In the future, electricity networks must be responsive to changing demands from traditional services while enabling new opportunities for energy resource sharing and balancing. Millions of customers generate electricity and over time will store it locally. These customers will be connected to the network and each other, enabling energy networks to act as platforms that match supply and demand and reduce the need for inefficient duplication of energy investments. At the same time, the state is working towards the decarbonisation of the broader energy supply network.

To support a renewable energy future and drive down emissions, major changes to the supply network are required. This includes the creation of local and regional renewable energy hubs across the state, improvements to crucial grid infrastructure, and support for more localised renewable energy generation and storage.

Large subdivisions and growth area development in the South Eastern Growth Corridor must be planned to support this future energy network and avoid the need to retrofit energy infrastructure.

STRATEGY 90. Ensure subdivision and greenfield development can support the emerging energy supply network.

DIRECTION 28.**Minimise and reduce risk from bushfire**

The Southern Metro Region is at risk from bushfire due to vegetated environments in the Mornington Peninsula and Frankston LGAs as well as grasslands in Casey and Greater Dandenong LGAs and parts of Kingston LGA's green wedge. The need to plan for the risk of bushfire to communities, infrastructure and natural environments will continue to increase as the climate warms and overall rainfall decreases.

The likelihood of forest fires and grass fires, and their severity and intensity, depends on the location and surrounding landscape characteristics. There are large areas of land, mostly outside the urban area, already governed by state planning policy for bushfire (Clause 13.02), the Bushfire Management Overlay (BMO) and the building systems bushfire prone areas (BPA). The BMO and BPA aim to strengthen community resilience to bushfire by considering bushfire measures as part of the design process and ensuring new development achieves an acceptable level of bushfire risk. However, there is also a need to strengthen the resilience of settlements and communities to bushfire through strategic, risk-based regional planning that prioritises the protection of human life over other policy considerations.

To protect human life from bushfire, population growth and development should be directed to low-risk locations and areas that are safe to access. Infill development should be limited in interface locations, where bushfire risks should be considered and protection measures maximised to reduce exposure. Areas of high bushfire risk should be avoided for more sensitive uses, frequented by vulnerable populations such as the elderly or the very young who may have difficulty evacuating in the event of a bushfire.

Bushfire risk should be incorporated into the design of the South Eastern Growth Corridor and subdivision adjacent to green wedge land. The road, subdivision and open space design and layout, and the treatment of the interface to green wedge land, can help reduce and manage bushfire risk.

STRATEGY 91. Limit housing growth and sensitive land uses within and in proximity to bushfire prone areas.

STRATEGY 92. Ensure precinct structure planning and subdivision design in the Southern Metro Region responds to bushfire risk and the urban rural interface, and utilises road, lot, open space and water cycle design to help reduce bushfire risk.

DIRECTION 29.**Increase the network of cool places, particularly in areas with communities vulnerable to urban heat and areas with high urban heat**

More tree canopy cover, permeable surfaces and water in the urban environment will help reduce urban temperatures and create cooler, more comfortable local micro-climates across the Southern Metro Region.

Plan Melbourne notes that temperature decreases of between 1° Celsius and 2° Celsius can have a significant impact on reducing heat-related morbidity and mortality (DELWP, 2017a).

In addition to trees, green walls, shade structures and low heat absorbing materials can help reduce urban surface temperatures and create cool urban areas. These techniques will be important in the South Eastern Growth Corridor, Dandenong NEIC, activity centres and the Southern SSIP which have areas of high urban heat. Land uses frequented by older people and children, who are more vulnerable to urban heat, will need to provide for more active cooling of outdoor environments.

Dandenong NEIC, Fountain Gate-Narre Warren and Frankston metropolitan activity centres, along with the Cheltenham-Southland, Mordialloc, Chelsea, Springvale, Noble Park, Keysborough Parkmore, Endeavour Hills, Hampton Park, Casey Central Berwick, Cranbourne, Officer, Pakenham major activity centres have communities vulnerable to urban heat. These communities are at a higher risk of heat-related illness during periods of multiple hot days (Sun, et al., 2019). There are also large areas of high urban surface temperatures in Hastings, Crib Point, proposed growth communities and the future activity centres of Clyde and Clyde North.

Buildings with vegetation and roof gardens will need to be combined with onsite water harvesting and storage to maintain vegetation health and reduce potable water demand.

STRATEGY 93. Increase tree canopy and water sensitive urban design in areas with high urban heat vulnerability and high urban heat.

STRATEGY 94. Design and develop outdoor spaces that are cool on hot days through the use of water-permeable paving, vegetation and water sensitive urban design in the:

- Dandenong NEIC and Fountain Gate-Narre Warren metropolitan activity centres
- Cheltenham-Southland, Mordialloc, Chelsea, Springvale, Noble Park, Keysborough-Parkmore, Endeavour Hills, Hampton Park, Casey Central Berwick, Cranbourne, Officer, Pakenham, Clyde and Clyde North major activity centres.

STRATEGY 95. Encourage green roofs and green structures with climate resilient planting and irrigation on apartment developments in areas with high urban heat and large commercial and industrial sites.

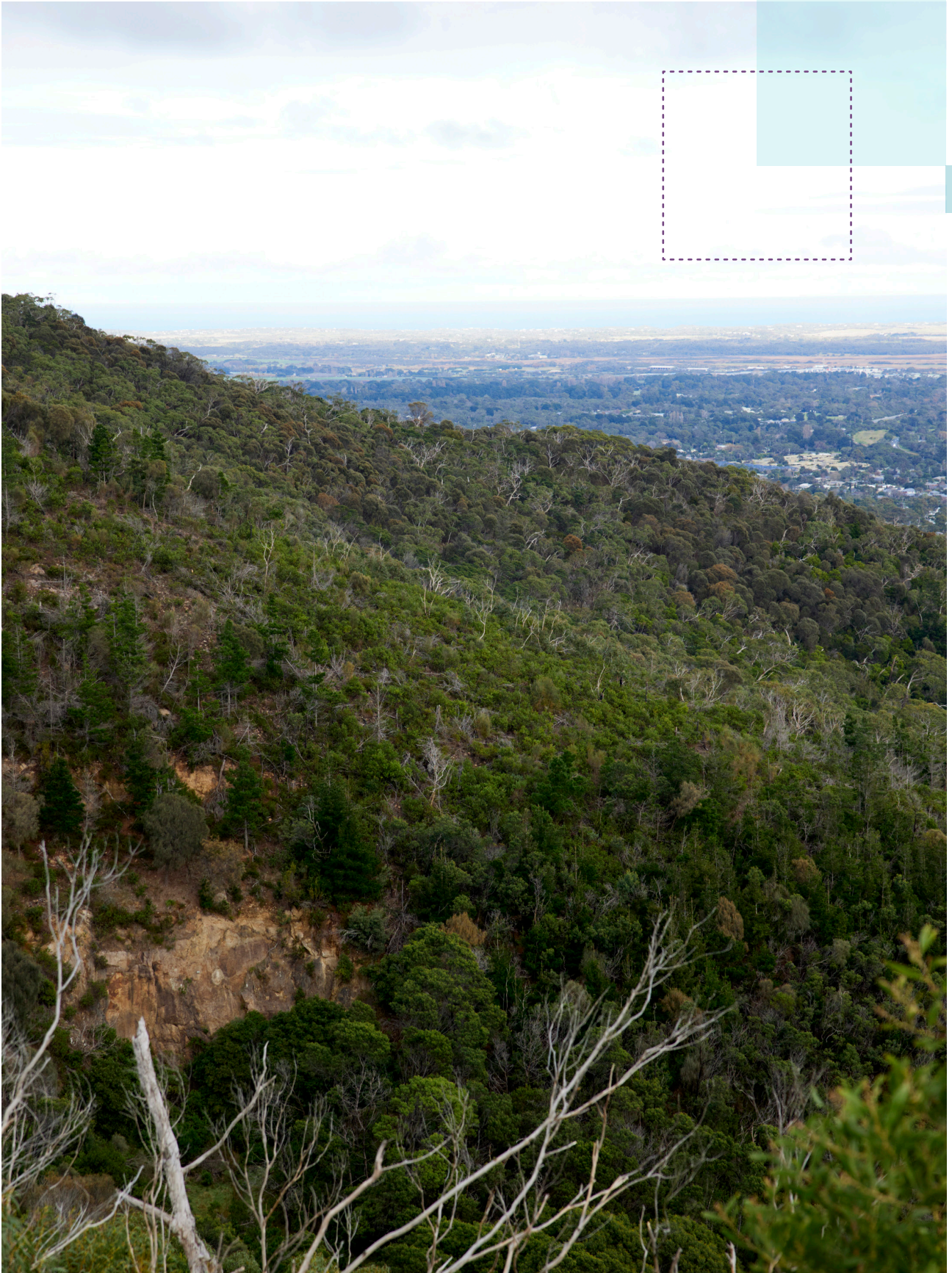


Photo credit: Tim Bell Studio



Photo credit: Tim Bell Studio

DIRECTION 30.

Increase urban tree canopy across the Southern Metro Region to achieve 30 per cent coverage by 2050

Trees provide an essential service to the surrounding environment. In the absence of water, trees and in particular clusters of trees, make the greatest contribution to reducing surface temperatures, along with contributing to stormwater filtration, amenity and biodiversity (Coutts Tapper, 2017) (Sun, et al., 2019). These important functions are vital for sustainability and resilience as our climate warms and the Southern Metro Region's population grows.

A key challenge for increasing tree canopy is the ability to retrofit existing urban areas for green infrastructure due to the availability of public and private space and the multiple functions of public land and publicly accessible places. For example, there are potential conflicts with electrical powerlines, underground cabling, gas and stormwater pipe works and regulation, and transport movement.

Tree planting will need to avoid remaining areas of natural grasslands as these are some of the most precious remaining natural assets in the region.

Most of the Southern Metro Region's growth is expected to be accommodated in the growth areas, in and around activity centres, and in areas with good access to existing services and transport infrastructure. These locations are important for growth and a sustainable urban form. Some of these sites will be less able to accommodate trees and a broader range of cooling and greening methods will be required. Outside of substantial change areas, more trees can be retained on private land and private developments can generally provide higher levels of planting. In bushfire interface areas, planting should be managed and respond to potential bushfire risk. Species selection can also help reduce bushfire risk.

While substantial change locations will likely be more constrained, tree planting may yield greater co-benefits such as reducing urban temperatures, regulating the local climate and offering stormwater benefits. Activity centres, areas with people exposed to high land surface temperatures, as well as communities in areas of high heat vulnerability should be a priority for tree planting (refer **Map 10**). Other priority locations for tree planting are mixed-use centres and points of access to the PPTN.

Streetscapes represent a significant opportunity to increase tree canopy cover. *Trees for Cooler and Greener Streetscapes – Guidelines for Streetscape Planning and Design* (DELWP, 2019b) will help increase Melbourne’s tree canopy cover by enabling trees to be prioritised on urban streets and encouraging adequate growing conditions for tree health and longevity.

Infrastructure such as rail corridors, new arterial roads and large at-grade car parks can also play a multi-purpose role for both movement and greening to help achieve urban forest targets Relocating powerlines underground in key locations should be considered to maximise the urban tree canopy.

All Southern Metro Region LGAs have endorsed the *Living Melbourne: Our Metropolitan Urban Forest* strategy, specifying a regional target of 30 per cent total tree canopy and 50 per cent combined tree canopy and shrubs by 2050 (The Nature Conservancy and Resilient Melbourne, 2019). To support this commitment, the tree canopy target is accompanied in **Table 15** by an aspirational distribution of tree canopy cover across four different land use types, adapted by DELWP from several related datasets (Hurley, et al., 2019a) (Urich Hardy, 2019) (PSMA Australia Limited, 2021).

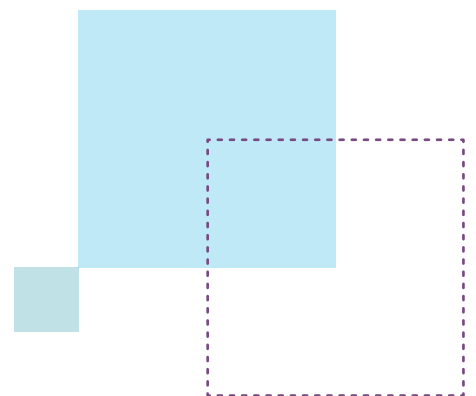
TABLE 15. Southern Metro Region tree canopy cover target and aspirational distribution

2018 TREE CANOPY COVER: 15.2%	
2050 TREE CANOPY COVER TARGET: 30%	
(+14.8% OR +14,190 HECTARES ADDITIONAL TREE CANOPY COVER)	
Residential, commercial, industrial and primary production	60%
Streets, roads and rail corridors	15%
Parks, open space and waterways	20%
Education and hospital/medical	5%

STRATEGY 96. Protect trees on private land outside locations identified for substantial levels of housing and mixed-use change.

STRATEGY 97. Increase tree canopy across the Southern Metro Region:

- Areas with high urban heat vulnerability and land surface temperature, particularly in the growth area
- Established suburbs
- Urban waterways and open spaces, including Clyde Regional Park and Cardinia Creek South Parkland
- Along streets and roadways where planting can be delivered safely.



DIRECTION 31.

Protect sites of strategic importance for recycling and plan for the expansion of key sites for future resource recovery needs

The *Statewide Waste and Resource Recovery Infrastructure Plan 2018* and the *Metropolitan Waste and Resource Recovery Implementation Plan 2016* aim to increase resource recovery. The metropolitan plan identifies the need for a Resource Recovery Centre and Transfer Station in the Southern Metro Region of 115,000 to 168,000 tonnes per annum (tpa) capacity by 2031-2040, and Organics/Garden Reprocessor facilities and in the south-east of Greater Dandenong (100,000 tpa and 24,000 tpa) (Metropolitan Waste and Resource Recovery Group, 2016).

The Victorian Government is currently developing the Victorian Recycling Infrastructure Plan (VRIP) which will ultimately replace the existing Statewide Waste Resource Recovery Implementation Plan (and other metro and regional implementation plans) in 2022. The VRIP will continue to review and assess the need for recycling and waste facilities throughout the metro area.

Waste and resource recovery hubs provide essential services to support waste and recycling for Victorian communities. There are four existing waste and resource recovery hubs of state importance for metropolitan Melbourne in the Southern Metro Region (Sustainability Victoria, 2018, p. 44):

- **SUEZ Hallam:** A putrescible and solid inert landfill serving the south east of metropolitan Melbourne (Sustainability Victoria, 2018, p. 70)
- **SUEZ Lyndhurst:** A putrescible and prescribed industry waste landfill and soil remediation and recovery in the Southern SSIP at Dandenong South (Sustainability Victoria, 2018, p. 71)
- **Ordish Road Precinct, South Dandenong:** The precinct has a number of transfer stations, organics reprocessing, and recycling facilities (Sustainability Victoria, 2018, p. 71)
- **Clayton South Precinct:** Construction and demolition waste, organics, commercial and community transfer stations (Sustainability Victoria, 2018, p. 73).

Waste and resource recovery hubs and facilities require buffers and protections to minimise impacts on communities, the environment and public health. There is also a need to support compatible land uses in and around the hubs and to identify adequate land and appropriate locations for future resource recovery infrastructure (Sustainability Victoria, 2018).

Waste and resource recovery hubs provide significant opportunities for investment in recycling. Opportunities to develop hubs include co-location of industries operating in synergy with waste and resource recovery facilities, increasing economies of scale or co-locating industries requiring similar buffers, thereby creating jobs and increasing the volume of materials recovered (Sustainability Victoria, 2018).

Successful recycling in Victoria requires markets for recycled products. Infrastructure projects throughout the region can contribute to strengthening these markets and reducing their environmental impact by using more recycled products and less virgin materials.

STRATEGY 98. Protect and buffer the SUEZ Hallam, Ordish Road Precinct and Clayton South Precinct waste and resource recovery hubs of state importance.

STRATEGY 99. Maintain adequate buffers and provisions to protect the SUEZ Hallam and SUEZ Lyndhurst waste and resource recovery hubs from residential encroachment and incompatible land uses and preserve the importance of the hub for the long-term.

STRATEGY 100. Ensure zoning can support complementary land uses to locate in and around the SUEZ Hallam, SUEZ Lyndhurst, Ordish Road Precinct and Clayton South Precinct waste and resource recovery facilities of adequate size and location to provide additional capacity for the Southern Metro Region.

ACTIONS – Sustainability and resilience

ACTION 15. Undertake detailed coastal settlement planning to identify short-, medium- and long-term options to reduce risk to population, infrastructure, agricultural land, ecosystems and property from sea level rise, storm surges, coastal erosion, tidal inundation and saline groundwater intrusion.

ACTION 16. Prepare a regional water infrastructure plan in conjunction with Integrated Water Management Forums to support state and local government and relevant agencies to prioritise and align water infrastructure needs and integrated water management outcomes.

ACTION 17. In partnership with local government, water sector agencies and stakeholders, prepare a cost benefit analysis and action plan to understand the value and options to better use water from the Eastern Treatment Plant for a range of land use types to support jobs creation, sustainability and climate resilience.

ACTION 18. Prepare a regional bushfire response for suburban and peri-urban communities that are subject to bushfire risk.

ACTION 19. Investigate options and land use protection for a Resource Recovery Centre and Transfer Station/s to support Melbourne's future resource and recovery needs.



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