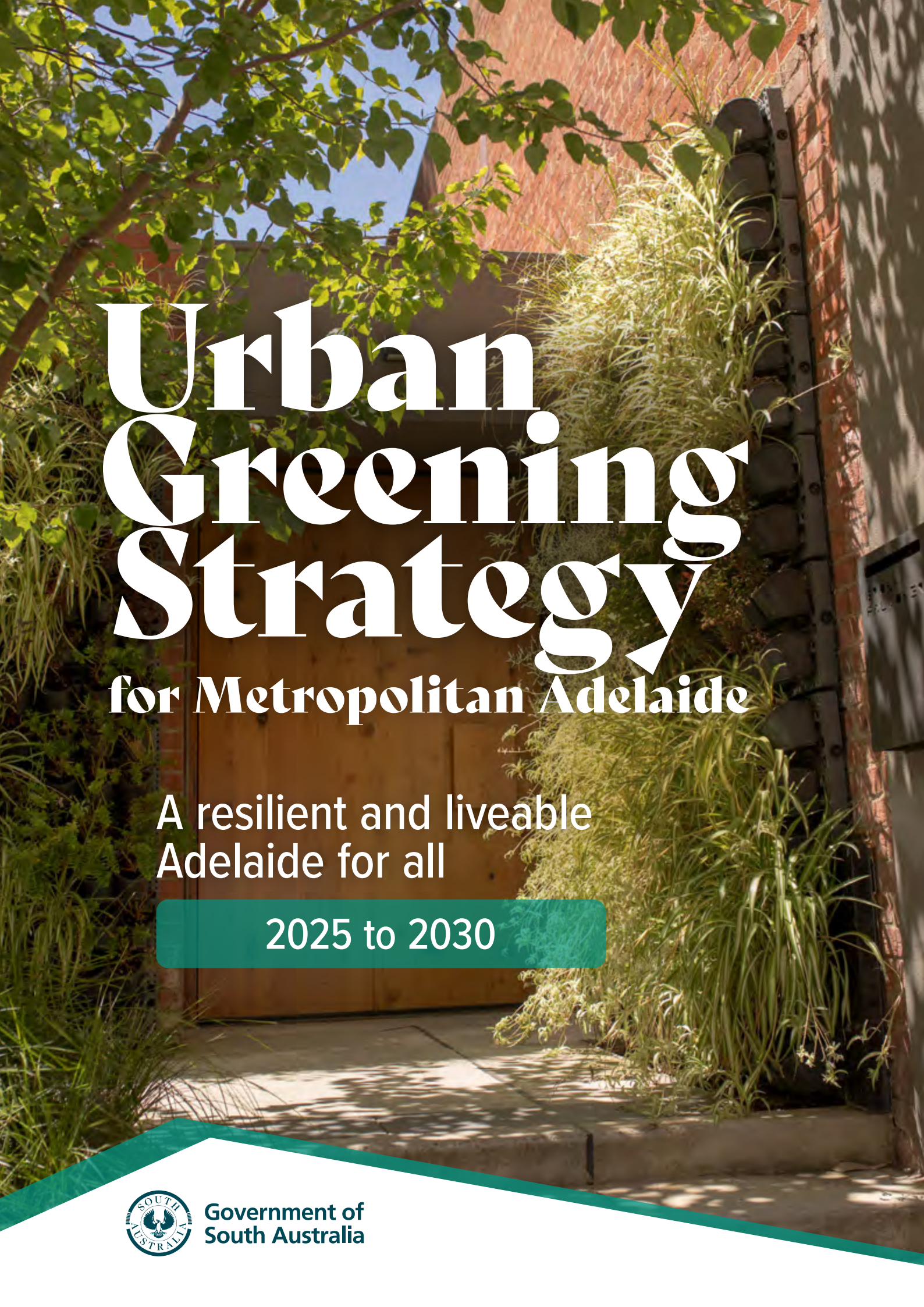


# Urban Greening Strategy

## for Metropolitan Adelaide

A resilient and liveable Adelaide for all

2025 to 2030

Government of South Australia

# Recognition of Kaurna Miyurna and Yarta

We acknowledge and respect the native title holders and Traditional Owners of the Adelaide region – the Kaurna People – and pay homage to their ancestors who maintained the natural processes of the land we are on and whose spirits still dwell on Yarta (Country).

In the spirit of recognition of our shared future, we have collaborated with representatives of the Kaurna community on the content within this strategy and will continue to work together to implement it.

Mutual respect and trust will enable us to walk side-by-side and restore Yarta.


## Acknowledgements

This strategy has been developed by Green Adelaide on behalf of the Government of South Australia.

We are grateful to the many organisations and individuals who have contributed their time and ideas to its development. For the full list of acknowledgements, see page 100.


*Proud supporters of*
ADELAIDE NATIONAL PARK CITY*

# Contents

# Foreword

I share the enthusiasm of the Adelaide community for growing our tree canopy – not only to enhance where we live, but also to bring nature into our suburbs.

Tree canopy and other urban greenery improves our wellbeing and health. It helps us connect to nature while living in an urban environment, and enhances spaces used for outdoor recreation. It creates shade, retains water in the landscape, and supports native wildlife. It is also an essential component of maintaining and building on Adelaide's enviable liveability status, which has received international recognition in recent times.

In our city, the trends of increased average temperatures and a greater frequency of very hot days will continue, so it is even more important that we maintain a healthy and diverse urban forest to ensure Adelaide stays liveable and cool. This is why the South Australian Government is so committed to better care for, and enhance, our urban forest and meet the tree canopy target that we set in 2017 – a target that has now been strengthened under this strategy and via the Greater Adelaide Regional Plan.

I am proud that in recent years we have strengthened the legislation for significant and regulated trees, so we can better protect our existing canopy. This is a positive step forward, as it reinforces the value of mature trees in our urban landscape and the contribution they make to our greening efforts. Building on this sentiment, all areas of the state government are now tasked with identifying opportunities to increase tree canopy and build nature into our urban areas through their respective portfolios, and I am excited about what this will look like for Adelaide in the years to come.

I am pleased to introduce this strategy – the first ever Urban Greening Strategy for metropolitan Adelaide. Through this strategy, the government looks forward to forging new partnerships with local government, industry, research institutions and community stakeholders in our collective effort to make Adelaide leafier, cooler and more biodiverse – for now, and for many generations to come.

**Dr Susan Close MP**

Deputy Premier
Minister for Climate, Environment and Water

## Green Adelaide, as the urban environmental organisation for metropolitan Adelaide, is committed to driving practical action to improve tree canopy and other greenery across our city.

We are already taking important urban greening action by delivering flagship rewilding projects, empowering the community through grant provision, and leading the Adelaide National Park City initiative that acknowledges our city's commitment to nature. Alongside these projects, we have now coordinated the development of this Urban Greening Strategy.

While it is certainly pleasing that the most recent data about Adelaide's tree canopy coverage shows a general increase, more action is needed – not just to continue to increase canopy but to minimise any unnecessary loss.

We need to improve the diversity of our urban forest, to ensure that the benefits are equally shared across metropolitan Adelaide, to protect valued existing trees and to respond to climate change. These actions are what the Urban Greening Strategy is all about – **a roadmap for growing our tree canopy, cooling our local neighbourhoods, and improving urban biodiversity**.

We thank all of our partners – government and non-government – for their contributions, energy and expertise in shaping this important document. We acknowledge the wonderful work and progress that has been made so far, and through these achievements we are constantly reminded that cross-sector collaboration and co-investment is the key to accelerating further gains.

We recognise the unique resources, knowledge and capabilities of different sectors and disciplines, and believe these powers combined can make an enormous difference. By partnering to deliver this practical strategy, we will have a much greater impact than could be achieved individually.

We look forward to working together on collaborative projects to create a resilient and liveable Adelaide for all.

**Professor Chris Daniels,**
**BSc (Hons), PhD, DSC, FAICD**

Green Adelaide Presiding Member

# Executive summary

## This Urban Greening Strategy for Metropolitan Adelaide will drive an ambitious and coordinated approach to the greening of our city.

This strategy aims to bring together state agencies, metropolitan councils, non-government organisations, industry peak bodies, research institutions, Kaurna representatives, community groups and the broader community to achieve a greener, more liveable city.

Urban greening in Adelaide includes trees and other plants located on both public and private land (see examples on Page 13).

An investment in urban greening is an investment in meeting the challenges of climate change, urban infill, biodiversity loss, and community health and wellbeing.

This strategy sets a shared long-term vision – '**a resilient and liveable Adelaide for all: leafier, cooler and more biodiverse'** and identifies practical actions to turn this vision into reality.

It outlines:

- the extensive **benefits** of urban greening
- the **current landscape**, including the status of tree canopy, tree species diversity, remnant vegetation, permeability, and community attitudes
- **megatrends** that are likely to impact urban greening into the future
- **priority areas for action**
- the **collaborative implementation** approach
- how **success** will be **measured**, at a regional level
- what **urban greening success** could look like for metropolitan Adelaide by 2055.

## Priority areas for action

Many government and non-government stakeholders are already actively working to deliver a cooler, greener and more liveable Adelaide. But achieving this vision for Adelaide is not without its challenges.

The Urban Greening Strategy aims to practically address challenges and opportunities by identifying priority areas for action that will better protect and enhance Adelaide's mature trees, green spaces and urban biodiversity.

The priority areas for action were drawn from extensive stakeholder consultation and community discussion. They are:

- cooler, greener and healthier development
- government leading by example
- building nature back in
- future-proofing our urban forest
- improving greening equity
- scaling up impact by working together.

This strategy establishes a consistent and shared monitoring approach across metropolitan Adelaide to increase efficiencies and provide optimal data for tracking progress towards its **30% urban tree canopy target**.

Additionally, the strategy sets 2 performance investigation areas: **reducing urban heat** and **improving plant species diversity**.

This strategy is supported by a series of background papers (see Appendix 1) that provide a compelling evidence-base for action.

## Collaboration maximises impact

All sectors, along with public and private landowners across metropolitan Adelaide, have an important role to play in greening our city.

By joining forces – having shared priorities, knowledge and resources, and collaborating and delivering complementary activities – we will grow our tree canopy and metropolitan greenery.

This strategy provides a mechanism for government and non-government partners to work together to achieve more, by enabling projects that share the load and bridge the gaps between jurisdictions.

Green Adelaide, as the lead facilitator, will coordinate partners in delivering this strategy. This will include facilitating an annual collaborative process to identify priorities for shared and region-wide action.

# Vision:

## A resilient and liveable Adelaide for all

Leafier, cooler and more biodiverse

# Priority areas for action

- Cooler, greener and healthier development
- Future-proofing our urban forest
- Government leading by example
- Improving greening equity
- Building nature back in
- Scaling up impact by working together

## Measuring performance

Target: Achieve 30% urban tree canopy cover

Performance investigation areas:

- Reduce urban heat
- Improve plant species diversity

# Snapshot: Priorities for action

**to drive practical urban greening action across metropolitan Adelaide**

## Cooler, greener and healthier development

It can be challenging to balance the benefits of new housing and other development with keeping our neighbourhoods cool and leafy. It is important to protect existing trees and provide sufficient space for new greening, supported by good soil and adequate water. An integrated package of initiatives will be undertaken to drive cooler, greener and more biodiverse places to live.

**Summary of actions**

- Strengthen tree protection legislation.
- Introduce user-friendly tools and other capacity-building measures to make exceeding minimum standards easy and attractive.
- Identify cost-effective solutions to remove barriers and incentivise positive action.

## Government leading by example

Expanding urban tree canopy in public spaces will become even more important for supporting sustainable and liveable neighbourhoods because more people have small, or no, front and back gardens. State and local government have important roles to play to identify and showcase innovative solutions to achieve greening outcomes, while balancing challenges with infrastructure and other constraints.

**Summary of actions**

- Showcase best-practice green and blue infrastructure along active transport corridors and in major land releases, schools and other government land.
- Find practical solutions to challenges such as infrastructure conflicts and maintenance.
- Ensure government systems and policy recognise the true value of trees.

## Building nature back in

Cities are increasingly recognised for their important role in supporting biodiversity. The concept of Biodiversity Sensitive Urban Design (BSUD) aims to create built environments that make a positive, on-site contribution to biodiversity while meeting other urban greening or development outcomes. Biodiverse greening enhances health and wellbeing, increases habitat for native wildlife and connects people with nature – right at their doorsteps.

**Summary of actions**

- Investigate how to encourage biodiverse plantings through levers such as legislation and policy.
- Build community and government understanding of BSUD principles, expertise and use.
- Identify and protect areas of valued native vegetation and critical habitat.

These priorities and actions are explored further on page 29.

## Future-proofing our urban forest

Climate change is already impacting the sustainability of metropolitan Adelaide's urban forest, which is largely comprised of a small number of plant families with varying tolerances to the projected warming and drying. It will be important to increase the diversity of our urban forest to improve climate-resilience, as well as ensure adequate water is available to support sustainable growth.

**Summary of actions**

- Increase knowledge and availability of locally endemic and climate-resilient plant species.
- Undertake research to improve the resilience and health of the urban forest.
- Build capacity in understanding and delivery of Water Sensitive Urban Design (WSUD) to ensure it becomes 'business as usual'.

## Improving greening equity

Research demonstrates that if a person can see trees and other vegetation from their home, place of work or school, it benefits their mental health and productivity. Not all residents in Adelaide have equitable access to urban green spaces and, in turn, the benefits they provide. It is vital to identify how to best prioritise urban greening investment where it is needed most.

**Summary of actions**

- Develop a spatial prioritisation tool to support evidence-based decision-making.
- Identify the greening potential ('plantable verge spaces') across metropolitan Adelaide.
- Undertake regional-level, open space planning to identify potential locations for new or improved green open space.

## Scaling up impact by working together

The need for urban greening action is strong and growing within the community. There is an opportunity for this work to be better coordinated and facilitated at a metropolitan-scale to enable the growing momentum to be translated into collective impact. It is also important to develop effective partnership models with Kaurna people to help heal our landscape.

**Summary of actions**

- Design a cross-sector collaboration process to facilitate better coordination, efficiencies and knowledge-sharing.
- Develop a joint research pipeline to fill knowledge gaps.
- Work with Kaurna Yerta Aboriginal Corporation (KYAC) to identify opportunities for partnerships with the Kaurna community.

# Snapshot: Measuring success

**to monitor whether we are achieving our vision of:**

## A leafier Adelaide: by achieving 30% tree canopy cover

A strengthened tree canopy target has been set for metropolitan Adelaide to achieve liveable, cool and healthy urban neighbourhoods. Based on tree canopy growth in recent years, the availability of improved data and the outcomes of the recent consultation processes, a target of 30% tree canopy cover has been introduced. This target is included in the Greater Adelaide Regional Plan to ensure a consistent, region-wide approach.

### Actions

- Undertake regular tree canopy data captures to monitor changes in tree canopy cover and assess them against the target.
- Work with stakeholders to investigate differential sub-targets for different land-uses and landscape types, and determine whether any land-use types should be excluded in the future.
- Prepare practical guidance on how different land-uses can accommodate optimal tree canopy cover.

## A cooler Adelaide: by reducing urban heat

Urban heat, particularly during extremely hot days, has a range of environmental, health and economic impacts. Urban heat is higher in areas with low tree canopy cover and high proportions of hard infrastructure and bare earth. Urban heat is lower in areas with an abundance of trees, other plants and water bodies. Urban heat analysis technology is rapidly evolving and improving. Existing heat data is already being used to help prioritise where urban greening investment is most needed.

### Actions

- Identify the best technology and methodology to monitor urban heat.
- Work with stakeholders to determine and set appropriate thresholds to measure success.

## A more biodiverse Adelaide: by improving plant species diversity

A diverse urban forest supports food and habitat availability for native wildlife, and limits the risks of widespread plant loss due to pests, diseases or climate change. A healthy urban forest includes a diversity in understory and mid-story vegetation and trees. Data analysis about Adelaide's plant species is limited. Any action needs to consider the local, historical and contemporary drivers of urban greening.

### Actions

- Identify a consistent methodology for monitoring the diversity of trees, shrubs and other vegetation across all land-use and landscape types.
- Determine appropriate diversity targets for the region.

# Setting the scene

# Defining urban greening

## Urban greening is the conservation, restoration or creation of green infrastructure, including trees and other plants, in urban areas that benefits people, nature and our economy, and the soils and water needed to support it.

There are many opportunities for urban greening across Adelaide, including:

### Urban parks

Local parks, playgrounds, sportsgrounds, community gardens, conservation areas and managed forests.



### Streetscapes and transport corridors

Local and arterial road verges and medians.



### Green roofs, walls and facades

Residential and commercial buildings



### Green and blue corridors

Greening along coastlines, lakes, rivers, natural and managed wetlands.



### Remnant vegetation

Coastal, riparian, wetland, grassland and grassy woodlands vegetation.



### Private greening

Residential gardens, commercial carparks, market gardens and urban renewal projects.




# The many benefits of urban greening

## It is now widely recognised, and supported by a substantial body of evidence[1], that trees and other greenery in cities deliver significant benefits to people, economies and nature.

People are happier, healthier, more active and more connected with their communities in greener cities. Water is cleaner and used as a resource, while stormwater management costs and flood risks are reduced. Air quality is better, urban heat is reduced, and microclimates are more comfortable for people. Soil is healthier and more food is produced locally. There is high market demand to live in green and leafy suburbs. People in these areas also spend more at local businesses, and jobs are created. Greener cities provide habitat that supports biodiversity. Carbon is sequestered, emissions are reduced and climate change impacts are mitigated.

**In short, greener cities are nicer to live in, respond better to climate challenges and contribute to a healthier economy.**

Urban greening has significant benefits, particularly around:

### Financial savings and gains

Shading from trees can greatly improve the thermal comfort of our homes, which reduces the reliance on air-conditioning on hot days. Not only does this provide financial benefits to householders in terms of energy costs, but it also leads to environmental benefits by reducing the greenhouse gases produced by these appliances[2].

**Shading the western façade of a dwelling with trees can drop total energy costs by 5% to 10%[3].**

A number of studies have also revealed significant boosts to house values in leafy neighbourhoods.

**A Brisbane-based study revealed a 5% increase in the median house price in streets with 50% canopy cover[4].**

**Perth-based research showed that having a broad-leaved tree in front of a home can add more than $16,000[5].**

## Urban cooling

Not only do trees provide shade by shielding areas from the sun and absorbing light, but they also actively cool the air through evapotranspiration.

**A study based in Adelaide's western suburbs has shown that trees and other vegetation can have significant cooling benefits and reduce the surface temperature in garden areas by 5 to 6 degrees Celsius[6].**

## Health and wellbeing benefits

Trees can support physiological health by providing sensory relief and generating a sense of calm. In fact, studies have shown that residents of tree-lined neighbourhoods feel healthier and have fewer cardiometabolic conditions[7].

**People who live in neighbourhoods with a tree canopy coverage of 30% or more have been shown to experience a third less stress[8].**

Recent research suggests the benefits are not just related to having access to green space, but that the more biodiverse the space the greater the benefits[9].

**Having a daily dose of nature gives people many health and wellbeing benefits.**

It is widely accepted that humans are hardwired to need connection with nature and other forms of life. With this in mind, a healthy, thriving natural environment is vital for creating resilient communities.

There is a large body of evidence to show that time spent in green spaces is linked to positive short-term and long-term health benefits[10].

## Provision of ecosystem services

Trees help improve air quality by capturing and filtering pollutants, including ozone, sulphur dioxide, nitrogen oxides and particulates.

**A New York study found that its urban forest removed 1,821 metric tonnes of air pollution at an estimated value to society of $9.3 million annually[11].**

Trees also play other important ecosystem services such as:

- improving stormwater quality by reducing run-off and erosion
- mitigating climate change by capturing and storing carbon dioxide.

## Habitat for animals

Trees and other urban green cover provide important habitat for animals. Cities around the world are home to numerous threatened plant and animal species, and are important places for conservation in their own right.

**In fact, Australian cities and towns have been shown to provide habitat for 3 times as many threatened species per unit area than rural areas[12].**

Some species are only found in urban environments, while others rely on cities for key food and habitat resources[13]. For some species, cities provide stable, year-round resources[14] due to plant selection and watering regimes. In addition, many of our animals, such as birds and possums, rely on hollows in large old trees to nest or den in.

## Attracting residents and businesses

The importance of creating a liveable Adelaide is recognised in **South Australia's Economic Statement** because it is a significant factor in attracting the best and brightest.

**Protecting and enhancing liveability can help to attract people to Adelaide to live and work here – and retain them.**

Green and leafy neighbourhoods, where residents have access to quality green spaces within walking distance, tend to make great places to live.

## Cultural value

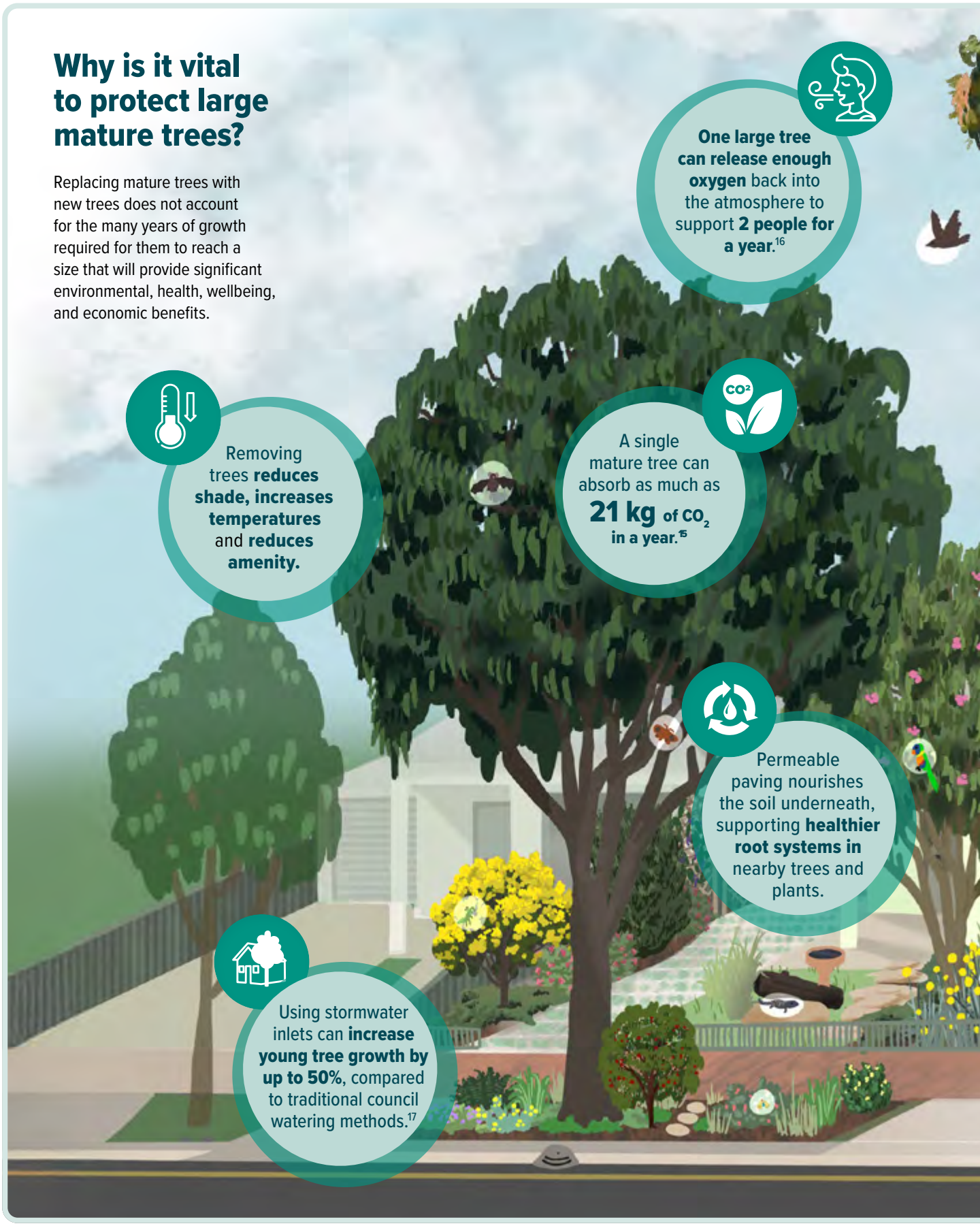
Kaurna people attach great value to natural habitats, which are core to many cultural practices and obligations.

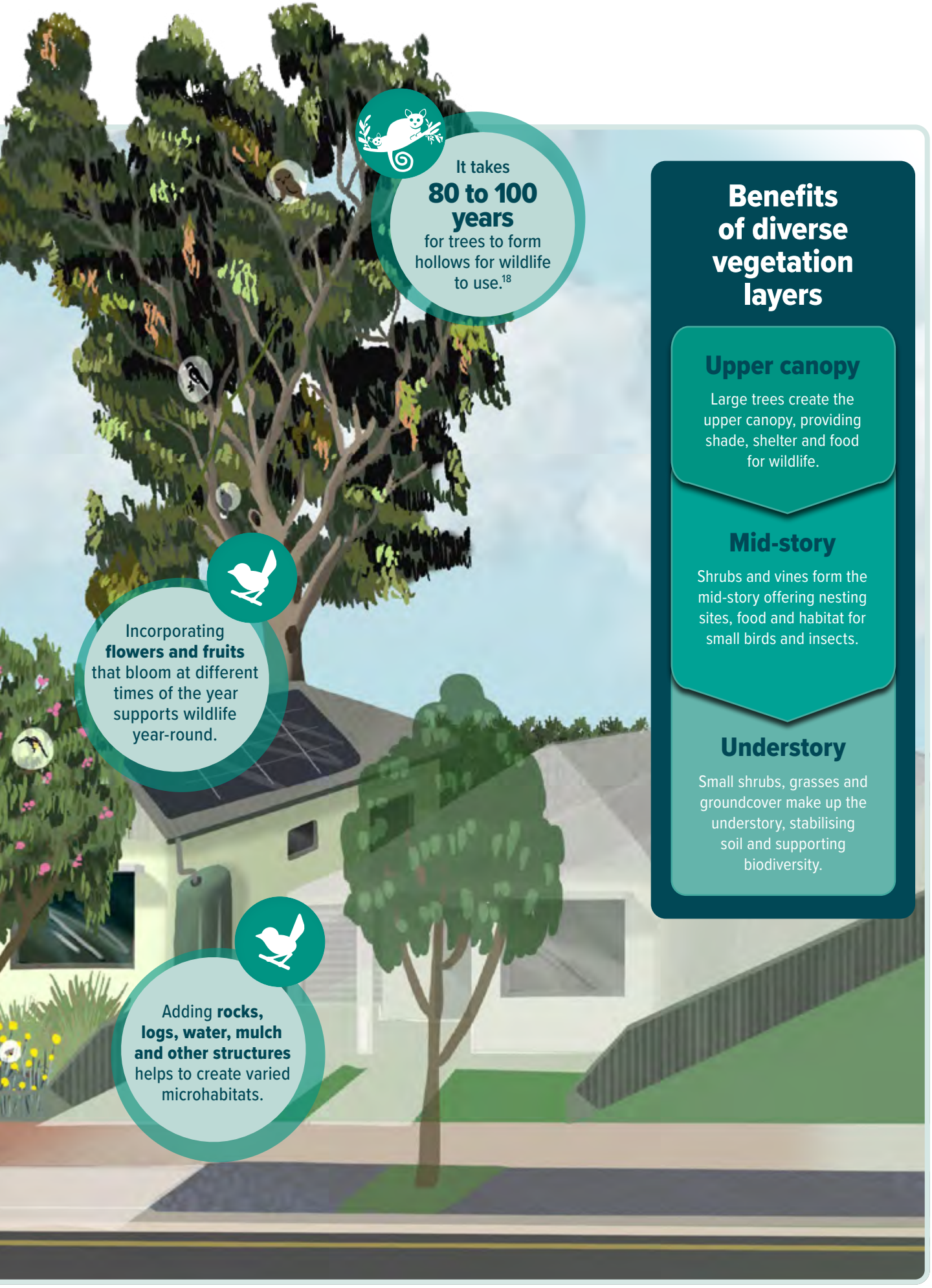
**Adelaide's unique species and ecosystems are an integral part of Kaurna Yerta – the identity, stories and history of the land and its people.**

For instance, for the Kaurna community and the broader community, trees are important as spaces for gatherings, ceremonies or experiencing a connection to a place.

# Why is it vital to protect large mature trees?

Replacing mature trees with new trees does not account for the many years of growth required for them to reach a size that will provide significant environmental, health, wellbeing, and economic benefits.




It takes
80 to 100 years
for trees to form hollows for wildlife to use.[18]
Incorporating flowers and fruits that bloom at different times of the year supports wildlife year-round.
Adding rocks, logs, water, mulch and other structures helps to create varied microhabitats.
Benefits of diverse vegetation layers
Upper canopy
Large trees create the upper canopy, providing shade, shelter and food for wildlife.
Mid-story
Shrubs and vines form the mid-story offering nesting sites, food and habitat for small birds and insects.
Understory
Small shrubs, grasses and groundcover make up the understory, stabilising soil and supporting biodiversity.

# The case for this strategy

## For metropolitan Adelaide's urban environment to thrive, we need a roadmap for increasing tree canopy, cooling the city and boosting biodiversity.

This Urban Greening Strategy for Metropolitan Adelaide will provide this direction, and help us to:

### Respond to challenges and opportunities facing urban greening

Numerous in-depth conversations have taken place in recent years to identify the challenges, and possible solutions, to increasing and improving the quality of urban greening in metropolitan Adelaide and ensuring everyone benefits.

These conversations have been led by Parliament, state government departments, the Local Government Association of South Australia, councils, non-government organisations, peak bodies, and research bodies – which demonstrates the **strong cross-sectoral interest in urban greening.** These discussions are reflected in:

- the parliamentary Natural Resources Committee's **Inquiry into Urban Green Spaces (2020)**
- Green Adelaide's **Regional Landscape Plan 2021-2026**
- the Conservation Council SA's **tree reform research and community advocacy**
- the Minister for Planning's **Planning System Implementation Review (2022-ongoing)**
- the parliamentary Environment, Resources and Development Committee's **Inquiry into the Urban Forest (2023-ongoing)**.

This strategy was developed in consultation with a wide range of stakeholders who deliver, influence and/or are interested in urban greening in metropolitan Adelaide (see Appendix 1). The 6 priority areas seek to tackle the key challenges and opportunities facing Adelaide's tree canopy and other greenery and build on the work undertaken by stakeholders across the region.

Through these investigations and from extensive stakeholder consultation, the following concerns have been identified:

- the impacts of climate change
- ensuring adequate water to support healthy and thriving green spaces
- the impacts of increased housing density on our neighbourhoods
- competition for street verge space with hard infrastructure
- community awareness and perceptions
- the loss of mature trees
- the lack of diverse understory and mid-story vegetation to support nature in cities, animals and climate-resilience.

## Ensure our long-term investments are based on long-term planning

Urban greening is a long-term investment. Trees can take decades to reach maturity, so creating a leafier Adelaide needs long-term planning.

While the state government does have an urban tree canopy target, there has been no dedicated, long-term metropolitan-level strategy setting out how this will be achieved. This strategy will fill this gap.

An important role of this strategy will also be to complement and amplify relevant, existing state and local government action, and facilitate a shared commitment to improving urban greening outcomes (see Appendix 2).

## Foster collaboration to scale up impact

No singular organisation or professional group is responsible for urban greening. Everyone has a different, but important, role to play. (See Figure 1, right)

Urban greening is delivered and influenced by many diverse stakeholder groups in metropolitan Adelaide, including the Kaurna community, local and state governments, not-for-profits, research bodies, private enterprise, community groups and individual households. Many are already actively working to increase urban greening within their own area.

Increasing tree canopy and other urban greenery will require action from all landowners and land managers across Adelaide. This includes those responsible for residential, state government, council, commercial and primary production land.

This strategy recognises that a range of complementary levers will need to come together to achieve the most impactful improvements to urban greening efforts. (See Figure 2, right)

This strategy identifies which levers are most impactful to improve urban greening and will help guide action. It will help partners achieve more by identifying projects that:

- fill known gaps or scale up what is already working well
- unlock metropolitan Adelaide-wide benefits
- harness cross-sector collaboration and/or co-investment.

**Figure 1. Everyone has an important role to play to green Adelaide**

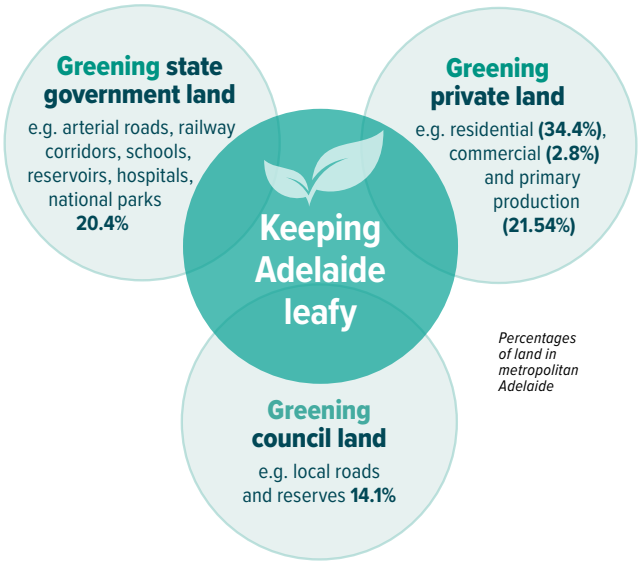
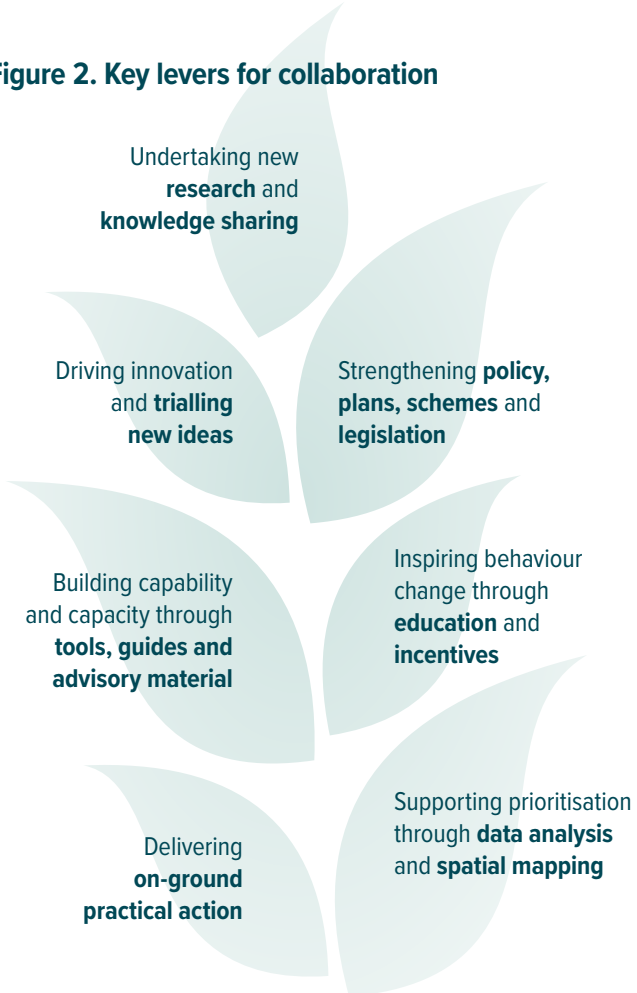



**Figure 2. Key levers for collaboration**



# Understanding Adelaide's current landscape

State and local government have worked together to use LiDAR (a remote sensing technique) and aerial imagery to better understand the state of Adelaide's urban forest, as well as the levels of urban heat and impermeability.

This allows the success of urban greening initiatives to be tracked, and helps identify priorities for investment and effort. A consolidated dataset for council street tree diversity has also recently been compiled for the first time across metropolitan Adelaide. It shows that:

### Tree canopy cover across metropolitan Adelaide has increased.

- Tree canopy increased from **14.5%** in **2018-2019** (baseline) to **18.26%** in **2022**[a].
- All local government areas experienced tree canopy cover increases, ranging from **1.5%** in the City of Port Adelaide Enfield to **7.5%** in the City of Mitcham.
- Average canopy height increased between 2018-2019 and 2022.
- About 69% of tree canopy is **less than 10 m** in height.

See **Map 1, Figure 3** and the **Tree Canopy Cover** Target section

### Tree canopy cover is unevenly distributed.

- Tree canopy cover across local government areas ranged from **8.1% to 39.8%** in 2022.
- **Three** council areas had **less than 10%** tree canopy cover, **7** had between **10% and 20%, 6** had between **20% and 25%**, and only **2** council areas **more than 30%** in 2022.
- Across metropolitan Adelaide, **295** suburbs (or **74%**) have **less than 20%** tree canopy cover.

See **Map 1 and 2** and the **Tree Canopy** Target section

### Tree species diversity in council parks and streets is considered low in a changing climate.

- The **top 13 most abundant species** make up **50%** of all trees[b].
- There is potential to improve the species, genus and family diversity of trees to increase resilience against climate change impacts and pests.
- No tree species diversity data is available yet for other land-use types.

See the **Plant Species Diversity** Performance Investigation area

**a** *LiDAR data capture (a remote sensing technique) was first carried out for part of metropolitan Adelaide in April 2018 and for some additional council areas in October 2019. A recapture was undertaken for the whole region in January 2022 (18 councils). Tree canopy change detection is based on the area for which LiDAR data capture has been undertaken twice, which includes only partial areas of City of Playford and Town of Gawler (see the map on Page 66).*

**b** *For areas where data was available*

### Remnant vegetation is scarce and it is important to protect what we have left.

- Since European colonisation the majority of native vegetation has been cleared, with only **28.8% remaining**[c].
- Work is needed to make biodiversity data more consistent and fill knowledge gaps.

See **Appendix 3 and 4**

### Impermeable surfaces are likely to be increasing in infill areas.

- The total percentage of impermeable surfaces across metropolitan Adelaide was **29.1%** in 2022.
- Impermeable surfaces reduce the space available for tree planting, prevent the infiltration of rainwater for vegetation, and increase stormwater run-off.

See **Appendix 5**

### Urban heat intensity varies significantly.

- Average urban heat intensity **increased by 0.2 C** from 2014 to 2023.
- While the results indicate an overall stable trend, there is **significant variation at the local scale** resulting from tree and vegetation clearance and new development.

See **Box 16** and the **Urban Heat Performance Investigation Area**

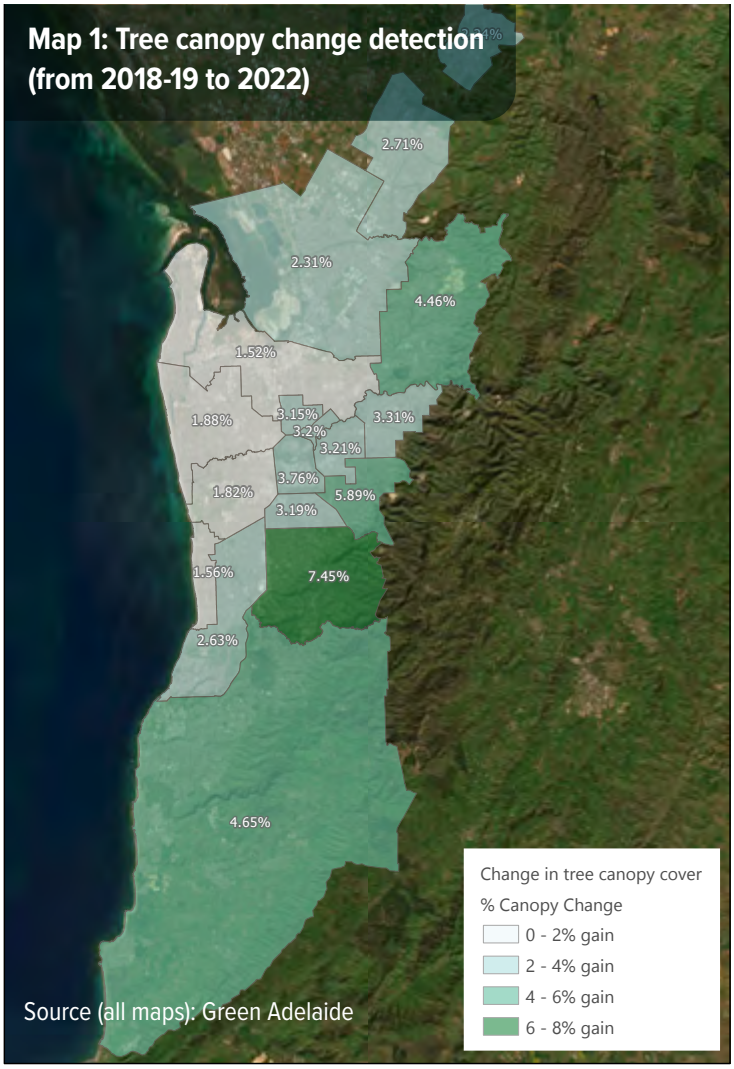
### Strong community appreciation for urban greening and nature.

- A **2019 national survey** found that urban greening is important to **85%** of people (while **12%** think it's a nuisance or have other concerns), with people appreciating it for its great aesthetics, for relaxation and health and wellbeing, and for wildlife[19].

See **Appendix 6**

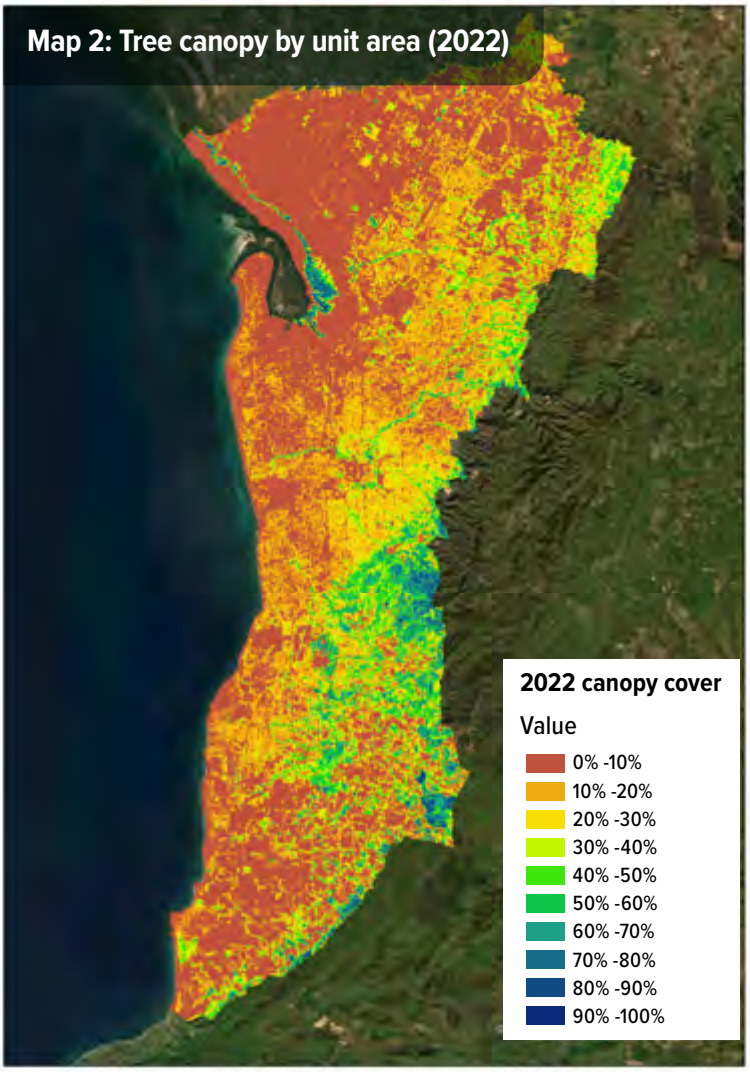
***c*** *2015-2020 SA Land Cover dataset, Department for Environment and Water.*

## Map 1: Tree canopy change detection (from 2018-19 to 2022)




Source (all maps): Green Adelaide

## Map 2: Tree canopy by unit area (2022)




## Map 3: Tree canopy cover by suburb

**Minimum for a residential suburb:**

**1.75% Seaford**

**Maximum for a residential suburb:**

**52.77% Waterfall Gully**

**Total canopy cover across the region:**

**16.7%**

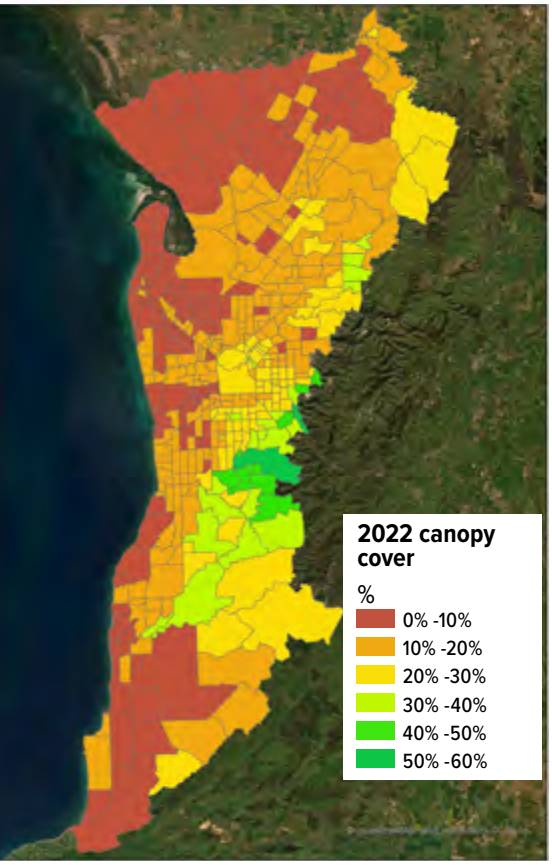
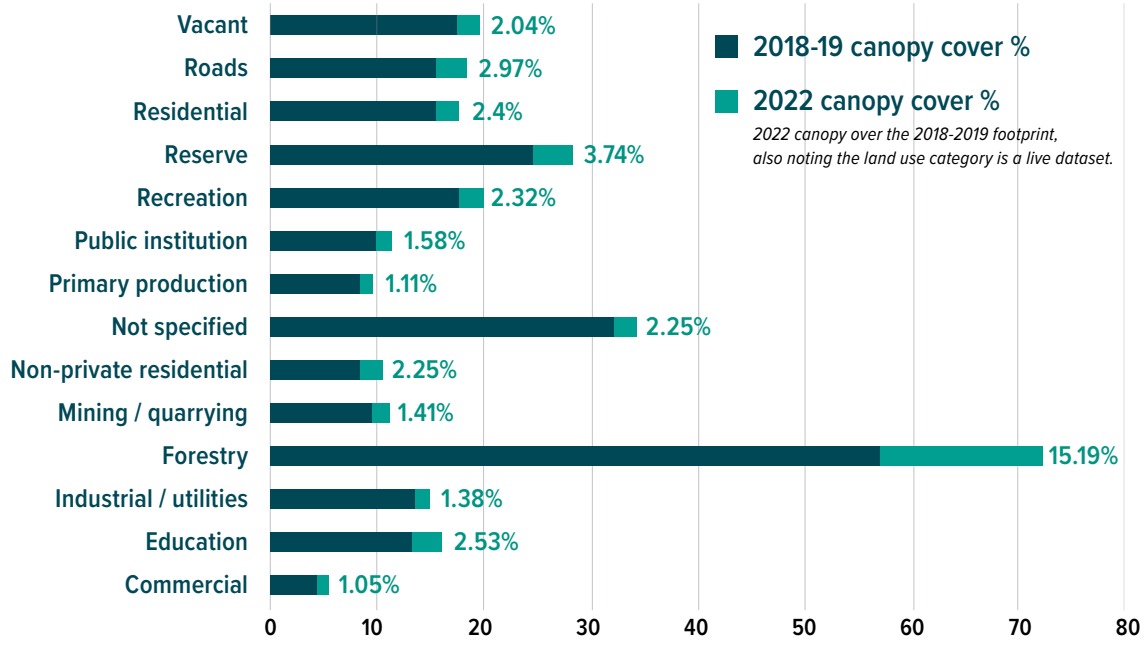



**Figure 3. Tree canopy cover % gain by land use**




*(Source: Green Adelaide)*

# Impact of global megatrends

## It is valuable to consider the global megatrends that are likely to impact on growing and improving the condition of Adelaide's trees and other plants in the future.

Scenarios are a useful frame for exploring the potential impacts of megatrends on urban greening, to ensure that this strategy is robust and responsive to a changing and unpredictable future.

For further information about the scenarios (and megatrends) that were prepared to support the development of this strategy refer to the **'Scenario planning background paper'**.

Some relevant megatrends include:

### Climate change

Climate change is one of the most significant challenges and drivers for growing our urban forest. Projected climate change impacts include hotter summer temperatures with more extreme heat days; more frequent, more severe and longer heatwaves; reduced annual rainfall; more intense high rainfall and storm events; and increased likelihood of bushfires and droughts[20]. For vegetation in metropolitan Adelaide, 2 of the biggest impacts of climate change will be increased evapotranspiration and reduced soil moisture.

### Liveability of our cities

The increased urban heat and drier conditions projected for the future are also predicted to impact human health, wellbeing and quality of life. Hotter temperatures have a direct impact on mortality rates, but also reduce the uptake of many outdoor activities including active transport, such as walking and cycling. SA Health advises that people, especially older and more vulnerable people, may not be able to remain cool enough to stay healthy on days that exceed 35°C.

This is reflected in a 16% increase in people visiting a doctor during heatwaves across metropolitan Adelaide between 2011 and 2016[21]. Increasing tree canopy will be increasingly important to cool urban areas for liveable outcomes.

> **Populations in major cities in Australia face a 2.3% increase in the risk of mortality during heatwaves, with Adelaide's population facing the greatest increase in the risk of heatwave-related deaths at 8.3%[22].**

**Figure 4: Climate trends projected to 2050 and beyond indicate:**

- Increasing maximum, minimum and average temperatures.*
- Warmer spring temperatures.*
- Hotter days and more frequent hot days.*
- Declining rainfall.*
- Lower spring rainfall.*
- More intense heavy rainfall events.
- More dangerous fire weather.

**Based on new climate projections from the NSW Australian Regional Climate Modelling Project stage 1.5.*

## Biodiversity loss

Pressures from climate change, habitat loss, pollution and invasive species are threatening every Australian ecosystem, with 19% showing signs of collapse loss[23]. Moreover, this number is predicted to increase substantially over the coming decades, with further extinctions expected unless radical changes are made. Therefore, it is vital to identify ways to protect and enhance the diversity of metropolitan Adelaide's vegetation.

> These pressures have resulted in the number of threatened species growing by 8% since 2016, such that 21% of Australian mammal species are now threatened[24].

## Changing mobility systems

**How people physically move around is changing, due to various trends such as electrification of vehicles, mobility-as-a-service, micro-mobility, connected and autonomous vehicles, and consumer preference for active transport[25].** Changing mobility systems impact roads and infrastructure, housing design, how we move around public spaces, and access to employment and educational opportunities for residents. It will potentially change how much road and verge space is needed, which could impact on space available for urban greening.

## Land use patterns

Traditionally, South Australian towns and cities have been low-density, dominated by detached houses on large allotments. **In recent years, the urban form has been changing, with a move to more medium- and high-density living. In metropolitan Adelaide, this often takes the form of small-scale infill development, with single allotments being split into 2 or more dwellings**. Infill development is likely to continue to be an important part of new housing and needs to be carefully managed to avoid negative impacts on retaining large trees and increases in impermeable surfaces[d].

> Greater Adelaide's population is projected to increase by up to 672,000 people by 2051 (under a high growth scenario), reaching between 2 million and 2.19 million people. This population will account for about 86% of the state's population[26].

## Declining water quantity, quality and availability

**Water demand is increasing, but less water sources will be available because of the drier climate.** The demand and supply of water will be impacted by various shifts, such as less reliable native water resources due to climate change, population growth, community acceptance of recycled water, technological innovations, demand from water-intensive industries, and our ability to maximise use of water where it falls through WSUD. Securing adequate water could be a limiting factor for successful urban greening. Water demand is increasing, but less water sources will be available because of the drier climate.

## Technology

Rapid adoption of digital and data technologies, and incredible improvements in the ability of software and machines to solve problems and perform complex tasks without explicit human guidance, might make it easier to understand how our urban forest is performing and better manage it.

These technological developments are driven by ongoing scientific breakthroughs in artificial intelligence and global investments in technology-driven research and development.

> While technical advancements have been significant, experts predict that this is just the tip of the iceberg, with the vast majority of digitisation yet to occur[27].

## Recognition and appreciation of Aboriginal people's wisdom

**For tens of thousands of years, Aboriginal people have addressed changing weather[28] in Australia and successfully applied their knowledge to land management.**

One of the distinctive characteristics of Indigenous stewardship is the focus on humans as caretakers of the land, rather than owning and controlling it. There is growing recognition and appreciation of cultural knowledge, skills and perspectives of the Kaurna Miyurna, and all Aboriginal people. This is likely to increasingly influence and shape land management practices.

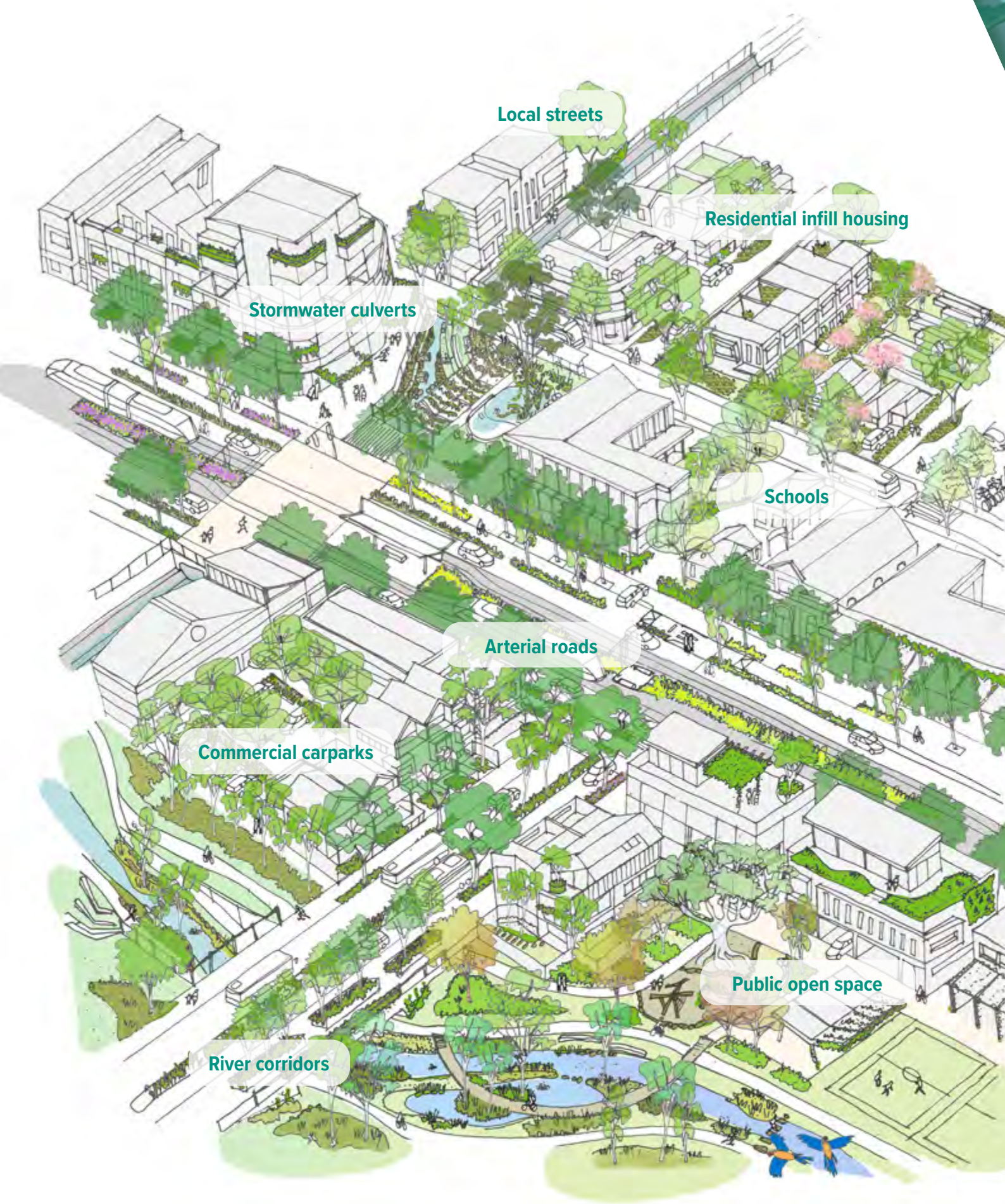
***d*** *The Greater Adelaide Regional Plan (GARP) guides decisions about how and where future population growth is accommodated.*

# Our vision for a greener future

## Our vision is a **resilient and liveable Adelaide for all: leafier, cooler and more biodiverse.** This means:

- tree canopy cover target of 30% is achieved and more mature trees are retained
- greening is embedded in new developments, and conflicts with built infrastructure are resolved
- more diverse vegetation is providing food and resources for animals
- more integrated water-sensitive urban design
- a climate-resilient urban forest
- equitable distribution of canopy cover across Adelaide
- strong community, industry and government support to deliver nature-based solutions
- meaningful partnerships with the Kaurna community
- collaborative management of urban greening.

This vision will be met by reaching the outcomes described in this strategy's 6 priority areas for action.




## Bringing the vision to life

This illustration shows the many opportunities to achieve our vision within metropolitan Adelaide by greening new housing and commercial carparks, and transforming public open space, river corridors, schools and arterial and local roads.

# 6 priority areas for action

- Cooler, greener and healthier development
- Government leading by example
- Building nature back in
- Future-proofing our urban forest
- Improving greening equity
- Scaling up impact by working together

# Priority Area 1: Cooler, greener and healthier development

There has been a significant trend across metropolitan Adelaide towards smaller blocks, larger houses and 'low maintenance' gardens. Infill, commercial and master-planned developments often involve clearing land, resulting in a loss of mature trees and other vegetation.

It is vital that all types of development protect existing trees and provide sufficient space for new urban greening, supported by adequate soil and water access. Therefore, a priority of this strategy is creating cooler, greener and healthier development facilitated by good planning and design.

Housing built on subdivided allotments – known as infill housing – is a challenge for urban greening. This type of development generally increases site coverage and driveway crossovers, creating up to 90% impermeable surfaces (see Box 1).

It is important to reduce impermeable surfaces, where possible, to help improve stormwater management, retain healthy soils, reduce the 'urban heat island' effect, and increase the available space for planting trees and other greenery.

Greenfield land is undeveloped land located on the urban fringe of a major town or city. This type of development can impact on native vegetation. While it is usually perceived that only small tracts of vegetation or scattered trees are lost, this vegetation is important to retain to provide habitat for wildlife and amenity for residents.

In master-planned communities (greenfield and brownfield), larger canopy trees can often be planted thanks to the undergrounding of powerlines, the use of common trench infrastructure, and integrated water management. As it generally takes 2 to 3 years for revegetation to support wildlife with food and shelter, it is recommended that new vegetation is established in preferable locations before existing plants are removed.

Other types of development, such as carparks outside commercial developments, also provide key opportunities for better urban greening outcomes (see Box 3).

Strengthening land-use planning policy and tree protection legislation is considered by many stakeholders to be the number one opportunity to support retention and expansion of greening on private land (see Box 2).

However, it is not possible to stem the loss of trees through these levers alone. Education, appropriate valuation of trees and other green infrastructure, tools, guides, incentives, and new practices supported by strong evidence and data are all needed to support this priority. It will also be vital to identify cost-effective and easy to implement solutions, suitable for small spaces.

Cultural shifts are also needed across the community, as well as within the development and building industries, to prioritise and understand the value of trees. It will be important to develop effective, wide-reaching social license campaigns that establishes a clear and consistent narrative to raise awareness about the value of urban greening. This will target those who are not already engaged, and include messages about the economic, health and wellbeing, wildlife, and climate-resilience benefits.

> Australian homes are among the largest in the world. The average house size increased between 2008 and 2018 from 234m$^2$ to 248m$^2$. Additionally, the median block size for new development across Greater Adelaide has reduced significantly – from approximately 600m$^2$ in 2000 to 468m$^2$ in 2021[29].


## Priority Area 1: Cooler, greener and healthier development

| Outcomes | Ref | Actions | Levers | Where |
|---|---|---|---|---|
| **Policy and legislation better support urban greening and are in line with national leading practice.** | 1.1 | Strengthen tree protection legislation (and associated offset schemes and guidelines) to reflect the true value of existing trees (and monitor the effectiveness of changes). | Legislation<br>Offset scheme | All land |
| | 1.2 | Strengthen the Urban Tree Canopy target and relevant objectives and actions as part of the Greater Adelaide Regional Plan. | Regional Plan | All land |
| **Developers and community value nature and have expertise to practically and cost-effectively achieve cooling and biodiverse greening outcomes.** | 1.3 | Enhance the Planning and Design Code (and develop supporting tools) to make it easier for developers to achieve greening outcomes in infill, master-planned and commercial developments. | Policy<br>Tool<br>Guide | Private (residential, commercial) |
| | 1.4 | Undertake coordinated metropolitan-wide social license campaigns targeted at different sectors and professions. | Education<br>Incentives | Private (residential, commercial) |
| | 1.5 | Develop a catalogue of costed housing and garden designs that showcase practical and affordable greening, WSUD and BSUD. | Education<br>Guidance | Private (residential, commercial) |
| **New developments include green infrastructure by adopting innovative and cost-effective solutions.** | 1.6 | Work with the development sector to understand urban greening drivers and encourage innovation and adoption of leading practice (including identifying effective education, awards and incentives). | Research<br>Trials<br>Incentives | Private (residential, commercial) |
| | 1.7 | Investigate engineering solutions, planting, and maintenance techniques to minimise conflicts between green and grey infrastructure (building footings and infrastructure). | Research<br>Trials | Private (residential, commercial) |

## Box 1: Impact of infill on existing mature trees

The images below for the City of Unley (2018 to 2021) and City of Campbelltown (2018 to 2020) suggest that urban development and associated infill is a cause of canopy loss. Reducing canopy loss, preserving existing trees and utilising plantable space on private land is key to growing Adelaide's urban forest. Community engagement with private landowners will play a critical role in helping build a greener, more sustainable future for Adelaide.

> Infill development delivered about 5,500 new dwellings per year in metropolitan Adelaide (between 2017 and 2021)[30] and will continue to be an important contributor to new housing growth.

For further information about these case studies, view **Aerometrex's webinar.**

### City of Unley


### City of Campbelltown


## Box 2: Urban greening and the planning system

The land-use planning system, using mechanisms such as the Planning and Design Code, structure planning, design standards and practice guidelines, has an important role to facilitate improved and consistent urban greening outcomes.

For example, in 2020 new urban greening policies were introduced into the Planning and Design Code by the State Planning Commission in response to significant community concern about the impact of infill development on mature trees and other urban greening. These included a minimum tree planting and soft landscaping requirement, and a supporting Urban Tree Canopy Offset Fund. To help developers achieve these new policies (and go beyond them) Green Adelaide partnered with the State Planning Commission in 2022 to release the **Adelaide Garden Guide for New Homes**.

Additionally, in 2024 the Significant and Regulated Tree legislation was strengthened to better protect large mature trees. It is important to monitor the impact of these new legislative and Planning and Design Code requirements and identify any opportunities for enhancement.

For further information visit: **PlanSA portal.**

## Box 3: Carparks could provide WSUD wins

Integrating WSUD into surface level carparks (see Glossary for definition) is a practical and effective way to manage stormwater, improve water quality, and maximise the growth of trees and other vegetation.

Carparks provide the opportunity for cost-effective and practical WSUD solutions as they usually have minimal underground services compared with other land-uses, such as roads.

A good example of this is the Fig Plaza Car Park at Adelaide Oval, where installing raingardens that collect stormwater to passively water garden beds led to significant tree growth in just 2 years.

For further information about this case study, visit: **Water Sensitive SA.**


# Priority Area 2: Government leading by example

## Well-vegetated streetscapes, public open space and other public areas are becoming increasingly important across metropolitan Adelaide, as more people live in neighbourhoods with small, or no, front and backyards.

Quality public green spaces provide many advantages for the community, such as improved physical and mental health and wellbeing. More broadly, benefits include opportunities for sport and recreational activities, provision of habitat for wildlife, improved urban stormwater management, and increased resilience to the impacts of climate change[31].

However, public space is often highly contested, with competing demands for space for different purposes. For example, due to safety risks, tree species that grow to more than 6m tall by maturity are not permitted to be planted directly under powerlines. This has contributed to less diversity in the species of trees that are planted, and less shade and aesthetic appeal than what would be provided by trees with larger canopy.

Major transport upgrades and other public infrastructure works can lead to the removal of mature trees and put pressure on the limited space available for new urban greening. In addition, roads are often urban heat islands, so greening is even more important to help shade pedestrians and cyclists (especially at intersections), as well as help cool the local microclimate.

It can be challenging to plant more street trees in some instances because of competing needs for space, such as allowing for driveway access, adequate sightlines and bin space. Some of these conflicts are not visible at all – for instance, below-ground utilities often have requirements around how close trees can be planted. There is an opportunity to pilot and scale up alternative approaches to installing infrastructure for utilities that would maximise space for urban greening, such as installing root barriers, undergrounding powerlines, consolidating services in common services and multi-utility tunnelling.

Greening has often been seen as 'nice-to-have' or an afterthought, rather than a critical piece of valuable public infrastructure. This is compounded by the fact that trees are often left out of asset management registers and systems, and there is no agreed mechanism to account for trees as 'appreciating assets' in financial systems. Dedicating budget to maintaining green infrastructure assets has also been raised as a challenge.

Resolving these barriers is likely to require a more robust evidence-base and tools, based on credible quantitative economic valuations in the local context. Identifying new ways to make public greening and its maintenance more cost-effective (and therefore financially sustainable) will also be vital.

It will be important for both state and local government to show leadership in their own projects, setting new policies, design standards and upskilling contractors (see Box 4). Traditional approaches to open space planning, streetscape design, stormwater management, asset systems and horticultural maintenance must evolve so that the economic and social benefits of urban greening are realised.

WSUD and BSUD outcomes in public spaces will need to become standard practice during planning, design and construction, which will require working together to identify and fund flagship projects that set new benchmarks. Active transport routes, significant land releases, public open space, schools, and along major creek lines all present significant opportunities for this (refer to the GARP for the locations of these).

Both state and local government can also play an important role in trialling new ideas, commissioning research and driving innovative solutions for greening the land that they own and manage (see Box 5, Box 6 and Box 7).

## Priority Area 2: Government leading by example

| Outcomes | Ref | Actions | Levers | Where |
|---|---|---|---|---|
| **Innovative and best-practice green and blue infrastructure is mainstreamed in government infrastructure works and major projects.** | **2.1** | Integrate diverse urban greening and WSUD as part of business-as-usual in government projects by setting new standards for:<br>• transport infrastructure upgrades (particularly roads with a high level of pedestrian and cyclist activity)<br>• major land releases<br>• new schools and significant upgrades<br>• SA Water assets<br>• healthcare facilities<br>• sporting/recreation facilities<br>• other government land. | Policy<br>On-ground work | State government land<br>(major projects) |
| | **2.2** | State and local governments to deliver flagship greening, BSUD and WSUD projects that cross boundaries and set new benchmarks (supported by grants programs). | Grants<br>Design guides<br>Demonstration projects<br>Master plans | State and local government land |
| **Barriers to BSUD and WSUD are solved to accelerate implementation.** | **2.3** | Identify and implement solutions to key barriers to BSUD and WSUD in public infrastructure and projects, such as maintenance. | Grants<br>Research<br>Policy<br>Demonstration projects | State and local government land |
| | **2.4** | Investigate alternative approaches to installing utilities infrastructure in roadways to create more space for trees. | Research trials | State and local government land |
| | **2.5** | Address legislative barriers and other restrictions on planting near utilities infrastructure, including permitted species lists. | Research<br>Legislation<br>Policy | State and local government land |
| **Green infrastructure is appropriately valued as essential community assets that contribute to the wellbeing of our community and environment.** | **2.6** | Determine and apply a standard methodology for applying economic valuations to trees, habitat areas and other green infrastructure. | Research<br>Tools | All land |
| | **2.7** | Investigate including green infrastructure into public asset management systems and account for trees as appreciating assets. | Research<br>Policy<br>Standards | State and local government land |

## Box 4: Commitment to greener transport infrastructure

As South Australia's key agency in delivering public infrastructure, the Department for Infrastructure and Transport (DIT) has a major role to play in achieving the government's tree canopy target.

DIT has developed a **Green Infrastructure Commitment (2021)**, which focuses on increasing tree canopy cover on department-managed land, over footpaths and bikeways, implementing WSUD for infrastructure projects, and ensuring that new green infrastructure contributes to improve biodiversity. Key actions within this Urban Greening Strategy will help DIT implement its Green Infrastructure Commitment.

An example of an infrastructure project with positive greening outcomes is the 1.8 km Regency Road to Pym Street upgrade in Adelaide's inner northwest – part of Adelaide's North-South Corridor initiative. It has:

- increased habitat for native butterflies
- retained existing trees, where possible
- positioned new trees to maximise shade for pedestrians, while minimising impacts to infrastructure
- incorporated WSUD elements, including turfed swales and passive irrigation for new trees
- incorporated trees that have a large canopy to maximise shade.

For further information, view DIT's **Green Infrastructure Commitment.**

## Box 5: Improving habitat connectivity by rewilding Breakout Creek

The Breakout Creek redevelopment stretches from Tapleys Hill Road in Lockleys to the Torrens Outlet in West Beach, a total of 2.7 km along the River Torrens.

Recent work has aimed to restore the river's natural ecosystem by replacing concrete channels with wetlands and native vegetation, improving water quality, biodiversity and wildlife habitat. The redevelopment has also opened many previously fenced-off spaces for people to enjoy, with new trails, picnic areas, signage and artworks.

The project highlights the importance of collaboration, via a successful partnership between Green Adelaide, the City of Charles Sturt, the City of West Torrens, the South Australian Department for Trade and Investment through the Planning and Development Fund, the Australian Government through the Environment Restoration Fund, SA Water, and the Traditional Owners of the Adelaide Plains, the Kaurna People.

For further information, visit: the **Green Adelaide website.**

## Box 6: Creation of a biodiversity corridor for animals and people

Windsor Street Linear Reserve in Parkside was created as part of the City of Unley's vision to develop a native plant corridor. It is used by people to walk or cycle from Urrbrae to the Adelaide Park Lands, while also providing an unhindered corridor for native bird movement.

Unley Council has taken advantage of repurposing an open concrete stormwater drain to create this reserve. The open drain has been replaced with box culverts to manage stormwater and now hosts a 11,000 $m^2$ linear reserve featuring 15,000 locally Indigenous plants, with 84 unique species. These include threatened species, such as grey box (*Eucalyptus microcarpa*), and other plants that made up the original woodland ecosystems of the area.

There is an opportunity to learn from, as well as scale up, the implementation of biodiverse linear reserves.

For further information refer to the **project fact sheet**.



## Box 7: 'Wild' street upgrade in St Peters

St Peters Street, in the City of Norwood Payneham and St Peters, has been transformed through a significant upgrade to include passive stormwater infrastructure, biodiversity and pedestrian amenities.

This award-winning project, jointly funded by the council, Green Adelaide and the Australian Government, retained 97 large trees and planted more than 200 new trees. The result is a symbiotic space for nature, pedestrians and cars.

For further information, visit:
**St Peters Street Streetscape Upgrade.**

# Priority Area 3: Building nature back in

Cities are increasingly recognised for providing a home to important biodiversity. However, without conscious efforts to protect and enhance habitat, the biodiversity of our region will continue to decline. The future of many threatened species will depend on actions to accommodate their needs within urban boundaries.

Recent research in Adelaide has demonstrated that higher levels of biodiversity, as measured by increasing naturalness and vegetation structure, enhanced the psychological benefits of the city's parks for visitors[32]. This work demonstrated that sometimes even small areas of biodiverse vegetation, from pocket parks to backyards, on streets and along urban waterways, can reinvite and support native wildlife.

Improving biodiversity in urban places is imperative as the climate crisis intensifies[33]. This was recognised at the 2022 United Nations Biodiversity Conference **(COP 15)**, which introduced a number of biodiversity targets committed to by the Australian Government (refer to Target 12 in particular). Jurisdictions around the world are increasingly introducing legislation and policies to achieve better biodiversity outcomes, and there is an opportunity to learn from this in the metropolitan Adelaide and broader South Australian context (see Box 8).

Understory and mid-story vegetation is critical for enhancing biodiversity – in the absence of this structure, the ability of the ecosystem to thrive can be limited. It is also important to consider what type of urban greening is appropriate. For example, in a remnant grassland, planting more trees can be detrimental, while in modified urban streetscapes, tree canopy is highly desirable. Additionally, it is vital to retain and protect old, large trees. For example, it typically takes eucalypts 120 to 150 years to develop hollows, with large ones taking more than 200 years[34].

Another priority in improving habitat connectivity is through the re-wilding of natural creek line corridors and 'daylighting' of drains, which is the opening up and restoration of a previously buried watercourse or channel. Doing so can often provide a link between open spaces of higher biodiversity. These types of opportunities generally span council boundaries and would benefit from a coordinated approach.

BSUD aims to create built environments that make a positive, on-site contribution to biodiversity while providing other urban greening or development outcomes. BSUD initiatives may target individual animal or bird species, a group of species, and/or entire ecosystems. This means that BSUD can be applied across multiple scales and contexts, from small-scale site redevelopments like green roofs or streetscapes, to precinct-scale planning for new developments (see Box 10), or large-scale infrastructure projects like transport corridors.

BSUD is an emerging area of focus, and practitioners and the community need education and capacity-building to understand what it is and how to practically deliver it, on both public and private land. A key focus of this strategy is to drive capacity-building to ensure biodiverse greening outcomes and support this with incentives to achieve a nature positive Adelaide.

There are several challenges facing diverse urban greening practices in metropolitan Adelaide where this strategy can play an important role. For instance, further spatial mapping could help practitioners better understand the locations of remnant vegetation and current or potential strategic landscape linkages. Additionally, it will be important to develop guidance material on which native wildlife species are most appropriate to target through new tree, understory or mid-story plantings in various areas of metropolitan Adelaide (see Box 9).

## Priority Area 3: Building nature back in

| Outcomes | Ref | Actions | Lever | Where |
|---|---|---|---|---|
| **More biodiversity net gain development.** | **3.1** | Investigate how the planning system and other government legislation could best facilitate biodiversity net gain development. | Legislation<br>Policy | Private residential land |
| **Increased understanding and expertise to undertake BSUD (government, council, developer and community).** | **3.2** | Develop a BSUD capacity-building program, including design guidance, for the government, the development sectors and the community. | Capacity-building | All land |
| | **3.3** | Develop a region-wide approach (including incentives) for supporting individuals and community groups to undertake biodiverse urban greening on private land, open space, sporting fields, linear parks and schools, and/or verge planting along strategic corridors. | Education<br>Capacity-building<br>On-ground action | Private residential land<br>Strategic transport corridors |
| **Areas of valued native vegetation and critical habitat are identified and protected.** | **3.4** | Map the extent and quality of remnant vegetation and critical habitat, and spatially represent this in the Greater Adelaide Regional Plan and the Planning and Design Code to identify areas for protection. | Policy<br>Spatial mapping | All land |

## Box 8: Implementation of Biodiversity Net Positive Legislation

Under the United Kingdom's *Environment Act 2021*, all planning permissions granted in England (with a few exemptions) will have to deliver at least 10% biodiversity net gain (BNG).

BNG is an approach to development, and/or land management, that aims to leave the natural environment in a better state than it was. It delivers measurable improvements for biodiversity by creating or enhancing habitats in association with development. It is additional to existing habitat and species protections, and aims to create new habitat as well as enhance existing habitats.

The mandatory BNG requirements started applying to housing, industrial and commercial development in 2024. BNG can be achieved on-site or off-site through a combination of measures, or through the purchase of statutory credits as a last resort.

There is an opportunity to learn from this leading example and identify how similar outcomes could potentially be achieved in the Adelaide context.

For further information, visit: **Biodiversity net gain**.

## Box 9: Biodiversity challenges and opportunities in Adelaide

RMIT University's Nature Positive in Adelaide report shows that there are numerous challenges and opportunities relevant to improving the biodiversity of metropolitan Adelaide's vegetation, including:

- protecting the remaining patches of remnant vegetation, which are often highly fragmented and vulnerable
- maintaining biodiverse plantings and ensuring adequate budgets for required maintenance
- improving knowledge and access to locally Indigenous plant species
- better supporting volunteers, who are often key to planting and maintaining successful biodiverse greening
- improving monitoring, which is vital for understanding the state of biodiversity and for determining the impact of investments, maintenance work and stewardship programs
- setting targets and measuring success, which would benefit from understanding the baseline and/or metrics.

For further discussion about the challenges to achieving biodiverse greening, information about BSUD and case studies from across metropolitan Adelaide, refer to RMIT University's **Nature Positive in Adelaide Report**.

## Box 10: Conserving nature in urban areas

Fishermans Bend is a large-scale urban renewal project that will be carried out in Melbourne. It provides a practical example of the BSUD framework and highlights the value of bringing partners together to co-design ways to enhance positive biodiversity outcomes.

Biodiversity objectives and actions for 4 target species have been identified – blue-tongued lizards, growling grass frogs, superb fairy wrens and blue-banded bees.

Co-design of the biodiversity objectives and approaches was led by RMIT University and was undertaken with Traditional Owners, ecologists, planners and local environment groups, along with the Fishermans Bend Authority and other key state agencies.

For further information, see RMIT's **Fishermans Bend BSUD case study** and the **RMIT's Interdisciplinary Conservation Science Group (ICON Science) website** for further information about BSUD.

# Priority Area 4: Future-proofing our urban forest

## Climate change impacts will likely have cascading effects on ecosystems, including changes to biodiversity and reduced ecosystem resilience.

Climate change is likely to significantly impact the sustainability of metropolitan Adelaide's urban forest, which largely comprises a small number of species – many of which might not cope well with the projected warming and drying[35]. Many popular introduced tree species are from areas that receive high annual rainfall and/or less extreme summer temperatures. It is also expected that climate change and urban activities will increase the ability of pests and pathogens, such as myrtle rust, phytophthora and borers, to spread.

The best way to bolster our urban forest against direct impacts of climate change and climate-mediated threats, like disease, is through diversification of new plantings. Higher diversity plant communities are more resilient, which means there would be a lesser impact, namely tree health decline or death, if Adelaide passes the climatic threshold or experiences the introduction of a pest or disease that heavily impacts one or more tree species.

Increased diversity should occur within species (maximising genetic diversity), between species (maximising the different trees we plant), in size and form (increasing functional diversity), and in age (ensuring not all trees will age at the same time). This includes reducing the number of cultivars that consist of clones with very little overall genetic diversity.

It will be important to investigate opportunities to work with the nursery, arboriculture, and horticulture industries to grow capacity and increase the stock and availability of a diverse range of locally native plants – particularly to meet the needs of large-scale developments.

Ensuring adequate water availability to support healthy vegetation growth is already a challenge. Demand for water will also increase as Adelaide becomes hotter and drier.

Meeting this increased water demand will likely require a combination of localised solutions, such as in situ-WSUD, and small-scale decentralised recycled water and stormwater schemes, as well as large-scale water infrastructure augmentation. Additionally, trade-offs may need to be made about where to prioritise water for greening (see Box 11).

Implementation of WSUD and integrated water management has advanced across Adelaide in the past 15 years. This has been spurred on by the Millennium Drought and Water for Good policy response, and facilitated by programs like Water Sensitive SA, which helps grow practitioner knowledge through training and research (see Box 12 and Box 13). However, there is still much to be done to support local and state governments, private developers, and the community to maximise opportunities for it to be delivered effectively.

Developing a solid foundation of credible and locally applicable research will help inform good policy and investment decisions, including via robust cost-benefit analyses and business cases, and will optimise outcomes from on-ground works. For example, more research needs to be undertaken to get an accurate understanding of the water requirements of urban vegetation to maximise cooling benefits and health. Improved climate-sensitivity modelling of different species is also needed to predict the impact of climate scenarios on common tree varieties in the local Adelaide context. Trials of new varieties, including to identify suitable new species to plant under powerlines, will add to the diversity of appropriate species for future widespread planting. Improving the access to quality information and guidance will also be important (see Box 14).

## Priority Area 4: Future-proofing our urban forest

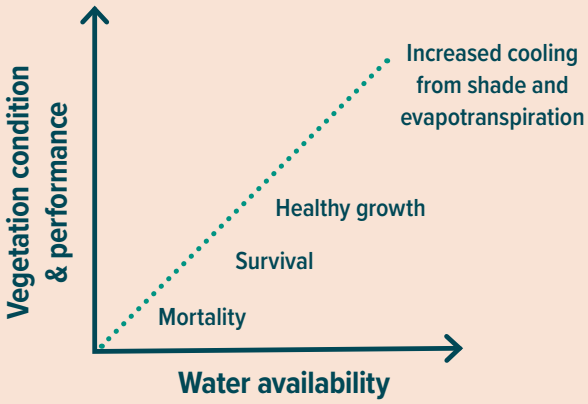
| Outcomes | Ref | Actions | Lever | Where |
|---|---|---|---|---|
| **Increased knowledge and availability of locally endemic and climate-resilient plant species.** | **4.1** | Develop up-to-date guidance to drive appropriate and climate-resilience species selection in a variety of contexts. | Tool<br>Education | All land |
| | **4.2** | Undertake research and trials to identify appropriate trees for Adelaide's projected future climate. | Research | Public land |
| | **4.3** | Investigate ways to increase the provision of local endemic and climate-resilient plant species and seed at scale, including working with the nursery industry. | Research<br>Capacity-building | All land |
| **Improved urban forest resilience and health.** | **4.4** | Identify and mitigate threats to the health of the urban forest from pests and diseases. | Research | All land |
| | **4.5** | Model future water demands, including volume and location, for meeting greening targets and to feed into integrated water management planning. | Capacity-building | All land |
| **Increased knowledge and capacity of government, councils, developers and community.** | **4.6** | Scale up established WSUD and integrated water management capacity-building programs that are working well. | Capacity-building | All land |
| | **4.7** | Investigate ways to grow the capacity of the nursery, arboriculture and horticulture industries. | Capacity-building | All land |

## Box 11: Understanding water challenges in Adelaide and implications for greening

The Greater Adelaide water supply system is complex and offers a diversity of supply sources including rivers, surface water reservoirs, groundwater, rainwater, stormwater and alternative water resources like wastewater.

In 2022, DEW released the **Urban Water Directions Statement** and supporting **background paper**. Part of this work identified the future challenges and opportunities associated with supplying enough water to ensure urban vegetation is healthy and resilient.

SA Water also leads adaptive planning processes to identify how metropolitan Adelaide can maintain a secure, sustainable and resilient water supply into the future. This involves consideration of the impact of increasing water demands to support population growth in a changing climate. This process takes an integrated water management approach, including consideration of alternative water sources, such as recycled water.




*Source: Urban Water Directions Statement Background Paper 3, 2022*

## Box 12: Water Sensitive Urban Design in practice

Water Sensitive SA is a collaborative program that promotes WSUD and integrated water management practices. It provides information, advice, training and tools to help government, industry and the community.

The program's goal is to mainstream WSUD practices that improve ecological health and wellbeing. WSUD is an approach to the planning and design of urban environments focused on integrating the urban water cycle, including potable water, wastewater and stormwater.

There are many different types of WSUD that can support better urban greening outcomes, such as raingardens, constructed wetlands, street tree bioretention pits and swales.

For further information, visit: the **Water Sensitive SA website**.

## Box 13: Impact of Kerb SPACE inlets

A Kerb SPACE inlet is a stormwater inlet that is part of a WSUD system. These inlets are designed to harvest stormwater run-off and prevent sediment from entering the stormwater system. They have been shown to significantly improve the growth rates and health of street trees. For the studied tree species, research of 'Kerb SPACE' inlets connected to soakage pits demonstrated:

- a 25% growth increase in young trees and 50% increase in saplings, compared to traditional council watering methods
- a 2-fold increase in photosynthesis rates and stomatal conductance, suggesting enhanced outcomes for tree health and enhanced evapotranspirational cooling.

For more information, see: **Space Down Under research.**

## Box 14: Use of a plant selector tool

The Botanic Gardens of South Australia's online Plant Selector + tool allows users to identify plants suitable for a particular location or search for information about individual plant species. The recommended species for a particular area is determined using locational data such as climate, soil and landscape types.

Over time, the recommended plant species lists will need to be reviewed to consider the impacts of climate change, such as changes in rainfall patterns and more extreme heat events, to ensure they are still appropriate in a changing environment.

For further information, see the **Plant Selector +.**

# Priority Area 5: Improving greening equity

Research demonstrates that having trees and other vegetation within view of one's home, place of work or school, has important mental health and productivity benefits.

In many cities, not all residents have equal access to urban green spaces and the benefits they provide, and Adelaide is no different. Therefore, it is vital to identify how to best prioritise urban greening investment where it is most needed.

In recent years, there have been significant advances in Adelaide in terms of the availability and capability of spatial data capture and analysis to observe successes and failures, and assist in planning for the future. This means it is possible to move to a more refined decision-making model for urban greening investment.

There is significant tree canopy variability across metropolitan Adelaide. Some of this is due to tree canopy being historically variable (pre-European colonisation), because of differences in soil and rainfall, while other variation has resulted from more recent human land management impacts (see maps on Page 22). Additionally, some local government areas contain protected areas or other large open spaces, while others have airports and commercial areas less suitable to accommodating more trees. Areas of high canopy cover are concentrated in the foothills, along river corridors and in the mangrove forests along the northwestern coast.

There is also variation of urban heat across the region due to a range of land-use and vegetation differences (refer to Box 16 and the map on Page 70). High temperatures impact most severely on vulnerable communities with low socio-economic status, high rates of unemployment, aging populations, and pre-existing health conditions. These communities are often less able to escape, and/or mitigate, the effects of urban heat because of a lack of access to green spaces, the cost of air-conditioning, and working in outdoor, manual-labour jobs. Urban greening efforts must target these areas as a priority.

The amount of public open space for greening can be limited, especially in inner-city suburbs. Adelaide has the lowest percentage of public open space of Australia's capital cities, at about 10%, compared with 57% in Sydney, 40% in Perth, 22% in Hobart and 20% in Melbourne[36]. This means the public open space that Adelaide does have needs to be high-quality, accommodate multiple uses and diverse users, and be high-performing to deliver multiple outcomes.

It will be important to develop criteria for prioritising the location of new public open space to support space for tree canopy and other urban greening, through considerations such as:

- low amounts of tree canopy and open space
- high urban heat
- areas of high conservation value
- connectivity of existing open space
- areas of significant new urban development.

It is also important to prioritise tree canopy along active transport routes and places with high pedestrian activity. This will involve identifying priority streets for urban greening where the 'place' value is high and where the focus needs to shift away from being vehicle-focused to achieving multiple benefits that provide cooler urban environments, active transport and the provision of habitat. Additionally, for land uses where increasing tree canopy is not appropriate, alternative forms of urban greening will be encouraged, such as shrubs, groundcovers, green walls and roofs.

Identifying 'plantable spaces' on street verges and medians across the region, and where water is available to support urban greening, will also be important to better understand the opportunities and constraints to meeting tree canopy targets. Refer to Box 15 for further information about greening prioritisation investigations to date in Adelaide.

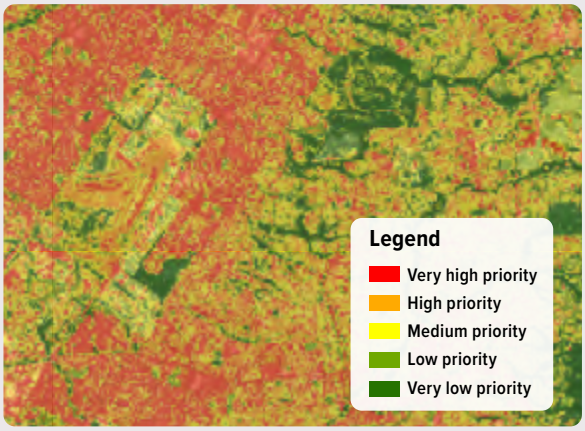
## Priority Area 5: Improving greening equity

| Outcomes | Ref | Actions | Levers | Where |
|---|---|---|---|---|
| **Urban greening investments are prioritised in areas of low greenery, high urban heat and high socio-economic disadvantage.** | **5.1** | Develop a spatial greening prioritisation tool to support urban greening investment decision-making, including relevant grants programs. | Tool | State and local government land |
| | **5.2** | Integrate urban heat mapping into the planning system and identify an appropriate policy response. | Mapping | All land |
| | **5.3** | Identify and map opportunities for greening investment along active transport routes, river corridors and stormwater channels. | Mapping<br>Policy | All public land |
| **Priority areas for new and/or improved green open space are identified and enabled.** | **5.4** | Prepare an open space strategy to identify priority areas for new or improved green open space and tree canopy. | Strategy | State and local government land |
| **Locations for new feasible plantings are identified to expand the urban forest.** | **5.5** | Identify and create new 'plantable space' for trees, including engineering solutions that supports trees in challenging spaces. | Research | State and local government land |

## Box 15: Priority areas for urban greening

In 2022, Green Adelaide undertook a Greening Prioritisation Study that combined spatial data on tree canopy, urban heat and population vulnerability (based on age and socioeconomic disadvantage) to identify the location of potential priority areas for urban greening.

Green Adelaide will re-run this study in liaison with councils and relevant state agencies using the latest ABS social vulnerability, urban heat, permeability, green space and tree canopy data. There is also an opportunity to compare this with reference data layers, such as biodiversity, active transport routes, land use and open space to help prioritise future urban greening investments.



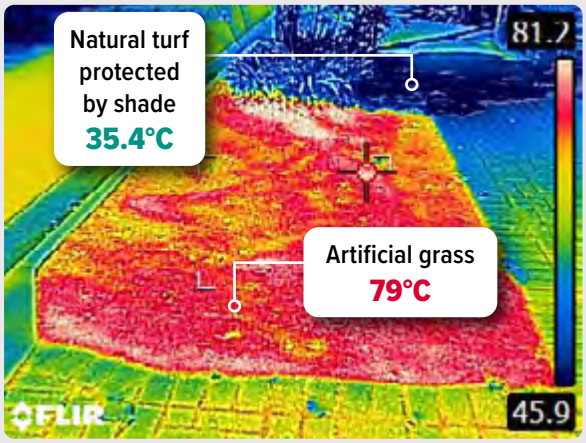

## Box 16: Impact of vegetation and hard surfaces on urban heat intensity

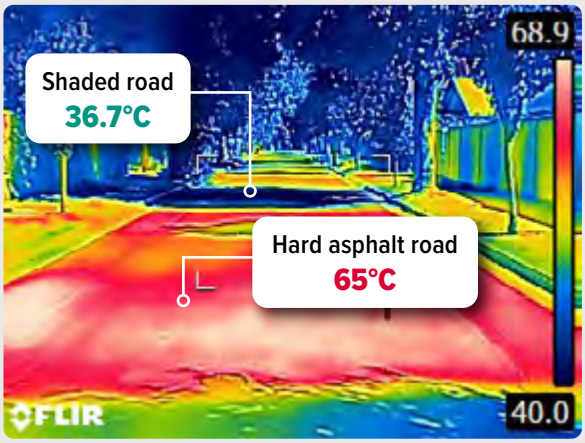
Thermal images taken in Dulwich in February 2023 on a 40°C day demonstrate significant differences in urban heat due to differences in vegetation and land surfaces.

As shown in the images below, hard asphalt surfaces can reach temperatures of more than 65°C when exposed to prolonged sunlight on a hot day, while nearby asphalt covered by shade can be almost 30°C cooler. Artificial lawn can get even hotter, reaching temperatures of almost 80°C in direct sun. Meanwhile, natural turf protected by shade was a far more comfortable 35°C.

This shading not only benefits road users, but also increases the life of assets, like roads, houses, footpaths and other infrastructure, and reduces maintenance costs through protection from extreme heat.

*(Source: City of Burnside 2023)*



## Box 17: Accommodating trees in challenging spaces

The City of West Torrens developed a set of design guidelines, co-funded by Green Adelaide, to help with the planting and maintenance of trees within confined spaces or at sites with poor soil quality. Optimising tree growth and canopy cover is critical given how limited space is becoming in the urban environment, and showcasing best practice is an important part of educating and raising awareness among practitioners.

There is potential for this framework to be further developed and offer more locale-specific strategies, facilitating future expansions of the urban forest – even in established areas.

For more information, see the **Street Trees in Challenging Space Design Guideline**.

## Box 18: A greener Woodville Road

The City of Charles Sturt has undertaken a significant effort to rehabilitate and transform Woodville Road into a more green and usable space. By investing heavily into relocating underground services, such as powerlines, previously unplantable spaces are now able to effectively support trees.

Woodville Road now serves as an example of how even high-volume arterial roads can successfully incorporate more greening. The council has even been recognised with an Australian Institute of Landscape Architects (AILA) award for this upgrade, highlighted for both its functional design and its commitment to finding innovative ways to deliver sustainable outcomes.

For more details about the project, see the **Woodville Road Upgrade**.

# Priority Area 6: Scaling up impact by working together

Urban greening is influenced by a diverse range of sectors, organisations and disciplines, such as sustainability, assets and infrastructure, parks and gardens, water management, utilities, planning policy, community engagement and education, academia, design, and maintenance and operations.

The impetus for urban greening action is strong and growing in many stakeholder sectors, including in the community. Many have already been involved in recent strategic planning activities, and there are many potential delivery partners for the strategy. What has been missing is a way for urban greening work to be coordinated at a metropolitan scale, to enable collective impact.

During the consultation process that was undertaken to develop this strategy, it was identified that some key issues are falling between jurisdictional gaps. Greater collaboration between stakeholders, including within and between agencies, councils, research institutions and other organisations, could enable accelerated action, reduce duplication and facilitate more cost-effective projects. This is particularly important where projects would benefit from co-investment of funds or resources.

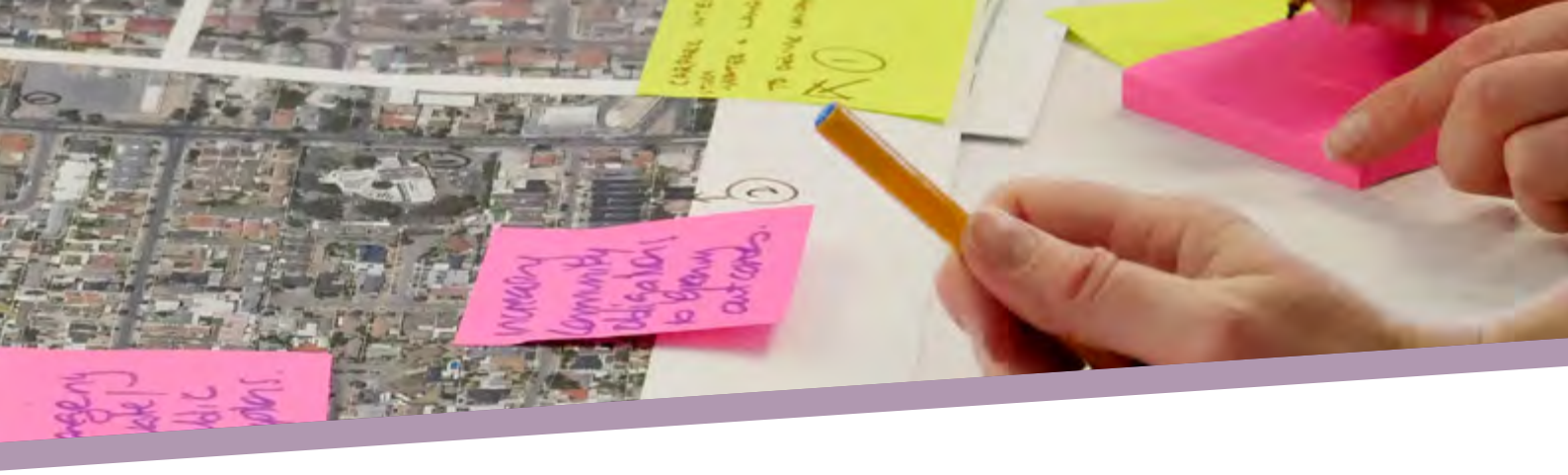
Where there are many beneficiaries for a project, it makes sense for those organisations to work together, share resources and knowledge, and make individual cost savings through leveraging and joint procurement. Effective delivery of the strategy will depend on the adoption of a defined collaboration process with cross-sector buy-in (see the 'Implementation approach' section on Page 54 for further detail). There is also an opportunity to learn from other jurisdictions about ways to work across different sectors and organisations to deliver better urban greening outcomes (see Box 19).

Practitioners have also expressed a strong interest in developing a research pipeline to fill knowledge gaps. Cross-sector and cross-disciplinary efforts are needed to clearly articulate what research is needed to support policy development and on-ground action, as well as to convert research outputs into practical and useful formats, such as tools and applications, for practitioners. To support this, it would be valuable to scale up the reach and impact of capacity-building organisations that have the skillsets and networks to provide a link between research and practice. Additionally, it will be important to support professional industries to upskill their members through accredited learning channels.

Collaborating with the Kaurna community, through the Kaurna Yerta Aboriginal Corporation (KYAC) and other Kaurna groups, will be important to incorporate cultural aspirations to enhance the health and wellbeing of the urban forest. Forming strong and meaningful partnerships with the Kaurna community could help inform biodiversity restoration goals while recognising cultural heritage. This could be through co-design projects, establishing formal partnerships, focusing on restoration of areas to reflect traditional landscapes, and establishing collaborative stewardship programs (See Box 20).

Finally, it will be important that the benefits that come from implementing this strategy are felt by all sectors of the community – including often overlooked community sectors, such as renters, public housing tenants, people with disability, minority cultural groups, and people experiencing socio-economic disadvantage.

**Working together, urban greening can flourish and grow for everyone to benefit.**



## Priority Area 6: Scaling up impact by working together

| Outcomes | Ref | Action | Lever | Where |
|---|---|---|---|---|
| **Roles and responsibilities are clear, learnings are shared, co-investment is optimised and cross-sector challenges are addressed.** | **6.1** | Develop and implement a cross-sector collaboration approach to identify opportunities for greater coordination, co-investment, efficiencies and measuring impact (see the 'Implementation approach' section on Page 54 and the 'Measuring impact' section on Page 60). | Whole of region coordination | All land |
| | **6.2** | Investigate funding mechanisms for protecting and expanding urban greening, WSUD and BSUD delivery (see the 'Implementation approach' section on Page 54). | Research<br>Funding<br>Policy | All land |
| **Quality information, education, research and guidance to achieve urban greening is available to all.** | **6.3** | Develop a coordinated and strategic research plan to identify and fill knowledge gaps. | Research<br>Whole of region coordination | All land |
| | **6.4** | Develop a centralised hub to share knowledge across the region, between government and non-government sectors and with the community. | Knowledge sharing | All land |
| | **6.5** | Extend the reach of established bridging organisations and networks that are working well. | Education | All land |
| | **6.6** | Build industry capacity through introducing WSUD, BSUD and nature-based solutions to tertiary education programs and other industry learning forums. | Education | All land |
| **Aboriginal wisdom is recognised and partnership opportunities are facilitated.** | **6.7** | Work with KYAC and other Kaurna groups to identify opportunities for partnerships with the Kaurna community. | On-ground projects<br>Policy | Public land |

## Box 19: Living Melbourne coordinates greening action

The Living Melbourne strategy was prepared by the Nature Conservancy and Resilient Melbourne on behalf of many partners across metropolitan Melbourne. This strategy aims to provide the missing link for Melbournians to work better together to connect, protect and enhance Melbourne's urban forest.

To achieve its vision of thriving communities that are resilient and connected through nature, partners were drawn from across Melbourne and all sectors. Interested organisations were invited to endorse the final strategy, including its vision, goals, high-level actions and framework for collaboration and coordination.

This approach provides an useful precedent for Adelaide to learn from. Find out more by visiting: **the Living Melbourne website.**

## Box 20: Partnering with Kaurna

Adelaide's unique species and ecosystems are an integral part of Kaurna Yerta (Country) – the identity, stories and history of the land and its people. Kaurna people have managed their land sustainably for tens of thousands of years, knowing that if they cared for Country, it would care for them.

KYAC is the peak body for the Kaurna community and is their registered native title body corporate. This strategy recognises that there is much to be learned from Traditional Owners. Their knowledge of the land and its systems, and how to live harmoniously within the landscape, is very relevant to the future of Adelaide's urban forest.

Partnerships take effort and there is no one-size-fits-all approach to building a relationship with the Kaurna community. Projects require purpose and meaningful social, cultural and economic outcomes for Aboriginal Peoples.

Refer to Box 21 for an example of an existing partnership project that improves the urban greening outcomes of Adelaide. Refer to Appendix 7 for a list of our collaboration principles for working with the Kaurna community.

## Box 21: Kaurna Kardla: Returning fire to Country

Also known as fire-stick farming, cultural burning has been used by Aboriginal people to manage their Country over tens of thousands of years. By introducing new generations of young people to the practice, traditional fire practitioners are keeping this ancient, invaluable Aboriginal cultural knowledge alive. Cultural burning is different to western prescribed burning in that smaller, cooler and slower burning fires are used to manage the landscape. The practice is based on a deep cultural understanding of the landscape and its needs. It is also about the healing that comes from people reconnecting with their Country. Cultural burning offers a number of benefits to urban forests, including biodiversity conservation, reducing fire risk and supporting regeneration and growth.

In 2021, the Kaurna community, Green Adelaide and the City of Adelaide took part in the 'Kaurna Kardla Parranthi Cultural Burn' project in the city's south Park Lands, which was funded by a Green Adelaide Grassroots Grant. The Kaurna community is now undertaking cultural burning along the Field River, south of Adelaide.

Reaffirming Aboriginal Fire Management as a critical component of natural resource management, underpinned by positive ecological outcomes, will contribute to climate adaptation.

# Implementation approach

This strategy recognises that partners working together on complementary actions will achieve the most impactful improvements to urban greening outcomes. Everyone has an important but different role to play in creating a leafier, cooler and biodiverse Adelaide.

This section outlines how the strategy will be implemented, including:

- how partners will work together, including **roles and responsibilities**
- the 7 principles for **investment** and **prioritisation**
- **funding mechanisms,** such as co-investment, grant programs and potential new funding sources.

# Working together

Coordination of government and non-government partners will support the delivery of this strategy. Green Adelaide will be the lead facilitator of this process.

## Green Adelaide

Green Adelaide will provide backbone support for partners to implement the Urban Green Strategy, including:

- driving a shared urban greening agenda with relevant government agencies and organisations
- facilitating an annual collaborative process to identify priorities for shared action and co-investment
- establishing and convening other collaboration pathways, like communities of practice (see Box 22) and/or technical working groups
- creating an online 'urban greening hub' to promote current initiatives and share knowledge
- identifying opportunities by tracking emerging trends and shared barriers and opportunities
- coordinating consistent, ongoing data capture and measurement of tree canopy, urban heat and biodiversity performance
- monitoring the state and condition of urban greening across metropolitan Adelaide and reporting on changes (at least every 5 years)
- reviewing the strategy to reflect on progress made on actions, improvements in expertise, and emerging challenges and opportunities (at least once every 5 years)
- providing executive support to the Urban Greening Government Leadership Group.

## Other government agencies

The following government agencies (and the LGA) have a shared responsibility in shaping and contributing to urban greening outcomes in Adelaide, and were involved in the development of the strategy:

- Department for Education
- Department for Environment and Water
- Department for Health and Wellbeing
- Department for Housing and Urban Development
- Department for Transport and Infrastructure
- Department of the Premier and Cabinet
- Infrastructure SA
- Preventive Health SA
- Renewal SA
- SA Water

These agencies will play important and complementary roles in achieving this strategy's vision and outcomes and will:

- consider opportunities to improve urban greening outcomes through relevant supporting strategies, plans, policies, standards, specifications and frameworks
- identify opportunities to deliver urban greening outcomes in their own projects
- showcase and share learnings about their urban greening initiatives on the Urban Greening Hub
- identify and leverage joint projects
- work with Green Adelaide to investigate the value of differential targets that contribute to the region-wide 30% tree canopy target for land that they own, manage or influence.

## Urban Greening Government Leadership Group

Together the government agencies outlined above (and the LGA) will work together as part of the Urban Greening Government Leadership Group. This will involve providing strategic direction on critical enablers and barriers, identifying flagship opportunities, and monitoring collective impact.

## Local government

This strategy recognises the valuable role that local government plays in creating cool, green and biodiverse urban neighbourhoods, including in the following ways:

- greening their own land and other public land that they manage, such as streetscapes and reserves
- providing education and incentives to local residents to encourage them to green their own private gardens and verges
- leading research and building knowledge in relation to delivering innovative urban greening outcomes.

Additionally, councils will be invited to:

- partner on shared urban greening projects
- participate in relevant communities of practice and technical working groups
- showcase and share learnings about their urban greening initiatives on the Urban Greening Hub
- work with Green Adelaide to investigate appropriate differential sub-targets that contribute to the region-wide 30% tree canopy target for land that they own, manage or influence.

## Other partners

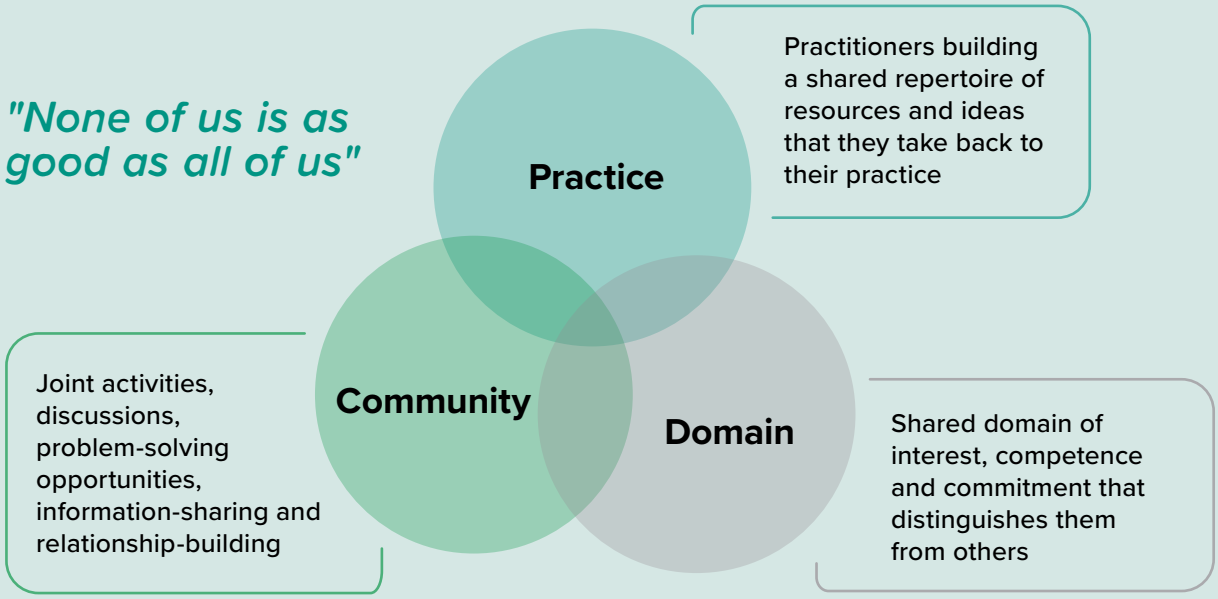
This strategy was developed in consultation with research institutions, peak bodies for the development sector, community groups and the Kaurna community.

Implementation will require all partners to take collective action and share resources.

Green Adelaide will bring all partners together to work on shared urban greening priorities, through its roles outlined above.

### Box 22: What is a community of practice?[37]

*"None of us is as good as all of us"*



# Principles for prioritisation and co-investment

Green Adelaide will foster a collaborative process on an annual basis to identify priorities for shared action and co-investment. This process will be as consistent as possible, so partners know what to expect, how to engage, and when to plan for co-investment. Initiatives will be prioritised by the following criteria, with preference given to those that:

1. Progress the **vision** of the strategy to create:

   **a resilient and liveable Adelaide for all: leafier, cooler and more biodiverse.**

2. Support at least one of the **outcomes** of the strategy.
3. Align with, and progresses, one of the actions endorsed in the strategy.
4. Meet the following criteria:
   - **fills a known gap or scales up what is already working well**
   - **unlocks benefits across metropolitan Adelaide**
   - **harnesses cross-sector collaboration and/or co-investment.**
5. Have clear objectives and benefits, which can include:
   - **a community benefit** – meeting the needs and objectives of our community.
   - **an economic benefit** – making a financial improvement, savings or better use of funds.
   - **an effectiveness benefit** – doing things better with fewer failures or defects.
   - **an efficiency benefit** – doing more for the same or doing the same with less.
   - **an environmental benefit** – supporting wilder and healthier urban ecology.
6. Supported by several stakeholder organisations and preferably a self-nominated lead organisation.
7. Help deliver on a relevant government or non-government strategy, policy or existing program.

Urban greening initiatives that contribute to delivering this strategy are not limited to the Green Adelaide-facilitated annual collaboration process. Partners are encouraged to initiate and run collaborative projects aligned with the criteria, and to seek joint investment from partners, including through grant programs, quarterly budget review processes and/or in-kind staff time.

# Funding mechanisms

This strategy will be implemented using 3 primary funding mechanisms – co-investment by partners, mobilisation of new opportunities, and realignment of existing grant programs and other resources.

## Co-investment by partners

Given that partners have different annual business planning processes and timing, Green Adelaide will facilitate a collaborative process to identify priorities for shared action. This may also identify staged, multi-year programs. The aim is for this process to be consistent and predictable, setting up opportunities to leverage co-investment, and enabling project partners to plan their co-investment.

## Mobilisation of new opportunities

New funding mechanisms will be investigated by partners to protect and expand urban greening, and deliver the strategy's vision.

## Use of existing grant programs and realignment of existing resources

Partners can consider opportunities to realign or use existing resources more efficiently or differently to facilitate the implementation of this strategy. This includes using grant programs, where relevant, such as:

- Cooler, Greener, Wilder Grants (Green Adelaide)
- Grassroots Grants Program (Green Adelaide)
- Planning and Development Fund (PlanSA)
- local government green funding initiatives.

# Measuring success

# Overview

This strategy seeks to establish consistent and shared monitoring across metropolitan Adelaide to increase efficiencies and provide optimal data. This will help track the progress of increasing urban tree canopy cover, reducing urban heat, and improving plant species diversity.

This section outlines how progress will be monitored, at a regional level, towards our vision of creating **'a resilient and liveable Adelaide for all: leafier, cooler and more biodiverse.'**

It includes a:

- target to **increase urban tree canopy cover** to achieve a leafier Adelaide
- performance investigation area to **reduce urban heat** to achieve a cooler Adelaide
- performance investigation area to **improve plant species diversity** to achieve a more biodiverse Adelaide.

## Working together to continuously improve

While significant progress has been made in terms of what we can now measure in Adelaide, there are still areas where existing data remains patchy and inconsistent across the metropolitan area.

For example, there are significant gaps and inconsistencies in the collection of biodiversity data. This makes it difficult to precisely identify where remnant vegetation occurs as well as track success. Additionally, technologies in many areas are rapidly evolving, leading to opportunities for improved outcomes and greater efficiency.

Therefore, an important role of the strategy will be to identify ways to work together across metropolitan Adelaide to harness improved methods to collect and analyse data, as well as set performance targets.

# Target: increase urban tree canopy cover

This target aims to achieve a leafier Adelaide, by reaching 30% urban tree canopy cover across metropolitan Adelaide by 2055.

## Why is this important?

Shady and leafy places to live are recognised as having multiple economic, biophysical and social benefits, such as:

- supporting community health and wellbeing
- providing positive visual amenity
- reducing urban heat islands
- providing habitat for wildlife
- enhancing air quality.

Measuring tree canopy cover provides us with one indicator of how shady and leafy our urban areas are, and an ability to assess whether we are meeting our societal expectations.

In recent years, there have been significant advancements in the measurement and analysis of tree canopy cover. This progress has resulted from a partnership between the state government and 18 local governments[e] to measure tree canopy cover across metropolitan Adelaide using LiDAR technology. It is a prime example of a collaborative cross-sector project that harnessed co-investment from multiple partners.

Based on the supporting public consultation process[f], tree canopy growth to date, and the availability of improved data, the government's tree canopy cover target has been updated to align with contemporary views on appropriate tree canopy cover to provide economic, environmental and health benefits. This target directly aligns with the target[g] in the Greater Adelaide Regional Plan, to ensure a consistent region-wide approach.

### Box 24: What is LiDAR?

LiDAR (Light Detection and Ranging) is a remote-sensing method that scans the surface of a survey area using a device installed in a light aircraft. This device fires to make a digital 3-dimensional image of objects on, or near, the ground, such as buildings, roads and trees.

The resulting data can be used to model tree canopies, including tree heights and canopy boundaries.

**e** *Cities of Adelaide, Burnside, Campbelltown, Charles Sturt, Holdfast Bay, Marion, Mitcham, Norwood, Payneham and St Peters. Onkaparinga, Playford, Port Adelaide Enfield, Prospect, Salisbury, Tea Tree Gully, Unley, West Torrens, Gawler and Walkerville.*

**f** *This included considering the outcomes of the public consultation process for developing the GARP.*

**g** *First introduced through the 30-Year Plan for Greater Adelaide (2017 Update) and now strengthened in GARP.*

## Current status

For this target, tree canopy cover refers to trees that are 3 m or taller and are located on public and private land.

As of 2022, tree canopy cover was 16.7% across the metropolitan Adelaide region. Overall, metropolitan Adelaide's canopy cover is considered 'fair' with much room to improve (refer to the report card in Table 1 below).

Figure 5 (on Page 64) shows the level of canopy cover over different land ownership types in metropolitan Adelaide. There is significant local variation across individual suburbs (ranging from 1.4% to 56.4%) and across land-use types (ranging from 5.12% to 50.72%). See Map 3 (on Page 22) and Figure 3 (on Page 23) for further details.

Some of this canopy variability is due to historical landscape differences, such as topography, soil and rainfall (for instance, there are more trees along the hills-face compared to coastal areas). Other changes are more recent, due to human land management impacts. Additionally, some council areas contain protected areas or other large open spaces, while others have airports, commercial areas and remnant grasslands that are less suitable to accommodating more trees.

Therefore, while 30% tree canopy cover is the overall target for the metropolitan Adelaide region, it is important to recognise that some areas and land-uses will likely always have less, and others more, than 30% canopy cover.

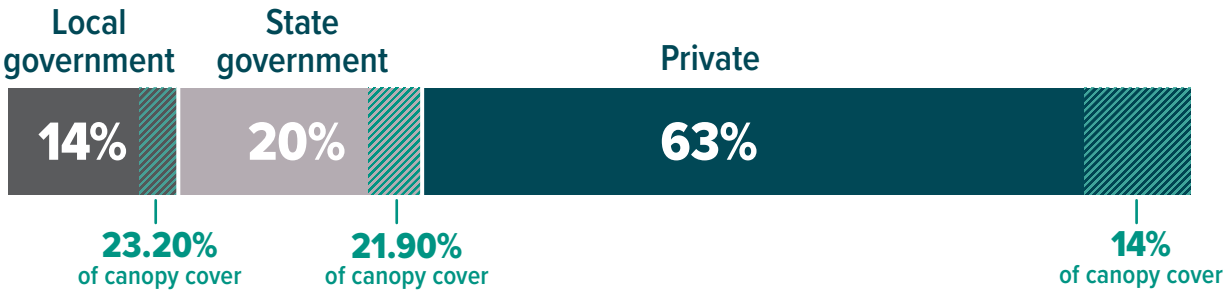
### Table 1: Adelaide Tree Canopy Report Card**

| Performance* | Description | Number of suburbs | |
|---|---|---|---|
| **Very good** >30% canopy cover | Canopy cover is high, providing significant urban forest benefits. | 31 | **Total canopy cover across metropolitan Adelaide is 16.7% and is considered 'fair'.** |
| **Good** Between 20% to 30% canopy cover | Canopy cover is quite extensive, delivering urban forest benefits in most locations, with only smaller pockets of less canopy occurring. | 79 | |
| **Fair** Between 10% to 20% canopy cover | Canopy cover is moderate, offering some urban forest benefits, however coverage is uneven, and inequity exists. | 187 | |
| **Low** <10% canopy cover | Canopy cover is sparse, and urban forest benefits are very limited, except perhaps in small pockets. | 108 | |

* The thresholds above are based on general 'rules of thumb' that other Australian jurisdictions use. It is important to note that some suburbs include a high proportion of land-uses that are not conducive to additional tree canopy coverage (such as airports) or where it is more challenging to increase canopy cover (requiring more effort and innovation). Other land-uses (such as conservation areas) can achieve much greater than 30% tree canopy cover.

** Tree canopy data is currently available for 18 metropolitan Adelaide councils.

**Figure 5: Tree canopy cover and land ownership in metropolitan Adelaide (2022)**




***Note:*** *Australian Government land makes up approximately 2% of land within metropolitan Adelaide (e.g. mostly consists of airports). Approximately 1% of land is classified as unspecified.*

## Tree canopy is growing

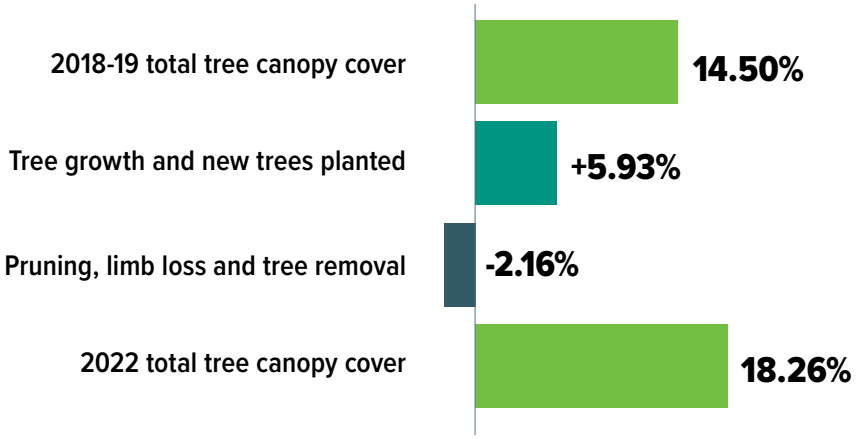
Tree canopy data for 16 (full) and one (partial) metropolitan Adelaide council area was captured in 2018-19 and in 2022.

Based on analysis of the LiDAR data, tree canopy cover increased from 14.5% in 2018 and 2019 to 18.26% over the same geographic region to 2022. This 3.8 percentage point increase in canopy over a 4-year period provides evidence that increasing canopy cover across Adelaide is possible, particularly as there were still significant tree removals during that time (see Figure 6 below).

Therefore, an environment that supports tree growth, adds trees into the landscape, and disincentivises tree removals is highly likely to result in significant, measurable canopy growth across the region.

Refer to Figure 3 (on Page 23) for the canopy gain achieved by land uses. Refer to Map 4 (on Page 66) which shows the geographical area captured in 2018-19 and 2022.

**Figure 6: Summary of canopy cover change**




*(Source: Green Adelaide)*

## How can the target be reached by 2055?

For tree canopy coverage to reach 30% across metropolitan Adelaide by 2055, tree canopy will need to grow by about^ 2 percentage points every 5 years.

| Metropolitan Adelaide region | Baseline | Interim growth rates to track progress towards 30% tree canopy target by 2055 | | | | | |
|---|---|---|---|---|---|---|---|
| | 2022 | 2026* | 2031 | 2036 | 2041 | 2046 | 2051 | 2055 |
| | Fair | | Good | | | | | Very good |
| | 16.7% | 18.7% | 20.7% | 22.7% | 24.7% | 26.7% | 28.7% | 30.7% |

^ Tree and canopy growth rates can be influenced by annual weather conditions, health, planting rates, tree age profiles, pruning and removals. So, while we need to aim for a growth trend of ~2 percentage points every 5 years, it is unlikely to track perfectly even at each monitoring step, and there can be considerable time-lag between urban greening improvement efforts and canopy gains.

* The next LiDAR recapture to calculate tree canopy coverage is scheduled for early 2026. Green Adelaide will again seek to coordinate this effort with state agencies and local councils. Therefore, this initial growth rate checkpoint will be at the 4-year mark.

### Individual land uses

New master-planned greenfield development and strategic infill sites should plan to achieve a 30% canopy cover once their landscaping matures.

Tailored sub-targets for other land-use types, and landscape types, will be investigated through consultation with key stakeholders. It is anticipated that sub-targets will be introduced through future amendments to the Greater Adelaide Regional Plan.

## Methodology and data source

Tree canopy data was captured across metropolitan Adelaide in 2022 using a repeatable and accurate airborne LiDAR and high-resolution satellite multispectral imagery.

For further information, see **Urban tree canopy data analysis report.**

The intention is to measure tree canopy every 4 to 5 years to allow trees time to grow between captures. The state government will work with local government and other partners to establish agreed monitoring methodology in order to track the progress of this target, which reflects the nuances of different land-uses, owners and landscape types.

## Future work and investigations

**Action T1:** Work with stakeholders to investigate differential sub-targets for different land-uses and landscape types, and determine whether any land-uses should be excluded in the future.

Green Adelaide will form technical working groups with representatives from state agencies, local councils and other key stakeholder groups to work together to investigate:

- whether differential sub-targets should be introduced for different land-uses and/or landscape types
- whether any land-uses should be excluded from the target, such as remnant grasslands, coastal samphire vegetation, primary production areas and airports
- how best to measure other types of urban greening, such as shrubs, groundcover and grass
- the best way to locate and record hollow-bearing trees that provide critical habitat for native animals.

**Action T2:** Undertake regular tree canopy data recaptures to monitor changes in tree canopy cover and assess against the target.

Mapping and analysis of tree canopy cover and green space is an evolving aspect of environmental monitoring. Advances in technology mean there are likely to be changes in future methodologies for this analysis. LiDAR is currently preferred as a highly accurate method and has been used for repeat captures in 2018/2019 and 2022 to monitor canopy cover changes.

Designing a future monitoring program for ongoing comparative analysis of canopy cover across metropolitan Adelaide may consider continuing LiDAR captures as well as other available technologies, such as combining satellite-based imagery with artificial intelligence. The most appropriate technology, method and frequency of future mapping of canopy cover and green space will be subject to further investigation through a technical working group, which will include members from state agencies and local government, and be convened by Green Adelaide.

**Action T3:** Prepare practical guidance material on how different land-uses can best accommodate optimal levels of tree canopy cover to support delivery partners in implementing the strategy.

Different land-uses have different abilities to accommodate greening outcomes. Some areas are challenging, so some stakeholders have sought additional guidance about how best to support more tree canopy and other plants.

### Map 4: Tree canopy LiDAR data captures


## Future amendments to this target

Any future amendments to this target, such as the introduction of differential land-use or landscape type sub-targets, will be included in the Greater Adelaide Regional Plan (subject to consultation in accordance with the Community Engagement Charter) and an updated Urban Greening Strategy.

Refer to Green Adelaide's Green Streets and flourishing parklands dashboard for further data and infographics about metropolitan Adelaide's tree canopy cover:

# Performance investigation area: reduce urban heat

This performance investigation area aims to achieve a cooler Adelaide.

## Why is measuring urban heat important?

Urban heat, in particular during extremely hot days or heatwave events, has a range of environmental, social and economic impacts. These include heat-related illness and mortality of people and wildlife, changes or cancellation of community events, and degradation of infrastructure. Long-term increases to average urban heat intensity can worsen the effects of extreme climate events, making the city less liveable.

Urban heat is generally higher in areas with low tree canopy cover and high proportions of hard infrastructure, such as roads, car parks, and buildings, as well as bare earth. The prevalence of dark roofs adds to localised increases in urban heat. Lower urban heat intensity is associated with vegetation and water bodies. Some changes to built infrastructure, such as light-coloured roofs and walls, can also decrease local urban heat.

## Box 25: Urban heat definitions

**Urban hot spots** are identified as areas of any size that are more than 2°C warmer than average. They help us understand which specific land surfaces are contributing to urban warming.

**An urban heat island** is an area that heats up more than surrounding areas (at least 2°C above average) and stays hotter than those areas. They can lead to a disproportionate build-up of urban heat, often in areas that are not readily able to release that heat effectively.

**Urban heat** and **urban heat island** refer to the phenomenon of increased heat over an area due to urban development, rather than specific measures.

**Urban heat intensity** is a relative measure of how much warmer an urban area is compared to nearby reference areas without urban development, highlighting the additional heat caused by urbanisation. In other words, how much additional heat is attributable to urban development.

## How is urban heat monitored?

Urban heat has been measured across metropolitan Adelaide in the following ways:

### Airborne

This method measures land surface temperature to identify hotter areas compared to others in the landscape on a given day under the prevailing weather conditions.

Airborne thermal imagery is captured from fixed wing aircraft and analysed to identify urban hot spots and urban heat islands.

In metropolitan Adelaide, this imagery was first captured by groups of local councils (Regional Climate Partnerships) for different parts of the region between 2016-2018, and again as a whole-of-region capture in 2022 and 2023.

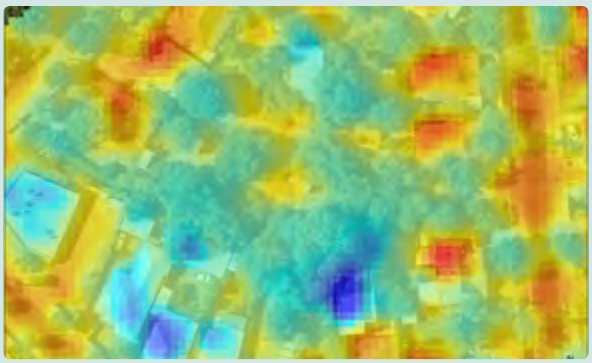
While locations can be reasonably compared for the same capture day, comparisons over time are not reliable as changes are just as likely to be from factors such as weather and rainfall at the time that the aircraft flyover is taken.

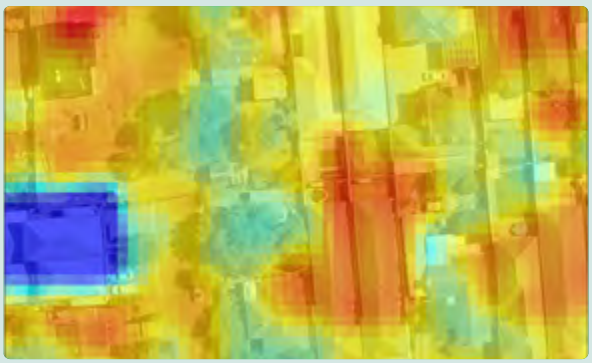
## Box 26: Airborne urban heat island mapping

State and local government worked together to commission a thermal heat imagery data capture in 2022. This allows a comparison between aerial maps and thermal heat images. The light and dark blue areas indicate cooler surfaces such as trees, irrigated vegetation and light-coloured roofs.

Areas of red, orange and yellow indicate hotter surfaces, such as dark roofs, bare ground and roads.

To explore the thermal imagery further, see the **Urban heat and tree mapping viewer.**





### Satellite

Landsat 8 and 9 satellite imagery has been used to calculate the difference in surface temperature between urban areas and analogous reference areas, to determine the average intensity of urban heat across metropolitan Adelaide[h] for 1 January 2023.

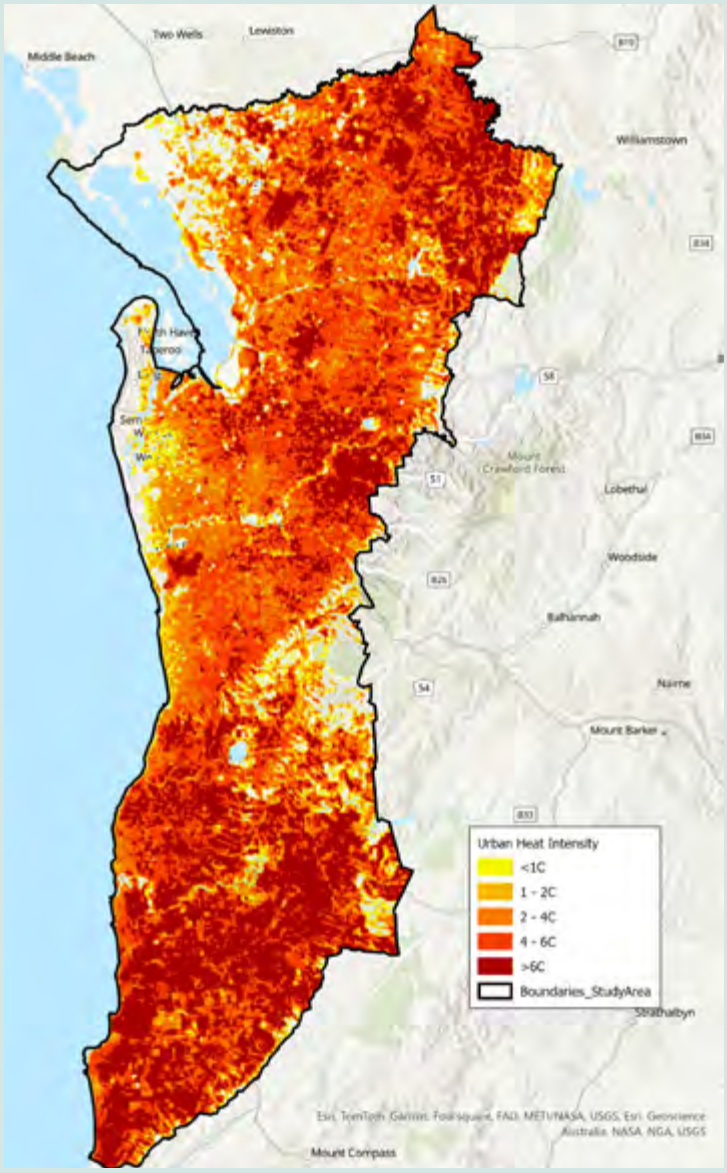
Urban heat intensity measures the extent to which an urban area experiences temperatures greater than an equivalent reference area without any urban development. This measure considers underlying temperature trends, such as those influenced by elevation, latitude and proximity to the coast, to isolate and quantify the additional heat directly caused by urban development. Unlike the airborne approach, satellite heat mapping has been shown to be independent to the temperature on a given day of capture, meaning that it is suitable for comparison and measurement over time. This provides the ability to track progress towards cooling metropolitan Adelaide.

## Box 27: Satellite urban heat intensity trends

DEW has undertaken an analysis to identify urban heat intensity trends across metropolitan Adelaide. This work found that the average urban heat intensity increased by 0.2°C from 1 January 2014 to 1 January 2023. While the results indicate a stable overall trend, there is significant variation at the local scale, showing areas of both warming and cooling since 2014.

See Map 5 and 6, which shows the spatial distribution of urban heat intensity across metropolitan Adelaide and where this analysis was undertaken.

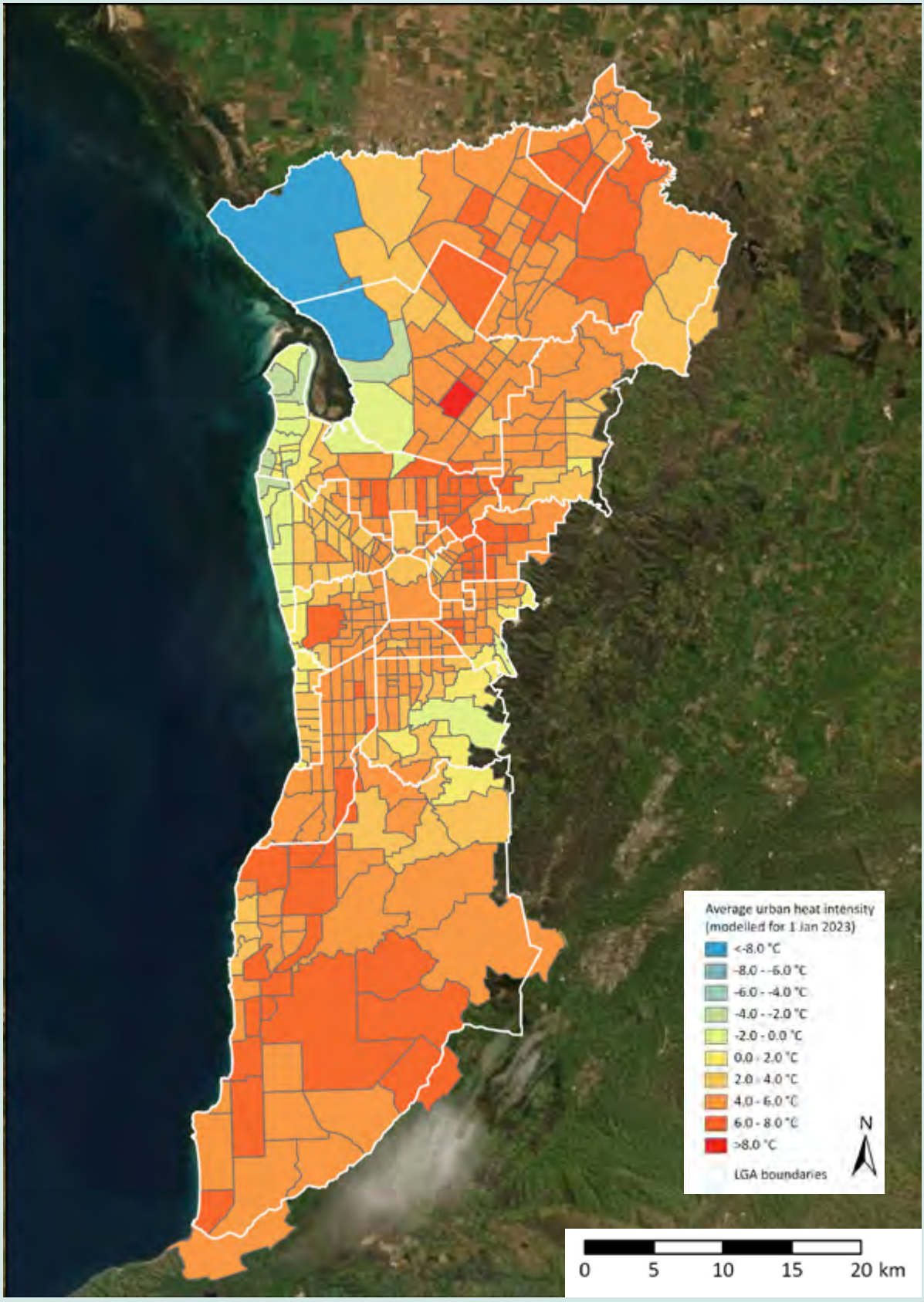
For further details about the results, refer to **DEW's Technical Information Supporting the 2023 Urban Heat Environmental Trend and Condition Report Card.**




**Map 5: Urban heat intensity (modelled for 1 January 2023) in 1ha grids**

*(Source: DEW 2023)*

**h** *Refer to the Urban Heat Report Card for the list of 18 metropolitan Adelaide LGAs in the study area.*




**Map 6: Average urban heat intensity (modelled for 1 January 2023) for each suburb**

*(Source: DEW 2023)*

## Current status

### Urban heat islands

Overall, a recent airborne heat capture identified **daytime urban heat islands** across 30% of the Adelaide metropolitan area, of which:

- 12.5% were classified as **High** (>2°C warmer than average)
- 8.6% were classified as **Severe** (>3°C warmer than average)
- 9.0% were classified as **Extreme** (>4°C warmer than average).

**Night-time urban heat islands** were identified across 5.7% of the Adelaide metropolitan area, and were mostly classified as High.

### Urban heat intensity

As of 1 January 2023, according to detailed satellite data the average heat intensity of metropolitan Adelaide was modelled at 3.2°C warmer than equivalent reference areas without urban development. Across the region, there was significant variation in average urban heat intensity.

See Map 5 and Map 6 for urban heat intensity data modelled at 1 hectare grid and suburb scales.

## Future work and investigations

**Action P1:** Work with partners to identify the best technology and methodology to track urban heat into the future.

Analysis technology for urban heat is an evolving aspect of environmental monitoring, which is likely to continue to advance in the near future. Acquiring airborne data is costly and is not currently suitable for monitoring individual locations over time, due to the influence of the weather conditions on the day of capture. Meanwhile, satellite imagery is readily available, but the time and effort required to process the data is significant. The technology, method and frequency of future measurement of urban heat has not yet been determined, but must weigh up the benefits and downsides of each option.

In the meantime, existing heat data is being used to help prioritise cooling efforts through greening where it is needed most, and to improve the understanding of different materials on urban heat.

**Action P2:** Work with stakeholders to determine and set appropriate urban heat thresholds to measure success.

Further work is needed to identify appropriate urban heat thresholds and/or performance targets.

# Performance investigation area: improve plant species diversity

This performance investigation area aims to achieve a more biodiverse Adelaide.

## Why is plant species diversity important?

A diverse mix of trees and other plant species is important for a healthy and resilient urban forest. High diversity supports food and habitat availability for animals, and limits risks of a large loss of plants due to pests, diseases or climate change. Urban street trees planted in avenues are particularly susceptible to pests and diseases but are valued highly for their uniform look.

Measuring and monitoring changes in urban forest diversity is one means of measuring success in creating a more biodiverse[i] Adelaide. A healthy urban forest includes diversity in understory and mid-story vegetation and trees on all land types.

Across metropolitan Adelaide, measurement and monitoring of plant species diversity is limited. However, the University of Adelaide established a baseline tree species diversity dataset in 2023 for council street trees and reserves that can act as our current best indicator for overall urban forest diversity.

Getting tree and other plant species diversity right is a balance between future-proofing our urban forest, maintaining existing healthy trees, respecting natural and cultural heritage, and fostering a pleasant look and feel. Setting targets and coordinating street tree diversity monitoring will help state government, local government and other partner organisations to assess and manage this diversity over time.

### Box 26: Factors in tree species selection

There are lots of reasons for selecting particular tree species, such as:

- residents' preferences
- cultural or heritage value
- local amenity
- available planting space
- soil type and quality
- adjacent infrastructure
- available nursery stock
- form (shape of the tree)
- maintenance requirements
- diseases
- climatic conditions
- health
- canopy height
- longevity
- root invasiveness
- evergreen/deciduous
- fauna food source.

**i** *Biodiversity is the variety of all plants, animals and microorganisms, their genes, and the ecosystems they live in.*

## How is plant species diversity measured and monitored?

There are currently no defined performance measures for the diversity of the urban forest for metropolitan Adelaide. Internationally, urban forest diversity is generally measured using thresholds for individual species, genera and families, measured against locally set benchmarks. Table 2 below shows tree species diversity benchmarks adopted by different international and Australian jurisdictions, noting that what has been chosen for other cities might not be appropriate for metropolitan Adelaide.

Along with setting benchmarks for species, genus and family, another technique to measure species diversity is using a 'top diversity index' or TD-50, which is the number of species that comprise the top 50% of the area's urban forest[38]. For example, if the total number of jacarandas, London plane, bottlebrush and ornamental pear trees accounted for more than half of the tree stock, then it would have a TD-50 of 4, reflecting a low diversity urban forest dominated by 4 species. The higher the TD-50 score, the more diversity in the planting palette and the less risk to future losses.

A potential baseline dataset for species diversity has been identified by the University of Adelaide as part of its Future Trees Benchmarking Project[35]. This project collated tree data, which includes street trees and reserves, to the extent that these are available, from all councils across the metropolitan Adelaide region and the Adelaide Hills and Mount Barker district councils, and reported on the diversity at the species, genus and family level.

The data can be compiled at LGA level as well as 1-hectare grids, providing a further ability to layer diversity data with other spatial information.

**Table 2: Diversity thresholds proposed by Santamour (1990), Morton Arboretum (2018) and jurisdictions in publicly available urban forest strategies**

| Source | Species benchmark | Genus benchmark | Family benchmark |
|---|---|---|---|
| Santamour (1990) | 10% | 20% | 30% |
| Morton Arboretum, USA (2018) | 5% | 10% | 15% |
| City of Melbourne (2012) | 5% | 10% | 20% |
| City of Perth (2018) | 10% | - | - |
| City of Sydney (2023) | 10% | 20% | 40% |
| City of Boston, USA (2022) | 10% | 20% | 30% |

*(Source: Caddy-Retalic et al, 2023)*

## Current status

The University of Adelaide's Future Trees Benchmarking Project[35] found that the trees along metropolitan Adelaide's streets and in reserves represent only a relatively small number of species. This lack of diversity could present high risks as our climate changes, and/or greater susceptibility to pests and diseases.

The overall species diversity (using the Top Diversity Index) results in a TD-50 of 13 across the Adelaide region. However, there is significant variation in this, ranging from a low diversity TD-50 of 4, to a high of 12, across the 18 LGAs studied.

The data shows that the species to genus to family percentages are currently 6.6%, 22.2% and 44.4% respectively, which is above the target for all 3 classifications using either the Morton Arboretum or City of Melbourne thresholds, and above the targets for genus and family for all thresholds[35]. However, as the family dominance is from the Australian native group Myrtaceae (for example, eucalypts and bottlebrushes), this category is of less concern compared to lower diversity in genus and species.

In Australia, the Myrtaceae plant family is very large, with more than 1,500 species covering a majority of the commonly used native street tree species, including gum trees (*eucalyptus, corymbia, angophora*), bottlebrush (*callistemon*), paperbarks (*melaleuca*) and lily-pillies (*syzygium*). Therefore, a high dominance of Myrtaceae is generally considered to be not as problematic as a high dominance of other family groups with less overall diversity and/or exotic species.

The lowest levels of tree diversity were found in the more newly established areas that have only recently urbanised, such as the cities of Onkaparinga, Tea Tree Gully and Playford. The highest tree diversity is in the northern Adelaide parklands and inner eastern suburbs, particularly in the City of Burnside. The study found that older suburbs have a greater variety of tree plantings and age classes.

The trees most planted across metropolitan councils are ornamental pears (7.43%), bottlebrushes (7.24%) and jacarandas (6.60%). Other common exotic trees include callery pears (4.76%) and golden rain trees (4.35%). In at least one council area, a mere 4 species make up half of the public urban forest.

Refer to Map 7 which shows species diversity in 1-hectare grids across the region. This provides an indication of locations that may be vulnerable to tree stock loss to disease, pests or climatic factors due to low diversity.

## Future work and investigations

**Action P3:** Identify an appropriate and consistent methodology for monitoring the diversity of trees and other vegetation in the Adelaide context.

As current analysis of species diversity is limited to trees maintained by local government, it represents only a portion of the overall vegetation present across metropolitan Adelaide.

The current data provides a baseline for the assessed tree stock within local government care and control. However, councils are at different stages of collecting data, so it primarily contains street tree data and data from reserves, where that is available. The data does not include trees on private or state government land, and in many cases includes spatial gaps such as cemeteries, golf courses and reserves. There is also no data on understory shrubs and other low vegetation, which contributes significantly to the diversity – and biodiversity – of metropolitan Adelaide's urban forest.

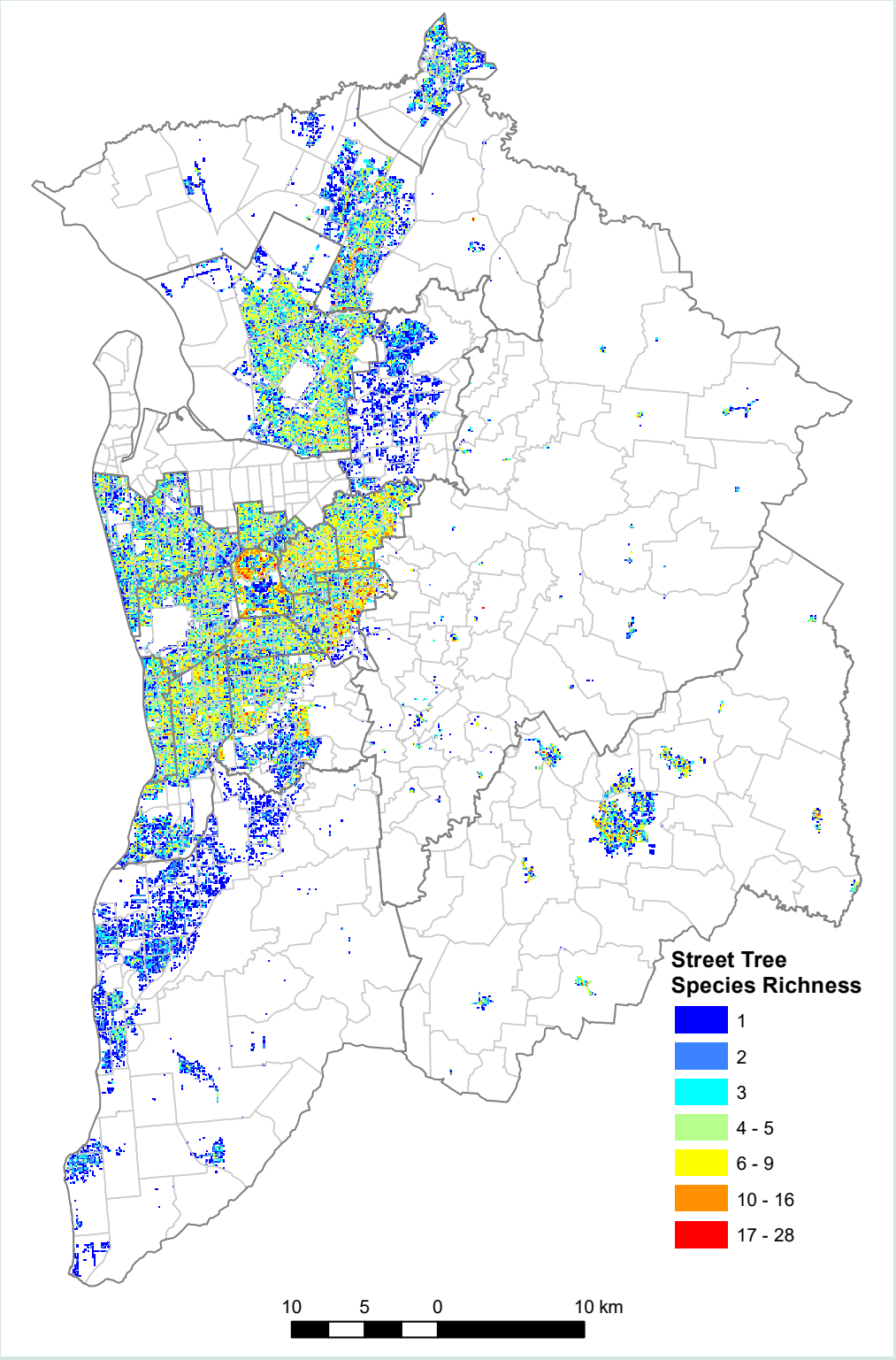
**Action P4:** Determine and set appropriate plant species diversity targets to measure success in the Adelaide context.

Work with local government and other partners to establish a benchmark and agreed monitoring methodology to track plant species diversity.

While a range of tree species diversity benchmarks exist, such as Santamour's Rule, detailed evidence-based research into how these apply in metropolitan Adelaide has not yet been developed. Further research and work is needed to identify an appropriate target and monitoring methodology for plant species diversity, which includes trees, shrubs and grasses, and native animal habitat quality for metropolitan Adelaide that considers the local historical and contemporary drivers of urban greening.

This may include monitoring abundance and diversity of animal species as an indicator of urban forest quality. Resolving gaps will require a better understanding of what we want to measure, what is possible, and what is cost-effective to measure.

## Map 7: Street and reserve tree species richness in 1-hectare cells across Greater Adelaide on local government land, University of Adelaide 2023




Note: The dark blue cells had one species present, with red cells containing 17+ species. This map was produced using the best available tree data in 2023, but there are a few notable deficiencies. The City of Port Adelaide Enfield was unable to be included due to the lack of individually georeferenced trees. There is also limited data available for the Cities of Onkaparinga, Adelaide Hills, and the District Council of Mount Barker. Therefore, any white sections on the map reflect lack of data, not a lack of any street tree species diversity.

# Full list of actions

## Priority area 1: Cooler, greener and healthier development

| Ref. | Actions |
|---|---|
| 1.1 | Strengthen tree protection legislation (and associated offset schemes and guidelines) to reflect the true value of existing trees (and monitor the effectiveness of changes). |
| 1.2 | Strengthen the Urban Tree Canopy target and relevant objectives and actions as part of the Greater Adelaide Regional Plan. |
| 1.3 | Enhance the Planning and Design Code (and develop supporting tools) to make it easier for developers to achieve greening outcomes in infill, master-planned and commercial developments. |
| 1.4 | Undertake coordinated metropolitan-wide social license campaigns targeted at different sectors and professions. |
| 1.5 | Develop a catalogue of costed housing and garden designs that showcase practical and affordable greening, WSUD and BSUD. |
| 1.6 | Work with the development sector to understand urban greening drivers and encourage innovation and adoption of leading practice (including identifying effective education, awards and incentives). |
| 1.7 | Investigate engineering solutions, planting, and maintenance techniques to minimise conflicts between green and grey infrastructure (building footings and infrastructure). |

## Priority Area 2: Government leading by example

| | |
|---|---|
| 2.1 | Integrate diverse urban greening and WSUD as part of business-as-usual in government projects by setting new standards for:<br>• transport infrastructure upgrades (particularly roads with a high level of pedestrian and cyclist activity)<br>• major land releases<br>• new schools and significant upgrades<br>• SA Water assets<br>• healthcare facilities<br>• sporting/recreation facilities<br>• other government land. |
| 2.2 | State and local governments to deliver flagship greening, BSUD and WSUD projects that cross boundaries and set new benchmarks (supported by grants programs). |
| 2.3 | Identify and implement solutions to key barriers to BSUD and WSUD in public infrastructure and projects, such as maintenance. |
| 2.4 | Investigate alternative approaches to installing utilities infrastructure in roadways to create more space for trees. |
| 2.5 | Address legislative barriers and other restrictions on planting near utilities infrastructure, including permitted species lists. |
| 2.6 | Determine and apply a standard methodology for applying economic valuations to trees, habitat areas and other green infrastructure. |
| 2.7 | Investigate including green infrastructure into public asset management systems and account for trees as appreciating assets. |

## Priority Area 3: Building nature back in

| Ref. | Actions |
|---|---|
| 3.1 | Investigate how the planning system and other government legislation could best facilitate biodiversity net gain development. |
| 3.2 | Develop a BSUD capacity-building program, including design guidance, for the government, the development sectors and the community. |
| 3.3 | Develop a region-wide approach (including incentives) for supporting individuals and community groups to undertake biodiverse urban greening on private land, open space, sporting fields, linear parks and schools, and/or verge planting along strategic corridors. |
| 3.4 | Map the extent and quality of remnant vegetation and critical habitat, and spatially represent this in the Greater Adelaide Regional Plan and the Planning and Design Code to identify areas for protection. |

## Priority area 4: Future-proofing our urban forest

| | |
|---|---|
| 4.1 | Develop up-to-date guidance to drive appropriate and climate-resilience species selection in a variety of contexts. |
| 4.2 | Undertake research and trials to identify appropriate trees for Adelaide's projected future climate. |
| 4.3 | Investigate ways to increase the provision of local endemic and climate-resilient plant species and seed at scale, including working with the nursery industry. |
| 4.4 | Identify and mitigate threats to the health of the urban forest from pests and diseases. |
| 4.5 | Model future water demands, including volume and location, for meeting greening targets and to feed into integrated water management planning. |
| 4.6 | Scale up established WSUD and integrated water management capacity-building programs that are working well. |
| 4.7 | Investigate ways to grow the capacity of the nursery, arboriculture and horticulture industries. |

## Priority area 5: Improving greening equity

| | |
|---|---|
| 5.1 | Develop a spatial greening prioritisation tool to support urban greening investment decision-making, including relevant grants programs. |
| 5.2 | Integrate urban heat mapping into the planning system and identify an appropriate policy response. |
| 5.3 | Identify and map opportunities for greening investment along active transport routes, river corridors and stormwater channels. |
| 5.4 | Prepare an open space strategy to identify priority areas for new or improved green open space and tree canopy. |
| 5.5 | Identify and create new 'plantable space' for trees, including engineering solutions that supports trees in challenging spaces. |

## Priority area 6: Scaling up impact by working together

| Ref. | Actions |
|---|---|
| 6.1 | Develop and implement a cross-sector collaboration approach to identify opportunities for greater coordination, co-investment, efficiencies and measuring impact (see the 'Implementation approach' section on Page 54 and the 'Measuring impact' section on Page 60). |
| 6.2 | Investigate funding mechanisms for protecting and expanding urban greening, WSUD and BSUD delivery (see the 'Implementation approach' section on Page 54). |
| 6.3 | Develop a coordinated and strategic research plan to identify and fill knowledge gaps. |
| 6.4 | Develop a centralised hub to share knowledge across the region, between government and non-government sectors and with the community. |
| 6.5 | Extend the reach of established bridging organisations and networks that are working well. |
| 6.6 | Build industry capacity through introducing WSUD, BSUD and nature-based solutions to tertiary education programs and other industry learning forums. |
| 6.7 | Work with KYAC and other Kaurna groups to identify opportunities for partnerships with the Kaurna community. |

## Measuring success: Target (T) and performance investigation areas (P)

| | |
|---|---|
| **Target – Increase urban tree canopy cover** | |
| T1 | Work with stakeholders to investigate and identify differential sub-targets for different land-uses and landscape types, and determine whether any land-uses should be excluded in the future. |
| T2 | Undertake regular tree canopy data recaptures to monitor changes in tree canopy cover and assess against the target. |
| T3 | Prepare practical guidance material on how different land-uses can best accommodate optimal levels of tree canopy cover to support delivery partners in implementing the strategy. |
| **Performance investigation area – Reduce urban heat** | |
| P1 | Work with partners to identify the best technology and methodology to track urban heat into the future. |
| P2 | Work with stakeholders to determine and set appropriate urban heat thresholds to measure success. |
| **Performance investigation area – Improve plant species diversity** | |
| P3 | Identify an appropriate and consistent methodology for monitoring the diversity of trees and other vegetation in the Adelaide context. |
| P4 | Determine and set appropriate plant species diversity targets to measure success in the Adelaide context. |

# A picture of urban greening success

# If this strategy is successful, by 2055 metropolitan Adelaide could have[j]:

## Increased tree canopy and greater retention of mature trees

- Adelaide's urban forest will have significantly increased across all council areas and on public and private land.
- It will be widely recognised that while planting new trees is important, it is not as valuable as looking after existing trees.
- Mature trees and remnant native vegetation will be highly valued and protected, and their significant ecosystem services and economic benefits will be recognised.

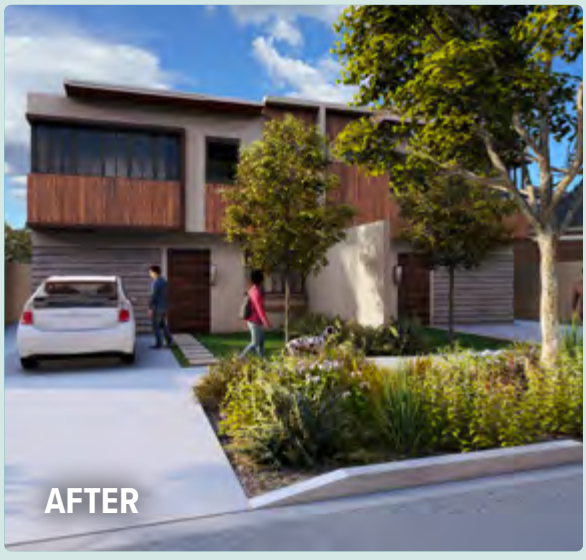
## Greening embedded in new developments and infrastructure conflicts resolved

- Metropolitan Adelaide will have transformed how it undertakes new development, including residential infill, commercial carparks and arterial road upgrades.
- Housing types that balance the protection of mature trees with the establishment of landscaping, and maximise the greening of small and vertical spaces, will be commonplace and affordable.
- More trees and garden space will be retained when existing houses are replaced.
- Planting tall, shady trees in streetscapes will work in harmony with powerlines and below-ground infrastructure.
- Green infrastructure will become embedded into the planning and design fabric of our urban areas.

## Abundant vegetation that provides habitat for birds and other animals

- Streetscapes will have a mixed vegetation structure, with far more shrubs and grasses.
- Mid-story and understory plantings will provide healthy habitat for our native wildlife, including birds, pollinators and living soils.
- The greening of our urban areas will be based on future considerations, such as strategic planting for climate-resilience and to support urban biodiversity.
- BSUD principles will be applied at all scales and for all types of development, to ensure adequate resources for our native wildlife.
- Ecological connectivity will be enhanced to facilitate the movement of native species through the urban landscape and to provide adequate habitat to ensure population viability.

## Residential infill


*j This was drawn from a visioning exercise undertaken to develop the draft strategy with a diverse range of cross-sector participants from local government, state agencies, research institutions, industry peak bodies and Warpulai Kumangka (Green Adelaide's Kaurna advisory group).*

## More integrated water-sensitive urban design

- Principles of WSUD will be applied to the planning of urban neighbourhoods, ensuring that water is captured and reused to facilitate urban cooling and greening.
- WSUD will be integrated into asset renewal, capital works projects, urban development and the retrofitting of existing homes and gardens.
- Stormwater-capture and WSUD will be linked to greening investments, to promote the survival and health of trees.

## A climate-resilient urban forest

- There will be a strong understanding and expertise about what to plant, to ensure that our urban forest is resilient to our warming climate.
- Government, industry and the community will have easy access to climate-resilient trees and other plants.

## Equitable urban greening across Adelaide

- Urban greening will be equitably distributed across our neighbourhoods. Areas of high urban heat and low socio-economic disadvantage will be targeted with climate-resilient plantings and increased canopy cover.
- All suburbs will have healthy tree canopy cover that mitigates the 'urban heat island' effect and creates walkable neighbourhoods.
- There will be an interconnected network of public open spaces linked to shady tree-lined streets, which will enhance biodiversity, harness stormwater run-off, and connect people to each other and to nature.

## Strong community, industry and government support for nature-based solutions

- The community, industry and government will have strong knowledge, motivation and capability to deliver nature-based solutions.
- Communities and other stakeholders will be ecologically literate and better understand the value of nature in the urban environment.
- More Adelaideans will value trees and other vegetation as assets and choose to protect them.

## Car parks


- There will be high levels of community participation in urban greening in a variety of ways, including within people's own homes, as well as in shared and/or public spaces.
- People will enjoy, value and actively care for their local natural spaces, which will help metropolitan Adelaide to adapt to a warmer, drier climate.

## Collaborative management of urban greening

- Agencies will be working together effectively and proactively, with ongoing dialogue to tackle barriers that emerge in delivering urban greening outcomes.
- All government and non-government stakeholders that either deliver, influence or are interested in urban greening outcomes will understand how best to coordinate, share data and leverage limited resources.

## Strong urban greening partnerships with Kaurna

- First Nations land management practices will be supported across our urban landscapes to protect, heal and enhance ecologically diverse ecosystems.
- Cultural burns that build natural disaster-resilience and urban biodiversity outcomes will be implemented.
- Adelaideans will have recognised and embraced Indigenous culture, practices and landscape management and, as a result, there will be greater connection to place.

## Decisions based on cutting-edge technology

- Effective shared monitoring systems will be in place to ensure that urban greening investment is efficient and is directed where it is needed most.
- Decisions about urban greening investment will be based on cutting-edge technology, such as remote-sensing, artificial intelligence and automation.

## Green targets met

- Our urban tree canopy cover target will have been met, with the aid of strong leadership at all levels.
- Plant diversity and urban heat performance measures will also have been met for strategic locations, such as along active transport routes and in areas of high urban heat.

## Public open space


## Major arterial roads



## Local streets


# Appendices

# Appendix 1: How was the strategy developed?

This strategy was developed in collaboration with key practitioner groups and was tested through a comprehensive consultation process.

It went through these stages:

## Stage 1: Scoping and early engagement

Green Adelaide undertook a literature review, practitioner survey and stakeholder workshops to better understand who is working on urban greening in metropolitan Adelaide, what they are doing, the critical gaps and what kind of strategy would work best.

## Stage 2: Drafting, stakeholder engagement and investigations

To support the preparation of the draft strategy, Green Adelaide undertook an extensive range of engagement activities with a wide range of stakeholders that have a role in delivering or influencing urban greening, and/or an interest in it.

This engagement process was overseen by a Government Leadership Group, which included senior representatives from the Local Government Association as well as the following government agencies: Department for Infrastructure and Transport, Renewal SA, Department for Trade and Investment, Department for Education, Department for Health and Wellbeing, Department of the Premier and Cabinet, Infrastructure SA, Preventive Health SA and SA Water.

Technical working groups, with cross-sector membership, were also set up to provide advice and support evidence-based content. Membership of these groups was sought via an expression of interest process and focused on:

- urban heat and tree canopy
- urban biodiversity
- policy and green open space.

Additionally, the following background papers were prepared to support this draft strategy:

- Blueprint for a Nature Positive Adelaide and urban biodiversity case studies (RMIT)
- Legislation, Policy and Urban Greening (Green Adelaide)
- Urban Greening Scenarios (DPC and Green Adelaide).

The strategy has also drawn on the following evidence bases:

- Future Trees Benchmarking Report[36]
- DEW's Urban heat report card (2023)
- Urban heat and tree mapping viewer

For further details, see Figure 7 and/or read the consultation material available on Green Adelaide's website.

**Figure 7: Summary of the consultation process to develop the draft strategy**

## Stage 1: Scoping and early engagement

### Practitioner survey

**127 respondents from more than 65 organisations** participated to identify key urban greening challenges and opportunities

### Local government workshops

**33** participants, representing **17 Adelaide metro councils** and LGA SA met, to understand what type of strategy would be most useful and identify ways to work together

### Targeted conversations

**Targeted discussions** with Kaurna, key agency partners, champions and influencers to discuss the priorities of different organisations and opportunities for alignment

## Stage 2: Developing the Strategy together

### Leadership event and cross-sector summit

**60 leaders, representing 36 organisations/interests,** to grow urban greening leadership and drive commitment for shared action

**More than 70 representatives** attended a cross-sector summit, to test vision elements, draft themes, outcomes, actions and identify potential flagship projects

### Development industry roundtable

**28 leaders,** representing **22 organisations,** to draw in development industry perspectives and identify practical ideas for implementation

### Partner conversations

**One-on-one meetings** to discuss draft actions, potential collaboration opportunities and proposed strategy endorsement process

### Scenario planning and urban greening workshop

**Cross-sector workshop** attended by more than **40** participants to discuss what could happen in the future, and explore and plan for uncertainties

### Technical working groups

**3 technical working groups** with subject matter experts from government (state and local), industry peak body, research institutes and NGOs:

- **Urban heat and tree canopy**
- **Urban biodiversity**
- **Quality green space and policy**

## Stage 3: Public consultation on the draft strategy

An 8-week public consultation process was held, which included:

- a leadership event with local government chief executives and mayors, agency heads and other non-government leaders
- a Warpulai Kumangka (Kaurna advisory group) workshop
- 4 cross-sector practitioner workshops
- a webinar
- a survey
- a Green Adelaide podcast episode
- an extensive social media campaign.

For further details, see Figure 8 and/or refer to the 'Consultation report' available at: **YourSAY.**

For the full list of organisations that participated in the strategy development process, see Page 100.

### Figure 8: Summary of the public consultation process to test the strategy

**Stage 3:** Public consultation

**YourSAy online consultation hub**

**13,390** visits
**354** responses to online survey
**75** written submissions
**17** questions received via online discussion
**934** responses to the quick poll – **96% support the draft strategy**

**Greening Adelaide Leaders Breakfast**

**64** leaders, representing **37** organisations, to foster urban greening leadership, identify new partnerships and build momentum for shared collaboration

**Targeted stakeholder workshops**

**4 targeted workshops** with subject matter experts from government (state and local), research institutes, NGOs and industry peak bodies:

- **Building nature back in and scaling up impact by working together**
- **Future-proofing our urban forest and scaling up impact by working together**
- **Government leading by example and improving greening equity**
- **Cooler, greener and healthier development**

**Social media**

**657** social media comments across all channels
**700** new followers to Green Adelaide's social channels
**2** online articles
**173** podcast episode listens

**Webinar**

**110** people joined an online presentation and Q&A about the draft Urban Greening Strategy

**Kaurna session**

Workshop with **Warpulai Kumangka** (Kaurna advisory group)

# Appendix 2: Relationship to other government strategies and plans

This Urban Greening Strategy aims to complement and amplify the work of the many existing urban greening commitments of state and local government.

## State Government

This includes commitments to increase greening, strengthen climate resilience and identify opportunities to improve biodiversity within our urban areas. This includes:

- **SA State Planning policies (2019)**, State Planning Commission
- **Greater Adelaide Regional Plan (GARP) (2025)**, State Planning Commission
- **Green Infrastructure Commitment (2021)**, Department of Infrastructure and Transport
- **South Australian Economic Statement (2023)**, Government of SA
- **20-Year State Infrastructure Strategy (2025)**, **Infrastructure SA** – currently under review
- **Green Adelaide Regional Landscape Plan 2021-26**, Green Adelaide
- **South Australian Government Climate Change Actions (2022)**, Government of SA
- Resilient Waters Future Strategy, led by SA Water – currently under development
- **Healthy Parks, Healthy People SA 2021-2026,** Department for Health and Wellbeing and Department for Environment and Water

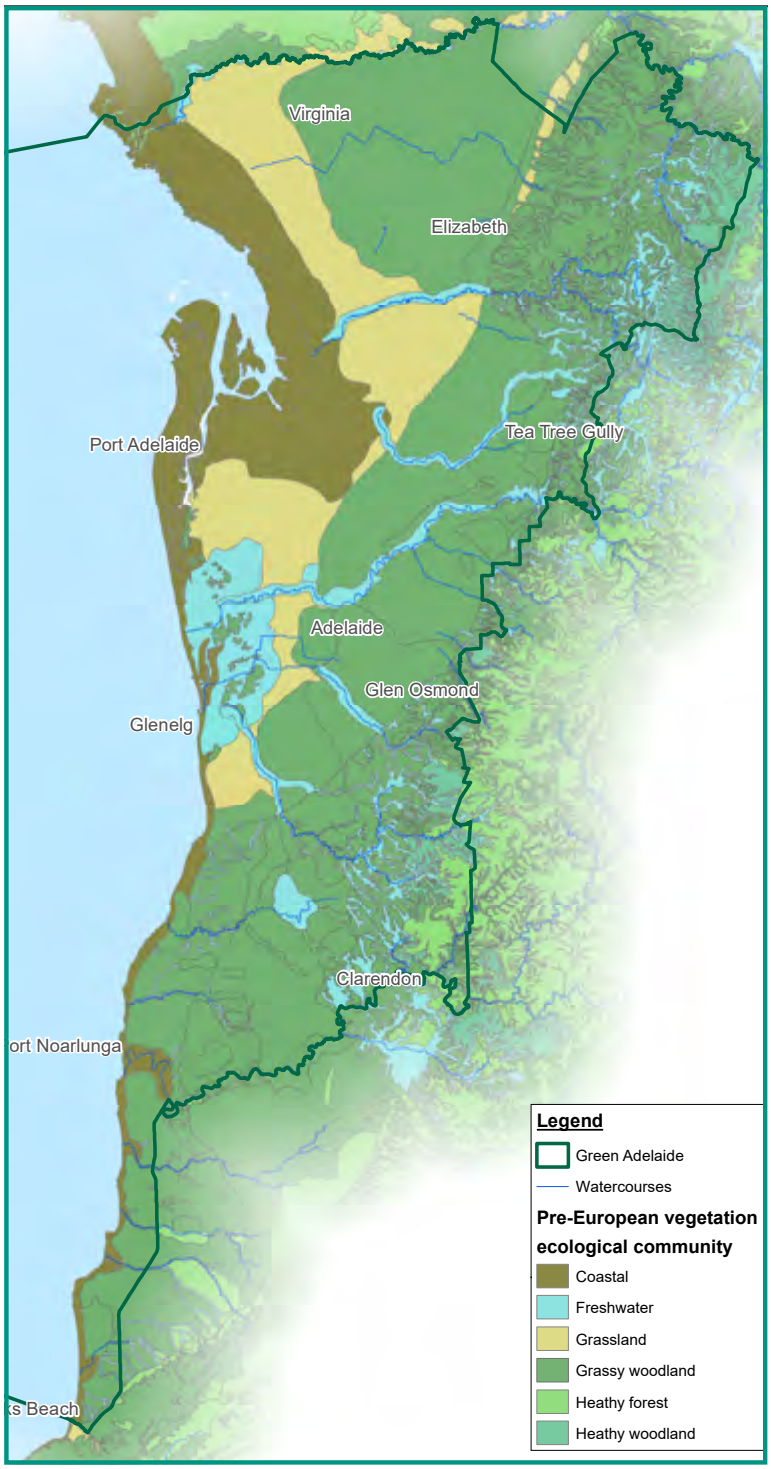
## Local government and other stakeholders

It is important to recognise that across metropolitan Adelaide we have a solid foundation of urban greening policy and practice already in place to build on.

The Urban Greening Strategy therefore strives to build on relevant plans and strategies developed by local government and other stakeholders, including those that focus on urban greening, open space, biodiversity, recreation, asset management. For example, 11 local councils have urban greening strategies and some councils have set a tree canopy target.

For further details, see the **Legislation, Policy and Urban Greening Background Paper**.

# Appendix 3: Adelaide's original urban forest

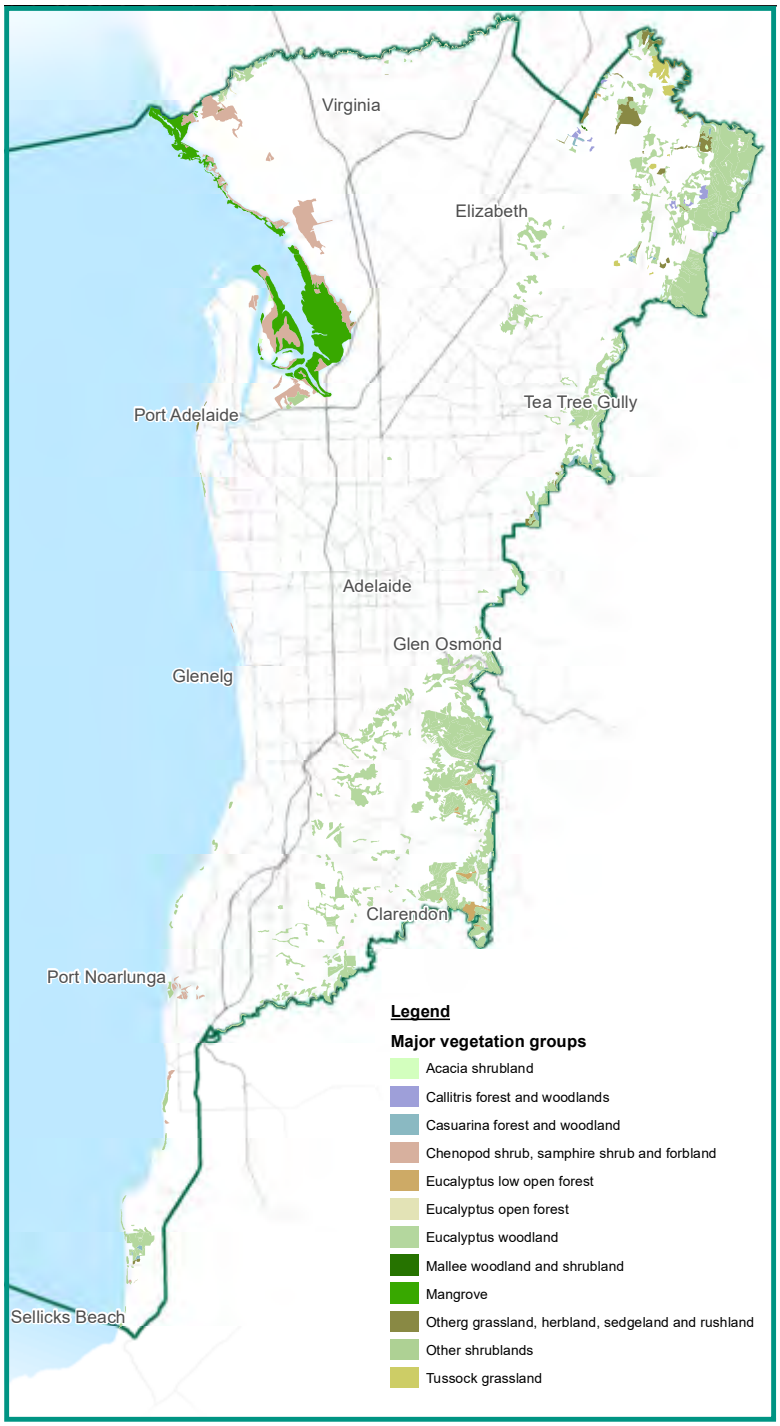



Prior to European colonisation Kaurna Miyurna maintained a varied landscape including highly vegetated woodlands, moderately vegetated grasslands and sparsely vegetated coastal plains.

Variability in landscape forms across the Adelaide Plains and Adelaide Hills influences the vegetation communities – from coastal dunes and wetlands, to open grassy woodlands of the foothills, and dense eucalypt forests of the hills.

*(Source: Darrell Kraehenbuehl)*

# Appendix 4: Remnant vegetation




Metropolitan Adelaide's natural landscape has changed dramatically over the past 200 years. Land clearance after European colonisation, mainly for agriculture, led to the removal of the majority of the native vegetation[39].

This area now predominantly consists of a highly urbanised landscape with many exotic trees, understory and grasses introduced from elsewhere in Australia and overseas. Trees and other vegetation also continue to be removed due to new developments to accommodate a growing population.

With such little remnant vegetation within metropolitan Adelaide, it is imperative that we value and restore remaining areas. Given the high species diversity of such remnants, including endemic plants, animals, and microorganisms, they can't simply be replaced elsewhere by garden plantings of a limited set of native plants.

## Where is remnant vegetation?

Ground-truthing has been undertaken to identify and describe scattered remnant vegetation in peri-urban areas, with larger patches found along the boundary of the region in the foothills along the Mount Lofty Ranges.

This remnant native vegetation can be classified in many different ways based on general characteristics and dominant species types.

This map shows the current ground-truthed extent of remnant vegetation in known major vegetation groups. This is likely to underrepresent the extent of remnant vegetation in metropolitan Adelaide, as more field surveys are needed to confirm the exact amount and location of remnant native vegetation. It also doesn't give any detail about the vegetation's condition.

Refer to the **Blueprint to a Nature-Positive Adelaide background report** for further details about the type of flora and fauna in the metropolitan Adelaide region.

Refer to the GARP for a spatial layer showing satellite inferred native vegetation and intersection with known EPBC and NPW values.

*(Source: Green Adelaide)*

# Appendix 5: Impermeable surfaces

It is important to understand the levels of permeability in our urban areas in relation to urban development. Impermeable surfaces, like buildings, roads, carparks, footpaths and other hard surfaces, do not absorb water and do not support tree growth. Instead, these surfaces increase water run-off, which carries water of poor quality into our rivers and Gulf St Vincent and negatively impacts aquatic life. Impermeable surfaces also encroach on the area available for urban green spaces.

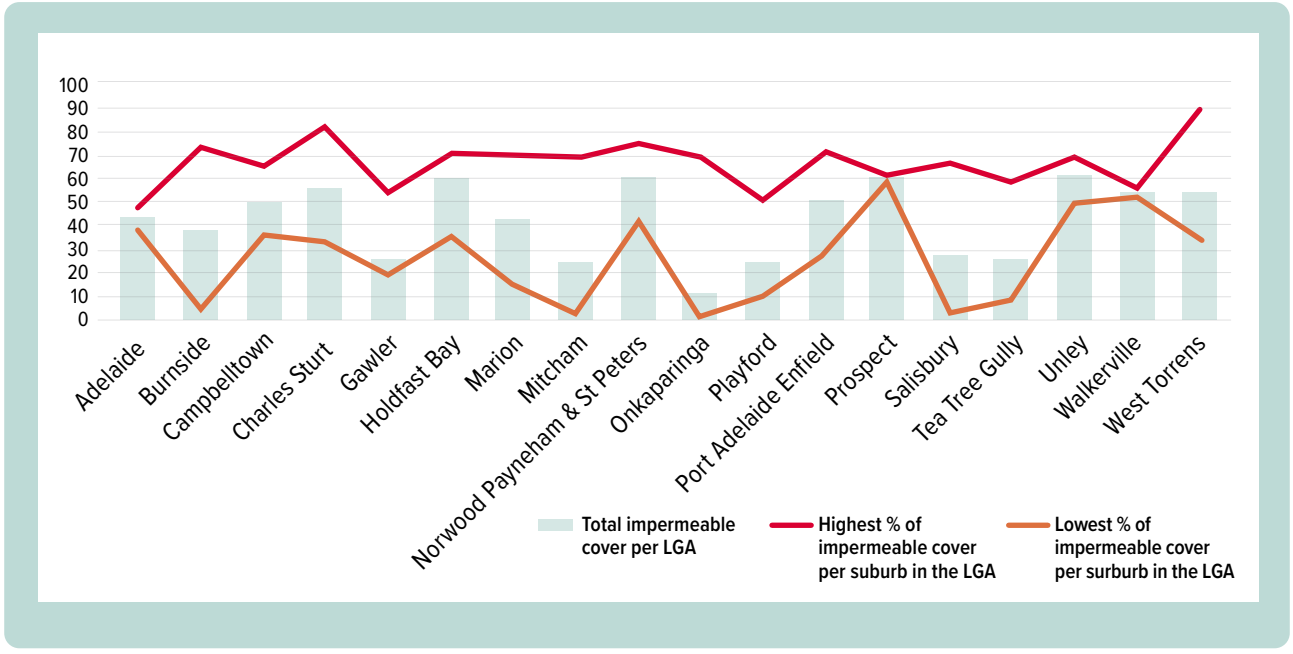
Permeable surfaces, such as grassed areas, mulched beds, groundcover plantings and porous bare earth, absorb water that supports tree growth. They are potential planting spaces for new trees.

The levels of impermeability in Adelaide range widely in many council areas (as shown in the graph below). The total area of impermeable surfaces in metropolitan Adelaide is 29.14%.

The top 3 most impermeable suburbs all have high levels of commercial and industrial land-use, namely Mile End South (93.11% impermeable surfaces), Marleston (86.33%) and Glanville (85.5%).

**Figure 5: 2022 Impermeable Surface % by LGA with respective minimum and maximum suburb values**

*(Source: Green Adelaide)*



## Infill development case studies

The following aerial imagery shows changes in canopy cover, total building footprint and impermeable surface levels due to infill development (between 2018 and 2022).



- Total canopy lost = 378m$^2$.
- Impermeable surface extent has increased from 523 m$^2$ (38.47%) to 1,281 m$^2$ (94.05%).
- Total building footprint has increased from 492.1 m$^2$ (36.13%) to 1,278.74 m$^2$ (93.89%).



- Total canopy lost = 72m$^2$.
- Impermeable surface extent has increased from 781 m$^2$ (55.7%) to 1,358 m$^2$ (96.9%).
- Total building footprint has increased from 553.4 m$^2$ (39.48%) to 966.8 m$^2$ (68.97%).

*(Source: Green Adelaide, 2024)*

# Appendix 6: Community urban greening attitudes

There is strong community appreciation for public urban greening. A 2016 survey found that 94% of South Australians considered conserving nature to be of critical importance[40].

There is also emerging global evidence that the COVID-19 pandemic has driven a marked increase in the appreciation and demand for public open spaces[41,k]. This provides an opportunity to build on and drive a deeper appreciation, stewardship and pride in urban greening as part of Adelaide's collective identity, which could lead to immeasurable benefits to the community's health, wellbeing, connection and cohesion, as well as climate adaptation, environmental and biodiversity outcomes[41].

The importance of engaging the community is reflected in a nationwide local government survey, which found that 'Community attitudes toward the value of trees' are just as important as 'Council's ability to plant and protect trees' for ensuring the success of urban greening strategies[42].

There is, however, a diverse range of community attitudes about trees and shrubs in the urban environment, with some people seeing trees as a potential maintenance issue and a safety risk from falling limbs or fire, whereas others appreciate the holistic value of plants.

***k*** *For example, an April 2020 'pulse check' survey found that 87% of Australian urban councils have noted a positive shift in community attitudes towards green space (Greener Spaces Better Places). A recent NSW Government survey found 45% of people are spending more time in public spaces than before COVID-19, 71% appreciate local parks more, and 94% are using public spaces for exercise. In South Australia, visitation to the state's parks and open spaces increased by 43% during the COVID-19 pandemic (Green Adelaide Regional Landscape Plan, 2021).*

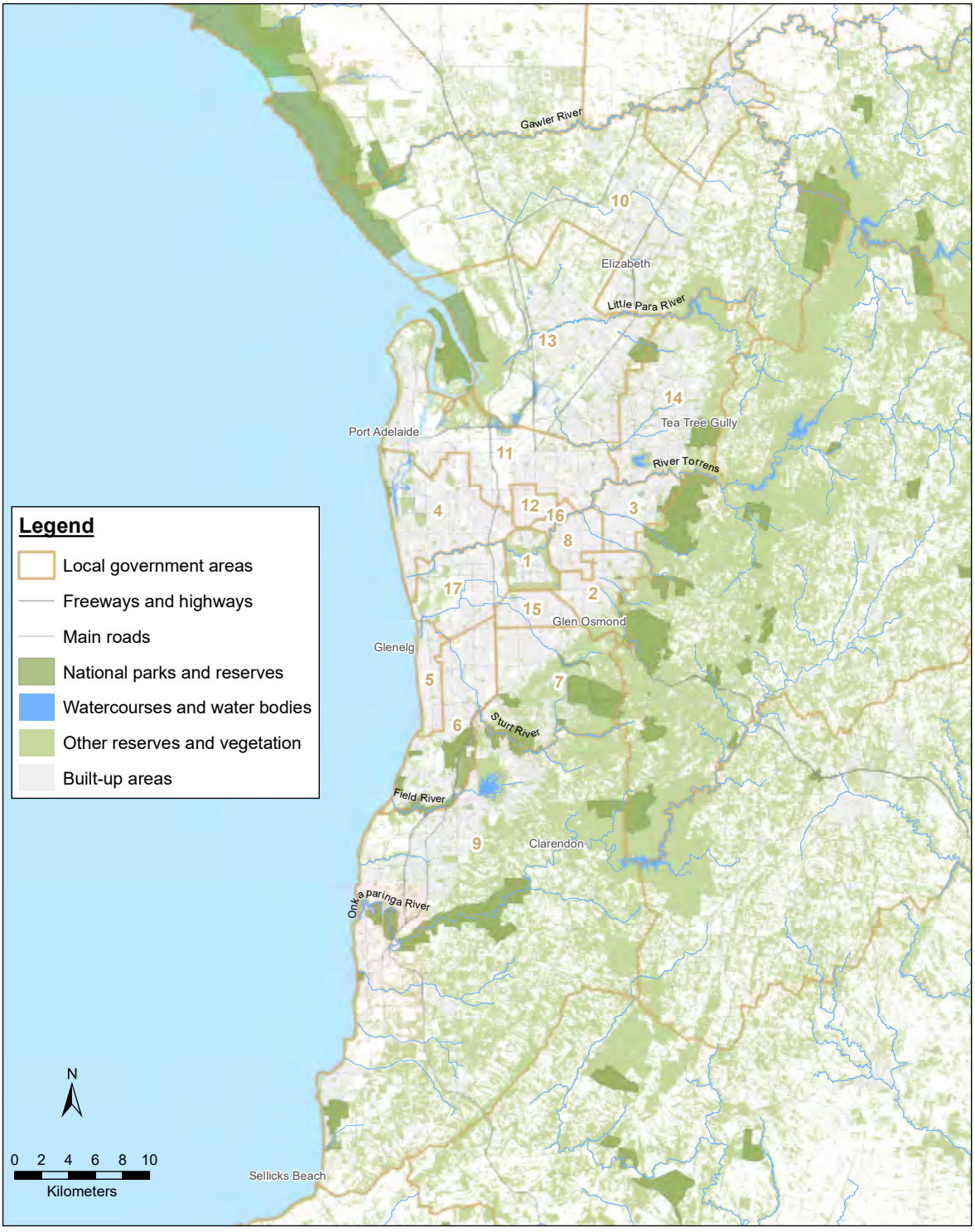
# Appendix 7: Our principles for collaboration with Kaurna

Our principles for collaboration with Kaurna are:

- **Respect:** The rights of Kaurna people to determine, own and control their culture should be respected and acknowledged. Their customary rights should be recognised, protected and maintained.
- **Involvement:** KYAC (or supported Kaurna advisory groups) should be the first point of contact for consultations and all forms of negotiations. The Kaurna community should be consulted on the ways in which their land, spiritual and cultural heritage, knowledge, beliefs, customs, true histories, community, interviews, lives and families are represented and/or used.
- **Timing:** It is important to recognise that engaging the Kaurna community will take time, and that sufficient time for proposals will be required for consideration by the appropriate Kaurna representatives.
- **Appropriate resources:** Participation of Kaurna people will require appropriate, fair and equitable resources to achieve outcomes.
- **Cross-boundary consultation:** A Traditional Owner will only comment on significant sites, places, objects and associations within their traditional homelands and country, so where projects or issues overlap, or are on other nation boundaries, a 10 km cross-boundary consultation overlap on either side should be conducted.
- **Acknowledge elders:** The term 'Elder' does not always mean men or women of a particular age. A relatively young man or woman may be considered an Elder because of their highly respected position in the community. They may possess specific skills and knowledge in an area, which endorses their position.
- **Establish a common purpose:** Kaurna people understand the need to establish a common purpose or shared vision.
- **Acknowledge Kaurna intellectual property rights:** It is essential that the cultural and intellectual property rights of Kaurna people are acknowledged, respected, recognised and protected. Approval by Kaurna people must be given on the use and representation of their cultural, heritage, language and intellectual property and copyrights[I].
- **Maintain confidentiality:** Confidentiality and privacy are very important for Kaurna people. The purpose for which information is obtained should be negotiated and agreed. Information that is 'women's business' or 'men's business' should be acknowledged as such, and not recorded or stored in such a way that is likely to been seen as disrespectful or culturally inappropriate.

*I Aboriginal cultural and intellectual property means the totality of the cultural heritage of Aboriginal people including, without limitation, their intangible heritage (such as songs, dances, artwork, stories, ecological and cultural knowledge), and cultural property, which includes Aboriginal human remains, artefacts, and any other tangible cultural objects.*

# Appendix 8: Rivers, creeks and open space




**Local government areas**

| | | | | | |
|---|---|---|---|---|---|
| 1. Adelaide | 4. Charles Sturt | 7. Mitcham | 10. Playford | 13. Salisbury | 16. Walkerville |
| 2. Burnside | 5. Holdfast Bay | 8. Norwood, Payneham & St Peters | 11. Port Adelaide Enfield | 14. Tea Tree Gully | 17. West Torrens |
| 3. Campbelltown | 6. Marion | 9. Onkaparinga | 12. Prospect | 15. Unley | |

# Glossary of terms

### Active transport

Active transport involves walking, cycling and other physical modes of travel to work, school, parks, shops or other destinations. Using public transport, such as catching a bus or train, also involves active travel when walking or cycling to and from stops, stations, home and destinations.

### Blue infrastructure

Blue infrastructure makes cities nature positive by repairing natural ecosystems. For example, wetlands, healthy catchments and permeable pavements help mitigate the impacts of flooding and stormwater run-off.

### Biodiversity

The variability among living organisms from all sources (including terrestrial, aquatic, marine and other ecosystems and the ecological complexes that they are part of), at all levels of organisation, including genetic diversity, species diversity and ecosystem diversity.

### Biodiversity Sensitive Urban Design (BSUD)

BSUD aims to create urban areas that make a positive on-site contribution to biodiversity through the provision of essential habitat and food resources for native animals.

BSUD links urban design to measurable biodiversity outcomes, providing a flexible framework for developers and planners to consider provisions for biodiversity alongside other considerations early in the development process.

### Blue water

Water found in surface-water systems (lakes, rivers and reservoirs) and groundwater.

### Brownfields

Brownfields are urban sites for potential building development that have had previous development on them.

### Canopy cover

The equivalent cover and ecosystem benefits associated with tree canopy cover.

### Climate change adaptation

Actions taken to help communities and ecosystems adjust to changing climate conditions and their effects.

### Cultural burning

Burning undertaken by Traditional Owners. Cultural burning is different to western prescribed burning in that smaller, cooler and slower burning fires are used to manage the landscape. The practice is based on a deep cultural understanding of the landscape and its needs. It is also about the healing that comes from people reconnecting with their Country.

### Ecosystem

A dynamic combination of plant, animal and microorganism communities and their non-living environment (for example, soil, water and the climatic regime) interacting as a functional unit. Examples of types of ecosystems include forests, wetlands, grasslands and tundra.

### Ecosystem services

The services provided by the functioning of natural ecosystems that are essential to human survival and wellbeing. Natural ecosystems maintain the atmosphere, provide clean water, control soil erosion, pollution and pests, pollinate plants and provide many other essential processes. The language of ecosystem services has emerged in recent decades as a way of representing the significance of the benefits humans derive from natural systems.

### Evapotranspiration

The release of water from leaves of vegetation to the surrounding air by the process of evaporation and transpiration. This cools the plant while cooling the air around the plant.

### Future Trees project

Future Trees is a Resilient South and University of Adelaide project focused on increasing urban tree diversity through data-sharing, trialling new species and developing new cultivars resilient to more challenging climates.

### Greenfield

Greenfield areas are made up of undeveloped land outside of the existing urban footprint. They are often located on the edge of existing urban areas. Greenfield development requires full assessment of environmental, infrastructure and planning issues, to determine future use and suitability for expansion of the city.

### Green infrastructure

Green infrastructure includes both natural and designed greening – from parks and street trees, to green roofs, raingardens and green laneways.

### Impermeable surfaces

Hard surfaces introduced by urban infrastructure that restrict or limit the permeability of surface layers of the landscape.

### Infill

Infill development involves the subdividing of one existing allotment into 2 or more new ones. This type of development increases the capacity of existing neighbourhoods to support population growth.

### LiDAR

LiDAR (Light Detection and Ranging) is a remote-sensing method that scans the surface of a survey area using a device installed in a light aircraft that fires to make a digital 3-dimensional image of objects on or near the ground, such as buildings, roads and trees.

The resulting data can be used to model tree canopies, including tree heights and canopy boundaries.

### Liveability

This is a measure of a city resident's quality of life and is used to benchmark cities around the world. It includes socio-economic, environmental, transport and recreational measures.

### Living infrastructure

Living infrastructure refers to all interconnected ecosystems within an urban catchment, including the 'green infrastructure' of trees, gardens, green walls and roofs, parks, reserves and open spaces, and the 'blue infrastructure' of our waterbodies, including lakes, wetlands and waterways.

### Nature positive

Nature positive refers to halting and reversing biodiversity loss, through measurable gains in the health, abundance, diversity and resilience of species, ecosystems and processes.

### Natural resources

Natural resources include soil, water, and marine resources; geological features and landscapes; native vegetation; native animals and other native organisms; and ecosystems.

### Permeable surfaces

Natural surfaces that allow water to penetrate and move through the underlying landscape.

### Resilience

The capacity of a system to absorb disturbances and reorganise while undergoing change, so as to retain essentially the same function, structure, identity and feedbacks.

### Surface-level parking

Surface-level parking refers to parking that is not enclosed or created by a structure and is allocated an area 'at grade' on ground level.

### Sustainable development

Forms of development that meet the needs of the present without compromising the ability of future generations to meet their needs.

### Thermal imagery

Thermal imaging cameras mounted on a purpose-built aircraft are used to capture surface temperature. Heat maps generated from this data identify thermal patterns in the landscape, including heat islands and localised hot spots.

### Urban design

Urban design is the collaborative and multidisciplinary process of shaping the physical setting for life in cities and towns. It involves the design of buildings, groups of buildings, spaces and landscapes, and the establishment of frameworks and processes that facilitate successful development.

### Urban forest

The urban forest comprises all trees and other living infrastructure, including soil and water, within an urban area. It applies to both the public and private realms, such as streets, parks, residential blocks, road and/or pathway corridors, universities, schools and open spaces.

### Urban form

Urban form is the general pattern of building height and development intensity, and the structural elements that define the city physically, such as natural features, transportation corridors (including fixed rail/tram transit system), open space and public facilities, as well as activity centres and focal elements.

### Urban heat island

An urban heat island is an area that heats up more than its surrounding areas and stays hotter than those areas. It is often the result of hard surfaces and urban development.

### Urban green corridors

Connected fragments of green space, such as trails, parks and waterways, within the urban footprint that provide ecological corridors for plant and animal biodiversity and habitat.

### Urban renewal

The process of improving the economic, social and environmental sustainability of a particular urban area through the redevelopment of under-utilised urban areas. It typically involves urban redesign, infrastructure renewal and investment, and identifying precincts and land for mixed use.

### Water sensitive urban design (WSUD)

WSUD is an approach to the planning and design of urban environments focused on integrating the urban water cycle (including potable water, wastewater and stormwater) with the built and natural environment.

# Acknowledgements

The development of this strategy has been coordinated by Green Adelaide on behalf of the South Australian Government. It has been prepared by Alison Collins with input from Louisa Halliday, James Peters, Sarah White, Blair Pellegrino, James Cameron, Renee Pearson, Dr Stefan Caddy-Retalic, Kat Ryan and Jen St Jack.

Green Adelaide is grateful to the many groups and individuals that contributed their time and ideas to the development of this strategy through the cross-sector engagement and investigation activities.

## Government Leadership Group

Green Adelaide thanks the Local Government Association and the following agencies for providing guidance and advice during the development of the strategy as part of the Government Leadership Group: Department for Education, Department for Environment and Water, Department for Health and Wellbeing, Department for Housing and Urban Development, Department for Infrastructure and Transport, Infrastructure SA, Department of the Premier and Cabinet, Preventive Heath SA and Renewal SA.

## Technical working groups

Green Adelaide thanks the following technical working group members who provided input and advice into developing the draft strategy and background technical papers:

- **Urban heat and tree canopy** – Amy Bruckman, Bec Taylor, Craig Johansen, Gill Weston, Jo-Anne Ragless, Kat Ryan, Mark Hannan, Rebecca Neumann, Sam Fulton, Dr Stefan Caddy-Retalic, Tim Kelly and Tom Morrison.
- **Urban biodiversity** – Aleisa Lamanna, Bianca Murfitt, Chris Butcher, Dr Georgia Garrard, Jacob Lemon, Jordana Wilson, Dr Katherine Berthon, Luke Kingston, Mauricio Herrera, Rebecca Neumann, Rick Chenoweth, Shaun Kennedy, Sabine Koolen, Samantha Buxton Stewart, Professor Sarah Bekessy and Tamika Cook.
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Green Adelaide also coordinated a range of other engagement activities during development of the strategy (see **Appendix 1**) and thanks the following organisations for their input and ideas:

### Boards, state agencies and services providers:

- Botanic Gardens State Herbarium
- Departments for Education, Environment and Water, Infrastructure and Transport, Premier and Cabinet, Housing and Urban Development (Planning and Land Use Services)
- Green Adelaide
- Infrastructure SA
- State Planning Commission
- Premier's Climate Change Council
- Office for Design and Architecture SA
- Office for Recreation, Sport and Racing
- Renewal SA
- SA Power Networks
- SA Water
- Wellbeing SA.

### Local government

- Local Government Association of SA
- Individual councils:  Adelaide, Burnside, Charles Sturt, Holdfast Bay, Marion, Mitcham, Norwood, Payneham & St Peters, Onkaparinga, Playford, Port Adelaide Enfield, Prospect, Salisbury, Tea Tree Gully, Unley, West Torrens and Mount Barker District Council
- Regional Climate Partnerships (Adapt West, Resilient South and Resilient East).

### Research institutions, non-government organisations and peak bodies

- Adelaide Sustainable Building Network
- Australian Institute of Architects
- Australian Institute of Landscape Architects
- Flinders University
- Greening Australia
- Housing Institute of Australia
- Parks and Leisure Australia
- Planning Institute of Australia
- Property Council of Australia
- Trees for Life
- Treenet
- Urban Development Institute of Australia SA
- Urban Futures Exchange
- University of Adelaide
- Warpulai Kumangka (Green Adelaide's Kaurna advisory group)
- Water Sensitive SA.

# References


1 Summaries are available in **Options Analysis: Costs and Benefits of Urban Tree Canopy Options for Minor Infill Development in the Planning and Design Code** (AGD PLUS, 2020), **Green Infrastructure: Life support for human habitats** (Ely & Pitman for the Botanic Gardens, 2014), **Healthy Parks Healthy People** literature review, and **TreeNet Symposium** proceedings.

2 Ossola, A., Staas., Keishman, M.R. (2020) **Urban Trees and People's yards Mitigate Extreme Heat in Western Adelaide**, Macquarie University, Sydney, Australia.

3 Rouhollahi, M., Whaley, D., Byrne, J., Boland, J. (2022) **Potential residential tree arrangement to optimise dwelling energy efficiency, Energy and Buildings**, Volume 261, 111962, ISSN 0378-7788.

4 Plant, L. (2016) **Making the case for planning and investment in green infrastructure: a case study of street trees and property value impacts in Brisbane**, Australia. The University of Queensland.

5 Pandit, Ram and Polyakov, Maksym & Tapsuwan, Sorada & Moran, Timothy. (2013). **The Effect of Street Trees on Property Value in Perth**, Landscape and Urban Planning. 110. 134-142. 10.1016/j.landurbplan.2012.11.00.

6 Ossola, A., Staas., Keishman, M.R. (2020) **Urban Trees and People's yards Mitigate Extreme Heat in Western Adelaide** . Macquarie University, Sydney, Australia.

7 Kardan, O., Gozdyra, P., Misic, B. et al (2015) **Neighbourhood greenspace and health in a large urban centre,** Scientific Reports 5, 11610.

8 Astell-Burt, T. and Feng, X. (2019) **Association of Urban Green Space With Mental Health and General Health Among Adults in Australia**, JAMA Open Network.

9 Lee, A.C.K and Maheswaran, R. (2011), **The health benefits of urban green spaces: a review of the evidence**, Journal of Public Health, Volume 33, Issue 2, June 2011, Pages 212–222.

10 Brown, C. and Grant, M. 2005. **Biodiversity and Human Health: What Role for Nature in Healthy Urban Planning?** Built Environment, 31(4): 326-338.

11 Nowak, D 2000. **The Effects of urban trees on air quality,** USDA Forest Service, Northeastern Research Station 5 Moon Library, SUNY-CESF, Syracuse, NY 13210.

12 Ives, C.D and Bekessy, S.A. (2015) **The ethics of offsetting nature**, Frontiers in Ecology and the Environment. 13, 568-573.

13 Soanes, K. and Lentini, P. E. (2019). **When cities are the last chance for saving species**, Frontiers in Ecology and the Environment, 17, 225-231.

14 Parris, K. M and Hazell, D. L. (2005) **Biotic effects of climate change in urban environments: The case of the grey-headed flying-fox (Pteropus poliocephalus),** in Melbourne, Australia. Biological Conservation, 124, 267–276.

15 Kardan, O., Gozdyra and P., Misic, B. et al (2015) **Neighbourhood greenspace and health in a large urban centre,** Scientific Reports 5, 11610.

16 McAliney, M. (1993) **Arguments for Land Conservation: Documentation and Information Sources for Land Resources Protection** Trust for Public Land, Sacramento, CA, December.

17 **Space Down Under**

18 Wilderness Society (2019) **Why are hollow-bearing trees so important**.

19 Greener Spaces, Better Places, 2019, **Who's With Us?**

20 Department for Environment and Water, 2022, **Guide to climate projections for risk assessment and planning in South Australia.**

21 Department for Environment and Water, **Technical Information Supporting the 2024 Urban Heat Environmental Trend and Condition Report Card.**

22 Longden, T, 2018, **Measuring temperature-related mortality using endogenously determined thresholds**, Climatic Change, 150 (3-4), pp. 343 – 375.

23 Cresswell I, Janke T and Johnston E. (2021) **Australia State of the Environment 2021**. Commonwealth of Australia.

24 Barraclough, K.A, Carey, M, Winkel, K.D, Humphries, E, Ah Shay and B, Foong Y. C. (2023), **Why losing Australia's biodiversity matters for human health: insights from the latest State of the Environment assessment**, Med J Australia.

25 Heineke, K., Laverty, N., Möller, T. and Ziegler, F. (2023), **The future of mobility**, McKinsey Quarterly.

26 PlanSA, **Population projections**

27 Naughtin C, Hajkowicz S, Schleiger E, Bratanova A, Cameron A, Zamin T and Dutta A (2022) **Our Future World: Global megatrends impacting the way we live over coming decades**, Brisbane, Australia: CSIRO. **d**

28 Robertson, F., and Barrow, J. (2020). **A review of Nyoongar responses to severe climate change and the threat of epidemic disease—Lessons from their past**, International Journal of Critical Indigenous Studies, 123-138.

29 Australian Bureau of Statistics (2022) **New houses being built on smaller blocks** (Article).

30 Department for Trade and Investment, data accessed October 2023, **Urban infill land supply | PlanSA**

31 SA Government and Australian Institute of Landscape Architects (2019) **Creating Greener Places for Healthy and Sustainable Communities.**

32 Schebella, M. F., Weber, D., Schultz, L. and Weinstein, P. (2019) **The Wellbeing Benefits Associated with Perceived and Measured Biodiversity in Australian Urban Green Spaces,** Sustainability, 11, 802.

33 Martindale, K., Hyon, R. and Crispin, S. (2022) **Biodiversity in cities: a route to resilience,** - UN Biodiversity Conference (COP 15).

34 Gibbons and Lindenmyer 2022, **Tree Hollows and Wildlife Conservation in Australia.**

35 Caddy-Retalic, S., Dormontt, E.E., Dorey, J.B. and Delaporte, K.D. (2023) Future Trees Project Phase 1: Benchmarking Adelaide's urban forest. Waite Arboretum, University of Adelaide, South Australia.

36 RMIT University (2021) **Creating Liveable Cities in Australia**, Centre for Urban Research.

37 **Gov Loop, What is a Community of Practice** (Accessed December 2024).

38 Love, N.L., Nguyen, V., Pawlak, C., Pineda, A., Reimer, J.L., Yost, J.M., Fricker, G.A., Ventura, J.D., Doremus, J.M., Crow, T. and Ritter, K. (2022). **Diversity and structure in California's urban forest: What over six million data points tell us about one of the world's largest urban forests**, Urban Forestry and Urban Greening, 74, p.127679.

39 Bradshaw, C.J.A. (2012). **Little left to lose deforestation and forest degradation in Australia since European colonization**, Journal of Plant Ecology, 5: 109-120.

40 South Australians and the Environment Community Survey (2016), Adelaide and Mount Lofty Ranges NRM Board, 2016 .

41 Yap, K.L, Soh, Sia, A, Malcolm, C.K, Chin, W.J, Araib, S, Ang, P. Y. T. and Er, K. B. H (2022) **The influence of the COVID- 19 pandemic on the demand for different shades of green.**

42 **Regional Landscape Plan**, Green Adelaide, 2021.

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