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.

Climate change challenges will be ongoing within the Inner South East Metro Region – including heatwaves, drought, increased storm intensity, stormwater inundation, storm surges and coastal inundation – requiring deliberate, coordinated steps by regional decision-makers to minimise these impacts.

The region is renowned for its vast, consistent tree canopy cover, and although the character of the region is increasingly urbanised, remnant native vegetation and biodiversity corridors remain, providing habitat for wildlife. Nevertheless, the issue of tree canopy loss is becoming acute. The ability to create opportunities for urban cooling and greening and adopt further strategies to reduce the urban heat island effect will be important to bolster community wellbeing and resilience into the future.

The region is also highly valued for its watercourses and natural landscapes including the Port Phillip Bay coastline, Yarra River and Koonung Koonung, Gardiners, Scotchmans and Elster creeks. These assets, which contain parks and recreational areas as well as habitat for local flora and fauna, will become increasingly vulnerable to the effects of climate change. The Inner South East Metro Region will experience significant challenges in maintaining and rehabilitating these resources.

State of play

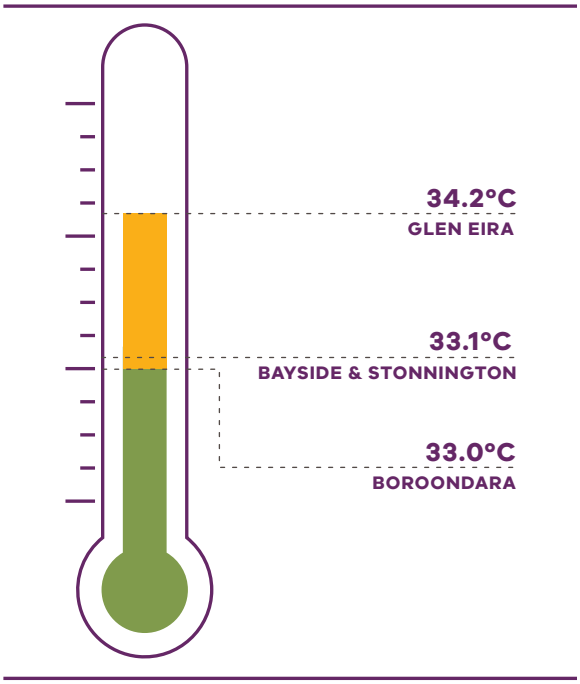
Urban heat environments

Urban environments that stay cooler on hot days are more physically comfortable to humans and animals, and continue to support movement and recreation. Cooler urban environments are characterised by more tree cover, fewer impermeable surfaces, more water infiltration into the ground and less heat-absorbing materials. As the number and duration of hot days increases due to climate change, it will become even more important to improve comfort and reduce the likelihood of heat-related stress and illness.

The elderly, the very young, those with chronic illnesses and those with fewer resources to adapt are at greater risk on hot days and in prolonged periods of hot weather. 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 2018, the average land surface temperature (LST) of the Inner South East Metro Region was 33.3° Celsius, slightly lower than the average LST of metropolitan Melbourne at 33.9° Celsius. Within the region, Glen Eira LGA had the highest LST and Boroondara the lowest (**Figure 19**).

FIGURE 19. 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 20. Heat vulnerability index map for the Inner South East Metro Region, 2018

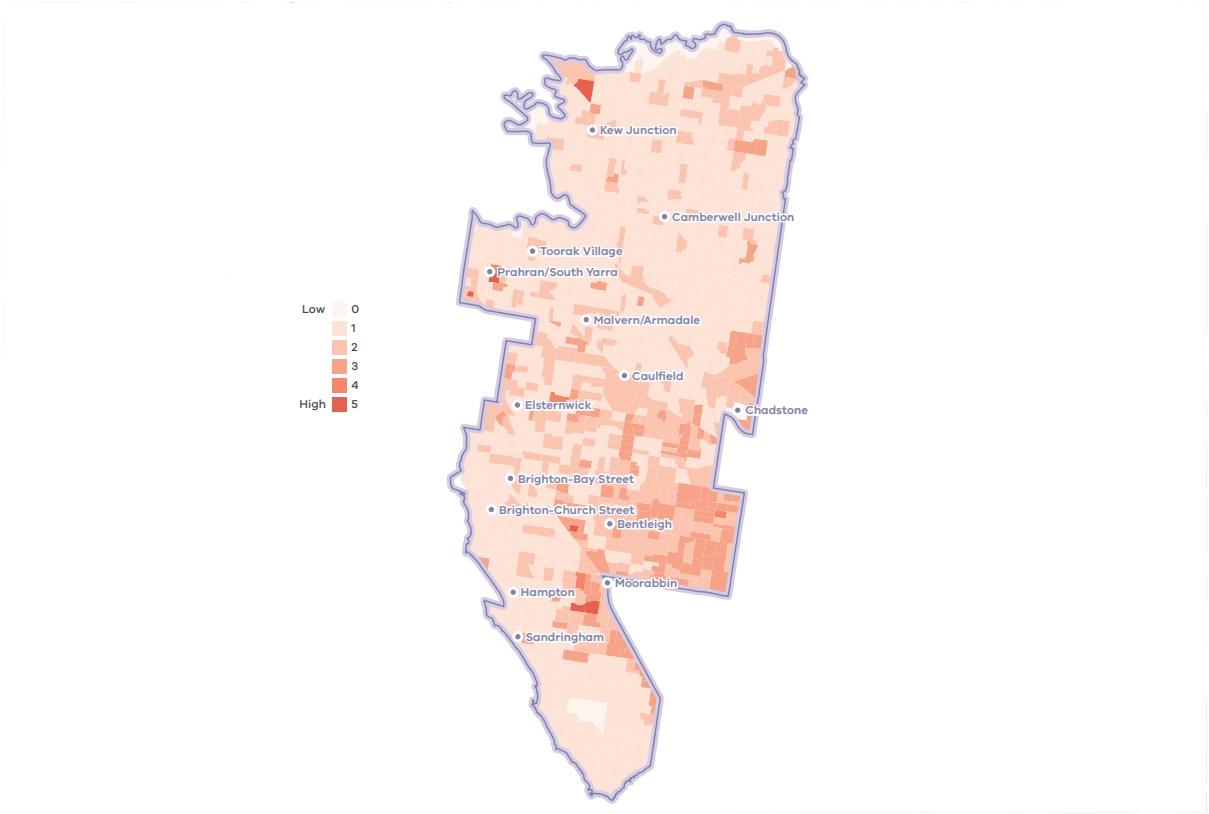
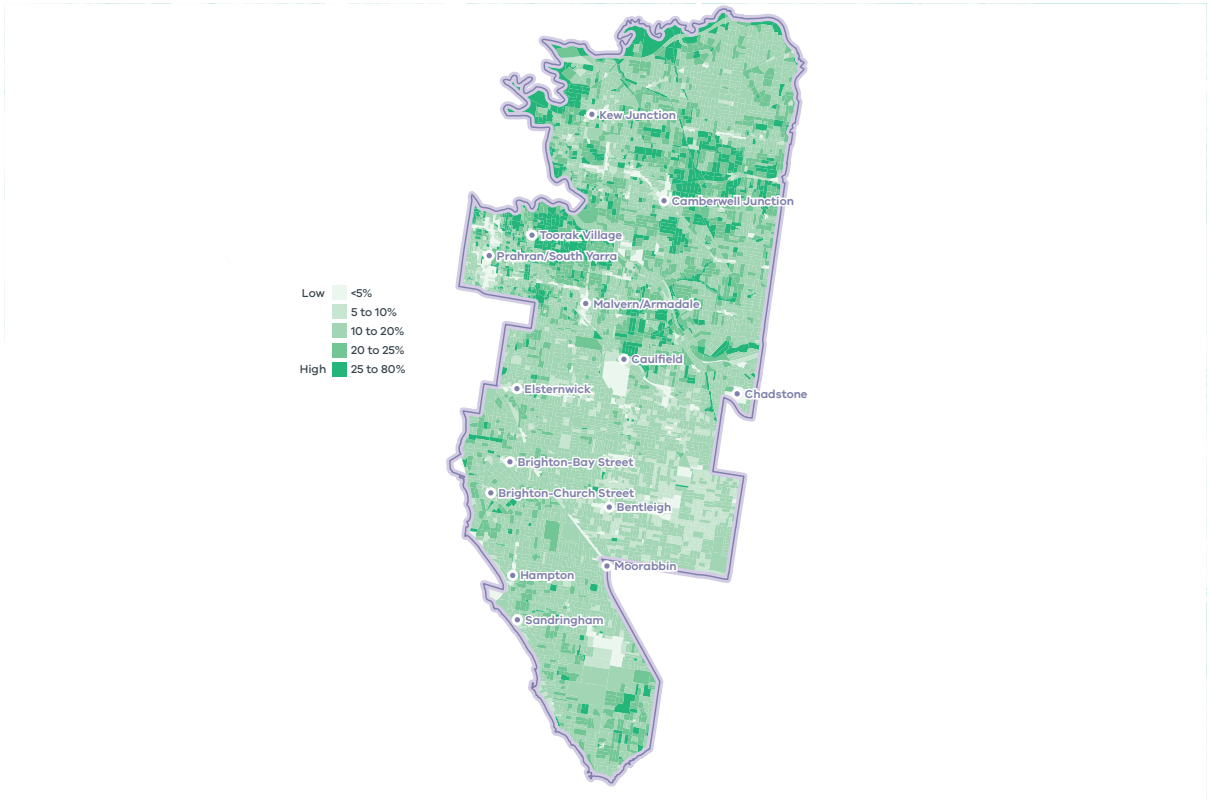


FIGURE 21. Inner South East Metro Region tree canopy cover, 2018



Vegetation cover

Vegetation cover is a defining feature of the Inner South East Metro Region, which in 2018 had 33.2 per cent vegetation cover and 17.4 per cent tree canopy cover, the second highest rate behind the Eastern Metro Region and 2.1 per cent greater than the metropolitan average. The Inner South East Metro Region makes a moderate contribution to Melbourne's overall vegetation and tree canopy cover, with 5370 hectares and 2821 hectares respectively (Hurley, et al., 2019a).

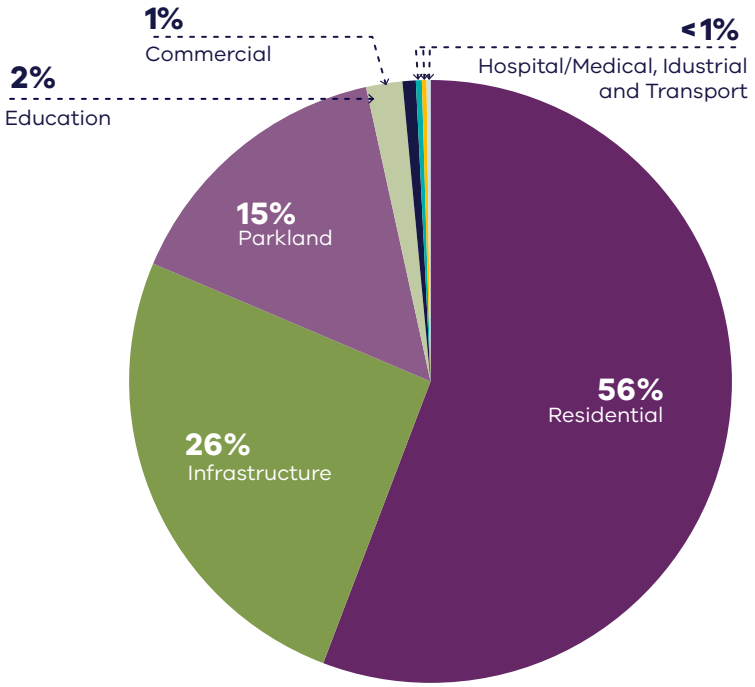
Urban tree canopy

In urban areas trees provide cooling, amenity, recreation and respite to residents. They also provide habitat for wildlife and contribute to urban character.

Within the region, residential land was the largest contributor of trees, followed by infrastructure land (primarily streets) and parkland (**Figure 22**). Tree canopy cover varied between the four LGAs comprising the Inner South East Metro Region (**Figure 23**).

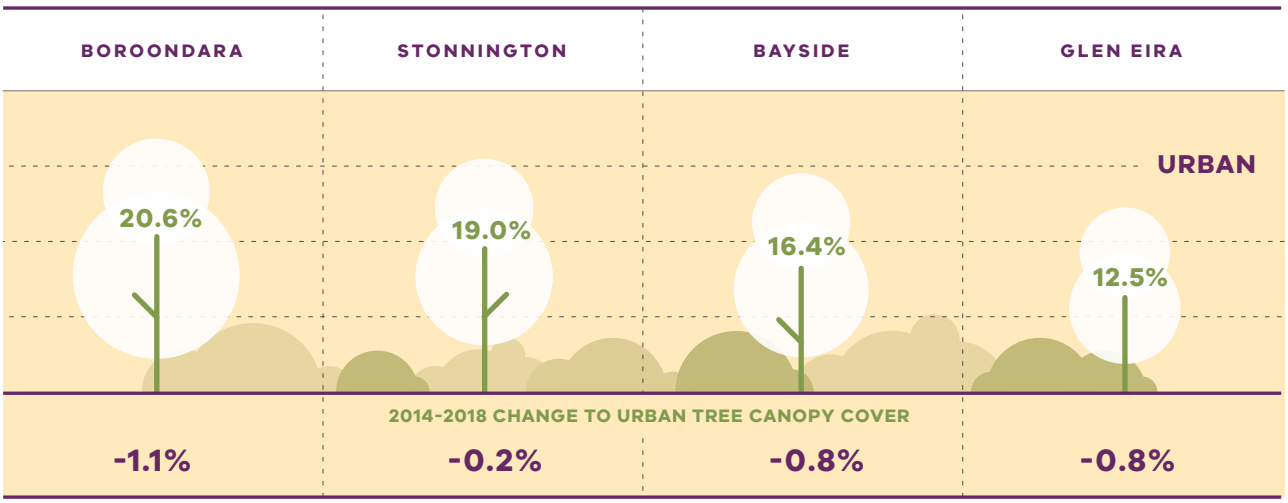
Although tree canopy cover in the Inner South East Region is relatively higher than most other metro regions, a relatively consistent and even distribution of tree cover loss is evident between 2014 and 2018 (**Figure 23**) with the greatest vegetation loss on residential land (Hurley, et al., 2019b). While the region as a whole is experiencing increased development pressure, LGAs with relatively greater tree canopy cover are generally cooler (**Figure 20** and **Figure 21**).

FIGURE 22. Urban tree canopy cover by land use, 2018



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

FIGURE 23. Tree canopy cover 2018 and tree canopy cover change 2014 to 2018, by LGA



Source: 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.

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

Flood risks and waterway health

Despite anticipated reductions in overall average annual rainfall caused by climate change, it is also predicted that heavy rainfall events will occur more frequently within the Inner South East Metro Region. 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 (DELWP, 2018b). Increased flooding within the Elster Creek catchment, extending through Glen Eira, Kingston and Bayside LGAs, is particularly concerning as it drains into the neighbouring Inner Metro Region. This runoff concentrates in the Elwood Canal, located in Port Phillip LGA, before emptying into Port Phillip Bay. The Gardiners Creek catchment presents similar issues as it collects runoff from Boroondara and Stonnington LGAs before reaching the Yarra River. Litter and chemical contaminants flushed from the stormwater system and higher volume water flows during these flood events could further impact the water quality and health of these waterways.

The Yarra River is a vital natural resource for eastern Melbourne and forms the northern boundary of the Inner South East Metro Region. The health of the Yarra River is under similar pressure from the impacts of climate change and encroaching development. The draft *Yarra Strategic Plan* sets out priorities for a coordinated response to protecting and managing the river by water authorities, local and State Government, and the community. This will help rehabilitate the river from past mismanagement and future-proof it for the anticipated impacts of a changing climate.

Sea level rise, coastal inundation risk

The coastline and bay have significant value to the Victorian community for a range of cultural, recreational, environmental and economic values, but both are under pressure from urbanisation and climate change (DELWP, 2017b). Rainfall intensification will exacerbate current impacts including increased stormwater and pollutant runoff. Marine and coastal environments will experience increases in water temperature and rising sea levels. 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 warming mean sea levels rise 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).

The expected impact of tidal inundation – including storm surge, wave action and saline groundwater intrusion – will have an increasingly significant influence over the future development of the Inner South East Metro Region. To optimise positive outcomes within areas affected by tidal inundation, compromises and special consideration will need to be made between flood management agencies, local and State Government, and developers alike.

Areas of the Inner South East Metro Region vulnerable to heat stress, high surface temperatures and the impacts of climate change are shown on **Map 8**.

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. Most of these emissions were generated through the consumption of grid-supplied electricity to power appliances, lighting and predominantly heating, ventilation and cooling (HVAC) systems (Australian Sustainable Built Environment Council, 2016).

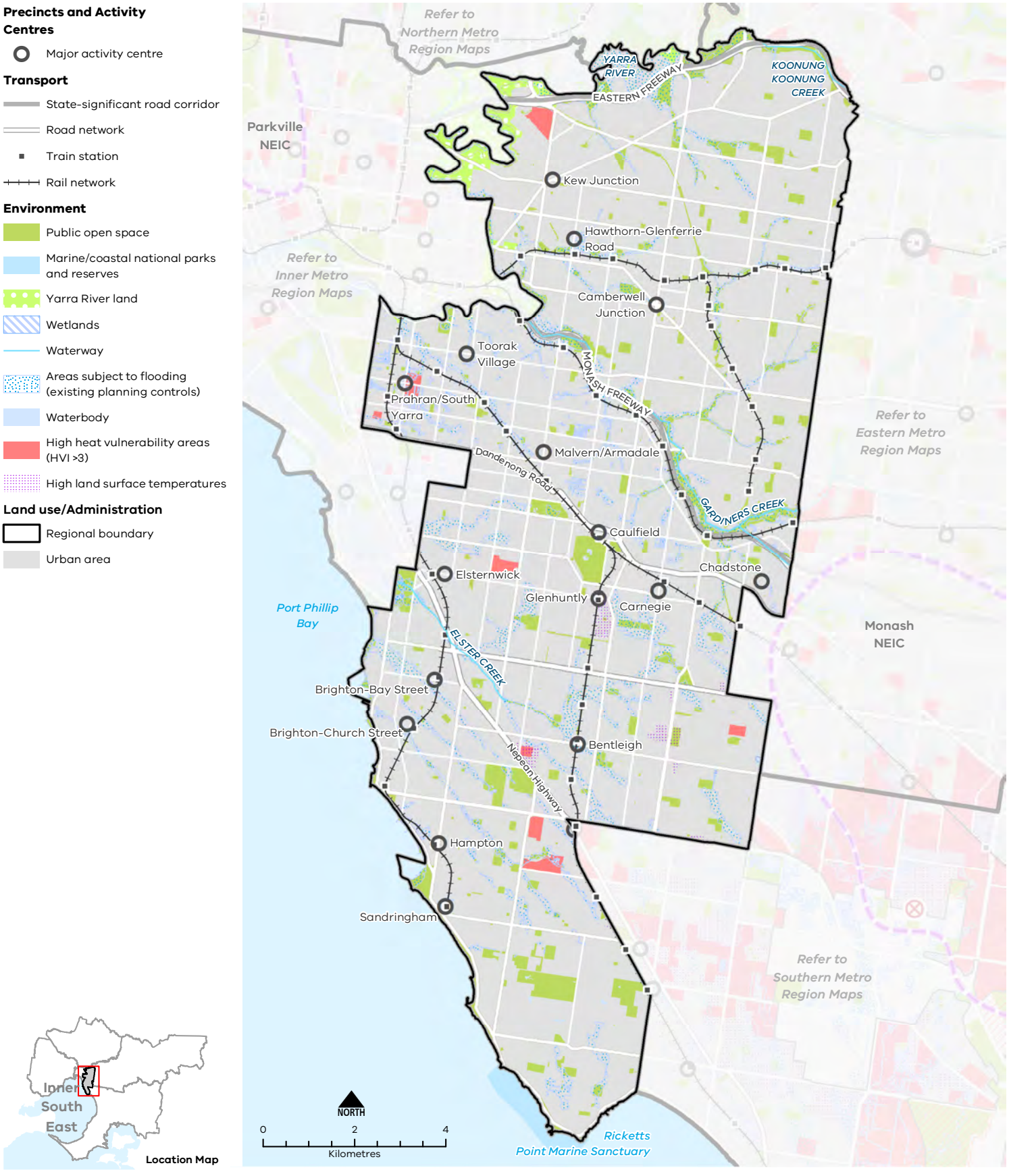
As average temperatures rise due to climate change, greater numbers of people are expected to seek comfort indoors during high heat conditions. This, combined with population growth and overall poor-performing building stock, means our city lacks energy efficiency and resilience on hot days. Maximising 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 Inner South East 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).

MAP 8. Inner South East Metro Region sustainability and resilience state of play



Regional strengths

- A strong tree canopy is well-established in some locations, and can be extended throughout the region.

Regional challenges

- Coastal inundation and sea level rise pose significant risk to population, ecosystems, infrastructure and property.
- Large expanses of land are subject to flooding.
- 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 Inner South East Metro Region in terms of sustainability and resilience and Outcome 6 of Plan Melbourne are:

Direction 19	Increase the tree canopy cover across the Inner South East Metro Region to achieve 30 per cent coverage by 2050
Direction 20	Manage the impact and risk of sea level rise and tidal inundation
Direction 21	Implement integrated water management initiatives to improve water quality, reduce the impacts of stormwater inundation and protect the region's key watercourse assets
Direction 22	Integrate green infrastructure with land use and infrastructure change to maintain cool urban environments

Each direction is implemented through regionally-specific strategies identified in this land use framework plan.

Map 9 shows how sustainability and resilience will be enhanced across the Inner South East 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**.

MAP 9. Inner South East Metro Region sustainability and resilience 2050

Precincts and Activity Centres

- Major activity centre

Transport

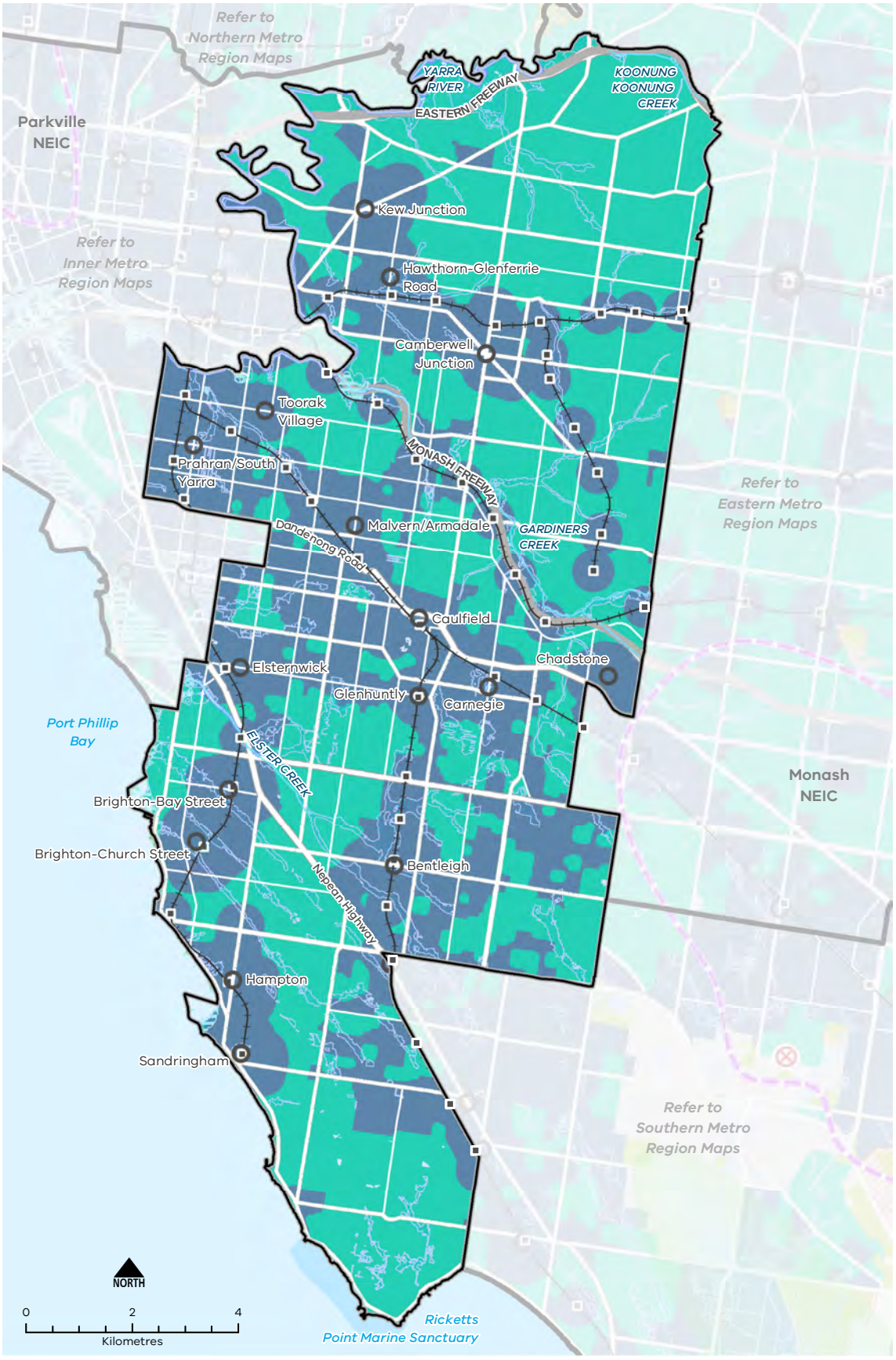
- State-significant road corridor
- Road network
- Train station
- Rail network

Environment

- Marine/coastal national parks and reserves
- Waterway
- Areas subject to flooding (Melbourne Water)
- Future coastal inundation risk
- Priority waterways for enhanced vegetation
- Waterbody
- Priority - urban heat response
- Priority - expand urban tree canopy cover

Land use/Administration

- Regional boundary



DIRECTION 19.

Increase the tree canopy cover across the Inner South East Metro Region to achieve 30 per cent coverage by 2050

Canopy trees are particularly effective at lowering maximum summer daytime air temperatures at ground level through transpiration and shading. Increased tree canopy cover and the clustering of trees provides the greatest response to the challenge of urban heat.

Expanding the region's tree canopy cover can be achieved by planting new canopy trees and preserving existing vegetation. However, ongoing development and climate change will place pressure on the urban forest. While residential land presently provides most of the tree canopy cover, tree canopy should be expanded on other land uses such as rail corridors, streets, school grounds and parkland.

All Inner South East 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 10** by an aspirational distribution of tree canopy cover across four different land use types, adapted by DELWP from several related datasets (Hurley, et al., 2019b) (Urich & Hardy, 2020) (PSMA Australia Limited, 2021).

TABLE 10. Inner South East Metro Region tree canopy cover target and aspirational distribution

2018 TREE CANOPY COVER: 17.4% 2050 TREE CANOPY COVER TARGET: 30% (+12.6% OR +2,030 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 61. Retain more trees on private land outside of locations identified for higher levels of housing and mixed-use change.

STRATEGY 62. Support alternative siting of buildings and more compact building forms to retain mature canopy vegetation.

STRATEGY 63. Increase tree canopy along urban waterways and on streetscapes, public land, large developments within activity centres, open spaces and road reserves, and large commercial and industrial sites.

STRATEGY 64. Encourage revegetation as part of the redevelopment of key sites and activity centres.

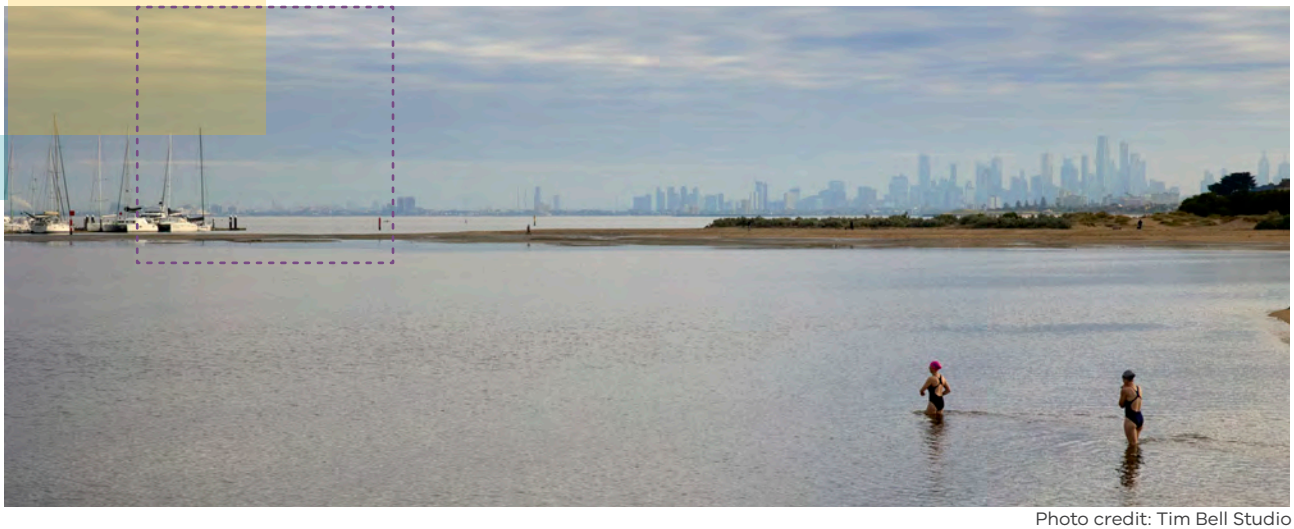


Photo credit: Tim Bell Studio

DIRECTION 20.
Manage the impact and risk of sea level rise and tidal inundation

Coastal areas are susceptible to rising sea levels as well as storm surges. Much work has been undertaken at the state level to determine the impact of sea level rise by 2100 in areas along Port Phillip Bay in the Inner South East Metro Region.

The impacts of storm surge and coastal inundation must be planned for (Water Technology, 2014, p. 40). 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 coastal areas around the bay.

Within the Port Phillip Region, an adaptation approach will be taken to protect public infrastructure and assets, coastal values and support community access to foreshores and the bay.

STRATEGY 65. Consider current forecasts of the level of sea level rise and coastal impacts on land use and infrastructure decision-making along the coast.

STRATEGY 66. Encourage settlement planning for coastal environments and communities to respond to sea level rise and natural hazard risk.

STRATEGY 67. Limit the location of major land use change in areas where there is likely to be future coastal inundation.

STRATEGY 68. Factor climate impacts into the total life cost of major public land use and infrastructure investment in the coastal areas of the Inner South East Metro Region.

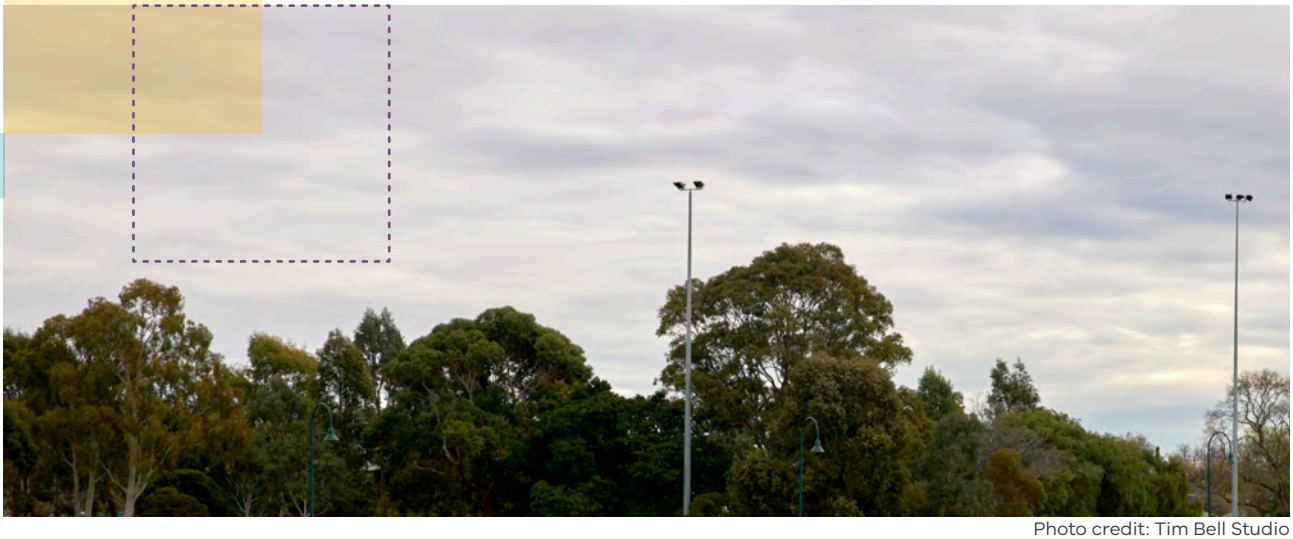


Photo credit: Tim Bell Studio

DIRECTION 21.
Implement integrated water management initiatives to improve water quality, reduce the impacts of stormwater inundation and protect the region's key watercourse assets

Integrated stormwater management, reducing runoff into waterways and wetlands, and water recycling will help improve climate resilience and liveability in the Inner South East Metro Region.

Parts of the Dandenong and Yarra catchments will continue to undergo significant land use change for housing, diversification of activity centres, and new road, health and education infrastructure. This will increase stormwater 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 for Port Phillip Bay, the Yarra River, Gardiners Creek, Koonung Koonung Creek and Elster Creek.

Where areas of the Inner South East 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. Development can reduce the impacts of flooding, support healthy vegetation and prepare for drying conditions by increasing permeable areas, increasing proportions of green space, avoiding paved areas and passively irrigating vegetation.

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 all use water sensitive urban design (WSUD) to improve urban amenity and retain water in the urban environment (DELWP, 2018b).

STRATEGY 69. **Retain and harvest stormwater at a range of scales to achieve co-benefits that respond to urban heat, reduce runoff volume and velocity, service community infrastructure and trees, and diversify water needs.**

DIRECTION 22.
Integrate green infrastructure with land use and infrastructure change to maintain cool urban environments

Public and private land both make significant contributions to the tree canopy cover of the Inner South East Metro Region, with existing vegetation fundamental to the region's sense of place. High levels of vegetation contribute to the region experiencing some of the lowest average urban heat in metropolitan Melbourne.

One of the challenges for increasing the tree canopy is the ability to retrofit existing urban areas with green infrastructure (trees, vegetation, green spaces and water systems) 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 transport movement and electrical powerlines, underground cabling, gas and stormwater pipe works and regulations (Banyule City Council, 2014).

Most of the Inner South East Metro Region's growth is set to be accommodated in and around activity centres and corridors and areas with good access to existing services and transport infrastructure. These locations are important for growth and a sustainable city form. Some of these sites will need a site-responsive design to retain mature trees. Other sites will be less able to accommodate trees, requiring alternative cooling and greening methods.

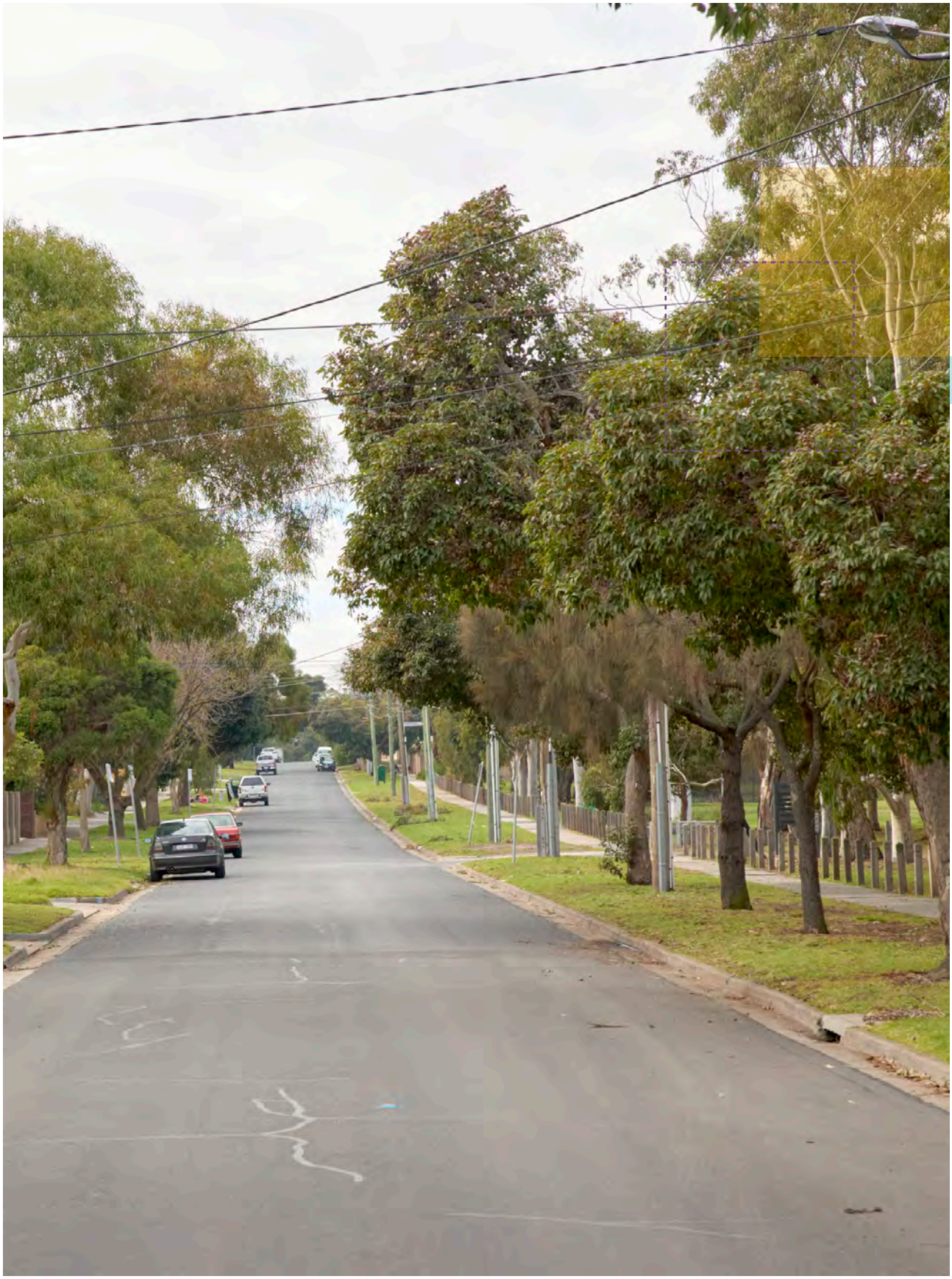
While some locations will be more constrained, tree planting and WSUD may yield greater co-benefits, such as reducing urban temperatures, local climate regulation and stormwater benefits. Making space, providing good growing conditions and using stormwater in high use activity locations will be important to maintain comfortable outdoor environments. Locations designated for higher levels of growth and change are a priority for urban heat response measures. Other priority locations for planting and WSUD are mixed use centres, railway stations and bus stops.

STRATEGY 70. Design and develop outdoor spaces that are cool on hot days through materials, vegetation and water sensitive urban design particularly in and around activity centres and corridors, and major redevelopment sites and precincts.

STRATEGY 71. 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.

ACTIONS – Sustainability and resilience

ACTION 11. Identify non-residential land where additional canopy trees can be planted to offset vegetation removal.



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