



# Greener neighbourhoods guide

Guiding strategic planning  
for urban forests



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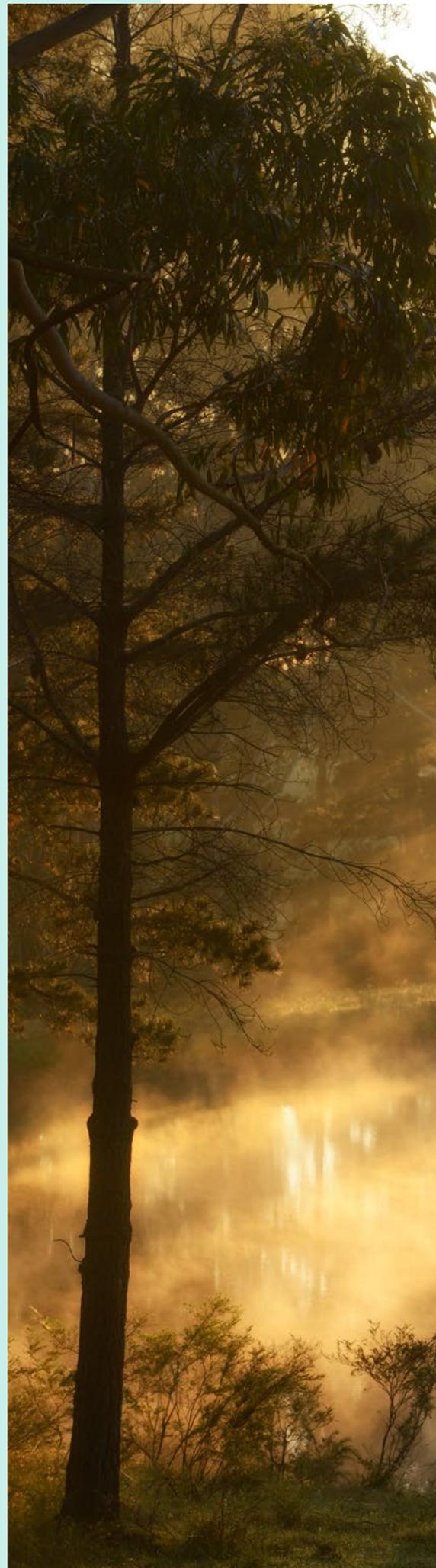
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Photograph on left: Scribbly gum at Ku-ring-gai  
Wildflower Garden, St. Ives. Credit: Destination NSW  
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## **Disclaimer**

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**Chapter 1:  
Introduction**



# Chapter 1: Introduction

## 1.1 About this guide

The NSW Government recognises councils are critical to the creation, protection and enhancement of tree canopy in NSW. We're supporting and empowering you to protect and enhance your urban forest through strategic planning.

This guide is for local governments across NSW who want to establish, build upon or re-envisage strategic planning for the urban forest. It gives you guidance on how to understand, plan for, monitor and manage your urban forests and promotes best practice and consistency in urban forest planning.

The guide is designed to support and complement other resources related to urban forestry and green infrastructure shown in Figure 1. Please see Appendix 3 for a longer list of relevant resources. The NSW Department of Planning, Industry and Environment may update this guide from time to time as priorities and policy settings change, and new information or case studies arise.

### Greener Neighbourhoods program

The department's Greener Neighbourhoods program provides targeted support to Greater Sydney councils so you can strengthen strategic management of the urban forest and contribute towards long-term canopy targets. The program provides funding, spatial data and policy guidance (this guide and future resources) under the Greening our City program to ensure you can better plan for and deliver tree canopy in places where it is most needed.

Figure 1: Resources to guide and inform urban forest planning and management

 <p><u><i>Greener Neighbourhoods Guide</i></u></p>	 <p><u><i>Urban Heat Planning Toolkit - WSROC (Western Sydney Regional Organisation of Councils)</i></u></p>	 <p><u><i>Gallagher Studio Urban Tree Canopy Targets and Development Controls Report</i></u></p>
 <p><u><i>Western Sydney Street Design Guidelines</i></u></p>	 <p><u><i>Water Efficiency Study for Urban Tree Management Report</i></u></p>	 <p><u><i>Everyone Plant One</i></u></p>
 <p><u><i>Urban Green Cover Technical Guidelines</i></u></p>	<p><b>Greener Spaces Better Places</b></p>  <p><u><i>How To Grow An Urban Forest Guide</i></u></p>  <p><u><i>Local Government Urban Forest Management report</i></u></p>	
<p><b>Rosemeadow Demonstration Project</b></p>  <p><u><i>Haydon Park investigation study</i></u></p>  <p><u><i>Street tree planting design manual</i></u></p>  <p><u><i>Copperfield Drive technical study</i></u></p>		
<p><b>Which Plant Where?</b></p>  <p><u><i>Climate ready street tree trials: a best practice guide</i></u></p>  <p><u><i>Climate ready online plant selector tool</i></u></p>		





## **1.2 How to use this guide**

This guide contains tools, case studies and resources for councils to further your urban forest planning. The wide-ranging information acknowledges councils are at varying points in strategically planning for urban forests – there is no expectation that you will use the entire guide.



The following provides a summary of what is included in each section:

- **Chapter 1** – information about using this guide and definition of an urban forest
- **Chapter 2** – details of how urban forest strategies fit within local government strategic planning processes, including the Integrated Planning and Reporting Framework
- **Chapter 3** – sets out 4 essential elements of urban forest planning (governance and leadership, data and evidence, engagement, goals and targets) as well as best-practice examples, and barriers that may arise, for each element
- **Chapter 4** – establishes a process for developing an urban forest strategy including tools to assist you – that is, a self-assessment checklist and references to a strategy template
- **Chapter 5** – information for councils wishing to further your urban forest planning via spatial data
- **Chapter 6** – methods and examples to enable you to set canopy targets for different development scales, from sites through to local government areas (LGAs)
- **Appendix 1** – case studies of initiatives and processes from councils in Australia and internationally to show best-practice urban forestry
- **Appendix 2** – a checklist to help you understand your organisation’s status, so you can use this guide to further your progress
- **Appendix 3** – a list of resources with more detailed information about urban forestry, for example plant selector tools and water efficiency studies.

### 1.3 What an urban forest is and why it is valuable

In Australia, tree planting and greening was fundamental to the initial design of many major cities. Traditional tree management primarily recognised the ornamental value of trees and was focused on the management of individual trees. Ownership was defined by property boundaries.



Urban forest – NSW definition

*An urban forest comprises all trees and vegetation –and the soils and water that support them –in an urban area. These components are strategically planned, designed, and managed to support resilience and wellbeing.*

Recently, there has been a shift from tree planting and management to a holistic approach that encompasses the entire urban forest. Urban forestry recognises trees as critical infrastructure that are valued as a continuous resource, irrespective of ownership boundaries (North Sydney Council, 2011).

Urban trees and greening (including vegetation on roofs, walls and facades) play a critical role in creating healthy cities. They provide shade and shelter, improve air quality, absorb carbon and rainfall, cool local environments, and support wildlife. We need trees and canopy to create sustainable, liveable, and resilient cities.

One of the largest risks to communities and the environment is the impact of climate change, including phenomena such as the urban heat island effect. Managing urban tree canopy and other vegetation as a system is pivotal to managing the impacts of these risks.

The value of managing trees holistically is well established, providing multiple social, environmental, and economic benefits that communities rely on. These benefits include mitigating urban heat build-up, increasing local amenity and encouraging walking and physical activity through more shade covering streets and paths. The value of the urban forest is evident in that:

- a 10% increase of canopy in Sydney can reduce land surface temperatures by more than 1 °C during summer mornings (Adams & Smith, 2014)
- adjusting the number and type of street trees in the Blacktown local government area could reduce average yearly household energy bills by \$249 (AECOM, 2017)
- vegetation cover can lower local land surface temperatures by up to 5-6 °C (Ossola, Staas, Leishman, 2020)
- the cost of replacing trees after an extreme heatwave can range from \$500,000 to over \$1,000,000 (Tabassum, Manea, Ossola, Thomy, Blackman, Leishman, 2021).



## **1.4 Strategic context**

The NSW Government recognises the value that trees, vegetation and green infrastructure play in our urban areas and is working to prioritise their provision through several targeted programs and policies.

### **Greening our City program**

The Greening our City program, previously known as the 5 Million Trees for Greater Sydney program, aims to enhance urban tree canopy and green cover across Greater Sydney by planting 5 million trees by 2030. The objective of the program is to plant trees in streets, open spaces and on private property, thereby contributing to the Greater Sydney Commission's target of increasing Greater Sydney's canopy cover to 40%.

### **Greater Sydney Region Plan (2018)**

The vision for A Metropolis of Three Cities sets out how residents will live within 30 minutes of jobs, education and health facilities, services, and great places. The Greater Sydney Region Plan aims to ensure urban tree canopy is increased (Objective 30) and has a target to increase canopy cover to 40% to provide shade, reduce ambient temperatures and mitigate the urban heat island effect.

### **Design and Place State Environmental Planning Policy (SEPP)**

The department is developing the draft Design and Place SEPP, which will simplify and consolidate how we deliver good design in NSW. The SEPP and its associated guides provide benchmarks for urban tree canopy in NSW. Parts of Chapter 6 in this guide align with the research and development in the draft SEPP package.

### **Greener Places: an urban green infrastructure design framework for NSW (2020)**

Green infrastructure is fundamental to a high quality of life and is important in creating places that are climate-resilient and adaptable to future needs. Greener Places is a green infrastructure design framework produced by the Government Architect NSW to guide the planning, design, and delivery of green infrastructure. It identifies urban tree canopy as an important component of green infrastructure.

### **Valuing green infrastructure and public spaces**

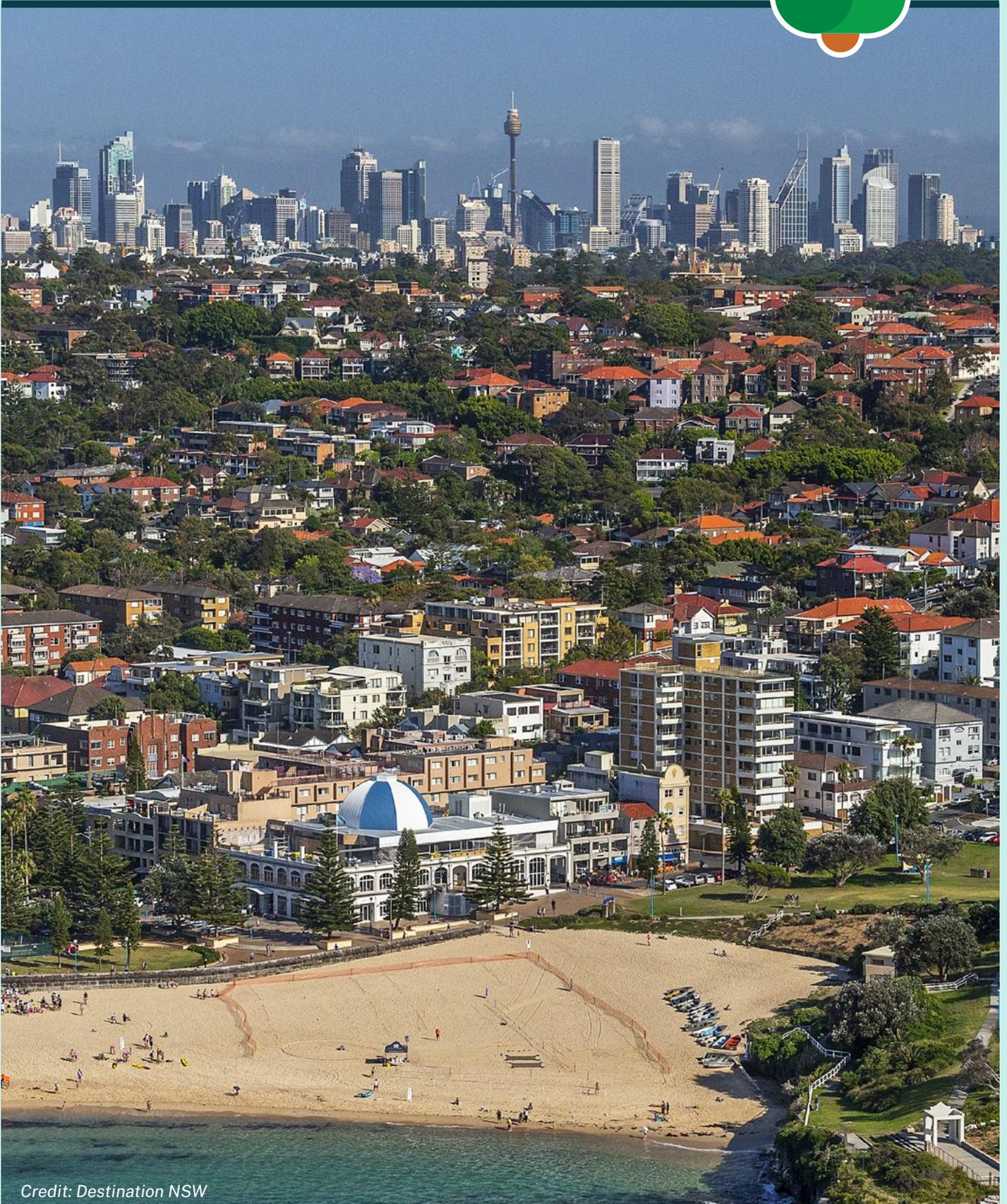
The department is developing a sector-specific framework for valuing green infrastructure and public spaces. The framework will be a public document that can be used to help prepare economic evaluations, including cost-benefit analysis, to ensure we have a consistent approach to valuing these important assets. We expect to complete this by early 2022.



## **1.5 A note on the use of 'urban forest strategy'**

The NSW Government acknowledges that not every council will develop an urban forest strategy. There are some NSW councils leading the way on urban forestry, who instead embed goals and actions for increasing canopy in local strategic planning statements (LSPSs) or strategies about the green grid, urban heat and water. The term 'urban forest strategy' is used frequently in this guide, with the intention of capturing all council strategies, plans and other documentation relating to with urban forestry.

## Chapter 2: Strategic planning for urban forests



*Credit: Destination NSW*

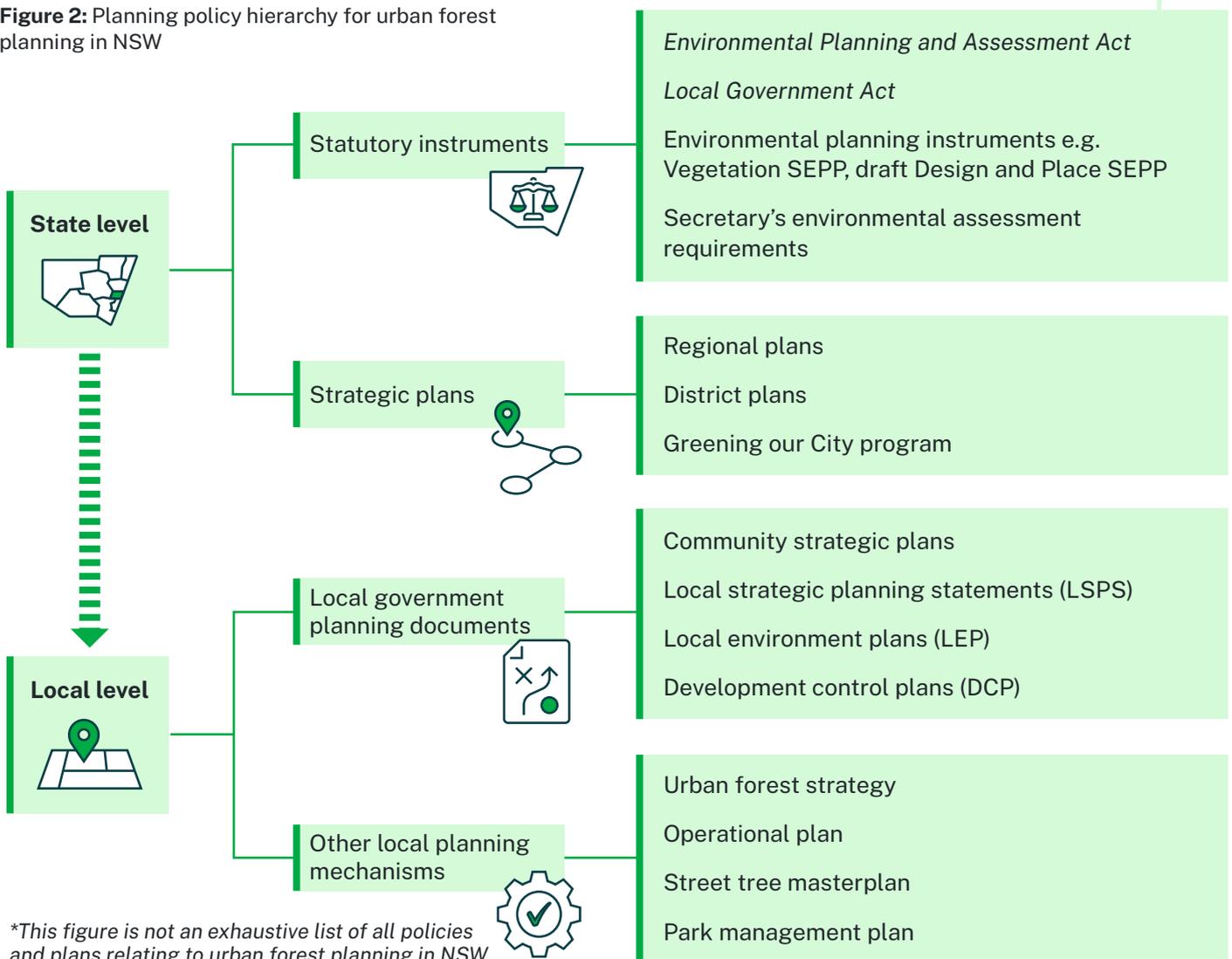
# Chapter 2: Strategic planning for urban forests

The development of urban forest strategies is not mandated in NSW, given the different operating contexts and past activity across councils. However, there is strong support for councils to develop, update and advance an urban forest strategy (or similar) to respond to and reflect the importance of the urban forest. This chapter outlines how urban forest strategies fit within the planning system and council's Integrated Planning and Reporting (IP&R) Framework.

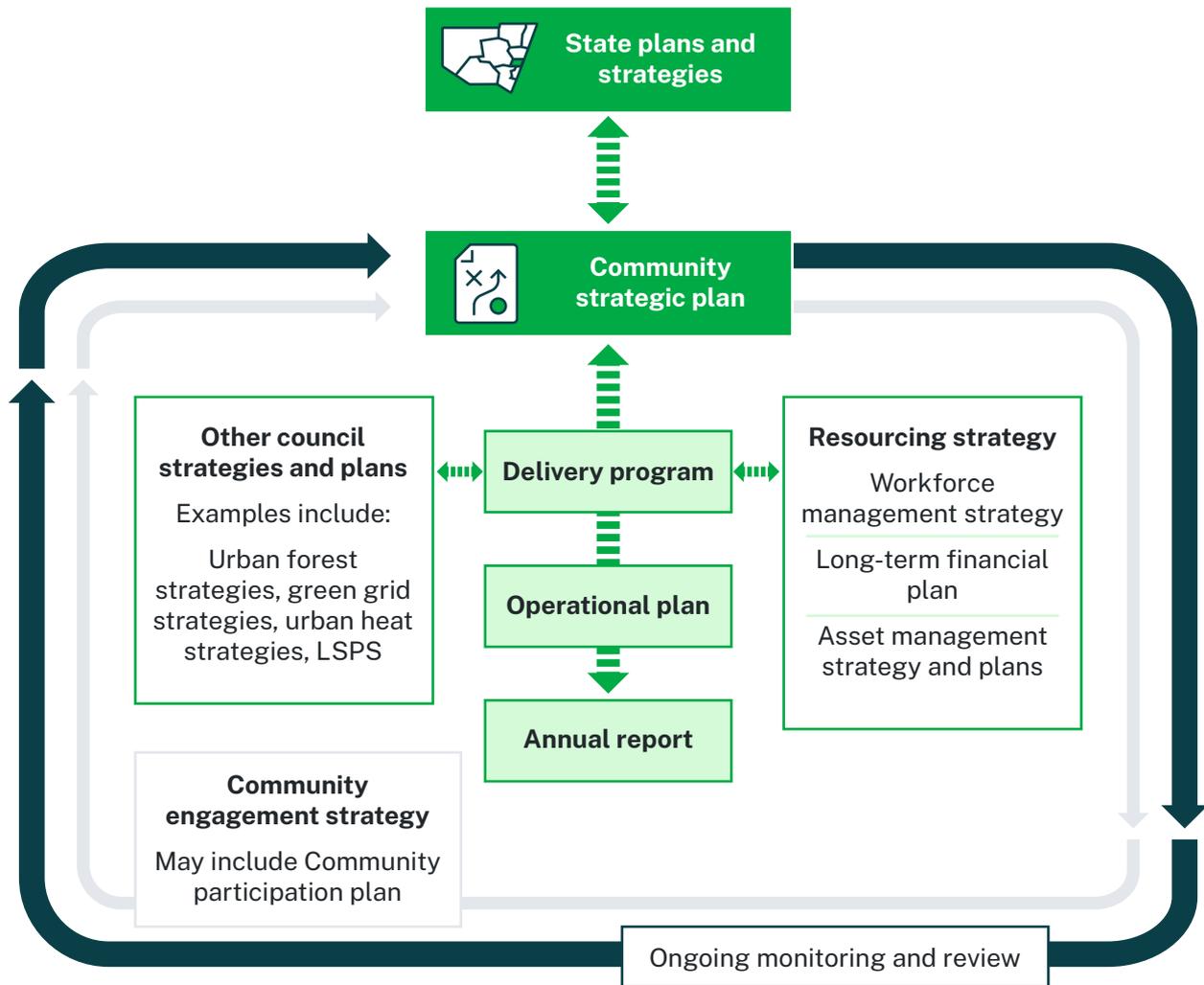
## 2.1 The NSW planning system

There are several key planning mechanisms that inform the management of urban forests in NSW (see Figure 2). These instruments and policies influence urban forest planning for local government.

**Figure 2:** Planning policy hierarchy for urban forest planning in NSW



**Figure 3:** IP&R Framework. Source: Office of Local Government (2021)



## 2.2 Local government strategic planning

When developing an urban forest strategy, you should work within your existing strategic planning framework (the IP&R Framework). This will ensure key planning priorities identified at the regional or district scale are connected to finer-grained planning at the local level. For example, a council’s urban forest strategy can provide local actions and targets to contribute to the NSW Government’s 40% canopy target.

All councils in NSW use the IP&R Framework to guide your planning and reporting activities. The requirements for the IP&R Framework are set out in the Local

Government Act 1993. Community strategic plans are required by all councils in NSW and link to state, regional and district priorities. The community strategic plan begins with the goals of communities and contains aspirations for the future (10 or more years) underpinned by a vision and strategic direction. The plan is implemented via an operational plan and delivery program. Urban forest strategies or other related strategies (that is, heat strategy, resilience plan) can be signalled in the community strategic plan and then form part of the delivery program.

See **Case study 2** for an example of Sutherland Shire Council placing canopy goals in its community strategic plan.

Figure 3 outlines the IP&R Framework, which includes:

- a suite of integrated plans that set out a vision, goals and strategic actions to achieve them
- a reporting structure to communicate progress to council and the community
- a structured timeline for review to ensure the goals and actions are still relevant
- an operational element that links actions to the strategic direction and vision.

**Chapter 3: Essential elements  
of an urban forest strategy**



# Chapter 3: Essential elements of an urban forest strategy

There is a great deal of variation in the urban forest strategies within Australia and throughout the world. Strategies vary according to the issues, needs and processes of each council. They are shaped by unique contextual features, as well as the capacity and resources available.

Despite this, there are 4 essential elements that successful urban forest strategies cover; these are listed at Figure 4. This chapter gives information about those 4 essential elements, including examples of what best practice looks like for each element and challenges you may face.

Figure 4: Essential elements of an urban forest strategy



## 3.1 Governance and leadership

How you manage your urban forest planning process will depend on the structures, policies, practices and culture of your organisation. It is essential to understand organisational capacity for governance and leadership and to design the approach to urban forest planning accordingly.

No matter what capacity exists in your organisation, there are several characteristics of good governance that can be applied to any project or program:

- **Take a long-term view** – For good governance and leadership, keep an eye on the future (even in situations where the project is short-term). Align urban forest work with the broader council vision, such as the community vision or LSPS. This way, you can identify measures of success and gain support from others who

have the same vision/strategic direction.

- **Base decisions on evidence** – Use the best available data to make decisions.
- **Collaborate** – It is crucial to work with champions and people internal or external to your organisation who share accountability, interest and knowledge in the urban forest.
- **Be transparent and accountable** – Ensure stakeholders can access information, see how decisions are being made and know who is responsible.
- **Communicate** – Keeping internal and external stakeholders and project partners informed and updated is crucial.

### Best practice

The capacity for a council to plan for and implement an urban forest strategy relies on:

- a clear vision for the urban forest and making sure time is put aside

to plan, engage, implement, and review this vision

- integrated operational service delivery and/or cross-organisational support for urban forest programs
- having urban forest champions (staff who are innovators, highly skilled, motivated and supported) from all levels of the organisation and within the community to help deliver a long-lasting and effective urban forest strategy
- a planned management process so an urban forest strategy is implemented through the delivery program and operational plan. This should have short, medium and long-term steps
- making sure resources (people, time and money) are put aside to implement and maintain the urban forest, and those involved have the authority to act
- stable but responsive governance that keeps up to date with the communities' needs for the urban forest.



## Barriers

Challenges to sound governance and leadership include:

- conflicts and a lack of connection between the urban forest strategy and other policies relating to urban heat, climate change, water management, urban ecology and biodiversity
- a culture of risk aversion, combined with sporadic and reactive management styles rather than a planned and adaptive approach
- poorly enforced regulation and controls, and a lack of compliance with targets set through strategies, LEPs and DCPs
- no clear processes for delivering the urban forest strategy.
- See **Case studies 6 and 7** for examples of how critical governance and leadership is to the success of urban forest planning.



## 3.2 Data and evidence

Data and evidence are the backbone of an urban forest strategy, and it is essential to gather as much relevant data as possible to inform the strategy.

Best practice requires having data on the tree population and other vegetation, and knowledge of changes over time. It also requires understanding of the benefits of trees and greening to the resilience and liveability of urban areas. This extends to having urban forest management informed by research and having ways of measuring success through engaging with local research and industry.

See **Chapter 5** and **Case studies 1, 3, 4, 5, 8 and 9** for more information about data and evidence.

### Best practice

Best practice in managing data and evidence includes:

- access to scientific data and policies on the urban forest that can be shared amongst departments and across institutions. This includes having the enabling infrastructure (such as computer software) and sufficient staff resourcing

- the ability to analyse data to understand and predict how the urban forest changes as a result of either climate change, natural changes or management changes
- a comprehensive tree inventory that is actively managed as a live database
- proactive and adaptive management and having the knowledge, ability and resources to 'pull the right levers' to keep the urban forest on the right track, in response to changes in data or evidence
- a comprehensive strategy for assessing and managing risks associated with urban trees that is understood and accepted by the organisation and broader community
- a learning culture linked with industry and local research activities that test the viability of new technologies or approaches to inform management practices and future strategies.

## Barriers

Barriers to best practice in gathering data and evidence of the urban forest can include:

- costs of tree inventories, mapping, data, and data maintenance
- lack of universal practice in traditional asset management, which includes environmental components (such as species biodiversity and ecology in the planning and design of the physical aspects of city spaces)
- lack of understanding of ecosystem service concepts and other aspects that are linked to the urban forest such as climate change, water and soils
- lack of resourcing and capability to analyse and monitor canopy change
- evolving nature of methods and approaches to measuring and reporting tree canopy over time.



### 3.3 Engagement

Most local government agencies have sound engagement policies and plans in place, and many have a team of specialists to assist with stakeholder engagement. All engagement needs to be well planned and should follow council policy.

The quality of the relationships and interactions with stakeholders will affect how well councils can deliver on the community's overall vision and any goal or target relating to the urban forest. To develop a successful engagement process, you need to understand the target audience.

The following are general principles to consider as part of any engagement.

**Clear** – have a clear outline, objectives and plan for the engagement

**Inclusive** – engage a diverse set of stakeholders and make it easy to participate

**Timely** – think about the right time to engage, and consider stakeholder fatigue

**Transparent** – keep communications open and honest and set clear expectations for all participants

**Respectful** – acknowledge and respect the local knowledge, expertise, perspective, and needs of stakeholders

**Open** – share information and knowledge widely to allow non-technical people to engage fully in the process

**Specific** – focus on clear topics that are well explained with clear communication; consider both people and place in engagement design.

### External engagement

Engaging with the community and wider stakeholders during urban forest planning can result in improved project outcomes, including:

- building urban forest awareness and support for the growth, retention, and management of trees and other associated vegetation
- the development of shared vision, local knowledge and values for the community
- greater participation through volunteer effort and diversified resources
- contribution of various landowners and managers in expanding greening efforts to private land
- creation of links with local networks to implement initiatives with low risk where projects are low-cost and small-scale.

Councils need to engage and have positive collaboration with key infrastructure agencies and providers such as Transport for NSW, Sydney Water, utilities and telecommunications providers.

#### Other potential allies include:

- your local government association
- state government departments
- First Nations groups
- bushland conservation groups
- carbon abatement or revegetation groups
- emergency services
- road services
- community gardeners
- schools
- outdoor recreation groups
- significant tree registries
- neighbouring council colleagues

## Internal engagement

The ongoing responsibility for the urban forest cannot be left to individual officers in tree or vegetation management roles. There are shared drivers, issues, and interventions across council, and as such a multi-disciplinary approach with shared responsibilities is required. There are a few key methods of engagement to adopt when engaging internal stakeholders:

- establish cross-council teams with staff who share responsibility for the urban forest (teams may or may not be formally recognised)
- identify champions at all levels to advocate and lead policy, programs and strategies
- establish lines of communication and a clear process for involvement and input.

## Best practice

Best-practice urban forest planning involves building trust and mutual understanding between relevant stakeholders and encouraging the community to take ownership for the urban forest within their area (Tawfik, 2016). Proactive approaches to stakeholder engagement include:

- ensuring engagement is continuous and accessible. Information needs to be presented in a variety of forms and at the right scale, while being aimed at key demographics within the local area
- allocating sufficient time and resources to follow through and deliver –don't over-promise and under-deliver, as this can erode trust
- developing a community engagement plan that has set targets and goals, and has mechanisms in place to assess whether these goals are being achieved
- involving the community as key decision-makers or stakeholders with an important role in the decision and ongoing management/success of the urban forest. That is, move away from formal planning processes that can be alienating for community-led initiatives (Coffey et al., 2020).

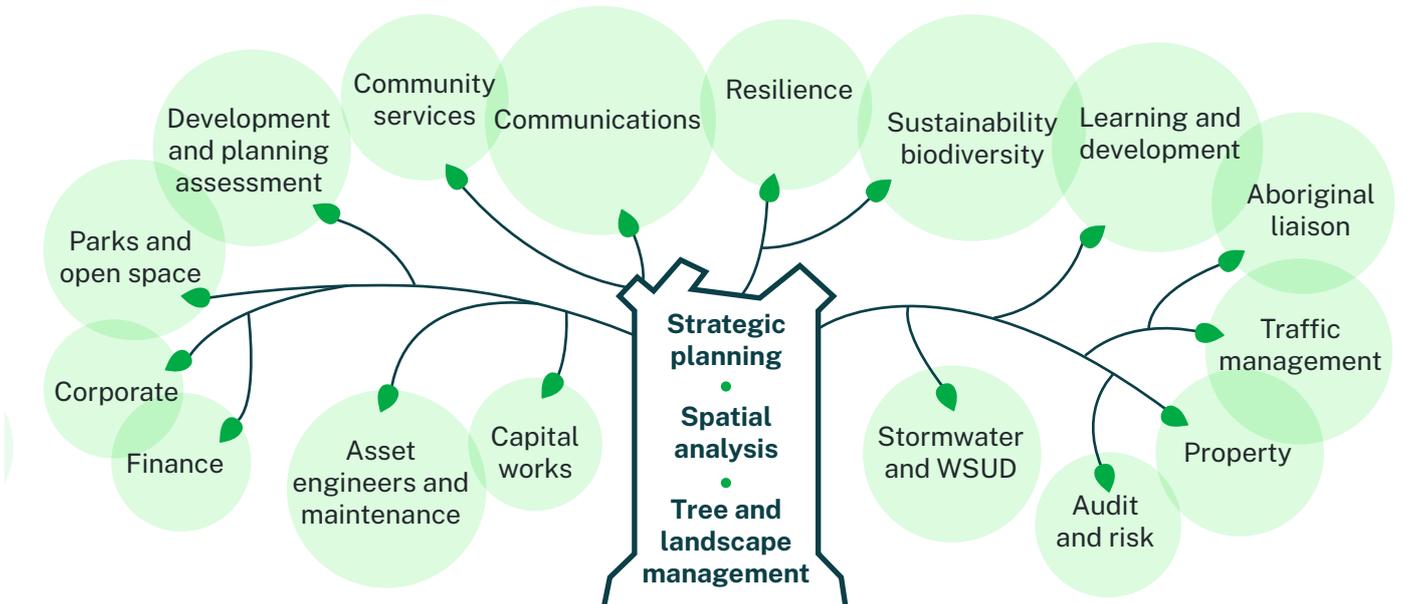
## Barriers

Long-term stakeholder support is essential for successful urban forest management. Some of the biggest barriers to gaining support and involvement in the urban forest are:

- a lack of skills in planning for engagement
- a lack of knowledge and understanding about the urban forest in the organisation and community
- negative experiences from past engagement programs or from past issues with urban trees, making the stakeholders less receptive to new initiatives
- inadequate notice of engagement, or too broad or narrow a scope, leaving stakeholders less engaged
- limited community awareness and understanding of the need for improved urban forest planning and greening outcomes.

See **Case studies 2 and 8** for information on how Sutherland Shire Council and the City of Melbourne have created initiatives to engage their communities in urban forestry and the success of early and continued engagement.

**Figure 5:** The many experts, teams and individuals who have a role to play in an urban forest strategy





### 3.4 Goals and targets

A comprehensive urban forest strategy will have specific goals and targets that align with the broader vision, and strategic aspirations of the council. Goals should be clear, focused and action-orientated to guide the planning, decision-making and management of urban forests.

Targets help identify milestones and actions that will assist councils meet your overarching strategic goals, as well as broader regional 'stretch' targets. Targets for minimising the loss of canopy on private land and increasing canopy on public land allow you to measure the effectiveness of actions. You can refine these in an adaptive management approach. Given the contextual differences of councils and the varying degrees of existing canopy cover, each council should adopt a target which is suitable for its community.

**Chapter 6** contains guidance about setting canopy targets for various scales of development. Some key considerations when setting targets are in Figure 6.

Remember the role of the urban forest in delivering quality of life, health and wellbeing, amenity, cooling, and habitat to urban areas. The urban forest strategy, while focused on the physical aspects of canopy, trees and greening, water, soils and ecology, should also consider opportunities to establish links to goals in other documents and programs such as community health, wellbeing and amenity (Figure 7).

Figure 6: What to consider when setting targets

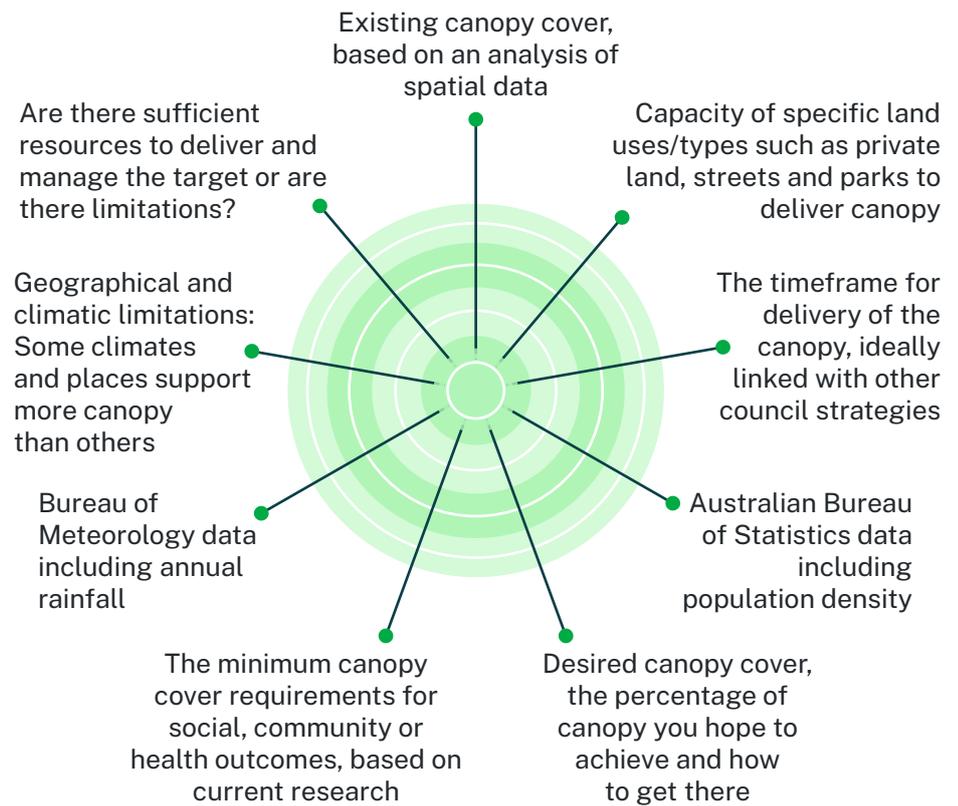
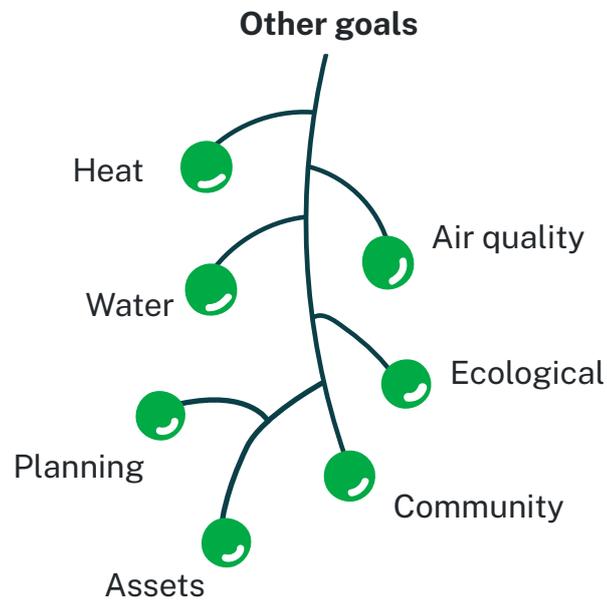


Figure 7: Examples of other goals or targets that relate to the urban forest strategy



## Best practice

Having clearly defined, specific goals and targets helps in achieving the aims of an urban forest strategy. Best-practice goals and targets for the urban forest include:

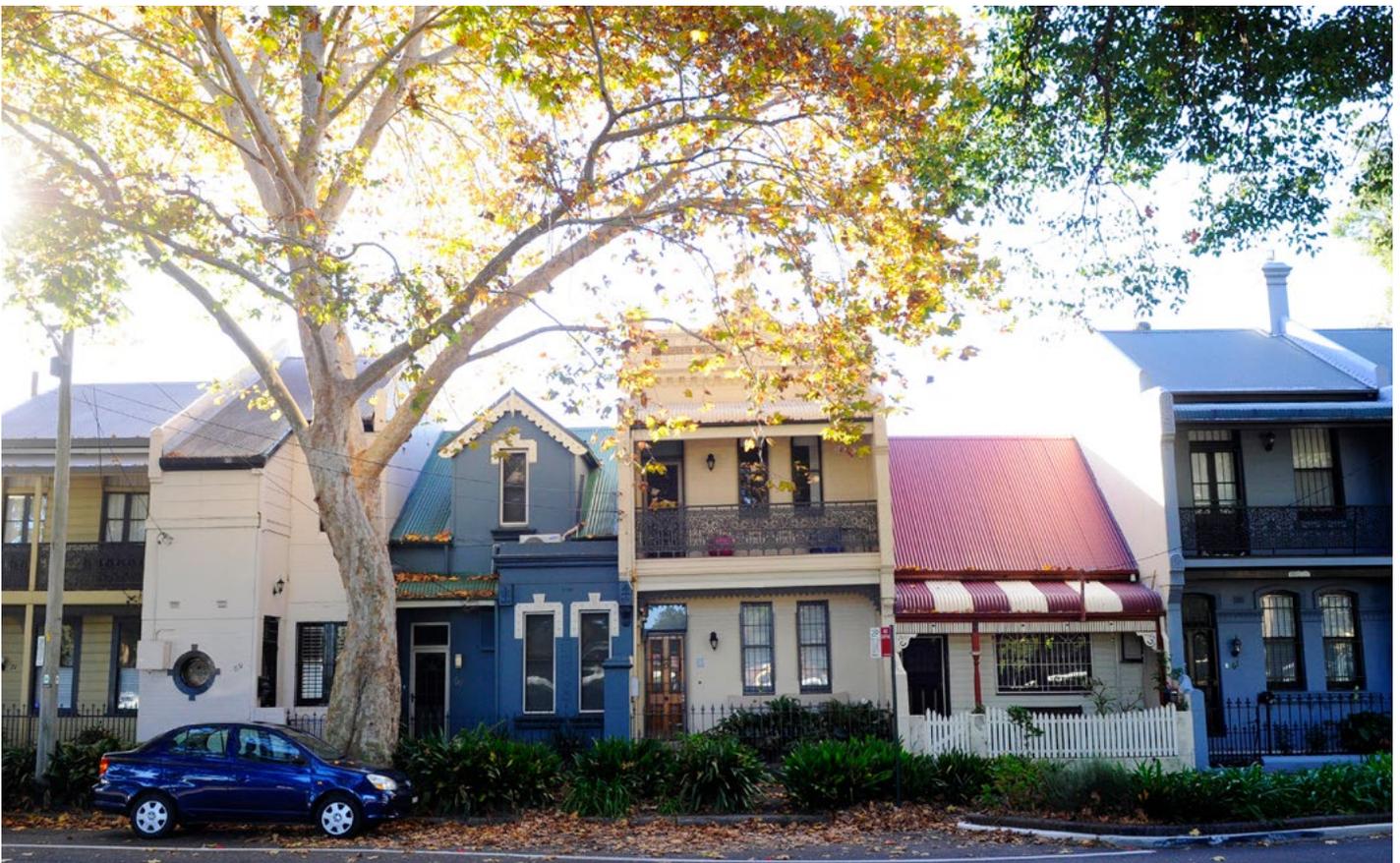
- considering the context, challenges and opportunities and the community that the goals and targets are for, and setting appropriate precinct or area-specific targets
- precinct or area-specific targets that consider the community context such as social data (culture, age, income), health and vulnerability data, additional environmental data (soil quality, air quality, stormwater quality, heat, rainfall) and risk
- setting specific targets that can be modified or adapted as new techniques or knowledge becomes available (Leff et al., 2016)
- setting goals that are ambitious and are based on recent research and evidence that demonstrate they are feasible and achievable. A set of actions or steps towards achievement should accompany goals
- setting diverse, multi-faceted targets and goals that capture all aspects of the urban forest (that is, canopy targets need to incorporate not just the quantity of canopy but also the quality of canopy)
- having urban forest targets and goals embedded in multiple documents and policies, as well as in standalone action plans and strategies. This spreads the workload of achieving the goals over multiple teams, increasing accountability and involvement
- identifying useful indicators of success for each of the targets
- adopting a simple evaluation program that can track progress over time while also identifying specific programs or projects to address underperforming areas.

## Barriers

Barriers to setting and achieving goals and targets for the urban forest include:

- inadequate datasets and/or information on canopy cover, age and species diversity
- using inappropriate or non-specific targets that do not consider local challenges
- political or community resistance to urban forestry projects or policies where the benefits of trees are poorly understood
- external influences impacting canopy on private and public land (for example, private land tree clearing, infrastructure development)
- setting inappropriate timeframes (too short or too long) to achieve the targets. This barrier can be compounded when not enough resources are allocated to achieve the targets.

See **Case studies 1 and 3** for examples of how councils are setting goals and targets to meet urban forest goals.



## Chapter 4: Developing an urban forest strategy



*Credit: Destination NSW*

# Chapter 4: Developing an urban forest strategy



## 4.1 Self-assessment checklist

To successfully develop an urban forest strategy, an understanding of council capacity is needed. The self-assessment checklist at **Appendix 2** is designed to help you understand your organisation's status for the 4 essential elements.

There are a series of questions to allow you to rate your council from 'absent' to 'beginning', 'intermediate' and 'advanced'. There is no final score. This process is designed to help you understand where your council is now, and the information and resources your council will need to progress its strategic planning.

This self-assessment checklist is ideally completed at the beginning of the process, but it can also be revisited at any time to allow for reassessment.

*Credit: Destination NSW*

## 4.2 A model process for strategy development

Figure 8 outlines a process for developing an urban forest strategy or other council strategy with canopy targets and actions. This process goes from the steps to take before developing a strategy, through to the implementation of the document, and embedding it into council's core business. It is a circular process with a monitoring and review element included.

### Step 1 – Understand organisational context, capacity and internal and external drivers

Assess organisational capacity to deliver improved tree canopy and urban greening outcomes. Understand the current state of internal and external drivers across the environmental, social and economic contexts. Gather and review relevant council plans and documents (for example, municipal strategic statement, recent annual report, open space plans, infrastructure strategies) to align with strategic priorities and consider drivers, benefits and barriers. See **Appendix 1** and **Section 3.1 Governance and leadership for more information**.

### Step 2 – Establish baseline of information and understand any gaps

Gather available data and evidence and understand information gaps. See **Section 3.2** and *Example strategic directions and actions* below for details.

### Step 3 – Communications and stakeholder engagement

Identify internal and external stakeholders and prepare a communications and engagement plan. Work with stakeholders to create a shared vision and narrative and build community awareness and ownership of the urban forest. **Section 3.3** and **Case studies 2 and 8** contain examples of how this can be done.

Figure 8: A model process for strategy development



### Step 4 – Draft a vision, narrative, and set goals

Envisage a future desired state and possible scenarios – draft the vision for the future over a longer timeframe such as 50 years. A vision should be an aspirational description of what the strategy would like to achieve in the future. Set goals for a shorter timeframe (for example, 10 years). **Section 3.4** and **Chapter 6** may assist here. The narrative is a common thread that:

- draws from history in your area
- speaks in a language familiar to the local community
- talks to the benefits of plants and trees, and about people and places (rather than explicitly or solely about trees)
- at its conclusion, results in the realisation of your vision for your council area.

### Step 5 – Describe the strategic direction and actions to achieve the vision

Linked to the vision and goals, describe the strategic direction to be taken to achieve the vision. Under each strategic direction list the actions. The actions need to describe how the outcomes will be achieved. See **Chapters 2 and 4**.

### Step 6 – Develop and adopt the strategy

Prepare the draft strategy, engage and seek feedback (including from the community if time and resources allow) and present the draft strategy to council for adoption. **Section 3.3** provides examples of best practice engagement and common barriers to inform this.

### Step 7 – Implement strategy

Strategies will be implemented by various council staff (for example, horticulturalists, open space staff, ecologists and biodiversity officers) with community collaboration. Prepare a detailed implementation plan that considers available funding and resourcing. Implementation plans should describe how, what and by whom activities will be carried out and when they will occur.

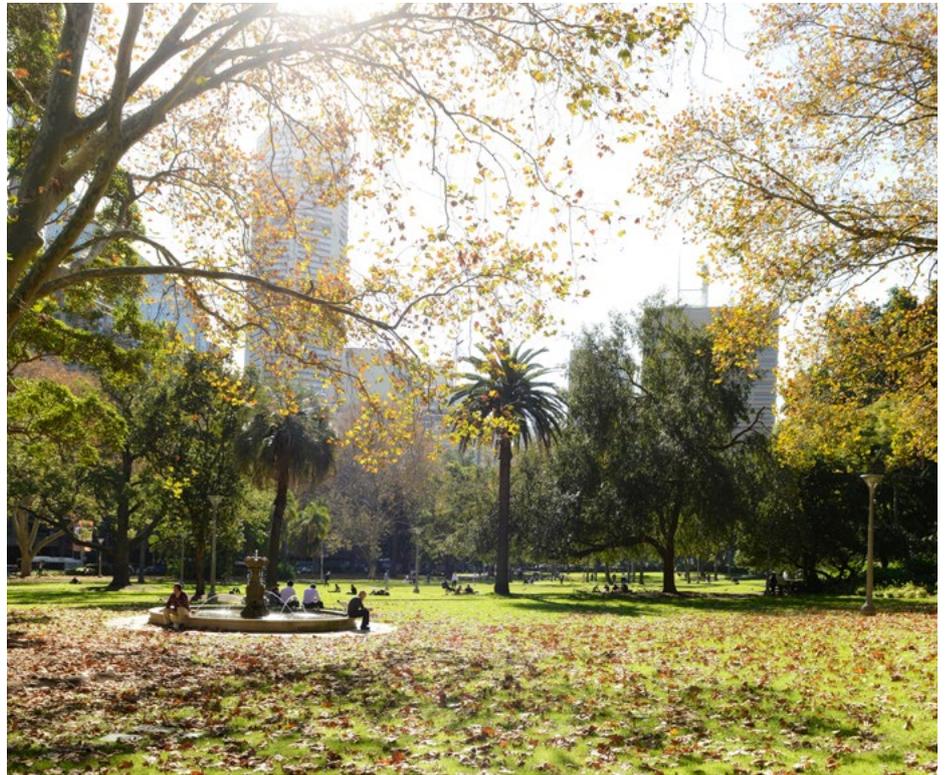
### Step 8 – Monitor, evaluate, report and review

Monitoring is essential for measuring implementation progress for a strategy. Monitoring allows for actions and plans to be adjusted over time. Plan for regular evaluation of whether actions are having their intended effect, and revision of the strategy to allow council to identify and make adjustments before issues develop.

## Strategic planning components

The vision, goals, strategic directions, and actions to be drafted as part of the urban forest strategy process (steps 4 and 5) are important parts of the urban forest planning process. They need to work together to prioritise and articulate the short, medium, and long-term approach to urban forest planning within a council.

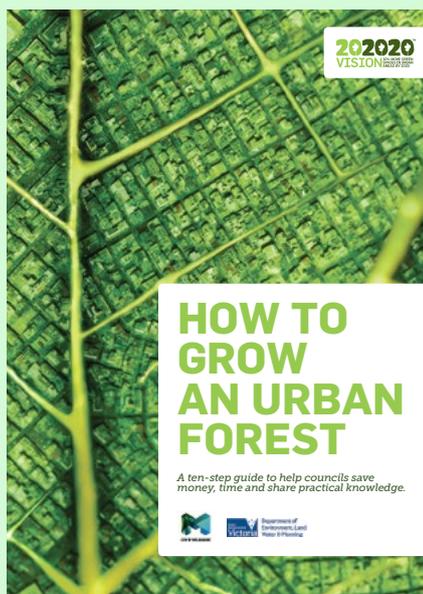
Once the vision and goals have been established, councils will be well placed to develop strategic directions and actions to meet the overall vision and goals. Figure 9 articulates the relationship between these strategic planning components for urban forestry.



**Figure 9:** The relationship between strategic planning components

		Timeframe
<b>Vision</b>	The vision is a statement about the desired state of the organisation, where you want to go. It should be achievable and not easily derailed by outside forces but should still be challenging and motivating with a clear direction for all those involved.	10 to 50 years
<b>Goals and targets</b>	Goal setting outlines for stakeholders the intended outcomes of the urban forest strategy and how success will be measured. They should be ambitious but achievable and based on evidence to gauge if the goals are feasible for the resources of the organisation.	Can match the vision or be shorter if the vision is very long-term
<b>Strategic directions</b>	The strategic directions establish the medium to long-term directions needed to achieve the vision and goals. They direct the performance of staff and teams in the short and medium-term and show the community what the council is planning to do to achieve the vision.	Shorter timeframe than the vision: 5 to 10 years or may be aligned to the delivery program
<b>Actions</b>	The actions are the operational, short-term or annual tasks you need to deliver to achieve the goals which have been set. Action plans should include tasks, costs, timeframes and responsible persons for each action and measures to evaluate progress.	Annual or up to 4 years

## Snapshot: Greener Spaces Better Places – *How to Grow an Urban Forest*



Greener Spaces Better Places (GSBP) has published [How to Grow an Urban Forest](#) as a 10-step activity-based workbook to creating an urban forest strategy that is applicable for all local government across Australia.

The workbook goes through a 10-step process to help councils easily navigate the urban forest planning process, with templates for each step (for example, templates for creating a vision and developing a community engagement plan). The City of Melbourne's Urban Forest Strategy guided the development of *How to Grow an Urban Forest*.

### **How does *How to Grow an Urban Forest* relate to this guide?**

The *How to Grow an Urban Forest* document is for local governments around Australia that are starting to develop an urban forest strategy. This guide is specific to NSW and contains detailed information that NSW councils can use to both create and inform an urban forest strategy. You could use the information in this guide when following the process and workbook in *How to Grow an Urban Forest Strategy*.

### **Example strategic directions and actions**

Strategic directions and actions included in an urban forest strategy should be specific to the context, and link to the goals and vision of the strategy. Below is a list of example strategic directions and actions that various councils across Australia have in place to meet the vision, goals and targets of urban forest strategies.

#### **Urban forest leadership and coordination**

- Develop sustainable funding mechanisms that will provide pathways for funding the cost of planting trees
- Develop an urban forest communications plan to increase the awareness of the benefits of tree canopy and urban forestry
- Develop a business case for an increase in council funding for implementing the urban forest strategy.

#### **Public land**

- Create or review and implement a street tree planning strategy/ master plan
- Identify opportunities for

increased tree planting in streets including kerbs, medians, roundabouts and nature strips.

- Develop tree-planting plans for major open spaces
- Create or review species lists, considering diversity and viability
- Develop an integrated water management plan to encourage the use of water-sensitive urban design and passive irrigation in streets and open spaces, as appropriate.

#### **Private land**

- Implement a free tree giveaway to encourage planting on private land
- Increase communications and media coverage about an LGA's urban forest
- Review LEPs and DCPs to provide guidance about permeable surfaces, floor space ratios, canopy targets, deep soil areas and the number of trees to be planted in those areas (see Chapter 6 for more information)
- Review internal process of conditioning development applications for tree and vegetation retention and removal

for existing developments.

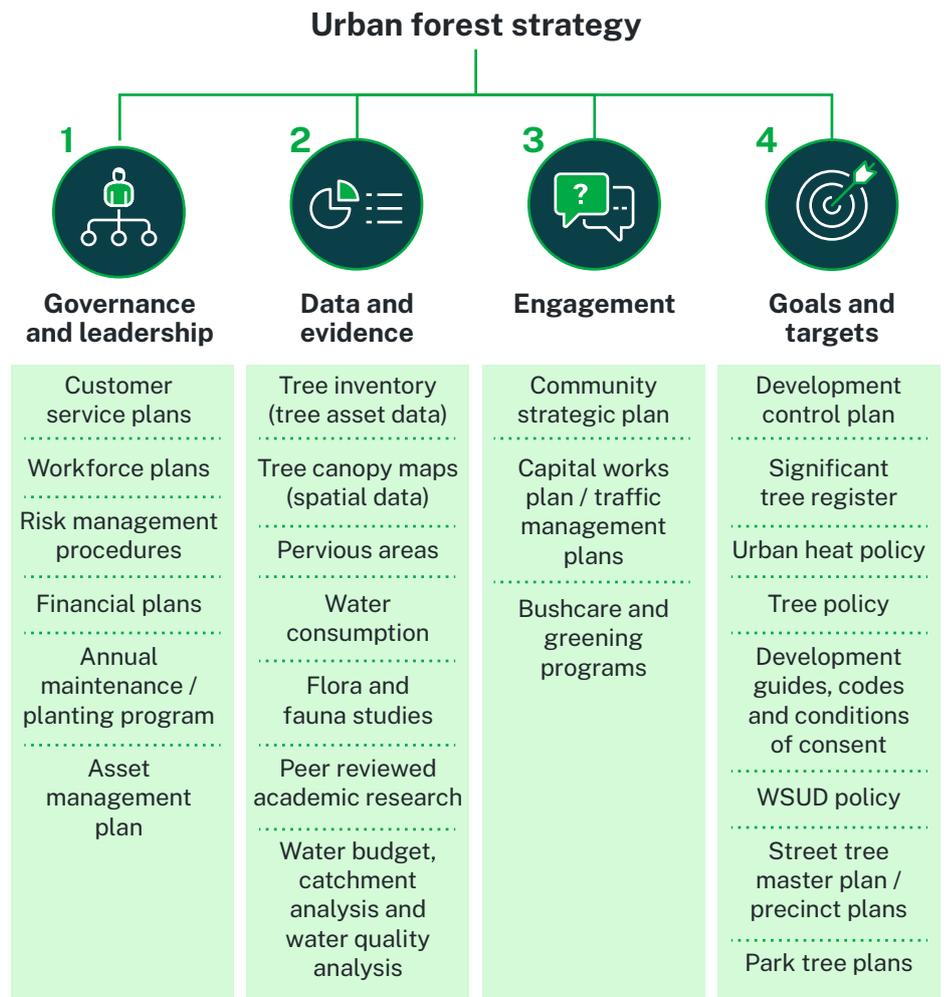
#### **Healthy urban forests**

- Undertake regular plantings across an LGA to reduce the risk of trees of a similar age dying at the same time
- Apply knowledge of what trees and associated vegetation need for healthy ecosystem functioning and adaptive management to ensure regeneration
- Consistently monitor, treat and evaluate threats and attack from pests and pathogens as part of the tree maintenance program.
- Enhance vegetation strata diversity through the planting of shrubs, ground covers and grasses where appropriate
- Select species that are robust and resilient to the potential effects of climate change and urbanisation
- Remove asphalt and concrete where possible and replace with pervious surfaces to encourage healthy root growth for larger trees.

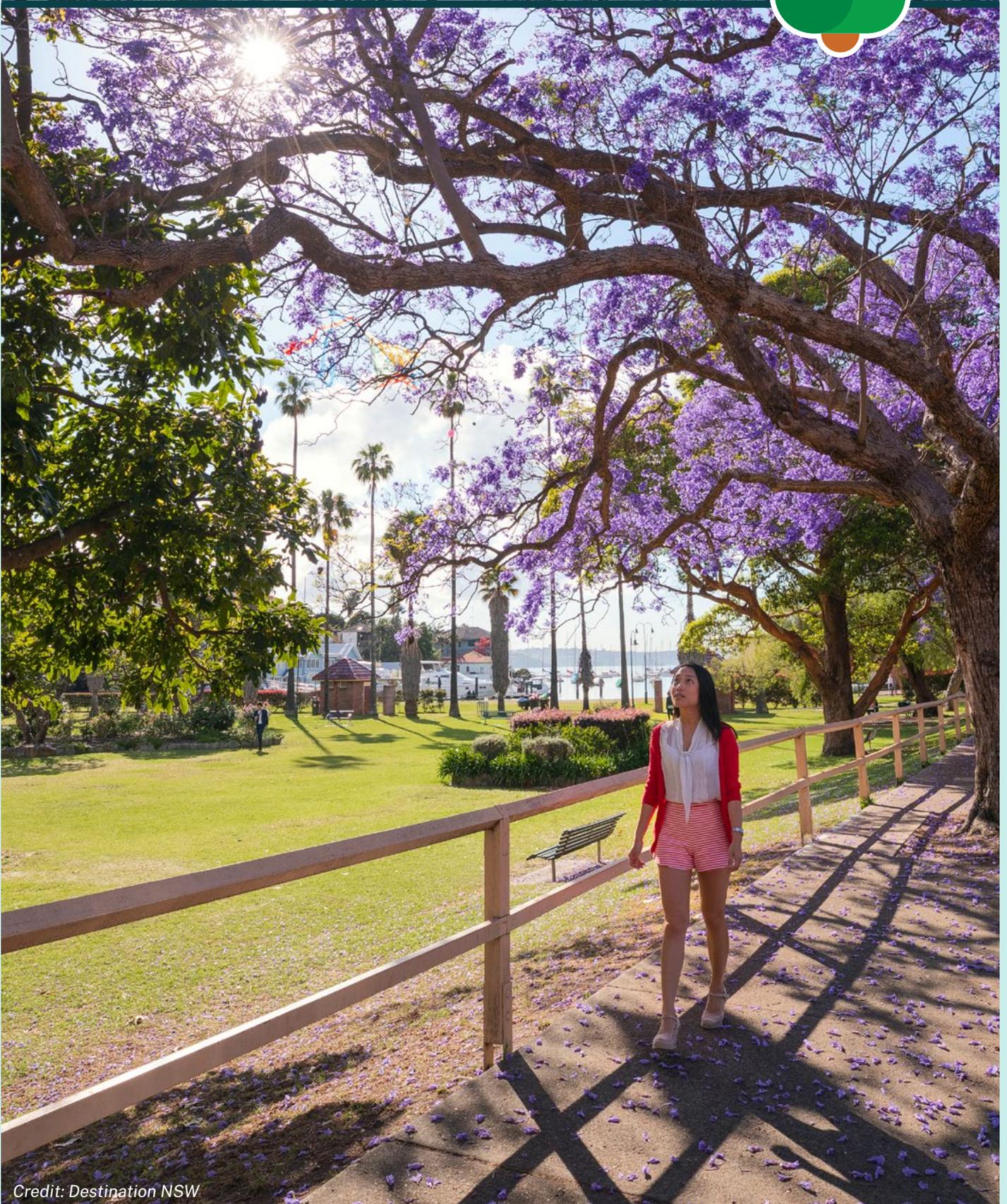
## 4.3 Key supporting documents

It is also important to understand the mid-level plans, policies, operational documents and programs that will support an urban forest strategy. Figure 10 is designed to promote thought about the outcomes of the strategy and the other documents or organisational policy that council may need or may need to update as a result of the urban forest strategy.

Figure 10: Key areas of work to support an urban forest strategy



## Chapter 5: Advanced data and evidence



*Credit: Destination NSW*

# Chapter 5:

## Advanced data and evidence

Measuring tree canopy is essential for establishing, updating, monitoring, and implementing urban forest strategies. It provides councils with an indication of tree canopy loss and gain. This chapter gives information on using data to measure tree canopy so you can advance your council's urban forest planning and management.

### 5.1 Measuring canopy cover

Measuring tree canopy gives councils an indication of the status of their urban forest and areas of loss and gain. It also helps councils prioritise and evaluate implementation activities. Maps and tables derived from data are important communication tools for councils' leaders and community, showing changes in canopy cover over time.

#### 5.1.1 Acquiring and analysing spatial data

Acquiring and analysing spatial data is the most common, cost-effective and efficient way to measure canopy. It provides information on the extent and distribution of canopy and is normally collected remotely (that is, not on the ground). Two common methods are used:

- aerial imagery – obtained from cameras mounted on an aircraft
- satellite imagery – collected by earth imaging satellites operated by governments and businesses.
- Table 1 compares aerial and satellite imagery.

Sensors can be combined with aerial and satellite sources to provide more insights. Sensors include:

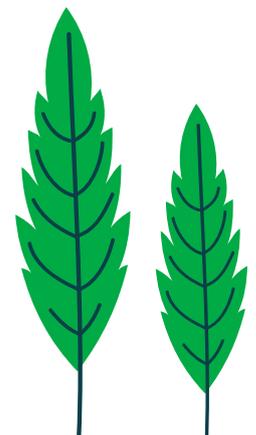
- multispectral and hyperspectral imagery will identify subtle changes for early detection of tree stress
- thermal imagery can be used to determine surface temperatures and to detect water stress
- LiDAR (Light Detection and Ranging) will capture all above ground features and translate them into a 3D image to model tree heights and canopy boundaries, enhancing the accuracy of the data.

Once imagery is acquired, analysis can be via:

- generating random sample points that allow you to estimate the canopy cover in a project area
- geographic information system technologies to calculate tree canopy over a specific area
- machine learning algorithms and artificial intelligence (Ai).

#### 5.1.2 An introduction to spatial data tools

For councils beginning their urban forest planning, spatial data can help establish and understand the baseline of canopy cover in an LGA – the starting point from which to maintain and enhance canopy. There are several easy-to-access spatial data tools, some are listed in Table 2.



**Table 1:** Comparing aerial and satellite imagery

Aerial imagery	Satellite imagery
<ul style="list-style-type: none"> <li>• Collected at relatively low altitudes compared to satellite imagery</li> <li>• Primarily used for visual interpretation as it has high spatial resolution</li> <li>• Pre-dates satellite imagery and therefore is a valuable source of historic landscape data</li> <li>• Tends to be lower cost (if bought off-the-shelf), easier to access and has higher spatial resolution</li> </ul>	<ul style="list-style-type: none"> <li>• Satellites have global coverage as they regularly orbit the earth revisiting the same area, making it easy to compare across years</li> <li>• Ability to obtain imagery from historic years</li> <li>• Very high-resolution satellite imagery falls within the mid to low range of digital aerial imagery resolution</li> </ul>

**Table 2: Spatial Data tools**



### **i-Tree Canopy**

- i-Tree Canopy is an open access, peer-reviewed, random point sampling tool from the United States Department of Agriculture (USDA) Forest Service.
- i-Tree Canopy produces an estimate of tree canopy coverage by extrapolating data from randomly selected points across a study area. The points are manually classified for their vegetation type (such as tree and grass).
- The accuracy of iTree Canopy can be affected by the ability of the user to classify each point and the number of points analysed (the more points analysed, the lower the standard of error).



### **Google Earth Pro**

- Google Earth Pro uses data to represent the Earth as a 3D globe. It displays satellite and aerial imagery, and layers of mappable data. It allows users to display third-party data, measure areas with circles and polygons and contains tools to create new data.
- Additional capabilities include importing Environmental Systems Research Institute (ESRI) shapefiles and MapInfo tab files.
- The resolution of Google Earth imagery depends on the data source and Google does not specify the resolution of imagery at different points. In general, the resolution is lower than NearMap or custom-acquired imagery.



### **Google Tree Canopy Lab**

- Google's Tree Canopy Lab combines artificial intelligence (Ai) and aerial imagery to help cities see their tree canopy cover.
- The imagery is analysed with 3D digital surface models to generate a vegetation probability model. Any values above a certain threshold are classified as tree canopy. The analysis includes near-infrared data, when available.
- Google is also equipping the Tree Canopy Lab with other layers to help users understand how heat and population density correlate with canopy cover.
- Tree Canopy Lab is not yet available in Australia; however, Google plans to expand it to hundreds of cities.



### **The department's urban vegetation data for Greater Sydney**

- The department has published urban vegetation spatial data on the SEED Portal in 2016 (Greater Sydney Region Urban Vegetation Cover to Modified Mesh Block) and 2019.
- The 2016 dataset uses high-resolution aerial imagery (0.2m). The 2019 dataset uses a combination of commercial Geoscape products for example, vegetation surface cover layer, tree height layer, at a 2m resolution for urban areas.
- For both 2016 and 2019, canopy cover (as a percentage of land area) has been determined in each Modified Mesh Block. This allows users to see canopy cover over blocks. The data is valuable for councils to analyse trends occurring on public and private land. See Figure X.
- The data also shows percentages of vegetation classes. Vegetation classes are defined as grass (less than 0.5 metres high), shrub (0.5 to 3 metres high) and trees/tree canopy (greater than 3 metres high).
- This data has limitations because it is not possible to access the raw imagery without the Modified Mesh Block overlay. This makes it difficult to analyse the canopy data at different scales for example, lot, standard instrument LEP zone.
- Modified mesh blocks vary in size after each census because they are based on a number of dwellings. This can make it difficult to undertake change analysis.



Credit: Destination NSW

## Snapshot – The department’s Greater Sydney urban vegetation data

### What is a Mesh Block?

Mesh Blocks are a geographic unit compiled by the Australian Bureau of Statistics (ABS). Mesh Blocks contain between 30 and 60 dwellings based on census data. Their size protects against disclosure of confidential information.

### What is a Modified Mesh Block?

A modified Mesh Block is a Mesh Block with roads and rail included. The roads and rail are mapped from the NSW Digital Cadastral Database in 2017.

Figure 11: MMB showing streets (left) and MMB showing properties (right)



Source: Western Australian Planning Commission’s Urban Tree Canopy Dashboard

### 5.1.3 Advanced spatial data tools

If a council has a well-developed strategy or canopy target(s), there are several tools available to advance their canopy spatial data, including those in Table 3.

Obtain data samples and accuracy statements when comparing providers. To be useful, council must be able to incorporate the data into its existing GIS (geographic information system) for viewing with other layers. The data must be comparable with existing historical data. Both weather and timing (to ensure seasonally matched surveys are used for change analysis) need to be considered. In change analysis, care is required to ensure that changes in tree canopy are attributed to actual gains and losses in tree canopy, as opposed to differences in the source data.

### 5.1.4 Analysing and displaying GIS data

There are various ways in which spatial data can be analysed and displayed (Table 4).

Most medium- and large-size councils should have resources within their GIS team to analyse canopy data in-house. Councils with limited in-house resources may need the help of consultants.



Table 3:

Data tool	Description
<b>Subscription-based commercial products such as NearMap, Geoscape, the Office of Planetary Observation or Orbica</b>	<ul style="list-style-type: none"> <li>Commercial providers deliver aerial imagery combined with Ai layers.</li> <li>The spatial data can be incorporated into a council's existing GIS system for layering with other data.</li> <li>These providers can also provide a catalogue of historical imagery which has been captured using the same method – useful for comparative analysis.</li> </ul>
<b>Custom-acquired satellite or aerial imagery</b>	<ul style="list-style-type: none"> <li>A custom acquisition allows a council to procure high-resolution satellite or aerial imagery specific for its LGA.</li> <li>Currently, high-resolution aerial imagery coupled with LiDAR is considered the most accurate method of spatial data for canopy assessments (USDA, Forest Service, 2019).</li> </ul>

Table 4:

Maturity	Options for analysis and display of data
Beginning	<ul style="list-style-type: none"> <li>Canopy cover measurement of the entire LGA as a percentage of the total area of the LGA</li> <li>Canopy cover measurement of the different suburbs and expressed as a percentage of the total area of each suburb</li> <li>Canopy cover measurement of private land and expressed as a percentage of the total private land</li> <li>Canopy cover measurement of public land and expressed as a percentage of the total public land</li> <li>Canopy cover measurement of parks and expressed as a percentage of the total parkland</li> <li>Canopy cover measurement of streets and expressed as a percentage of the total street area</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Canopy cover measurement of the different suburbs, differentiating between public and private land and expressed individually as a percentage of the total public and private land</li> <li>Canopy cover measurement of the different standard instrument land-use zone types of private land and expressed as a percentage of the total private land</li> <li>Canopy cover measurement of the different park types (that is, iconic, neighbourhood, pocket, civil, sports field, golf courses, natural areas/bushland) and expressed as a percentage of the total parkland</li> <li>Canopy cover measurement of different street types (that is, state, regional, local, laneway, other) and expressed as a percentage of the total street area</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>Stratified canopy map showing areas covered by canopy at different tree height ranges</li> <li>Unit analysis maps (that is, 100 m x 100 m) showing the spatial distribution of canopy percentage without the constraints of other geographies that have unequal area</li> <li>Change analysis maps showing the changing structure of the urban forest to help determine future management strategies</li> </ul>



### 5.1.5 Layering other data

Combining canopy spatial data with other datasets (for example, social, economic and health) helps councils explore the relationship between canopy and the community, determine planting priorities and set broader ecosystem and health goals. Table 5 contains resources for other data layers.

Two key datasets for layering with canopy data are:

- Heat Vulnerability Index (HVI). HVI data shows places where communities are more vulnerable to the adverse effects of urban heat. HVI uses indicators for exposure, sensitivity and adaptive capacity to calculate an overall heat vulnerability number between one and 5 (low to high vulnerability)
- Urban Heat Island (UHI). The UHI dataset measures the effects of urbanisation on land surface temperatures.

#### Other datasets which may be useful to analyse include:

- topographic maps
- land surface temperatures
- water catchment and flooding
- riparian areas
- transportation and walking routes
- overhead and underground utilities
- soils
- air quality
- schools and educational facilities

**Table 5:** Other data layers

Resource	Description
<a href="#">NSW Government Spatial Services</a>	Creates and maintains a spatial representation of the state and acts as a ‘single source of truth’ for foundation spatial information and survey infrastructure and services in NSW. The state’s <a href="#">urban vegetation</a> (including canopy), <a href="#">HVI</a> and <a href="#">UHI</a> datasets can be found here.
<a href="#">Socio-Economic Indexes for Areas</a>	Summary of a different subset of census variables and focuses on a different aspect of socio-economic advantage and disadvantage.
<a href="#">ABS Census Table Builder</a>	Allows the user to collate census data on a range of classifications for a given area, such as age, education, housing, income, transport, religion, ethnicity and occupation.

## Snapshot – City of Melbourne Urban Forest Visual

The City of Melbourne has compiled and now maintains the [Urban Forest Visual](#) website.

It is an interactive inventory, containing information on more than 70,000 trees in the city. The website contains information about age diversity, tree genus and a future planting program.

It also allows users to engage with some of the challenges facing the more than 70,000 trees. See Case study 8 for more information.

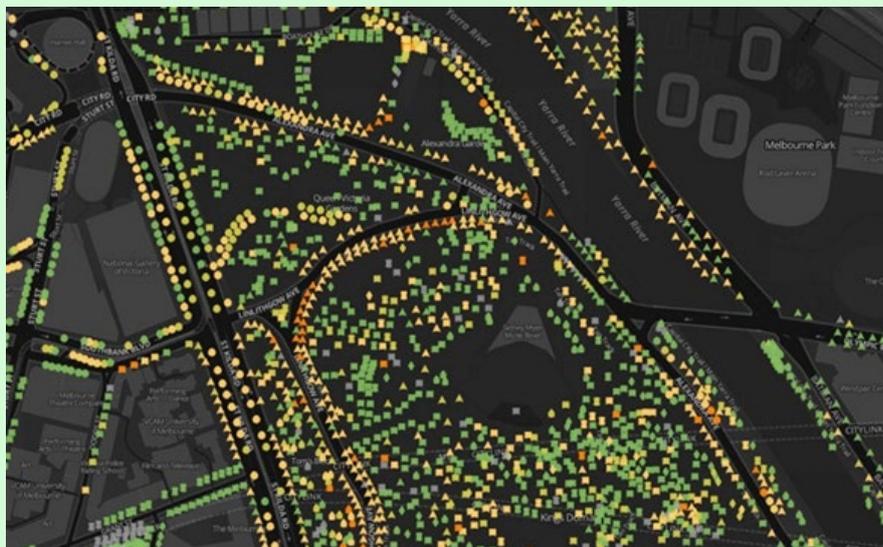


Figure 12: Image of the Urban Forest Visual. Source: City of Melbourne (2021)

## 5.2 Trees as assets

Tree asset data provides valuable information on the quality and quantity of the tree population.

Asset data can be used to:

- understand tree population characteristics and composition (that is, species, age and diversity)
- update asset information so that it can be easily integrated with councils' contractor systems
- assess and manage tree risk
- record tree failures to establish risk profiles
- increase efficiencies and determine resourcing and budgets
- assist with maintenance schedules and facilitate short and long-term planning
- calculate the monetary value of the tree population
- determine the impact of future climate and potential pest and disease outbreaks
- assign responsibility within council for maintenance and management.

Combining spatial data (canopy, land use, land surface temperature) and tree asset data, along with other data layers (such as social vulnerability index), helps to better understand the urban forest and its benefits and prioritise interventions.

### 5.2.1 Establishing a tree inventory

The establishment and management of a tree inventory is an important investment. Many councils will already have their public trees recorded within a tree inventory. If there are insufficient funds or resources to undertake and manage a complete inventory, a council could undertake a partial inventory for specific areas, for example key precincts. Councils should consider the following when developing a tree inventory:

- the end use of the data
- data ownership and availability
- a suitably qualified person(s) to undertake a tree assessment, for example council staff, level 5 arborist under the Australia

Qualification Framework (AQF) and persons with a Tree Risk Assessment Qualification (TRAQ)

- collection frequency
- data format and integration into a council's existing systems
- data text fields, for example large blocks of text should be avoided, and automated lookups should be used
- quality control measures to ensure the consistency and accuracy of the data
- the ability to export the data into programs that can display the data in appealing ways for decisions-makers and the community.

For information about the fields tree asset data should include, see Table 6.

There are many new subscription-based app platforms that make it easy to begin or build on existing inventories and integrate into other council systems. Examples include [TreePlotter](#), [Forestree](#) and [Konect](#).

**Table 6:** Fields that tree asset data should include

<b>Beginning</b>	Field	Benefits
	Tree location	<ul style="list-style-type: none"> <li>• Benefits</li> <li>• Provides GPS location based on Easting/Northing and longitude/latitude</li> <li>• Allows locations to be viewed in council’s existing GIS system</li> <li>• Primary consideration for tree-risk assessment</li> <li>• Allows analysis of tree population distribution</li> </ul>
	Botanical name	<ul style="list-style-type: none"> <li>• Informs maintenance programs</li> <li>• Helps with costing for maintenance, pruning and tree removals</li> <li>• Allows analysis of tree population characteristics and species diversity</li> </ul>
	Size	<ul style="list-style-type: none"> <li>• Informs maintenance programs</li> <li>• Helps with costing for maintenance, pruning and tree removals</li> <li>• Allows analysis of tree population characteristics</li> <li>• Informs tree-risk assessment</li> </ul>
	Health and structural condition	<ul style="list-style-type: none"> <li>• Informs maintenance programs</li> <li>• Allows analysis of tree population characteristics</li> <li>• Informs tree-risk assessment</li> </ul>
	Key actions (maintenance, further investigations, risk assessment)	<ul style="list-style-type: none"> <li>• Informs maintenance programs</li> <li>• Manages risk</li> </ul>
<b>Intermediate</b>	Field	Benefits
	Useful life expectancy or age class	<ul style="list-style-type: none"> <li>• Informs strategy and maintenance programs</li> <li>• Helps with costing for maintenance, pruning and tree removals</li> <li>• Allows analysis of tree population characteristics</li> </ul>
	Powerlines	<ul style="list-style-type: none"> <li>• Identifies unsuitable species under powerlines</li> <li>• Informs maintenance/upgrade programs (pruning, conversion to Aerial Bundles Cables or undergrounding)</li> </ul>
<b>Advanced</b>	Field	Benefits
	Verge type	<ul style="list-style-type: none"> <li>• Informs planting programs</li> <li>• Helps with master planning</li> <li>• Helps determine the actual capacity of an area to increase canopy</li> </ul>
	Vacant planting sites	<ul style="list-style-type: none"> <li>• Determines the actual capacity of an area to increase canopy</li> <li>• Prioritising tree planting</li> </ul>
	Photographs of each tree/defect	<ul style="list-style-type: none"> <li>• Provides a visual record of tree and street conditions at the time of the photograph</li> <li>• Helps determine the equipment required for pruning and the traffic control requirements</li> <li>• Demonstrates growth rates over time</li> </ul>
	Additional fields for tree valuation	<ul style="list-style-type: none"> <li>• Provides a quantifiable value of individual trees in the landscape and the urban forest as a whole</li> </ul>

**Chapter 6:**  
**Advanced goals and targets**



# Chapter 6: Advanced goals and targets



Setting realistic tree canopy targets is key to councils enhancing their urban forests. This chapter gives information on setting canopy targets so you can advance your council's urban forest planning and management.

Canopy targets establish clear milestones and council should develop a set of actions to meet those targets. Targets allow councils to prioritise the retention of existing trees and maximise opportunities for new planting. Having targets allows a council to measure the effect of actions and make adjustments.

When setting canopy targets, councils need to consider an LGA's physical attributes, capacity to plant, finances and community. Some councils will be able to set targets for their LGA, precincts and sites and others might set a target only for a key precinct or a specific development type. Data is a critical input to establishing targets (see **Chapter 5**).

The below sections contain:

- site and precinct canopy targets and planning controls, based on research and design testing the department commissioned
- methods for setting targets for different development scales (sites, precincts and LGAs).



## **Snapshot – Gallagher Studio's Urban Tree Canopy Targets and Development Controls Report**

The department commissioned Gallagher Studio and Studio Zanardo to develop urban tree canopy targets and planning controls to enhance urban canopy across NSW. The tree canopy targets and controls will inform the department's policy reform, including the draft Design and Place State Environmental Planning Policy (SEPP) and its guides.

This report:

- details the targets and planning controls
- outlines the method for establishing the targets
- contains examples of design solutions that can be used to achieve the targets.

The targets and controls (in Table 7, Table 8 and Table 9 below) account for metropolitan and regional NSW, as well as infill and greenfield areas. Many councils have already established targets for development types that are higher. The below targets are not intended to override higher local controls that reflect variations in character and local context.

## 6.1 Site targets

To enhance an LGA's urban forest, both public and private land must retain and plant new trees. Table 7 and Table 8 contain canopy targets to enhance canopy in open spaces and streets. Table 9 has canopy and deep soil targets, and tree-planting rates for canopy on private land. The benchmarks recognise that development types and site areas contribute to canopy cover differently. These tables are the recommendations of Gallagher Studio and Studio Zanardo – they are guidance for councils only and could inform strategic plans as well as DCPs.



### Public domain canopy targets

**Table 7:** Open space canopy targets

Land-use category	Minimum canopy target
Open spaces (< 5 ha) without sports courts and fields	Minimum 45% canopy cover
Open spaces (< 5 ha) with sports courts and fields	Minimum 45% canopy cover. Target only applies to areas outside the courts and fields. Where possible, the remaining area should exceed the 45% minimum to compensate for any reduced canopy
Regional open space	Determined on a case-by-case basis. At a minimum, proponents should demonstrate no-net loss of canopy and a contribution to strategic canopy targets.

**Table 8:** Street canopy targets

Land-use category	Minimum canopy target
<b>Existing residential streets</b>	
12 m – 20 m reserve* with overhead powerlines	Minimum 40% canopy cover
12 m – 20 m reserve* with underground powerlines	Minimum 50% canopy cover
<b>Existing industrial streets</b>	
20 m – 25 m reserve with overhead powerlines	Minimum 35% canopy cover
20 m – 25 m reserve with underground powerlines	Minimum 45% canopy cover
<b>New residential streets</b>	
12 m – 20 m reserve* with underground powerlines	Minimum 70% canopy cover
<b>New industrial streets</b>	
20 m – 25 m reserve* with underground powerlines	Minimum 60% canopy cover

\*Note: Targets exclude intersections and arterial roads. These street types are highly variable and subject to specific design standards, therefore canopy targets for these roads should be developed on a site-specific basis

## Private domain canopy targets



**Table 9:** Private land canopy targets

Development category	Tree canopy target (min % of site area)	Deep soil# target (min% of site area)	Tree-planting rate*
<b>Detached dwellings<sup>^</sup></b>			
Less than 300 m <sup>2</sup>	20%	20%	For every 200 m <sup>2</sup> of site area, or part thereof at least one small tree
300 m <sup>2</sup> – 600 m <sup>2</sup>	25%	25%	For every 250 m <sup>2</sup> of site area, or part thereof at least one medium tree
Greater than 600 m <sup>2</sup>	30%	30%	For every 350 m <sup>2</sup> of site area, or part thereof at least 2 medium trees or one large tree
<b>Attached dwellings<sup>^</sup></b>			
Less than 150 m <sup>2</sup>	15%	15%	At least one small tree
150 m <sup>2</sup> – 300 m <sup>2</sup>	20%	20%	For every 200 m <sup>2</sup> of site area, or part thereof at least one small tree
Greater than 300 m <sup>2</sup>	25%	25%	For every 225 m <sup>2</sup> of site area, or part thereof at least one medium tree
<b>Multi dwelling housing<sup>^</sup></b>			
Less than 1,000 m <sup>2</sup>	20%	20%	For every 300 m <sup>2</sup> of site area, or part thereof at least one medium tree
1,000m <sup>2</sup> –3,000 m <sup>2</sup>	25%	25%	For every 200 m <sup>2</sup> of site area, or part thereof at least one medium tree
Greater than 3,000 m <sup>2</sup>	30%	30%	For every 350 m <sup>2</sup> of site area, or part thereof at least 2 medium trees or one large tree
<b>Apartments</b>			
Less than 650 m <sup>2</sup>	15%	10%. Minimum 3 m dimension.	For every 350 m <sup>2</sup> of site area or part thereof, at least one small tree is to be planted in the deep soil area
650 m <sup>2</sup> – 1,500 m <sup>2</sup>	20%	15%. Minimum 3 m dimension.	For every 275 m <sup>2</sup> of site area or part thereof, at least one medium tree is to be planted in the deep soil area
1,500 m <sup>2</sup> – 3,000 m <sup>2</sup>	25%	20%. Minimum 3 m dimension with a wider contiguous portion that is a minimum 6 m wide and at least 25% of the minimum deep soil area.	For every 450 m <sup>2</sup> of site area or part thereof, at least 2 medium trees or one large tree is to be planted in the deep soil area
Greater than 3,000 m <sup>2</sup>	35%	25%. Minimum 3 m dimension, with a wider contiguous portion that is a minimum 6 m wide and at least 25% of the minimum deep soil area	For every 300 m <sup>2</sup> of site area or part thereof, at least one large or 2 medium trees are to be planted in the deep soil area

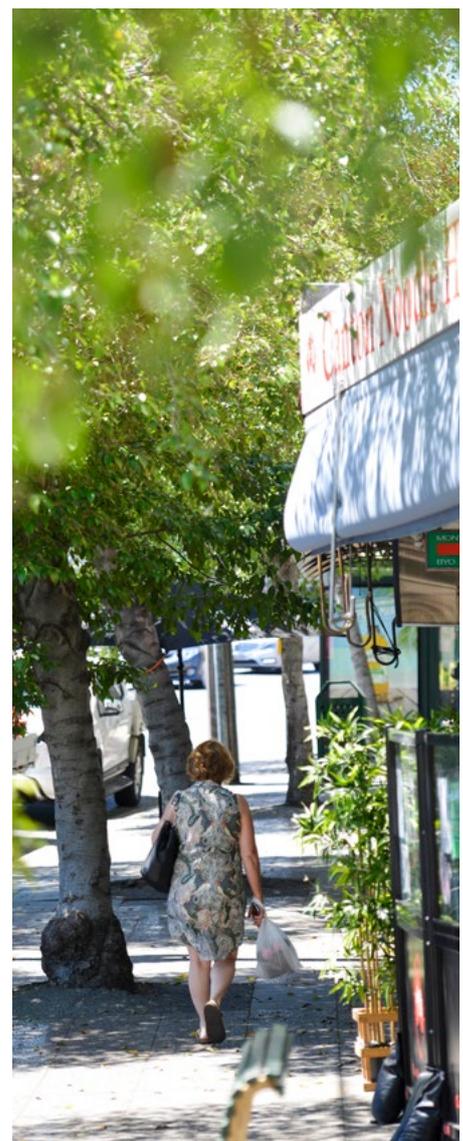
Development category	Tree canopy target (min % of site area)	Deep soil <sup>#</sup> target (min% of site area)	Tree-planting rate*
<b>Business parks</b>			
All lots	35%	25%	For every 300 m <sup>2</sup> of site area, at least 2 medium trees or one large tree
<b>Industrial</b>			
All lots	25%	15%	For every 400 m <sup>2</sup> of site area or part thereof, at least 2 medium trees or one large tree
<b>Bulky goods</b>			
All lots	25%	15%. Minimum 6 m dimension	For every 400 m <sup>2</sup> of site area or part thereof, at least 2 medium trees or one large tree
<b>On grade carparking park associated with above development categories</b>			
Development with 5 or more car spaces	One medium tree should be planted in every fifth car parking space provided. The tree is to be in a planted zone of 13 m <sup>2</sup> – the equivalent of a car parking bay area. Trees should be evenly distributed in a chequerboard fashion to increase shading.		

<sup>#</sup>Deep soil is critical to deliver effective urban tree canopy – without a sufficient deep soil area, canopy targets cannot be met. Deep soil could be included in an LEP, and as a subset of landscaped area. Deep soil reflects the same aspects of a landscaped area, but also requires a minimum surface area, and to be unimpeded above and below ground. See the Glossary for its definition.

\*The tree-planting rate: the number of trees that need to be planted within a deep soil area to achieve a set target. Tree size categories:

- Small tree – minimum 6 m mature canopy diameter
- Medium tree – minimum 8 m mature diameter
- Large tree – minimum 12 m mature diameter.

^ For these development types, the canopy and deep soil target are the same. In these situations, tree canopy will not cover the entire deep soil area. Proponents should meet the deep soil target as a priority and are encouraged to plant more trees than prescribed in the tree-planting rate, where possible.



### Snapshot – Woollahra Municipal Council floor space ratio and canopy controls

Woollahra Municipal Council, in collaboration with an urban forest consultant, developed controls to ensure that new low-density (R2 and R3) development contributes to Woollahra’s leafy character. Amendments to the Woollahra Local Environmental Plan (LEP) and DCP are proposed, including changes to its floor space ratio (0.5:1 from 0.55:1), a deep soil target (35% of site area) and canopy target (35%). See **Case study 3** for more information.

## 6.2 Precinct targets

Precincts are key areas for councils to set, deliver and enforce canopy targets because they are strategically identified for redevelopment and involve the public and private domain. When setting a precinct canopy target, councils should consider:

- opportunities to exceed the existing canopy baseline
- prioritising the retention of existing canopy
- the opportunities of each precinct for example, large areas of very steep topography may be able to accommodate significant tree canopy.

Figure 13 contains a method for councils to set a precinct target.

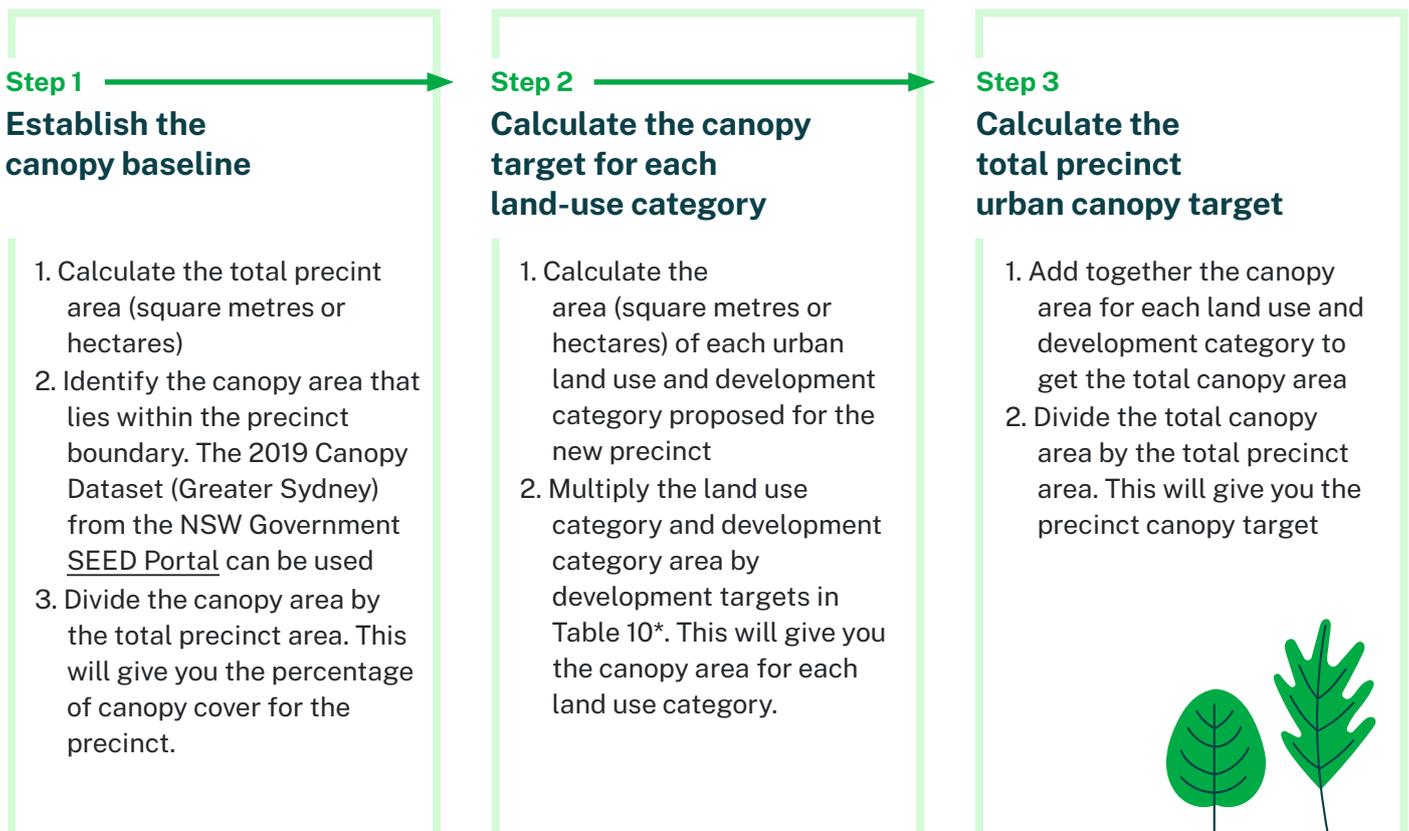
## Precinct targets (including streets)

**Table 10:** Precinct canopy targets (including streets)

Land-use category	Minimum canopy target
Residential-zoned land (R1, R2, R3, R4) including streets	40%
Industrial-zoned land (IN1, IN2) including streets	35%
Business-zoned land (B5, B6, B7) including streets	35%
Open space (RE1) including streets	45%
Unlisted land uses e.g. mixed-use zones (B4)	Use a site-specific analysis to determine the target

Note: It is not the intention of these targets to reduce or support the reduction of canopy cover

**Figure 13:** Method for developing a precinct canopy target



\*In the early stages of precinct planning, the street network and detailed development mix may be unknown. At this stage in the planning process, the targets in Table 10 can be used to set a precinct target. Once detailed designs have been developed for a site, the precinct target should be evaluated and confirmed using the street and private land targets at Table 8 and Table 9 in this guide.



Credit: Destination NSW

## 6.3 LGA targets

Setting a meaningful, realistic and context-specific canopy target for a whole LGA should be a goal for councils. An LGA-wide target can ensure the urban forest is managed as a system, help identify priority areas for tree retention and replenishment, and encourage decisions-makers and the community to support the actions needed to achieve the target.

Gallagher Studio and Studio Zanardo found that many canopy policies and plans in Australia and internationally contained aspirational targets, based on examples set by other councils or general benefits, with very few detailing the methods used to set those targets.

Some councils may not have the resources to set an LGA-wide target. In this case, setting targets for sites and precincts is an important first step.

For councils who have the data and support from internal and external stakeholders to set an LGA target,

there are some leading jurisdictions in Australia who have established methods, including:

- **City of Sydney** – modelled capacity for tree planting on streets, parks and properties, using a series of assumptions about the canopy cover that is achievable on each of those land uses. For example, the council grouped parks into 6 categories such as pocket and sports field and identified a canopy cover percentage that could be achieved in each category. This was used to determine an overall target for the entire park area of the LGA. See **Case studies 1 and 4**.
- The **Hobsons Bay City Council** has adopted an overall LGA target of 30%. It considers the unique features of the LGA, including the large proportion of industrial areas, parklands and conservation lands, including grasslands and wetlands. The 30% target is informed by canopy projections for

these prevalent land uses. The projections were drawn from existing canopy cover averages for various land uses in western Melbourne (Hurley et al., 2018), as well as examples for tree canopy in other Australian cities. For more information, refer to [Hobsons Bay City Council's Urban Forest Strategy](#).

- The **City of Gold Coast** has completed a strategy paper with suggested next steps to determine a canopy target. The existing canopy of streets and land zones was mapped. Case studies of each land use were used to determine potential canopy capacity. Draft canopy targets were developed for 'liveable streets' (50%), 'conservation corridors' (60%) and liveable neighbourhoods (30%). The authors note the next step would be to test these targets against actual capacity. For more information, refer to [City of Gold Coast's Urban Tree Canopy Study](#).

# Appendix 1: Case studies



Organisation	Reference	Case study	Urban forest strategy essential element(s)
1 City of Sydney	Karen Sweeney	Specific and achievable canopy targets	<ul style="list-style-type: none"> <li>• Data and evidence</li> <li>• Goals and targets</li> </ul>
2 Sutherland Shire Council	Katie Denoon and Michael Ryan	Community engagement	<ul style="list-style-type: none"> <li>• Engagement</li> </ul>
3 Woollahra Municipal Council	Deeksha Nathan and Andrew Simpson	Private tree canopy controls	<ul style="list-style-type: none"> <li>• Goals and targets</li> <li>• Data and evidence</li> </ul>
4 City of Sydney	Phillip Julian	Spatial analysis	<ul style="list-style-type: none"> <li>• Data and evidence</li> </ul>
5 Inner West Council	Gwilym Griffiths	Tree inventory and integration across other council assets	<ul style="list-style-type: none"> <li>• Data and evidence</li> </ul>
6 Penrith City Council	Paula Tomkins	Draft Green Grid Strategy	<ul style="list-style-type: none"> <li>• Governance and leadership</li> </ul>
7 Cambridge Massachusetts	David Lefcourt	Strategic planning approach	<ul style="list-style-type: none"> <li>• Governance and leadership</li> </ul>
8 City of Melbourne	David Callow and Marie Grenfell	Urban Forest Visual	<ul style="list-style-type: none"> <li>• Data and evidence</li> <li>• Engagement</li> </ul>
9 Moreland City Council	Cameron Schmelitschek	Tree Ledger	<ul style="list-style-type: none"> <li>• Data and evidence</li> </ul>



Credit: Destination NSW

## Case study 1: Specific and achievable canopy targets – City of Sydney

### How a council can model its capacity for tree canopy

**Overview:** In the process of setting targets for greening and canopy, all land within the City of Sydney local government boundary was considered and assessed, including public and private land, regardless of ownership or accessibility. The capacity and opportunity for greening and canopy was quantified and assessed at the scale of individual land parcels, using techniques specific to their land-use type.

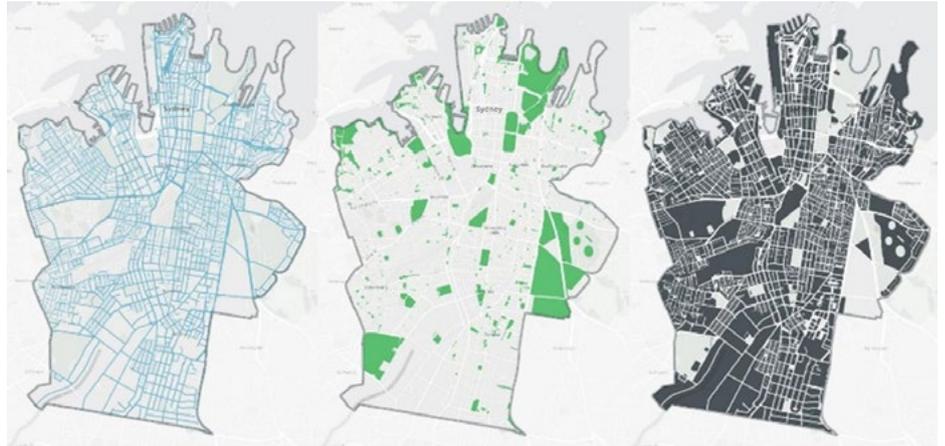
**Goal:** The City of Sydney has endeavoured to develop targets for greening and canopy that are ambitious, yet achievable and relative to the future opportunities provided by the land uses within their LGA. LGAs differ in their capacity to accommodate tree canopy and greening, and the relative proportions of streets, parks, and other built or open spaces to an LGA is a major influence on canopy capacity.

**Approach:** Overall targets for greening and canopy for the entire City of Sydney were produced as a sum of streets, parks, and properties.

**Streets:** The maximum potential total canopy area that could be achieved under real-world conditions for each street segment was calculated by modelling planting scenarios common in the City of Sydney – parking lanes, laneways and medians. The optimal mature size of tree suitable for planting in each street segment was determined.

Each individual street segment had a site-specific canopy target equal to its calculated capacity. Targets for green cover were recommended for each street type classification and aggregated to an overall target for the street network.

**Figure 14:** Maps of the City of Sydney streets (left), parks (middle), and property (right). A sum of these 3 land use areas is equal to the total City of Sydney land area.



**Park analysis and targets:** All parks were grouped into one of the following park types: iconic, neighbourhood, pocket, civic, sports field, or golf course. The target canopy cover percentages considered most appropriate for each park type were found and were applied to each individual park. This information was used to determine an overall target amount of canopy area and percentage canopy cover for the entire park land area of the city.

**Estimating private open space:** The unbuilt portion of each private land parcel was used to assess the potential for tree canopy. The potential canopy areas for each land parcel were grouped by zone to create targets for tree canopy cover and green cover for each private land use type.

The area of private open space required to accommodate trees was determined to be 20 m<sup>2</sup> to 25 m<sup>2</sup> for a small sized tree, 25 m<sup>2</sup> to 60 m<sup>2</sup> for a medium sized tree, and > 60 m<sup>2</sup> for a large-sized tree. Areas of private open space less than 20 m<sup>2</sup> were considered as inadequate spaces for any tree. Land parcels with more than 200 m<sup>2</sup> of open space were assigned multiple large trees.

**Key results:** The analysis highlighted sites that are over or under achieving and provided insight to drive site-specific projects and programs aimed at achieving targets (Figure 14). It also helped to highlight specific land where the removal of canopy would compromise the ability to achieve targets.

#### Challenges:

- Assumptions affecting accuracy:
  - any open space not occupied by a building is available for tree planting
  - tree canopy cannot overhang buildings
  - trees do not overhang.
- Age diversity – not all trees in the City of Sydney's streets are mature. Therefore, a diversity of tree ages needed to be factored into the analysis.
- Infrastructure impacts – low-voltage, multi-span overhead power lines reduce the potential of trees to grow canopy.

## Case study 2: Community engagement – Sutherland Shire Council

### How councils can better communicate with the community and stakeholders about urban forestry

**Overview:** Sutherland Shire Council has been on a 7-year community journey with various urban forestry-related projects, including their Green Streets initiative. Sutherland Shire Council has a vocal and passionate community and developed a communication plan as part of the initiative.

**Goal:** In its community strategic plan, Sutherland Shire Council is aiming for no net canopy loss. It has a snapshot of canopy cover data from 2014 to use as a baseline. Sutherland Shire Council has also developed a model for bringing back their locally indigenous tree canopy.

**Approach:** Sutherland Shire Council developed a communication plan outlining the key messages, the audience per precinct and how to reach them, communications milestones, and the frequency of information going out. Strong community support for tree planting helped to build political support, and in turn continued program funding.

The Community Consultation Interactive Map was a game-changer for Sutherland Shire Council's community engagement process, especially the way it captured and recorded community responses for action. The map is an easily accessible and user-friendly tool that enables residents to view the proposed trees around their property and neighbourhood. The tree icon expands to:

- illustrate images of the species
- a description of its characteristics
- a visual representation of the tree at planting, at 5 years and at maturity.

**Figure 15:** A screenshot from Sutherland Shire Council's Community Consultation Interactive Map



Residents can also submit an enquiry and request a call to discuss species, tree position, the program and their concerns. While they can view all trees, they can only submit an enquiry about the tree in their frontage.

**Key results:** In 2020, Sutherland Shire Council planted 3,000 trees as part of their tree renewal program. In addition, planting projects are slowly being elevated in priority from small-scale, low-resource programs with limited governance and no reform, to those with more strategic and executive level support and collaborative implementation.

**Challenges:** Sutherland Shire Council cite a lack of resourcing as the number one problem with its ability to implement no net loss of canopy cover.

Sutherland Shire Council also identifies competition for space in the public domain as a key challenge. Sutherland Shire Council identified the following as examples of where this occurs:

- Sutherland Shire Council's Footpath Program is sometimes at odds with canopy retention and future planting opportunities
- Ausgrid's electrical works drive selection of small to medium trees that ultimately have a smaller canopy at maturity
- Recreation and open public space such as sports fields surrounds can also conflict directly with canopy retention due to fences, training areas, lighting and access for maintenance machinery.

## Case study 3: Private tree canopy controls – Woollahra Municipal Council

### How councils can increase urban greening within low-density residential development

**Overview:** This project introduced floor space ratio (FSR) standards and urban greening provisions for low-density residential development in Woollahra Municipal Council. It was based on research and analysis of the built form and character of residential areas to ensure future built form aligns with the desired leafy character for Woollahra Municipal Council – a key priority in the Woollahra LSPS 2020.

**Goal:** The goal of the project was to develop a proposed suite of controls to ensure that the future built form aligns with the desired leafy character of low-density residential areas in the Woollahra LGA.

**Approach:** Woollahra Municipal Council undertook extensive site testing and research over a 5-year period, in collaboration with a consulting urban forester (Lyndal Plant). The site testing involved:

- selecting low-and medium-density residential developments across different residential precincts approved and constructed since March 2015
- determining if the approximate gross floor areas (GFA) and FSRs of the selected residential development were in accordance with the definitions of GFA and FSR in Woollahra LEP 2014
- examining if the residential developments were consistent with the desired future character of the precinct
- calculating the site coverage and deep soil landscaped area of the selected residential developments using the landscape and architectural plans submitted
- calculating tree canopy using the estimated crown spread of the proposed tree species (as per in the landscape plan submitted with development application) at maturity
- preparing an ‘improved’ tree canopy area for the selected sites by hypothetically locating canopy trees on the site, in a deep soil area, in accordance with best-practice guidance
- comparing the various ‘improved’ versions using 2 methods of calculation (see Figure 16).

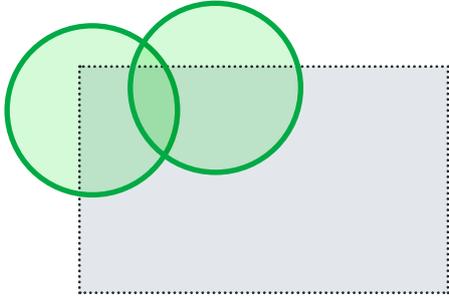
*Credit: Destination NSW*



**Figure 16:** The two methods used to calculate canopy cover

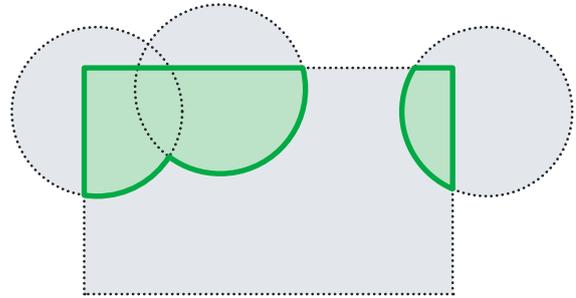
### Method A

The tree canopy area is measured from the overall extent of tree crowns of canopy trees planted on the site, and includes the area of the tree crown which extends beyond the subject.



### Method B

The tree canopy is measured from the overall extent of tree crowns of vegetation on the subject site, including neighbouring canopy that overhangs on the subject site. It excludes the tree crown which extends beyond the subject site.



**Key results:** In most cases, the site could accommodate more canopy trees than were approved in the landscape plans.

Woollahra Municipal Council proposed several amendments to the Woollahra LEP 2014 and Woollahra DCP 2015. For low-density residential development, a FSR standard of 0.5:1 that would accommodate a revised deep soil landscaped area control of 35% of site area was proposed. Thirty-five per cent deep soil could accommodate trees which had the capacity to achieve a 35% canopy coverage of sites.

Additional amendments to the Woollahra LEP have been proposed to accommodate Woollahra Municipal Council's aspiration to enhance urban greening. This includes new aims, zone objectives and a new local provision to conserve and enhance urban greening in residential zones. New definitions and objectives for urban greening are also proposed in the Woollahra DCP.

On 15 October 2020, the Woollahra Local Planning Panel (Woollahra LPP) advised council that it supports, in principle, the proposed suite of controls. After considering the advice of the Woollahra LPP, on 23 November 2020, council resolved to submit the amended planning proposal for Gateway Determination, which will allow public exhibition of the proposal.

**Challenges:** Woollahra Municipal Council's challenges included:

- landholders' concerns about the potential impact of canopy trees on views and solar access
- developing the definition of 'tree canopy area' for the Woollahra DCP and whether tree canopy area should include overhangs of public trees and adjacent trees to the site
- access to mapping data was another – Woollahra Municipal Council used the 2016 SEED data, which did not allow Woollahra Municipal Council to segregate individual trees by canopy size.

## Case study 4: Spatial analysis – City of Sydney

### How councils can assess urban forests in discreet packages while acknowledging forest continuity

**Overview:** Urban foresters use boundaries to identify and measure the trees that they manage. However, management issues such as diversity, resilience and equitable access extend across these boundaries. Canopy cover is a common feature for inclusion in urban forest strategies. The granularity of canopy data has improved and many councils now analyse it at the lot scale.

City of Sydney has gone further and created a new 'Urban Tapestry' method, which operates at a 100 m grid scale.

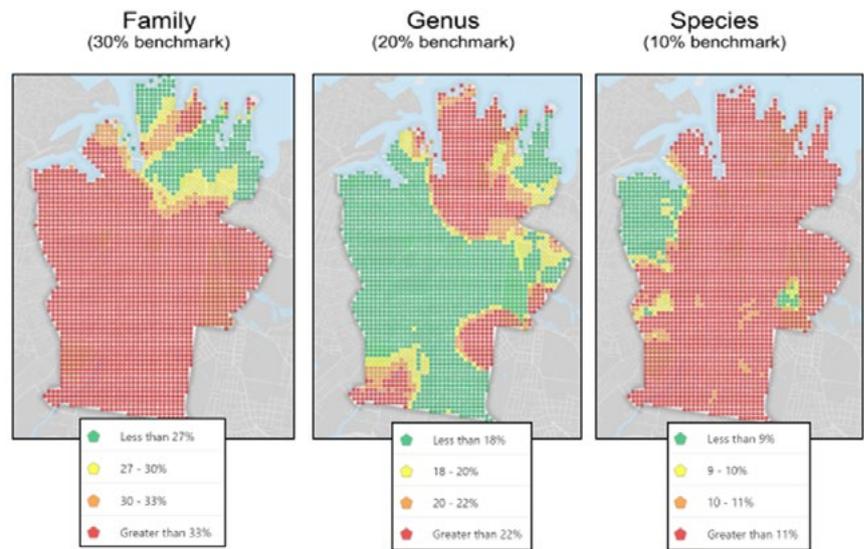
**Goal:** The Urban Tapestry approach allows the user to assess the urban forest at a customisable scale, beyond a hard boundary.

**Approach:** A grid of uniformly placed points (100 m x 100 m) is laid over a given area. A buffer radius is drawn around each point, and summary statistics are created for the area enclosed within the buffer. Buffer size and distance between points can be adjusted to match the analysis need.

**Key results:** The Urban Tapestry method allowed the City of Sydney flexibility to analyse data in several ways:

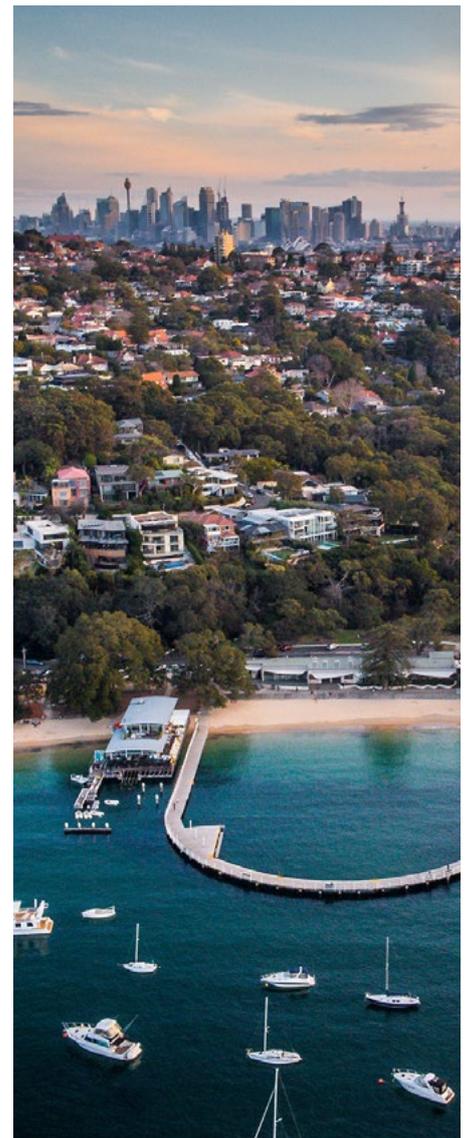
- Assessing the percentage of the LGA with access to a certain canopy cover, within a defined buffer. For example, the City of Sydney used a 1.6 km buffer to assess the percentage of its community living within 1.6 km of 30% green space – an ideal canopy cover and buffer for health benefits (Astell-Burt, Feng, 2021).

**Figure 17:** Tree diversity in City of Sydney LGA, produced using the Urban Tapestry Method. Source: City of Sydney (2021)



- Canopy cover for urban heat mitigation was calculated using the canopy cover at 100 m grid scale for 2008, 2013 and 2019. At this block-sized scale, the urban tapestry approach was used to identify city 'blocks' that had experienced canopy cover change over time.
- City of Sydney uses the common tree diversity target of no more than 10% of a single species, no more than 20% of a single genus, and no more than 30% of a single family. Points with 800 m buffers were assessed against this diversity benchmark, to identify areas exceeding the benchmarks and those falling short (see Figure 17).

**Challenges:** The Urban Tapestry approach requires the right canopy spatial data and GIS (geographic information systems) resources to analyse it.



Credit: Destination NSW

## Case study 5: Integration of trees with other council assets – Inner West Council

### How councils can build relationships and processes to protect trees and integrate design with grey infrastructure

**Overview:** Before the development of its first Street Tree Masterplan (2014), Marrickville Council (now amalgamated into Inner West Council) had an annual budget of \$50,000 per year for all tree planning management and maintenance. With an increasing population and density and ongoing conflicts between trees and hard infrastructure, changes to tree management were necessary.

A tree management role was created, and the first tree inventory completed. This single action resulted in the development of an entire public tree management program that significantly improved urban forestry.

**Goal:** Gather evidence about the trees as assets to:

- improve the organisation's knowledge and evidence of the urban forest
- work closely with the asset management teams to change the sentiment about trees and plan more appropriately for their protection and inclusion in the streetscape. For example, Inner West Council integrated tree works and footpath replacements into a single project
- demonstrate a new way of managing the conflicts between trees and infrastructure, including planning for large trees in tight urban spaces.

**Approach:** A report on best-practice tree management was prepared for senior managers. It presented an argument for changes to tree management and recommended a budget allocation to complete the council's first tree inventory. Following the completion of the



inventory, a business case was presented to complete a detailed Street Tree Masterplan.

The Street Tree Masterplan divided Marrickville into precincts and detailed:

- each street tree, its species, attributes (such as age, health and height) and the physical conditions affecting growth
- planting priorities.

Once the masterplan was complete, staff were in a strong position to take clear evidence and information to the asset teams and to work with them on the design of streets, replacement of footpaths and the provision of improved planting conditions across the LGA.

**Key results:** One of the biggest achievements was embedding better proactive tree planning and maintenance approaches. These core programs were integrated with transitional asset management planning design and delivery. Additionally, tree planting programs increased, and council was planting between 500 to 600 trees a year with a budget of \$150,000 per year for urban forestry.

By building better relationships with asset planning design and delivery staff, council could demonstrate better urban forestry and innovation, including:

- delivering in-road street trees using structural soils in an inner-city street in Enmore
- adjusting footpath design to accommodate significantly wider and deeper tree pits and verge gardens in all replacement programs
- developing a resident verge garden program to encourage residents to take ownership and maintenance of the verge and to increase permeable surfaces for water-sensitive urban design
- maintaining a live database and registering tree assets in the council asset register.

**Challenges:** The major challenges were:

- understanding how to pitch the change to council
- limited budget
- lack of data and evidence
- political differences
- silos – absence of interdepartmental communication.

## Case study 6: Penrith City Council's Green Grid Strategy

### How we can embed canopy targets and goals in council's other strategies

**Overview:** In 2021, Penrith City Council prepared a Green Grid Strategy (the Strategy) as part of a new strategic framework being developed to provide direction for future growth in Penrith. The Strategy balances positive social, economic, ecological and recreational outcomes.

The strategy identifies and addresses challenges which are unique to Penrith, including how to increase canopy to reduce urban heat and retrofit solutions to older suburban areas, as well as those undergoing urban renewal.

Once implemented, the green grid will help keep the city cool, encourage healthy lifestyles, support walking and cycling, provide better access to open spaces, enhance biodiversity and tree canopy cover and support ecological resilience.

**Goal:** To develop an LGA-wide plan to support the creation of cool and green neighbourhoods and active transport by connecting schools, public transport and town centres to green infrastructure such as green spaces, parks, waterways and bushland.

**Approach:** The NSW Government's Metropolitan Greenspace Program funded the development of the Penrith Green Grid Strategy to improve access to open space and increase liveability in Penrith.

The Strategy builds on the Government Architect NSW's Sydney Green Grid. The Strategy provides a spatial framework and series of projects and actions to guide the creation of a network

of high-quality open spaces on public land in the next 10–20 years, connecting the growing community to green infrastructure.

To identify the relative priority of green grid projects, Penrith City Council used a matrix to assess projects against 8 values including urban heat mitigation, recreational space and connections and future growth areas. The highest scoring projects are those that have the capacity to deliver the greatest benefits to the community.

Several priority projects were selected, based on their score, complexity, relevance, and overall benefits, and were further developed with a concept plan and visualisation. Precedence was placed on the creation of contiguous corridors of open public space and urban tree canopy that will mitigate urban heat and manage flows of stormwater to create liveable and sustainable communities.

**Key results:** The Penrith Green Grid Strategy was publicly exhibited in the third quarter of 2021. It builds on existing strategic work already undertaken by council including the Resilient Penrith Action Plan, Cooling the City Strategy, Sport and Recreation Strategy, and Street and Park Tree Management Plan.

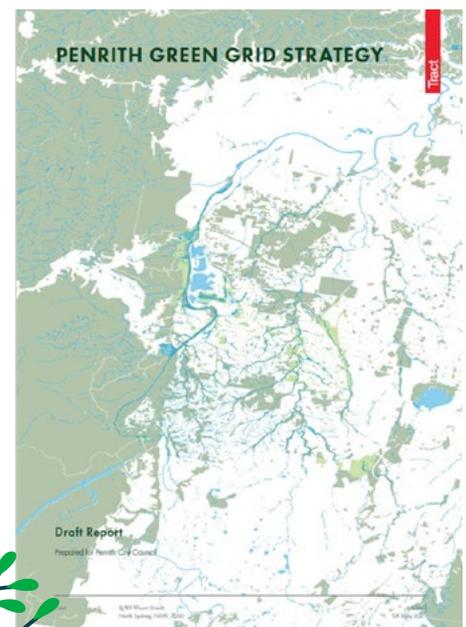
The Strategy clearly identifies priorities, outcomes and actions in an implementation plan that will be embedded in council's future delivery program to ensure delivery over the short, medium and long term. The Strategy provides baseline canopy data for the urban areas of the local government area that will form the basis for monitoring of canopy cover

over time and identifies a short to medium term action to develop centre specific canopy targets for the centres undergoing the most change such as Penrith and St Marys.

**Challenges:** The challenges associated with implementing the Strategy include ongoing funding for delivery of the identified projects, valuing green infrastructure as an asset and effectively managing site specific constraints such as overhead powerlines, contamination and drainage infrastructure.

State government assistance will be important in implementing the Strategy over time. In particular, the Strategy includes actions to advocate to State government for increased tree canopy in infrastructure projects and the bundling and co-sharing of in ground utilities in common easements to provide more room for tree planting.

Penrith Green Grid Strategy



## Case study 7: Strategic planning approach – City of Cambridge Massachusetts



City of Cambridge, Massachusetts USA

### How strategic planning has allowed for expansion of urban forest management in Cambridge MA

**Overview:** Although there has always been support for the trees in Cambridge, urban forest management is still evolving. Trees are not evenly distributed throughout the City of Cambridge's neighbourhoods, and canopy cover ranges from 13% to 39%. Areas with more closely spaced buildings, more paved areas, less green space and fewer trees are more likely to suffer from heat extremes. Many of these neighbourhoods are also home to people most vulnerable to heat stress – those with lower incomes, minorities and the elderly.

**Goal:** Reverse the tree canopy loss occurring in the City of Cambridge through the development of an Urban Forest Master Plan (UFMP). Since 2009, Cambridge has lost the equivalent of 86 soccer fields of tree canopy. If this trend continues, an additional 107 fields will be lost by 2030.

**Approach:** The council set up an Urban Forest Master Plan Task Force with residents and other key stakeholders to develop the UFMP. The role of the task force was to provide local perspectives, feedback and suggestions.

**Key results:** Before the development of the UFMP, operational tree planting and maintenance was contracted out. Since the development of the UFMP, Cambridge has built a tree nursery at its municipal golf course and has funding to grow its urban forestry team. This is an outcome that the tree warden ties to having the task force.

The task force is still operating, despite finalising the UFMP. It provides ongoing community input into strategic action, which the tree warden finds valuable. The tree warden is confident that if they or some of the team left tomorrow, the City of Cambridge would continue to maintain and strengthen its urban forestry goals. This is a legacy of the master planning process, which through its collaboration via the task force, built a deeper understanding across community and council.

**Challenges:** The City of Cambridge experienced 2 key challenges for urban forest management:

- Resourcing - the tree warden was solely responsible for urban forest management until the creation of the Urban Forestry Master Plan. The team has since tripled.
- Awareness of the benefits of trees - initially, there was a lack of awareness throughout council about creating a healthy urban forest. For example, the use of air spading (a tool for sensitively removing soil from the base of a tree) in management was previously unheard of and considered too costly. After over a decade of communication and working collaboratively, the tree warden has managed to normalise the practice among contractors and engineers.

## Case study 8: Urban Forest Visual – City of Melbourne

### How information about the urban forest can be made clear and visually engaging for stakeholders and community members

**Overview:** Melbourne's city trees are a defining part of the City of Melbourne. Its parks, gardens, green spaces and tree-lined streets contribute enormously to the liveability of the city. However, years of drought and extreme heat have left public trees vulnerable and facing decline.

Building long-term engagement with community has been identified as a vital component of successful management of the urban forest. The creation of the Urban Forest Visual has allowed users to engage with some of the challenges facing more than 70,000 trees in the City of Melbourne.

**Goal:** The aim was to show trees as a resource through data visualisation and encourage the community to recognise the value of trees and assets and invest in their health.

**Approach:** After a scoping phase with the urban forest team, it was decided to focus on a public interactive map that could be part of the public consultation workshops. The Urban Forest Visual is based on its entire tree inventory, using a colour range to indicate life expectancy or health. The approach involved workshops and online input.

**Key results:** The tool is nearly 10 years old and is still used by the community. All data is available on the open data platform. The Urban Forest Visual has been instrumental in getting political buy-in for addressing tree losses in heritage landscapes and other important sites. The data highlighted the need for succession planning and the need for action by council.



A commonality of spatial data between the tool and other City of Melbourne data allows council to layer data for strategic planning and decision-making.

**Challenges:** A key challenge that the City of Melbourne faced was different attitudes towards trees. For example, the tree that an ecologist loves may be the same tree that arborists find hard to manage. The visual map and a greater understanding of the benefits of trees helped to overcome this.

**Figure 18:** Online communication tools developed by the City of Melbourne to engage the community in urban tree management



## Case study 9: Tree Ledger – Moreland City Council, Victoria

### How an older tree inventory can be updated with newer technologies to better inform urban forest management

**Overview:** Moreland City Council had a tree inventory but there was no practice of updating and management. At a time when the inventory hadn't been updated for 5 years, Resilient Melbourne's canopy analysis showed different canopy figures to those available to council. This highlighted a need for improved data. Council engaged Player Piano Data Analytics to create a Tree Ledger, to update and add to Moreland's tree inventory.

**Goal:** To update and significantly improve the quality and storage of data to allow for monitoring of urban forest aspects at a much finer scale.

**Approach:** Council investigated different technologies available, including LiDAR, satellite imagery, and aerial imagery. Ultimately, Player Piano was used for its sophisticated canopy mapping products, and ability to work with the aerial imagery that was available for the last 10 years on Moreland's urban forest.

Out of this research work, they reached a few decisions about data and tools to manage information:

1. a platform called TreePlotter, which keeps track of every tree that gets planted and every tree that is removed
2. Tree Ledger, which identifies and tracks a tree over time - allowing council to track growth and model future potential to give much better projections for canopy in years to come.

**Key results:** There has been significant improvement in knowledge and tools to support tree-management decisions. The data is updated every 2 years to track canopy change. Council has integrated the Tree Ledger with its inventory data to give a richer data source. That is, council can determine the location and species of each tree, as well as its growth rate and life expectancy.

The more granular imagery and analysis pinpointed that canopy loss was occurring on private land, particularly new development. In part informed by this canopy information, strategic planning has been initiated to set a minimum

area for planting trees within development ([Moreland Planning Scheme's Amendment C189](#)). The new data also highlighted losses in canopy previously unquantified. For example, when townhouses are built, public street trees are often removed for driveways.

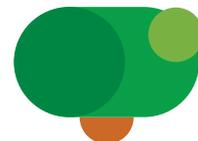
#### Challenges:

- New development - Moreland has one of Melbourne's highest rates of infill development, particularly through the transformation of larger blocks into townhouses. This process removes private tree canopy, as well as adjacent street tree canopy. Even with a finer-scale monitoring and understanding of tree canopy cover, the challenges of maintaining (let alone growing canopy cover), are very real. The development is earmarked for large parts of the council area, but there still a few pockets where it won't be, and those areas are getting greener.
- Tree canopy cover is the sole focus for urban heat mitigation in Moreland, as it is perceived as the most cost-effective option. This has not been thoroughly tested. There are still barriers to implementing best-practice, such as passive irrigation for tree maintenance is shown to reduce the amount of stormwater run-off and irrigate street trees.

Extract from the Moreland Tree Ledger.



# Appendix 2: Self-assessment checklist



## Appendix 2: Self assessment checklist

This self-assessment checklist is designed to help you understand your organisation's status for the 4 essential elements of strategically planning for urban forests.

There are a series of questions to allow you to rate your council from 'absent' to 'beginning', 'intermediate' and 'advanced'. There is no final score. This process is

designed to help you understand where your council is now, and the information and resources your council will need to progress its strategic planning.

This self-assessment checklist is ideally completed at the beginning of the process, but it can also be revisited at any time to allow for reassessment.

**Table 11:** Self-assessment checklist

Element	Advanced	Intermediate	Beginning	Absent
 <p>Governance and leadership</p>	<p>A learning and innovation culture exists and is supported by formal policy and day-to-day behaviours. There are performance plans in place that support collaboration and integration.</p>	<p>Sound approaches to innovation and learning in some areas, but not evident in others. There is some formal policy, but it is not evident in all day-to-day behaviours. There are some teams with performance plans that support collaboration and integration.</p>	<p>Champions who support innovation and learning exist but there is little formal policy support, an innovation/learning culture is not evident in day-to-day behaviours. There are no teams with performance plans that support collaborative or integrated approaches.</p>	<p>There are no formal or informal policies or performance management actions for innovation or learning, collaboration and integration and no evidence of this in day-to-day behaviours.</p>
 <p>Data and evidence</p>	<p>There is a wealth of data and information available across disciplines and the organisation.</p>	<p>There are some good urban forest data but no data on water, soils and ecology to support a full urban forest strategy.</p>	<p>There are small amounts of data to support one aspect of urban forestry.</p>	<p>There is no data or information collated around urban forestry.</p>
 <p>Engagement</p>	<p>There is a strong track record of successful engagement processes and participatory decision-making for complex urban issues. There is in-house, expert support for engagement of stakeholders.</p>	<p>There are sound engagement practices occurring across council and there is in-house, expert support for engagement of stakeholders.</p>	<p>There is a small team of in-house engagement support and some examples of sound engagement.</p>	<p>There is no in-house engagement support and no experience in engagement of stakeholders.</p>
 <p>Goals and targets</p>	<p>Clear drivers exist which are formal and well described for both public and private land. Relevant statements are included in the community strategic plan (CSP) and local strategic planning statement (LSPS). There are corresponding objectives in the delivery program (DP), operational plans (OP) and budgets of several teams across council. Senior managers are driving better practice and participate at key stages in decision-making and planning.</p>	<p>Clear drivers exist but are largely informal and not well understood. Relevant statements are included in the CSP and LSPS. There are corresponding objectives in the DP, OP and budget but not across all teams. Senior managers support better practice and the planning and decision-making processes in some areas.</p>	<p>Drivers exist but they are not formally adopted and undefined. Relevant statements are included in the CSP and LSPS. There are no real corresponding objectives in the DP and OP and limited resources for urban forestry. There are some champions in senior roles but no focus on better practice and involvement of senior managers.</p>	<p>There are no clear drivers. There are no strong statements in the CSP or LSPS that support an urban forest approach. There may be some potential champions in senior roles, but they are not evident in the most relevant teams.</p>



**Table 12:** Self-assessment checklist – Governance and leadership

How would you rate your organisation's current status in these areas?	Advanced	Intermediate	Beginning	Absent
<b>Learning and innovation culture</b>				
Have you partnered with other teams on urban forestry related projects?				
Do you have reliable and dedicated resourcing to support learning and innovation in urban forestry?				
<b>Policy and strategy</b>				
Do plans relevant and supportive of the urban forest exist in your council and can an urban forest strategy be aligned with or linked to these?				
Is there policy covering both public and private land urban forestry measures?				
Is there a commitment to a healthy urban forest as part of the organisational identity?				
<b>Leadership and capacity</b>				
Are there champions of urban forestry in your council?				
Are there champions of urban forestry in your council in leadership or influential positions?				
How much influence do these champions exert in key projects and initiatives?				
Is there awareness throughout council about the benefits of trees and creating a healthy urban forest?				
<b>Collaboration and integration</b>				
Are interdisciplinary or cross-council collaborations regularly seen or initiated?				
Is the public engaged (informed, consulted, involved, empowered) on urban forestry decisions?				
Where internal partnerships exist, how effective are these?				
Are there contacts and partnerships with research organisations?				
Is the process for acquiring resources clear/ established?				



**Table 13:** Self-assessment checklist – Data and evidence

How would you rate your organisation's current status in these areas?	Advanced	Intermediate	Beginning	Absent
How developed are the technical urban forestry and analysis skills within your team relative to other activities within your council?				
How developed are the technical urban forestry and analysis skills within other teams in your council?				
How well developed are processes for dealing with gaps in skills and knowledge?				
<b>What collection stage is your organisation at for these urban forest datasets?</b>				
Spatial				
Tree assets				
Heat				
Vulnerability (e. g. SEIFA, HVI)				
Water availability				
Biodiversity				



**Table 14:** Self-assessment checklist – Engagement

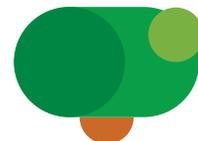
How would you rate your organisation's current status in these areas?	Advanced	Intermediate	Beginning	Absent
<b>Is there strong community support for urban forestry?</b>				
Is the public well informed about the urban forest and the value of trees?				
Are there public education/information programs in place about urban forest activities for both public and private land?				
Are engagement activities created to reach of people in different areas and from diverse backgrounds?				
Are the public aware of the relationship between urban forests and urban heat?				
Is the urban forest considered to be an asset to the neighbourhood?				
Are there any urban forestry events, awards or grants?				
Are there council committees or advisory groups relevant to urban forestry with community representatives/members present?				
Have perspectives of Aboriginal peoples been included in urban forest planning and management?				
Are there examples that demonstrate Aboriginal peoples economic, cultural and/or spiritual interests in planning and management of urban forests?				
Does your council have experience in managing conflict around the urban forest?				
How are community values and desires around liveability, sustainability and resilience embedded in urban forestry or related policies and practice?				
Does council have joint strategies or implementation approaches with neighbouring councils and other sectors?				
Is there a communications plan for engaging private landowners in urban forestry?				



**Table 15:** Self-assessment checklist –Goals and targets

How would you rate your organisation's current status in these areas?	Advanced	Intermediate	Beginning	Absent
<b>How well defined are the drivers/goals/targets for the following?</b>				
Canopy and urban greening on public land				
Canopy and urban greening on private land				
Urban water				
A changing climate				
Population growth and development				
Liveability and amenity of urban centres				
Protecting the natural environment and biodiversity				
Enabling a healthy, active lifestyle				
Resilience				
Does your council have demonstration projects it can draw upon to highlight good urban forest management?				
Does your council have urban forest-related activities in the operational plan and delivery program?				
Do you have any evidence of achievement of older goals or targets?				

# Appendix 3: Resources

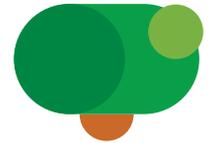


**Table 16:** Resources

Resource	Description
<b>Plant selection tools</b>	
<b>Which Plant Where?</b> <a href="http://www.whichplantwhere.com.au">www.whichplantwhere.com.au</a>	A tool to help practitioners and decision makers to identify species that will be resilient to climate change across Australia. The tool also provides resources and best practice guides that tackle some of the universal barriers to green space.
<b>Networking</b>	
<b>Treenet</b> <a href="http://treenet.org/">treenet.org/</a>	Treenet is the national urban tree research and education cluster, which provides networking, resource, education and event opportunities. .
<b>Resilient Cities Network</b> <a href="http://resilientcitiesnetwork.org/">resilientcitiesnetwork.org/</a>	Resilient Cities Network co-creates urban solutions to address complex and interrelated urban challenges, so that cities and communities thrive. The network will focus on 3 priorities to be delivered through programs of collective action with member cities during the next 2 years through a holistic approach to resilience.
<b>Local Government NSW</b> <a href="http://lgnsw.org.au/">lgnsw.org.au/</a>	Local Government NSW is the peak organisation that represents the interests of NSW general and special purpose councils. Local Government NSW aims to strengthen and protect an effective, democratic system of local government across NSW by supporting and advocating on behalf of member councils and delivering a range of relevant, quality services
<b>Other urban forestry resources</b>	
<b>Urban Greeners' Resource Hub</b> <a href="http://www.greenerspacesbetterplaces.com.au/resources-hub/">www.greenerspacesbetterplaces.com.au/resources-hub/</a>	Greener Spaces Better Places and Living Melbourne teamed up to create the Urban Greeners' Resource Hub, a curated collection of best practice tools, guides, resources and case studies to help urban greening professionals protect and enhance Australia's urban forests and green cover in our towns and cities.
<b>How To Grow An Urban Forest</b> <a href="http://www.greenerspacesbetterplaces.com.au/guides/how-to-grow-an-urban-forest/">www.greenerspacesbetterplaces.com.au/guides/how-to-grow-an-urban-forest/</a>	Designed for councils, this guide is based on a decade of work by the City of Melbourne.
<b>Urban Forest Management Toolkit</b> <a href="http://ufmptoolkit.net/resources/tools/">ufmptoolkit.net/resources/tools/</a>	A collection of tools that are available internationally
<b>Trees for Cities</b> <a href="http://www.treesforcities.org/">www.treesforcities.org/</a>	UK charity working at a national and international scale to improve lives by planting trees in cities
<b>Urban Heat Planning Toolkit</b> <a href="http://wsroc.com.au/media-a-resources/reports/send/3-reports/306-wsroc-urban-heat-planning-toolkit">wsroc.com.au/media-a-resources/reports/send/3-reports/306-wsroc-urban-heat-planning-toolkit</a>	The toolkit focuses on strategies that can be implemented in new development and redevelopment, to reduce urban heat and help people adapt.
<b>Rosemeadow Demonstration Project</b> <a href="http://www.dpie.nsw.gov.au/premiers-priorities/greening-our-city/greening-our-city-grants/rosemeadow">www.dpie.nsw.gov.au/premiers-priorities/greening-our-city/greening-our-city-grants/rosemeadow</a>	The project is an innovative NSW Government initiative that sets a new benchmark for tree planting in urban environments to improve liveability for communities in areas with critical urban heat problem.

Resource	Description
<b>Water Efficiency Study for Urban Tree Management Report</b> <a href="http://www.dpie.nsw.gov.au/_data/assets/pdf_file/0006/346659/Water-Efficiency-Study-Urban-Tree-Management-Report.pdf">www.dpie.nsw.gov.au/_data/assets/pdf_file/0006/346659/Water-Efficiency-Study-Urban-Tree-Management-Report.pdf</a>	NSW Department of Planning, Industry and Environment commissioned a water efficiency study to guide councils in supporting responsible tree planting.
<b>Gallagher Studio Urban Tree Canopy Targets and Development Controls Report</b>	This report details the targets and planning controls, outlines the method for establishing the targets, and contains examples of design solutions that can be used to achieve the targets.
<b>Western Sydney Street Design Guidelines</b> <a href="http://static1.squarespace.com/static/5bfca472b10598dbe206dd0d/t/6108c8c9453cf233243b9039/1627965702642/Street+Design+Guidelines_0920.pdf">static1.squarespace.com/static/5bfca472b10598dbe206dd0d/t/6108c8c9453cf233243b9039/1627965702642/Street+Design+Guidelines_0920.pdf</a>	The guidelines seek to create streets with improved environmental, social and health outcomes for all street users. The guidelines are focused on service provision to new greenfield development areas in Western Sydney. They do, however, have the potential to be applied to existing areas that are undergoing significant change and are in an appropriate urban setting.
<b>Urban Green Cover Technical Guidelines</b> <a href="https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Section-4-PDFs/Urban-Green-Cover-Technical-Guidelines.pdf">https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Section-4-PDFs/Urban-Green-Cover-Technical-Guidelines.pdf</a>	The guidelines provide practical guidance on how to adapt the urban environment through urban green cover projects.
<b>Australian initiatives</b>	
<b>Greener Spaces Better Places</b> <a href="http://www.greenspacesbetterplaces.com.au">www.greenspacesbetterplaces.com.au</a>	Originally the 2020 Vision program, Greener Spaces Better Places is a movement that brings together community, growers, government, academia, business, industry and everyday people to make our homes, streets and suburbs the greenest in the world. After all, every green space counts towards a greener Australia.
<b>Atlas of Living Australia</b> <a href="http://www.ala.org.au">www.ala.org.au</a>	Open access online repository of information about the distribution of Australian plants, animals, and fungi.
<b>Australian Citizen Science Association (ACSA)</b> <a href="http://citizenscience.org.au">citizenscience.org.au</a>	ACSA is member-based incorporated association that seeks to advance citizen science through the sharing of knowledge, collaboration, capacity building and advocacy
<b>Botanical resources</b>	
<b>Kew Gardens Plants of the World</b> <a href="http://www.plantsoftheworldonline.org">www.plantsoftheworldonline.org</a>	1,198,000 global plant names, 106,800 detailed descriptions, and 278,600 images
<b>Australian Plant Name Index</b> <a href="http://biodiversity.org.au/nsl/services/search/names">biodiversity.org.au/nsl/services/search/names</a>	A tool for the botanical community that deals with plant names and their usage in the scientific literature, whether as a name or synonym.

# Appendix 4: References



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