



About TiCkLe

TiCkLe is Taylor Cullity Lethlean's vehicle for research, discourse, collaboration and innovation.

TiCkLe aims to challenge, generate, capture, disseminate and archive, through a wide range of media and sources research investigations, manifestos, exhibitions, lectures and symposiums and other such investigations and events undertaken by TiCkLe.

TiCkLe will generate a discourse that informs the practice's work and creates a dialogue between TiCkLe and the broader design disciplines.

TiCkLe is to be facilitated through a culture of staff involvement, shared discourse and formed alliances.

TiCkLe is to be facilitated through the identification and establishment of project / research relationships.

TiCkLe will speculate on the future of landscape architecture and emerging practice, and how TCL may continue to contribute meaningfully and challenge existing paradigms.

Cover image: AVATAR (2009), directed by James Cameron

A case for trees .09

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01

Introduction

“Street trees are the greatest urban design tool to connect communities, green our cities and tackle climate change.”

Perry Lethlean

1.0 Introduction

PERRY LETHLEAN

Trees are the greatest urban design tool to connect communities, green our cities and tackle climate change. What other city ingredient naturally cools our city, cleans our air and water, creates homes for native fauna and fosters sociable walkable communities?

The merits of trees in our city centres and established parklands have long been valued and recognised. Not only for their amenity value, but more recently, for their important role in cooling our cities. Many cities and councils are recognising the value of trees in our more established urban environments through the establishment of canopy coverage targets and urban forest strategies to improve the long term health of our communities.

Yet in the growth suburbs of Australia's peri-urban areas, where large scale suburban development is transforming farmlands into our newest

communities, the value of trees and their many benefits is mostly ignored. New streets in typical conventional developments are not providing the conditions for trees to be large, healthy or thrive. Councils, state government agencies and service authorities are planning, mandating and approving streets with narrow verges, shallow soils, little access to water, poor drainage and uncoordinated services. Trees and their important horticultural needs are not part of a considered and coordinated street and subdivision design consideration.

In the context of rising climate change induced temperatures and associated urban heat island effects the potential impact to residents and communities could not be more worrying.

This research was commissioned to provide a case for trees. To advocate for better tree infrastructures in Australia's

emerging communities. To ensure the residents in these growth areas, reap the benefits of a shady, cool and beautiful tree canopy, that provides a distinct identity and fosters community pride.

The report is structured in two parts:

1. A case for trees is provided based on their benefits under three primary themes:

Environmental: Identifying how trees provide a range of important functions that improve the ecologies of our cities.

Social: Outlining the many benefits trees provide for the health and wellbeing of our communities.

Economic: Recognising the range of economic benefits trees bring to neighbourhoods and commercial enterprises.

This captures local and global research on beneficial attributes



2. Applying the Lessons: Here we identify various engineering and planning issues that limit the ability to establish healthy tree canopies for our emerging cities.

It illustrates how suburban development design has changed over the last forty years with more recent trends for larger houses on

smaller lots, reducing the ability for homes owners or residents to establish significant trees in their own gardens. The provision of important canopy cover in these contexts rely on street tree planting.

However, with street design prioritising narrow verges, poor soils with uncoordinated service provisions, the ability for trees to

thrive is impossible. The report concludes with illustrations and examples of the necessary street infrastructure that trees require to thrive. Through simple yet effective changes to the design of our streets we can unlock the true potential of these magnificent green assets. The significant environmental, social and economic benefits for

02.

Benefits of trees in the community



Trees provide significant environmental, social and economic benefits to communities on the local, national and global scale. Communities across Australia are increasingly impacted by this pronounced period of global climate change, weather extremes and environmental degradation. Strategies for urban reforestation, canopy targets and street strategies are critical

mechanisms to reduce local temperatures, improving air quality, reduction in storm water run-off and improving biodiversity. Trees can be a primary tool to deliver sustainable urban infrastructure and provide a means to assist in the holistic health of communities. Trees benefit neighbourhoods in a myriad of ways, through reinforcing a sense of place and the individual's connection to it, and

promoting walkability and social interaction. Thereby improving the physical and mental health of individuals, families, and the broader community. Trees are an investment with incredibly high return. Research has proven that trees increase property value as well as reducing the costs of heating and cooling buildings and increase the longevity of infrastructure.

BENEFITS

ENVIRONMENTAL BENEFITS

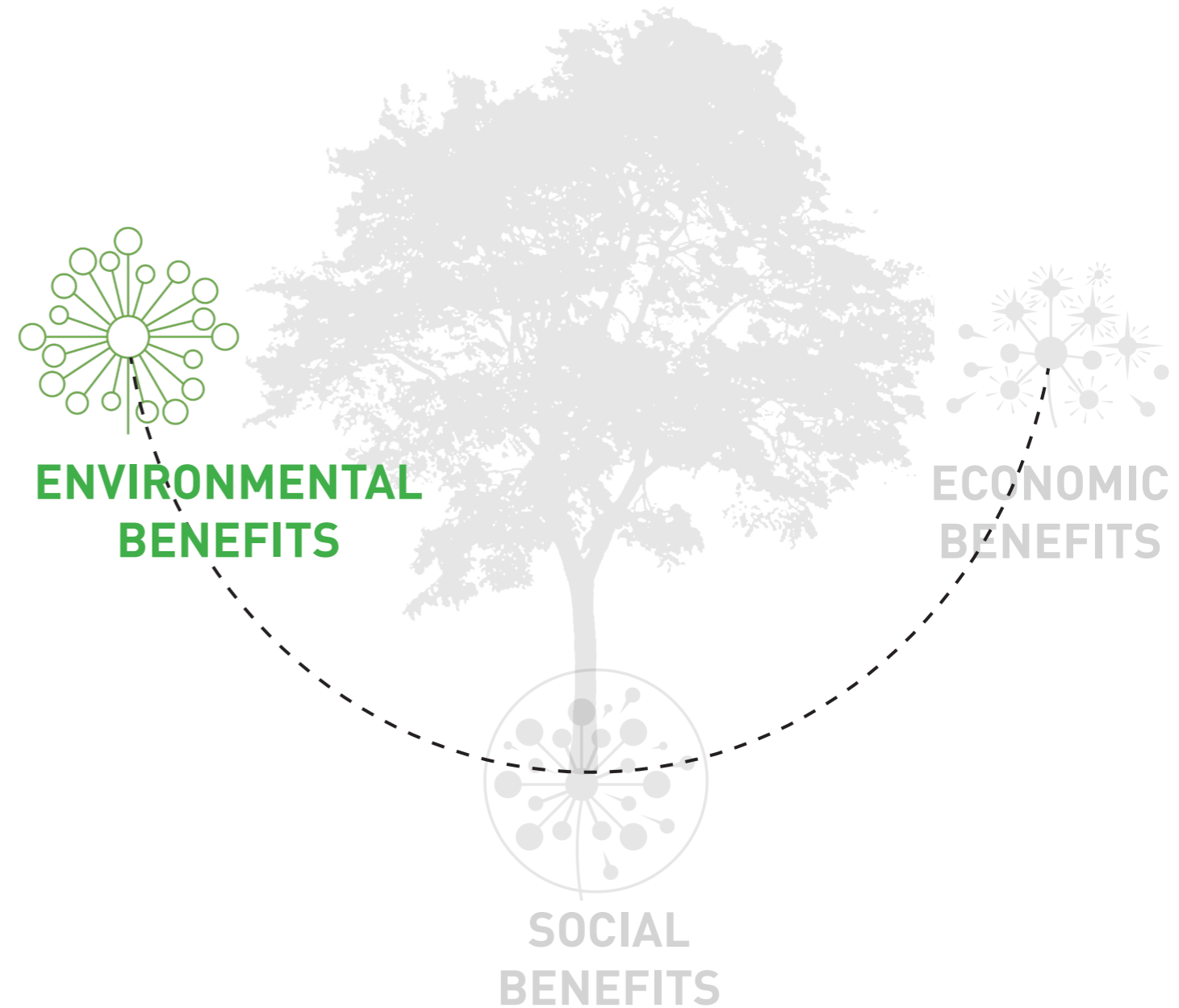
Trees enrich the environment of developing and established communities.

In urban and suburban contexts well planned tree canopy coverage significantly reduces local temperatures and the urban heat island effect.

Trees are also able to improve the air quality of local communities through filtration of pollutants and sequestering carbon and producing oxygen.

Tree roots absorb stormwater reducing the amount of Nitrogen, Phosphorus and heavy Metals entering our drainage systems.

Trees are of course a major feature in the environmental health of our urban ecosystems, increasing the biodiversity, provision of habitat for native fauna, and contributing to the linking eco-corridors.



TREES REDUCE TEMPERATURES

01

ENVIRONMENTAL BENEFITS

Cities are increasingly vulnerable to rising temperatures through climate change and urban heat island effects. A critical tool to tackle this issue are trees with their ability to significantly reduce local temperatures.

The ability of trees to provide localized cooling for urban communities is well documented. They do this in two simple ways, transpiration, the release of moisture to the air through leaves and the provision of shade via canopies.

Temperature reductions under canopies are significant, ranging from 5-20°C cooler (Greater City of Geelong Urban Forest Strategy 2015 - 2025).

Trees also have the ability to significantly reduce the urban heat island effect: where paved areas store heat that increases local temperatures. The City of Sydney have identified that for every 10% increase in the urban forest canopy coverage, land surface temperatures can decrease by 1.13°C (A Metropolis Of Three Cities City of Sydney Urban Forest Strategy 2013).

Urban tree canopies lower the amount of heat absorbed by buildings, resulting in reductions



One tree cools the same as 10 air conditioners running

Data Source: A Metropolis Of Three Cities City of Sydney Urban Forest Strategy 2013



Urban trees reduce the urban heat island effect of

Data Source: Coutts et al, 2012



Temperatures are between 5 °C and 20 °C cooler underneath tree canopies

Data Source: Greater City of Geelong Urban Forest Strategy 2015 - 2025



Every 10% increase in tree canopy can reduce land surface temperatures by 1.13 degrees

Data Source: A Metropolis Of Three Cities City of Sydney Urban Forest Strategy 2013

TREES IMPROVE AIR QUALITY

02

ENVIRONMENTAL BENEFITS

Trees are a significant urban infrastructure asset and are increasingly considered a key strategy in mitigating carbon emissions and pollutants within the atmosphere.

Mature trees produce 21kg of oxygen per year. They also improve air quality through their ability to filter chemicals and pollutants.

Through photosynthesis, trees remove 12.5t of carbon dioxide from the atmosphere each year (Moore, 2009 Urban Trees: More Than What they Cost), along with 27kg of other chemicals including nitrous oxides, sulfur dioxide, carbon monoxide, and ozone from the atmosphere per year (Burden, D. 22 Benefits of Urban Street Trees). Mature trees are 60-70 times more effective in reducing air pollution in comparison to smaller trees (Moore, 2009 Urban Trees: More than what they cost).

Automobile exhaust is a major contributor to these pollutants, with trees located near roads, able to absorb nine times the amount of pollutants in comparison to more distant trees. (Burden, D. 22 Benefits of Urban Street Trees).



SEQUESTERS 12.5t C_{ARBON}

A large mature tree can sequester as much as 12.5 tonnes of carbon.

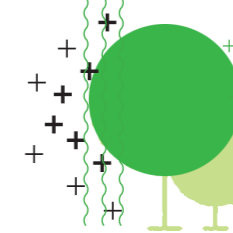
Data Source: Moore, 2009 Urban Trees: More Than What they Cost



PRODUCES 21kg O_{XYGEN}

On average 1 tree produces 21kg of oxygen per year.

Data Source: Environment Canada



FILTERS 27 kg POLLUTANTS

One tree filters 27 kilograms of pollutants per year including carbon monoxide, nitrogen oxides, ozone and particulate matter (PM)

Data source: Burden, D. 22 Benefits of Urban Street Trees



SIZE MATTERS

Large trees with dense canopies can remove 60-70 times more air pollution than smaller trees

Data Source: Moore, 2009 Urban Trees: More Than What they Cost

TREES REDUCE STORMWATER RUNOFF

03

ENVIRONMENTAL BENEFITS



Trees are increasingly valued as green infrastructure within urban communities for their ability to reduce stormwater flows and therefore nutrient loads from entering local drainage systems and waterways.

SOAKAGE TRENCHES

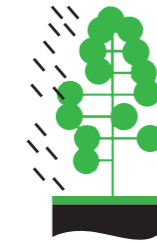
Gravel-filled soakage trenches take stormwater from the road and direct it underground to the roots of trees in the reserve. This grows healthier trees and keeps reserves greener and shaded. Over a year the soakage trenches in the reserve will divert a megalitre of water underground for the trees while also removing pollutants from the stormwater such as nitrogen and phosphorus. Nitrogen and phosphorus are used by the trees like fertiliser, this supports their growth and stops pollution from entering the environment downstream.

For further information please visit nrc.humandoc.com.au/gov/urbanforestry

Urbanisation has led to a rise in impervious surfaces, increasing pollutants levels, stormwater runoff volumes and peak flow rates within environments, increasing the risk of localised flash flooding.

Substantial tree plantings provide a simple solution to reducing the associated problems of stormwater runoff, as canopy and root systems of trees prove to function as incredibly effective natural drainage systems.

The tree canopy is able to deflect up to 40% of precipitation from reaching the ground, with water absorbed through the leaves and evaporated back into the atmosphere. Furthermore, one tree is able to absorb 3400L of water and associated filtration of Nitrogen, Phosphorus and heavy metals through its root system reducing pollution and stormwater peak flow volumes entering local drainage systems and waterways. (A Metropolis Of Three Cities City of Sydney Urban Forest Strategy



**ABSORB
3400 L
STORMWATER**

One tree absorbs 3400 liters of stormwater per year

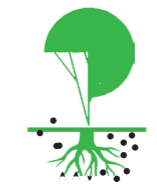
Data Source: A Metropolis Of Three Cities City of Sydney Urban Forest Strategy 2013



**INTERCEPT
HEAVY RAINFALL**

Trees hold up to 40% of water that impacts on them intercepting heavy

Data Source: Moore, 2009 Urban Trees: More Than What they Cost



**REDUCE
NITROGEN,
PHOSPHORUS
HEAVY METAL
IN STORMWATER**

Healthy tree roots help reduce the nitrogen, phosphorus and heavy metal content in stormwater

Data Source: Melbourne Urban Forest Strategy 2012-2032



SUDS

Trees are an integral part of sustainable drainage systems

Data Source: A Metropolis Of Three Cities City of Sydney Urban Forest Strategy 2013

TREES INCREASE BIODIVERSITY

04

ENVIRONMENTAL BENEFITS

Over 30% of Australia's threatened plant and animal species occur in urban areas. Trees, as part of an integrated ecological response to streets, parks and drainage corridors provide important biodiversity outcomes and support threatened species (DWELP. Trees for Cooler and Greener Streetscapes Guidelines for Streetscape Planning and Design).

Trees within urban communities enhance the biodiversity within environments through the provision of local habitat and of eco-corridors, providing food and habitat connectivity for native fauna.

Urban biodiversity also exists within a range of urban conditions, from public and private parks and gardens, vacant lots, street planting, and along waterways. Combined, they are incredibly important to the sustainability and resilience of environments. Providing genetic, ecosystem and species diversity, acting as an insurance policy for ecosystems, allowing an ability to recover from natural disturbances including flood, fire and drought. (Roetman & Daniels 2008).



PROVIDE HABITAT

Major Australian cities are biodiversity hotspots. Healthy urban forests provide habitat for native

Data Source: Roetman & Daniels 2008



SUPPORT THREATENED SPECIES

Over 30% of Australia's threatened plants and animals occur in urban areas

Data source: DWELP. Trees for Cooler and Greener Streetscapes Guidelines for Streetscape Planning and Design



LINK ECO-CORRIDORS

Streets that support native vegetation have a greater

Data source: DWELP. Trees for Cooler and Greener Streetscapes Guidelines for Streetscape Planning and Design

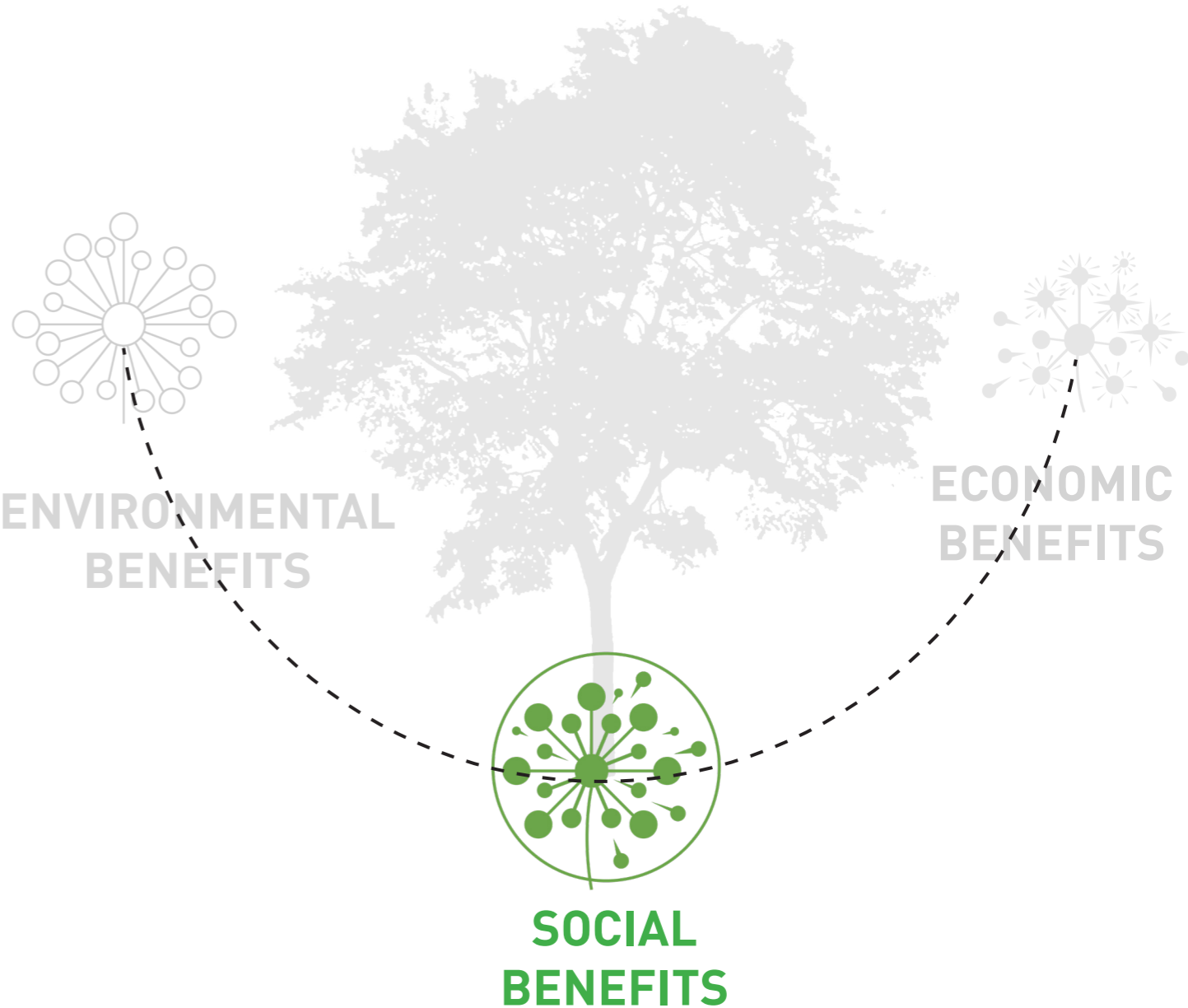
BENEFITS

SOCIAL BENEFITS

Trees contribute to the psychological and physical health of urban communities.

They establish and define a collective identity of local communities aiding in a sense of belonging and pride. This contributes to the improvement of an individuals' mental health, providing settings for connection to nature, quiet reflection and relaxation.

Trees can also improve the health of individuals through improvements to air quality, reduction in exposure to harmful UV, and localised heat stress.



TREES REINFORCE A SENSE OF PLACE

01 SOCIAL BENEFITS

Trees are important in defining the character of communities, establishing a distinctive identity for local neighborhoods.

Whether it's a memorable avenue, boulevard, signature tree or biodiversity expression, trees provide a sense of place that communities identify with. This helps engender a sense of belonging and pride.

Furthermore, trees can reflect the history of the neighborhood, providing a sense of constancy, and a place for events and milestones, establishing important cultural links with the past.

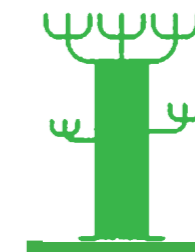
Trees also provide a sense of seasonality for communities contributing to mental and physical health, and vital in our understanding of the progression of time.



PROVIDE SEASONALITY

Provide a sense of the seasons and the links between the natural world and the urban environment

Data Source: CABE Space, 2005. Does money grow on trees?



A SENSE OF IDENTITY

Streets trees can provide a very strong sense of identity to a street and local area

Data Source: Street Tree Values and Benefits



LINK TO OUR HERITAGE

Street trees can also reflect the history of an area, providing an

Data Source: Street Tree Values and Benefits

TREES CONNECT COMMUNITIES

02 SOCIAL BENEFITS

Trees create sociable, comfortable, and enjoyable spaces. People are drawn to settings with beautiful trees, bringing together diverse groups of people within the public realm. Safe streets with an enveloping canopy invite public use for a range of sociable activities.

Trees are a vital ingredient in the enjoyment of our streets and parks. They provide a setting for many everyday community functions and recreational activities including meeting with friends and family and physical activities including walking, running and organised sports. They also provide opportunities for community events, developing an individual's sense of connection to place, assisting also in the integration of minority groups and immigrants into the local community.

They also function as attractive, protected and cool environments to exercise, recreate, learn and engage in the health of the natural environment, improving community's health, knowledge and connection to nature.



PROMOTE SOCIAL INTERACTION

Tree lined streets provide safe and comfortable areas to meet, talk and play

Data Source: CABE Space, 2005. Does money grow on trees?



PROMOTE WALKABILITY

Trees improve community amenity and connection to nature, providing attractive, protected, cooler walking

Data Source: City of Darebin. 2012. Greenstreets Strategy.



A SENSE OF PRIDE

Trees increase a positive aesthetic and promote feelings of safety and ownership in an urban environment

Data Source: Burden, D. 2006. Urban Street Trees: 22 benefits

TREES MAKE HEALTHY COMMUNITIES

03 SOCIAL BENEFITS

Communities with street trees have reported better overall health in comparison to communities with none. (DWELP. Planning and Design.)

Trees improve the quality of air, producing oxygen and removing carbon monoxide and airborne pollutants, improving the respiratory health of local communities.

Tree canopy and resultant shade can reduce the community's exposure to harmful UV rays by 75%. The mitigation of urban heat island effects through the reduction in street and neighbourhood temperatures results in improvements to those impacted by heat related illness and mortality. Noting that in Australia there are more deaths caused by heat waves than all other natural disaster (DWELP. Planning and Design).

A study found that communities with a tree count of 10+ per block have reported better overall health in comparison to communities with less trees (Kardan, O, 2015 Scientific reports).



CLEAN THE AIR WE BREATHE

Trees enhance a community's respiratory health by producing oxygen, intercepting airborne particulates, and reducing smog

Data Source: A Metropolis Of Three Cities City of Sydney Urban Forest Strategy 2013



REDUCE SUN EXPOSURE

A shaded street reduces exposure to harmful

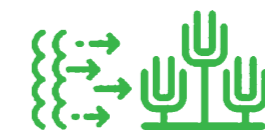
Data Source: City of Moreland Urban Forest



10 MORE TREES

People reported better overall health ratings with an average of 10 more trees on a city block

Data source: Kardan, O, 2015 Scientific reports



HEAT RESILIENCE

There are more deaths from heatwaves than any other natural disaster in Australia which are expected to increase. Urban trees reduce the risk of heat related

Data source: DWELP. Planning and Design

TREES BENEFIT OUR MENTAL HEALTH

04

SOCIAL BENEFITS

Walking through natural environments has shown to have improved the mental health of communities, as it provides an opportunity for quiet reflection and relaxation. Through doing so the individuals blood pressure and feelings of anxiety are reduced, while their mental acuity and memory recall is improved (Astell-Burt, T. Mental health benefits of neighbourhood green space are stronger among physically active adults in middle-to-older age: Evidence from 260,061 Australians).

The healing effects of nature are incredibly effective, one study found that hospital patients who had a view of trees were shown to recover quicker and with fewer complications in comparison to those without (Hansmann, R., S.M. Hug, and K. Seeland. 2007. Urban Forestry & Urban Greening).

Interaction with the natural environment also has great benefit to children as it encourages creativity of the mind and experimental learning, the exploration and adventure of the natural world, and promotes physical activity, all of which correlates to the psychological wellbeing of children (Hansmann, R., S.M. Hug, and K. Seeland. 2007. Urban Forestry & Urban Greening).



IMPROVE WALKING ENVIRONMENTS

Walks through green space have been shown to reduce blood pressure, improve mental acuity, boost memory recall and reduce feel-

Data source: Astell-Burt, T. Mental health benefits of neighbourhood green space are stronger among physically active adults in middle-to-older age: Evidence from 260,061 Australians



BENEFIT CHILDREN

Greater exposure to natural settings correlates to psychological wellbeing for

Data source: Hansmann, R., S.M. Hug, and K. Seeland. 2007. Urban Forestry & Urban Greening



HEALING EFFECTS OF NATURE

Simply having a view of nature produces recovery

Data source: Hansmann, R., S.M. Hug, and K. Seeland. 2007. Urban Forestry & Urban Greening



QUALITY IS IMPORTANT

Health outcomes are dependent on the quality of green spaces, which includes density of canopy

Data source: McGonagle, K.A., and R.C. Kessler. 1990. Journal of Community Psychology

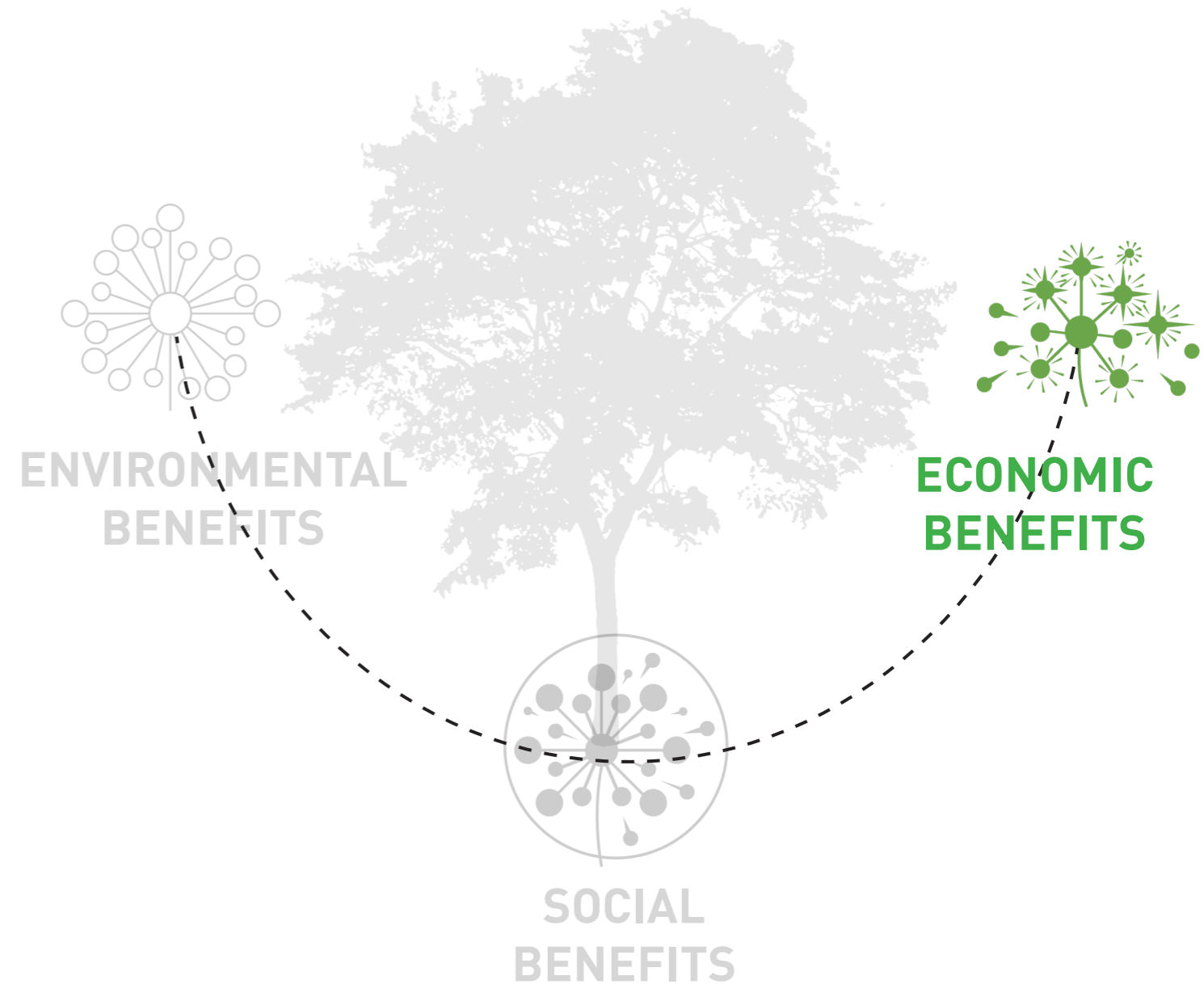
BENEFITS

ECONOMICAL BENEFITS

Trees are a valuable asset to the economy of local communities. They improve the aesthetic character of local neighbourhoods and increase the value of properties. Extensive research has also demonstrated that retail areas also benefit, with consumers spending up to 12% more in areas with the presence of large trees.

Trees are also an asset with a very high return, with each tree estimated to return \$200AUD annually due to the extensive benefits they provide communities.

Economic benefits also include the reduction in household energy usage and improvements in the lifespan of infrastructure through the establishment of microclimates and protection of streets and buildings from the temperature extremes of heat and cold.



TREES INCREASE PROPERTY VALUES

01

ECONOMICAL BENEFITS

Urban forests not only contribute to the character and identity of neighborhoods, they also provide aesthetic value to neighborhoods, and as a result trees have proven to increase property values within communities.

One study has found that a 10% increase in the street tree canopy within communities increases the value of properties by an average of \$50,000 (AECOM, Economic Assessment of the Urban Heat Island Effect, prepared for The City of Melbourne, 2012).

And as trees grow larger, the value of properties grow proportionately (Beecham, S & Lucke, T. Street Tree Benefits and Challenges, 2015). Trees, and their associated aesthetic, social and environmental benefits create a positive perception of a place for potential property buyers (Plant, L. et al, Property value returns on investment in street trees 2016).

Furthermore, it was found that due to the calming effects of trees, consumers spend up to 12% more in commercial areas with the presence of large street trees in comparison to areas without (Burden, D. Urban Street Trees: 22 benefits, 2006).

+ 10%



STREET TREE
CANOPY ↑ =
PROPERTY
VALUE ↑

A 10 % increase in street tree canopy increases the value of properties by an average of \$50,000 AUD

Data source: AECOM, Economic Assessment of the Urban Heat Island Effect, prepared for The City of Melbourne, 2012

GROW PROPORTIONATELY



TREES GROW
PROPERTY VALUES
GROW

As trees grow larger, the lift they give to property values grows proportionately

Data source: Beecham, S & Lucke, T. Street Tree Benefits and Challenges, 2015



POTENTIAL
PROPERTY
BUYERS

Trees create a positive perception of a place for potential property buyers.

Data source: Plant, L. et al, Property value returns on investment in street trees, 2016



ENHANCE
COMMERCIAL
VALUE

Consumers spend 12% more in commercial areas with large street trees

Data source: Burden, D. Urban Street Trees: 22 benefits, 2006

TREES ARE AN INVESTMENT WITH HIGH RETURNS

02

ECONOMICAL BENEFITS

Urban street trees require the expenditure of resources for their proper management by communities, this including labour, energy and water. However, this cost is far outweighed by the significant social, economic and environmental benefits, proving to be a strategic investment with high economic returns.

A study in 2009 found that the average street tree is estimated to return \$200AUD per annum due to the extensive benefits they provide communities (G.M. Moore 'Urban Trees: Worth more than what they cost' Burnley College).

In the City of Melbourne, the economic return of street trees was found to be significant, as the 70,000 street trees planted will returned over \$14million AUD per year (Beecham, S & Lucke, T. Street Tree Benefits and Challenges, 2015).

And the bigger the tree, the higher the return, as one large street tree is worth 4 times the value in economic return compared to that of one small street tree (Beecham, S & Lucke, T. Street Tree Benefits and Challenges, 2015).



BIGGER TREE = BIGGER RETURN

A large street tree is four times the value in economic return than a small street tree

Data source: Beecham, S & Lucke, T. Street Tree Benefits and Challenges, 2015



EACH TREE IS A VALUABLE ASSET

Average street tree value: \$200AUD per annum

Data source: G.M. Moore 'Urban Trees: Worth more than what they cost' Burnley College



A CITY'S INVESTMENT

City of Melbourne's 70 000 street trees have returned over \$14 million per annum

Data source: Beecham, S & Lucke, T. Street Tree Benefits and Challenges, 2015

TREES REDUCE COSTS

03

ECONOMICAL BENEFITS

Trees provide important economic benefits to individuals and communities by limiting the demand for cooling and heating. The shade provided by established trees, mitigates and moderates temperatures by cooling buildings during the warmer seasons and protects buildings from the cold and wind during the cooler seasons.

Cooling and heating effects provided by trees is directly related to tree size and canopy cover, their location relative to buildings and the planting density of trees. One study found that increasing tree canopy coverage by 10% over buildings reduces annual cooling and heating costs by 12-15%. (City of Melbourne. Urban forest strategy, making a great city greener 2012-2032). A single tree was found to decrease annual cooling costs of a building by 7%. (Beecham, S & Lucke, T. Street Tree Benefits and Challenges, 2015).

In addition, the canopy coverage of urban forests can increase the lifespan of infrastructure, as through shading asphalt pavement from harmful UV rays can increase its lifespan by 30% (G.M. Moore 'Urban Trees: Worth more than what they cost' Burnley College). This significantly reduces communities investment, repair and replacement of footpaths, roads and carparks.



Increasing tree cover by 10% saves annual heating and cooling costs by an estimated \$50 to \$90 per dwelling.

Data source: City of Melbourne. Urban forest strategy, making a great city greener 2012-2032



SAVING 12%-15%

Tree cover enables overall household energy savings of 12-15% per annum

Data source: City of Melbourne. Urban forest strategy, making a great city greener 2012-2032



Shade protection by street trees increases the useful life of an asphalt pavement by at least 30%

Data source: G.M. Moore 'Urban Trees: Worth more than what they cost' Burnley College

03.

The Current Context

“Bigger and bigger dwellings are diminishing the size of backyards in contemporary suburban developments, leaving less opportunity for biodiversity and canopy cover in our cities”.

ARCHITECTURE AU, 2016
on the loss of private open space

The Past vs The Present

PERRY LETHLEAN

Trees once cloaked the front and back gardens of communities across suburban Australia. More recently, residential developments have been planned with larger houses on smaller allotments. Large private gardens with supporting trees have largely disappeared from newer community developments. What is apparent is that streets now comprise up to 30% of a developments non developed area.

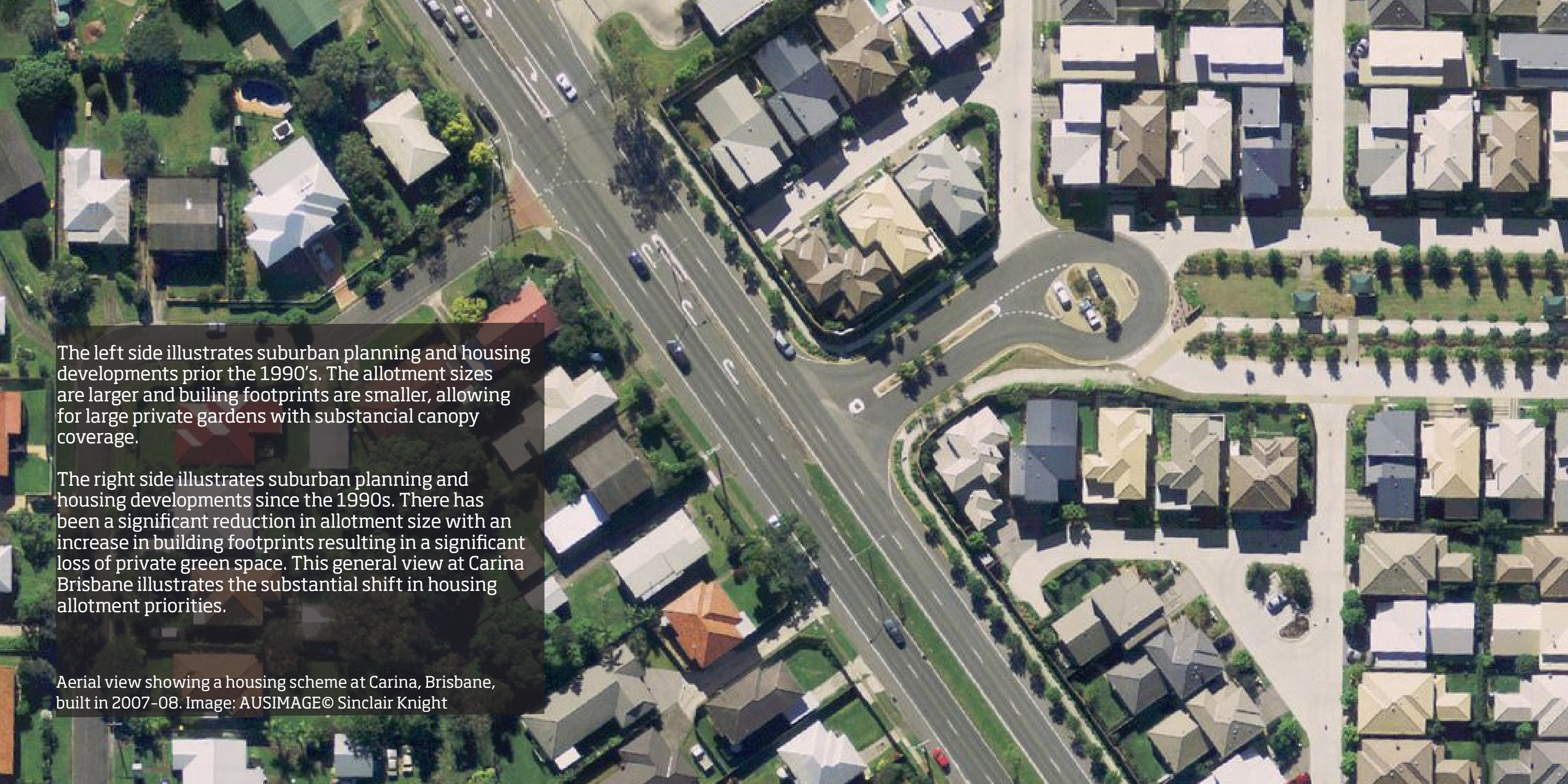
Streets are therefore now emerging as the critical green infrastructure of the future and must be planned to enable the planting of large trees with substantive canopy cover.

Newer subdivisions in developing communities represent a paradigm shift in priorities compared to 30 years ago. According to Australian Bureau of Statistics 2020, typical subdivision allotments today are 22% proportionally smaller, this, coupled with 6% larger building footprints has resulted in a significant reduction in private open space. Unlike private dwellings of the past, as represented in many of Australia's middle ring suburbs, the capacity of these contemporary private allotments to host significant trees has been largely eliminated.



“Streets are our most fundamental shared public spaces, but they are also one of the most contested and overlooked”

Annah Mackenzie, 2015



The left side illustrates suburban planning and housing developments prior the 1990's. The allotment sizes are larger and building footprints are smaller, allowing for large private gardens with substantial canopy coverage.

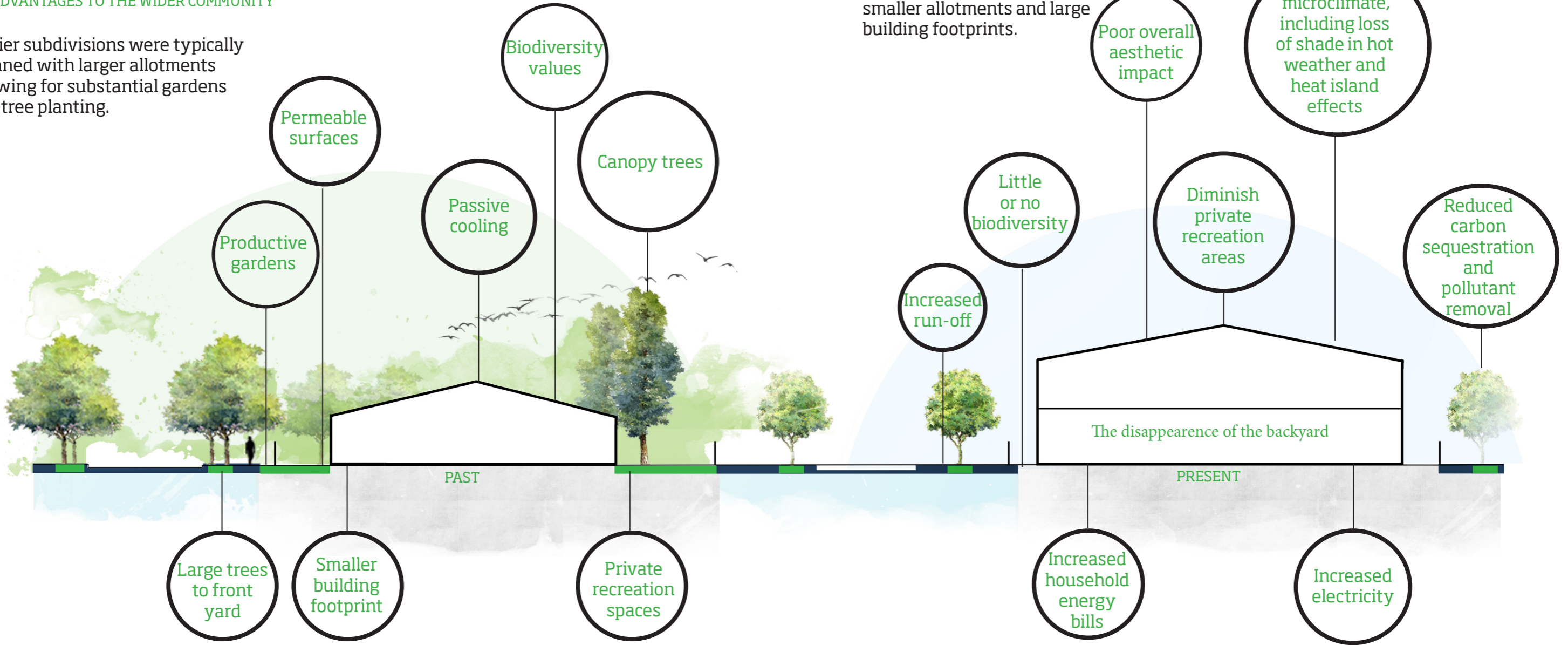
The right side illustrates suburban planning and housing developments since the 1990s. There has been a significant reduction in allotment size with an increase in building footprints resulting in a significant loss of private green space. This general view at Carina Brisbane illustrates the substantial shift in housing allotment priorities.

Aerial view showing a housing scheme at Carina, Brisbane, built in 2007-08. Image: AUSIMAGE© Sinclair Knight

THE CURRENT CONTEXT

DISADVANTAGES TO THE WIDER COMMUNITY

Earlier subdivisions were typically planned with larger allotments allowing for substantial gardens and tree planting.

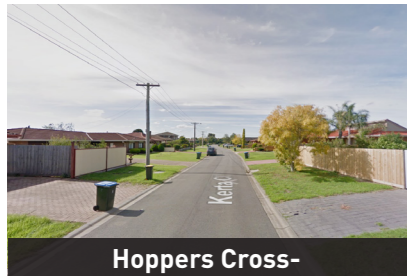


Current subdivisions are currently planned with smaller allotments and large building footprints.

THE CURRENT CONTEXT

MELBOURNE FRINGE SUBURBS

Streets have become the critical infrastructure to enable the delivery of the economic, environmental and social benefits of trees. With the substantial reduction of front and backyards in contemporary residential developments, streets are now the primary receptacle for hosting significant and meaningful tree planting and urban forestation. However as an illustrative street survey indicates, large trees are mostly absent in recent subdivisions since the 1990s.



THE CURRENT CONTEXT

MELBOURNE FRINGE SUBURBS



This plan of the Williams Landing subdivision has coloured green the proposed extent of roadways. They comprise 15 hectares or 30% of the non-developal area, this is a significant proportion of the subdivision site and therefore a key opportunity to implement substantive tree canopy targets to benefit community and ecology.



Roadways

15.09 ha



29.7% of NDA

THE CURRENT CONTEXT

WILLIAMS LANDING NEIGHBOURHOOD CASE STUDY

On average 35% of our suburbs is public land. This is where our focus needs to be, to boost canopy coverage.

Streets are now the largest component of a community's open space allocation. Williams

Landing, a contemporary subdivision in Melbourne's west, illustrates the substantial proportion of non-developable land that roads now comprise.

The planting for large trees with substantial canopies, in subdivisions like Williams Landing, will achieve substantial canopy coverage targets.

Current street design is
limiting the ability for
trees to thrive.

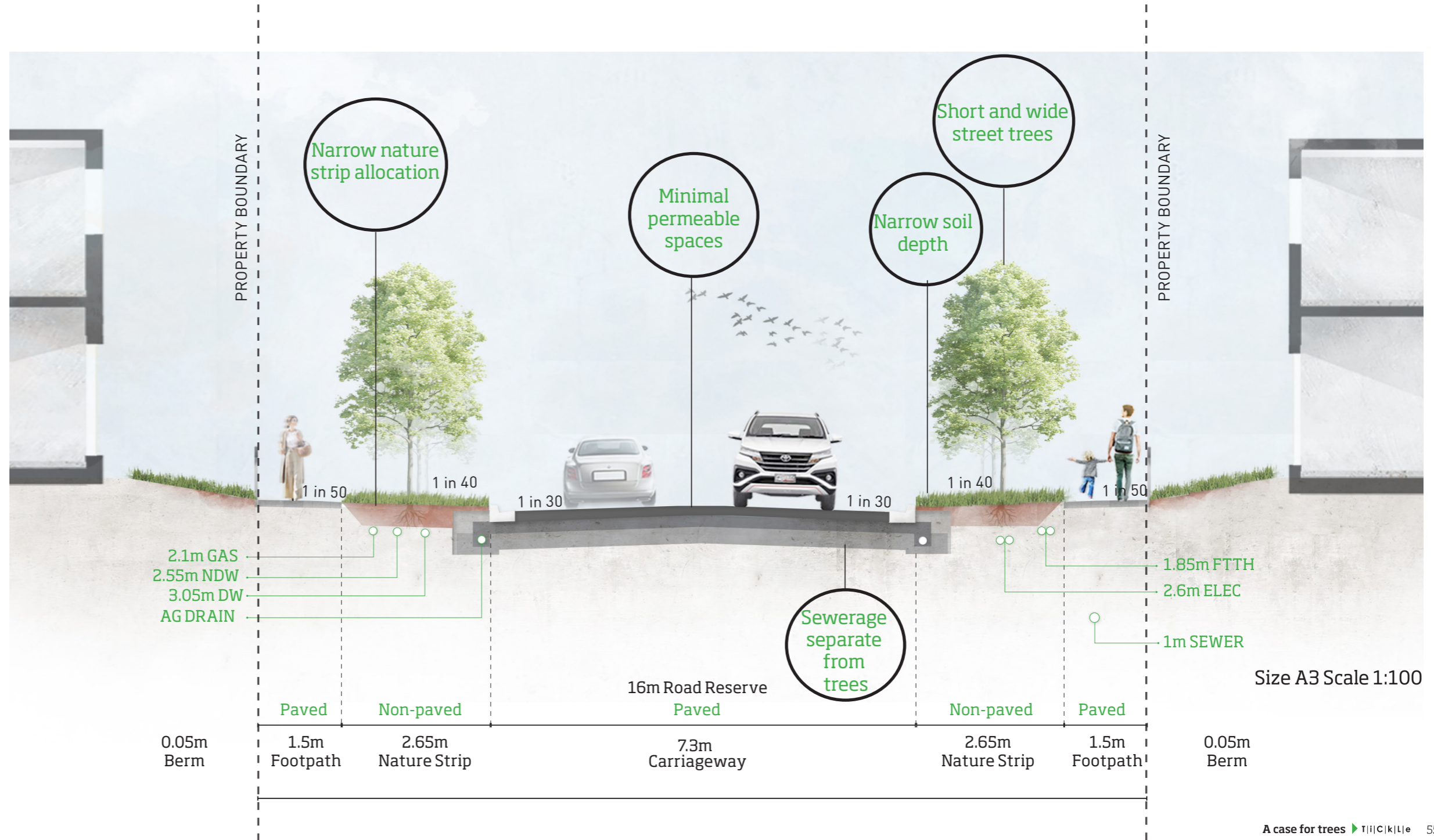
The current designs of our streets are limiting the ability of trees to thrive.

Streets are designed as conveyers of cars and host a variety of services to support the residential development. Trees, community space and attractive walks are secondary considerations, resulting in streets that effectively eliminate the ability for substantial tree planting opportunities.

Examples of streets built over the past 30 years illustrate a consistent outcome of narrow verges, footpaths and small widely spaced tree provisions. The lack of soil, water and width results in streets bereft of shade beauty and a sense of identity.

The Guardian Australia, October 2023 cited Edward Jegasothy from the University of Sydney, who stated that if the planning and installation of these community assets continue to be infrastructure and service orientated, communities will continue to be impacted with serious health and environmental issues.

This typical cross section of a local street being “rolled out” across Australia illustrates the priority of infrastructure to the detriment of trees.



04.

What trees need
to thrive



Geelong, VIC



Kingston, ACT



Canterbury, VIC



West Leederville, WA

SOIL VOLUME + HORTICULTURAL ESSENTIALS

WHY IT IS IMPORTANT + WHAT A TREE NEEDS

The capacity for trees to thrive directly relates to the provision of adequate soil volumes and access to water.

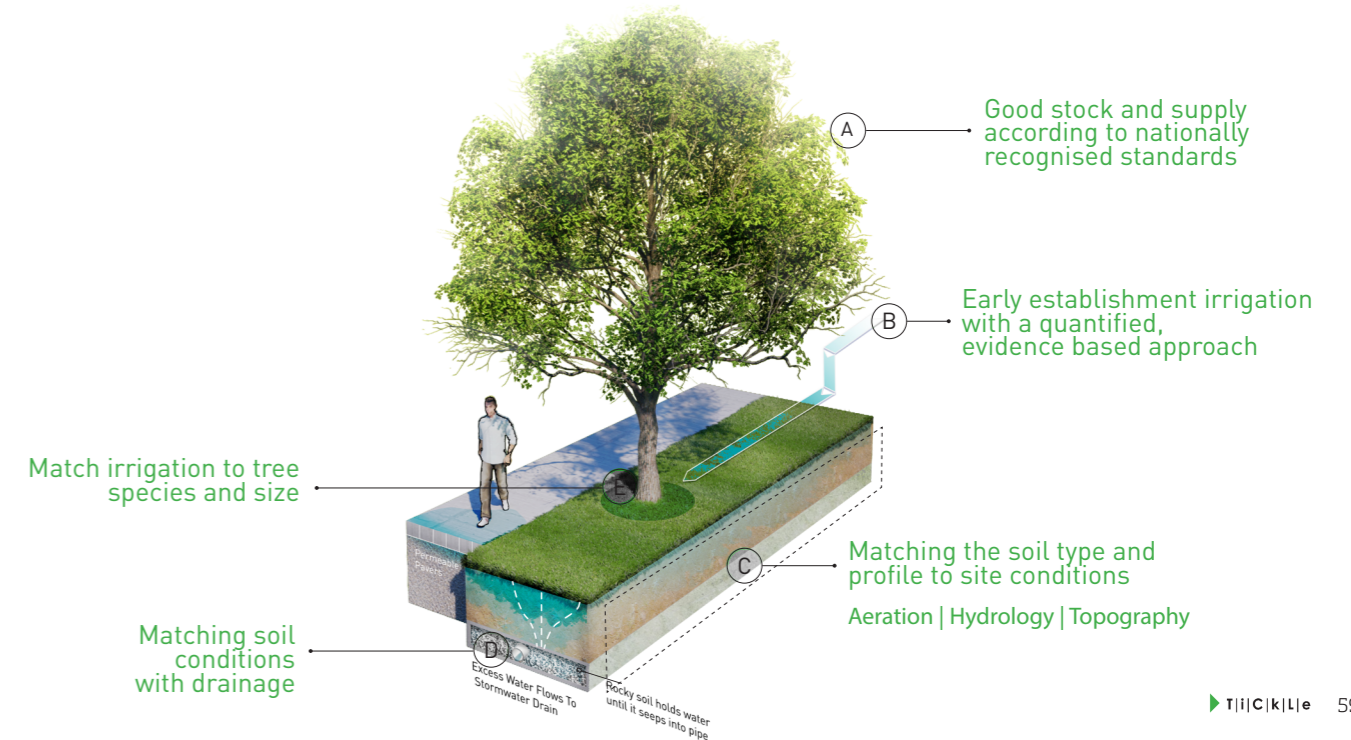
There is a direct correlation between these factors and the size of trees that are able to be established.

A range of additional factors including correct site preparation, drainage, species selection and the quality of plant stock are also important to consider.

The diagrams indicate the direct correlation between soil volumes and tree canopy size and optimal horticultural conditions.

If our streets are intended to become important tools to tackle climate change and heat mitigation then well planned planting conditions must be provided.

This will require the redesign of assets/services and infrastructure provisions.



05.

Applying the lessons

The current typical street dimensions of developing communities have the capacity to host large canopy trees.

A coordinated and integrated design approach is necessary to ensure services are located in common trenches, allowing for unencumbered areas for substantial tree plantings.

This will in turn become a catalyst to deliver the range of environmental, social and economic benefits.

This simple strategy allows for suitable soil volumes to be provided which will unlock the potential for trees to thrive.

SOLUTIONS

MAXIMISE TREE GROWTH ZONE

Technique 01 - Relocate Services to increase soil volumes



Good soil quality

Adequate soil volumes

Appropriate tree selection

Wide tree planting trench

Permeable footpaths

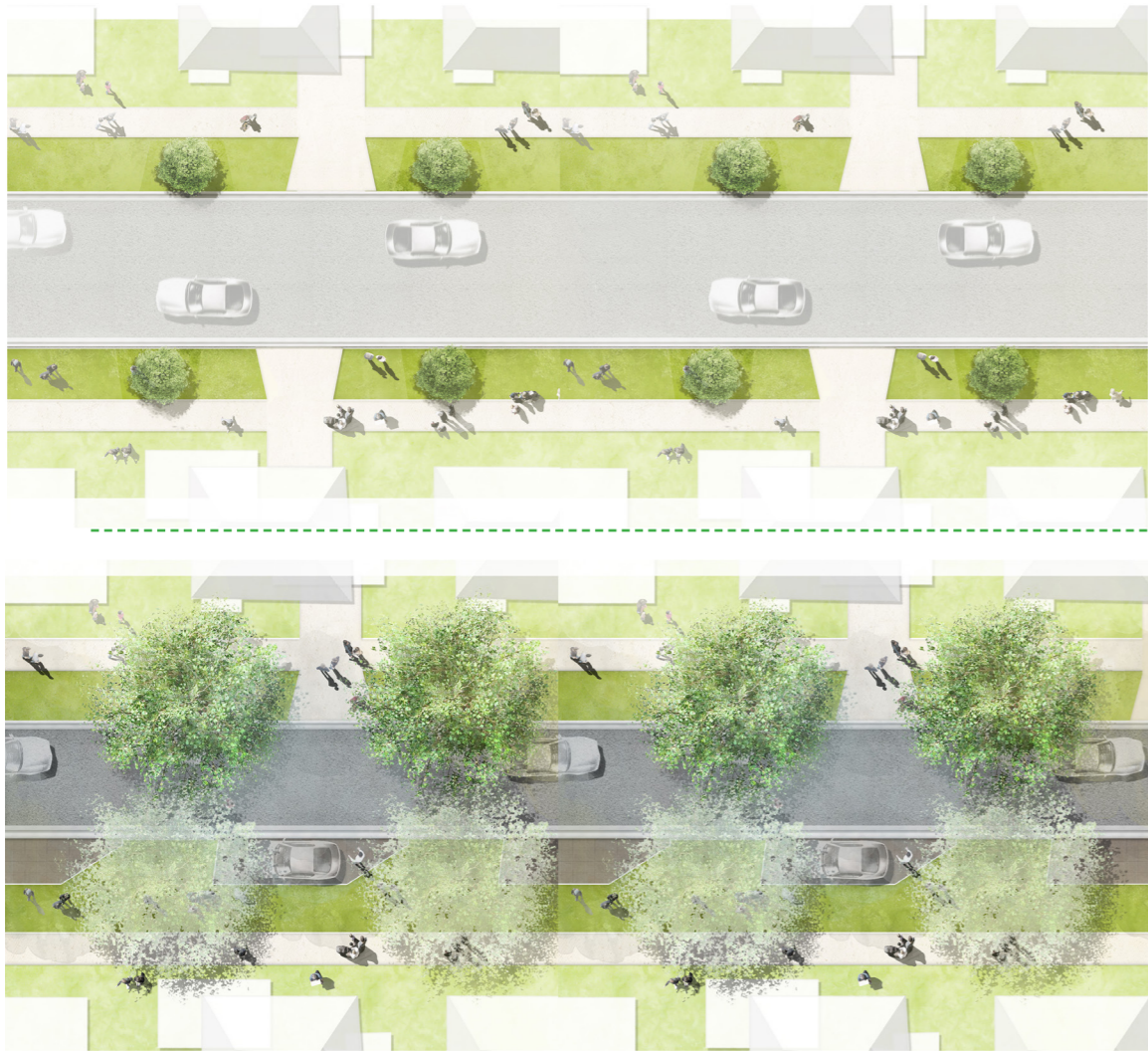
Relocate services

Appropriately compacted tree root zone

Greater soil depth

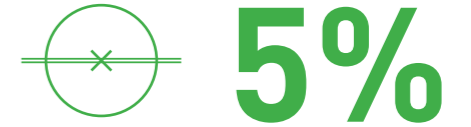
The ability for trees to become a significant part of street and community will be realized once the tools for streets are applied.

COMPARISON



The current typical structure of small, widely spaced trees does not allow for the benefits of trees within communities to be realised, and contrasts with streets with large canopy trees. Once the tools for streets are applied, the benefits of street trees will be evident.

Typical 16m Local Street



Typical tree size and canopy cover of the subdivision (Small Trees 3m DIA)

Proposed 16m Street



Proposed typical tree canopy cover of the subdivision (Large Trees 10m DIA)

Reference list

Astell-Burt, T., Feng, X., & Kolt, G. S. (2013). Mental health benefits of neighbourhood green space are stronger among physically active adults in middle-to-older age: Evidence from 260,061 Australians. *Preventive Medicine*, 57(5), 601–606. <https://doi.org/10.1016/j.ypmed.2013.08.017>

Beecham, S., & Lucke, T. (2018). Street Trees in Paved Urban Environments - The Benefits and Challenges. *Treenet*. <https://treenet.org/resource/street-trees-in-paved-urban-environments-the-benefits-and-challenges/>

Burden, D., & Jackson, G. (2006). 22 benefits of urban street trees. In walkable communities. Walkable communities. https://www.walkable.org/download/22_benefits.pdf

Coutts, A. M., Tapper, N. J., Beringer, J., Loughnan, M., & Demuzere, M. (2012). Watering our cities. *Progress in Physical Geography: Earth and Environment*, 37(1), 2–28. <https://doi.org/10.1177/0309133312461032>

E.J. Roetman, P., & B. Daniels, C. (2008). Including biodiversity as a component of sustainability as Australian cities grow: Why and How? In *Treenet*. *Treenet*. <https://www.treenet.org/wp-content/uploads/2017/06/2008-INCLUDING-BIODIVERSITY-AS-A-COMPONENT-OF-SUSTAINABILITY-Philip-EJ-Roetman-and-Christopher-B-Daniels.pdf>

Greenstreets Streetscape strategy . (2012). In File stack content. City of Darebin. <https://cdn.filestackcontent.com/AiqZ2cu1QLyOoqBAW3dc#:~:text=GreenStreets%20Streetscape%20Strategy%202012%2D2020%2C%20sets%20the%20strategic%20vision%2for,urban%20food%20production%2C%20varied%20species>

Hall, T. (2016, October 17). What has happened to the Australian backyard? *ArchitectureAU*. <https://architectureau.com/articles/what-has-happened-to-the-australian-backyard/>

Hansmann, R., Hug, S.-M., & Seeland, K. (2007). Restoration and stress relief through physical activities in forests and parks. *Urban Forestry & Urban Greening*, 6(4), 213–225. <https://doi.org/10.1016/j.ufug.2007.08.004>

Kardan, O., Gozdyra, P., Mistic, B., Moola, F., J. Palmer, L., Paus, T., & G. Berman, M. (2015). Neighbourhood greenspace and health in large urban center. In *Scientific reports*. <https://www.nature.com/articles/srep11610>

McGonagle, K. A., & Kessler, R. C. (1990). Chronic stress, acute stress, and depressive symptoms. *American Journal of Community Psychology*, 18(5), 681–706. <https://doi.org/10.1007/bf00931237>

Melbourne council. (2012). Urban forest strategy: Making a great city greener. In *City of Melbourne*. *City of Melbourne*. <https://www.melbourne.vic.gov.au/sitecollectiondocuments/urban-forest-strategy.pdf>

Moore, G. (2009). Urban Trees: Worth More Than They Cost - *Treenet*. *Treenet*. <https://treenet.org/resource/urban-trees-worth-more-than-they-cost/>

Moore, G. (2009). Urban Trees: Worth More Than They Cost - *Treenet*. *Treenet*. [https://treenet.org/resource/urban-trees-worth-more-than-they-cost/Moreland City Council](https://treenet.org/resource/urban-trees-worth-more-than-they-cost/Moreland%20City%20Council). (2017). Urban Forest Strategy 2017-2027. In *Merri-bek City Council*. *Merri-bek City Council*. <https://www.merri-bek.vic.gov.au/globalassets/areas/strategic-planning/urban-forest-strategy-2017.pdf>

Plant, L., Rambaldi, A., & Sipe, N. (2016). Property value returns on investment in street trees: a business case for collaborative investment in Brisbane, Australia. In *University of Queensland*. *University of Queensland, School of economics*. <https://www.uq.edu.au/economics/abstract/563.pdf>

Savills, F., Evamy, M., Hobson, E., & Eaton, R. (2005). Does money grow on trees. In *Word Press*. *Cabe Space*. <https://parksmanagementforum.files.wordpress.com/2020/06/does-money-grow-on-trees-1.pdf>

Street trees values and benefits . (n.d.). In *Amazon*. Retrieved October 27, 2023, from https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/b6639f9cab3e8823506b56a0274c63f83d0bba43/documents/attachments/000/003/882/original/Street_Trees_Values_and_Benefits.pdf?1393347847

Sweeney, K., Lymbery, S., Johnson, J., Smart, R., & Griffiths, G. (2013). Urban Forest Strategy. In *City of Sydney*. *City of Sydney*. https://www.cityofsydney.nsw.gov.au/-/media/corporate/files/2020-07-migrated/files_u/urban-forest-strategy-adopted-feb-2013.pdf?download=true

Trees for cooler and greener streetscapes. (2019). In *Victoria State department*. *Victoria Government department of environment, land, water and planning*. <https://www.planning.vic.gov.au/guides-and-resources/guides/all-guides/trees-for-cooler-and-greener-streetscapes>

Urban forest strategy. (2015). In *City of Greater Geelong*. *City of Greater Geelong*. <https://www.geelongaustralia.com.au/common/Public/Documents/8d30153dfee2a6c-Urban%20Forest%20Strategy.pdf> Van Raalte, L., Nolan, M., Thakur, P., Xue, S., & Parker, N. (2012). Economic assessment of the Urban Heat Island Effect. In *AECOM*. *Aecom*. <https://www.melbourne.vic.gov.au/sitecollectiondocuments/eco-assessment-of-urban-heat-island-effect.pdf>

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