

The Tree Report

Living Cities: Trees in the Urban Environment

national
tree day 

2019

PLANET ARK  TOYOTA

Acknowledgements

We have an innate and unbreakable connection to nature.

20-Year Partnership with Toyota

This year Planet Ark is celebrating 20 years of partnership with Toyota Australia for National Tree Day. This long-term partnership has seen over 25 million trees planted around Australia by over five million volunteers. National Tree Day wouldn't be Australia's biggest tree-planting and nature care event without Toyota and their dealers' support, as well as the hard work of volunteers around the country. Together, Toyota and Planet Ark are working to build a greater understanding of how people can create a better environment for future generations.

Partnership with 202020 Vision

The 202020 Vision campaign is providing the roadmap to increase urban green space in Australia by 20% by 2020 through collaborative planning and action. Their research on Australia's urban green cover has been used throughout this report and we would like to acknowledge their terrific work. Find out more about the vision at 202020vision.com.au.

Design by GLIDER

GLIDER is a research and conceptual studio, working in the area of human futures, transformation and new form experience design. Find out more about Glider at gliderglobal.com.

Organic Photography by Mayu Kataoka

Mayumi Kataoka has generously supplied the beautiful photographs of Australian native trees and barks used in this report. Find out more about Mayu's work at organicphotography.com.au.

Foreword



A Message to the Tree Day Community

National Tree Day was established 23 years ago as a positive, community-based activity to bring native plant communities back into the Australian environment and connect people, especially children, with nature. In the time since, almost five million amazing volunteers from all over Australia have given ten million hours of their time and planted over twenty-five million trees, shrubs and grasses. Those are extraordinary numbers and testament to Australians' willingness to roll up their sleeves, get out into the community and get their hands dirty for a good cause.

As the effects of climate change become more apparent, our mission is more important than ever before. Trees have an amazing capacity to regulate our environment by filtering the air we breathe, sequestering carbon while producing oxygen, stabilising soil and providing food and shelter for wildlife. They increase resilience within our cities both physically and socially, creating future-proof urban environments that encourage social interaction and moderate incivility. They help us raise happier and healthier children who are less likely to experience difficulties later in life. And they reduce costs to our society in terms of infrastructure, health and worker productivity.

A few years ago, we looked at ways to ensure National Tree Day retained its significance in Australian life and guarantee it had an important message for the future. With the generous support of our major sponsor Toyota, since 2011 we have commissioned and released eight research reports looking at the importance of trees and connecting with nature. This research showed that in the space of a single generation, kids' play moved from outdoors to indoors, the iconic backyard shrank, parents became increasingly anxious about children's safety, working hours and stress levels rose and technology (especially screens) encroached into almost all areas of our lives.

This year, we have partnered with the 2020 Vision group to bring you the latest science on the benefits of trees in the urban environment. Given that more of us live in cities than ever before, and this is a trend likely to continue with population growth, we have narrowed the focus to the positives trees can bring to our cities.

As a society we are increasingly aware of the problems associated with our technologically-connected indoor lives as well as the benefits of getting outside (or bringing the outdoors inside). It's time to turn this knowledge into action and bring the green back into our urban lives.

Rebecca Gilling
Deputy CEO
Planet Ark



The Beauty & Function of Trees

William Blake, the famous English poet, painter and printmaker, wrote passionately on the need for people to train their eyes to appreciate things of nobility and beauty. Blake used trees to frame his point, noting a tree may move some people to tears of joy, while others will only see it as a green thing standing in their way.

Blake's notion is elegant in its simplicity. We must first learn to see before we can distinguish beauty. But aesthetics are not the sole value of trees. There is also function. Indeed, beauty may be better understood as one function among many in the case of trees.

Ask yourself when was the last time you specifically noticed a tree in a city? Do you remember considering anything beyond the tree's aesthetic? Did you consider the many other functions it provides as you marvelled at its nobility? Perhaps you don't know what these functions might be – many people don't, including many city shapers working in politics, policy, planning and design. But if they did, their passion for urban trees would surely grow.



This year's Planet Ark Tree Report points to a quiet revolution underway in many Australian cities. Research and investment into understanding how to add greenery to benefit cities, particularly by planting more trees, is fuelling a groundswell of positive change. This work aims to leverage the capacity of urban trees to manage climate change impacts, reduce urban heat, improve wellbeing and improve environmental outcomes. Central to this is establishing which tree species work best in different Australian urban settings and microclimates.

The benefits are already being acknowledged. More and more city shapers, as well as members of the community and environmental groups, are coming to understand the many benefits, functions and services that trees offer. Just as importantly, they are beginning to understand the costs associated with their absence.

Trees are not expensive and may be the most cost effective and positive urban intervention available to us. Urban trees offer many functions beyond the aesthetic. They provide shade and can substantially lower urban temperatures. Trees can naturally cool buildings, reducing demand for air conditioning. They improve storm water management, provide habitat for wildlife, remove pollutants from the air and contribute to improved mental and physical health outcomes among urban dwellers. Best of all, urban trees provide these valuable functions while looking beautiful and offering us a direct connection to the natural world.

If you're lucky, you live in a city with plenty of trees, distributed generously from the urban core to the outer suburbs. As you'll see in this report, some Australian urban residents already enjoy this. Unfortunately, most live in cities with significant room for improvement.

For National Tree Day 2019, let's approach this as an area for imagination. You can be part of a nationwide movement of hundreds of thousands of Australians who volunteer their time to plant seedlings that will enrich Australia's urban landscapes for generations to come.

So, grab a pair of gloves, a hat and a shovel and plant a tree in your garden or your neighbourhood on National Tree Day. Get some fresh air and spend some time giving back to nature. Meet some friends and make it an occasion. However you do it, you'll be having fun while offering a gift that keeps on giving. I'll see you out there on July 28!

**Tony Matthews
Senior Lecturer in Urban &
Environmental Planning
Griffith University**



We educate and inspire Australian communities to connect with nature and create a world where people live in balance with nature.

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Introduction

Governments at all levels invest in greening Australian urban spaces. Yet, there is a wealth of evidence suggesting that despite these efforts, most of our metropolitan areas are actually losing green tree cover.

This is concerning as greening has clear environmental, social, health and economic benefits. So how do we explain, stop and reverse the loss of green cover in Australian urban spaces?

This year's Tree Report has compiled science from some of the most informed and reliable academic sources in Australia in order to provide an answer to these very questions.



A History of National Tree Day



National Tree Day started in 1996 and has grown into Australia's largest community tree-planting and nature care event. It's a call to action for all Australians to get their hands dirty and give back to nature and the community.



Each year, hundreds of thousands of people volunteer their time to plant seedlings and restore thousands of hectares of unique Australian landscape.



National Tree Day is an initiative organised by Planet Ark in partnership with Toyota Australia and its Dealer Network which provides on-the-ground support at tree planting sites across Australia.

Our Mission

Connection

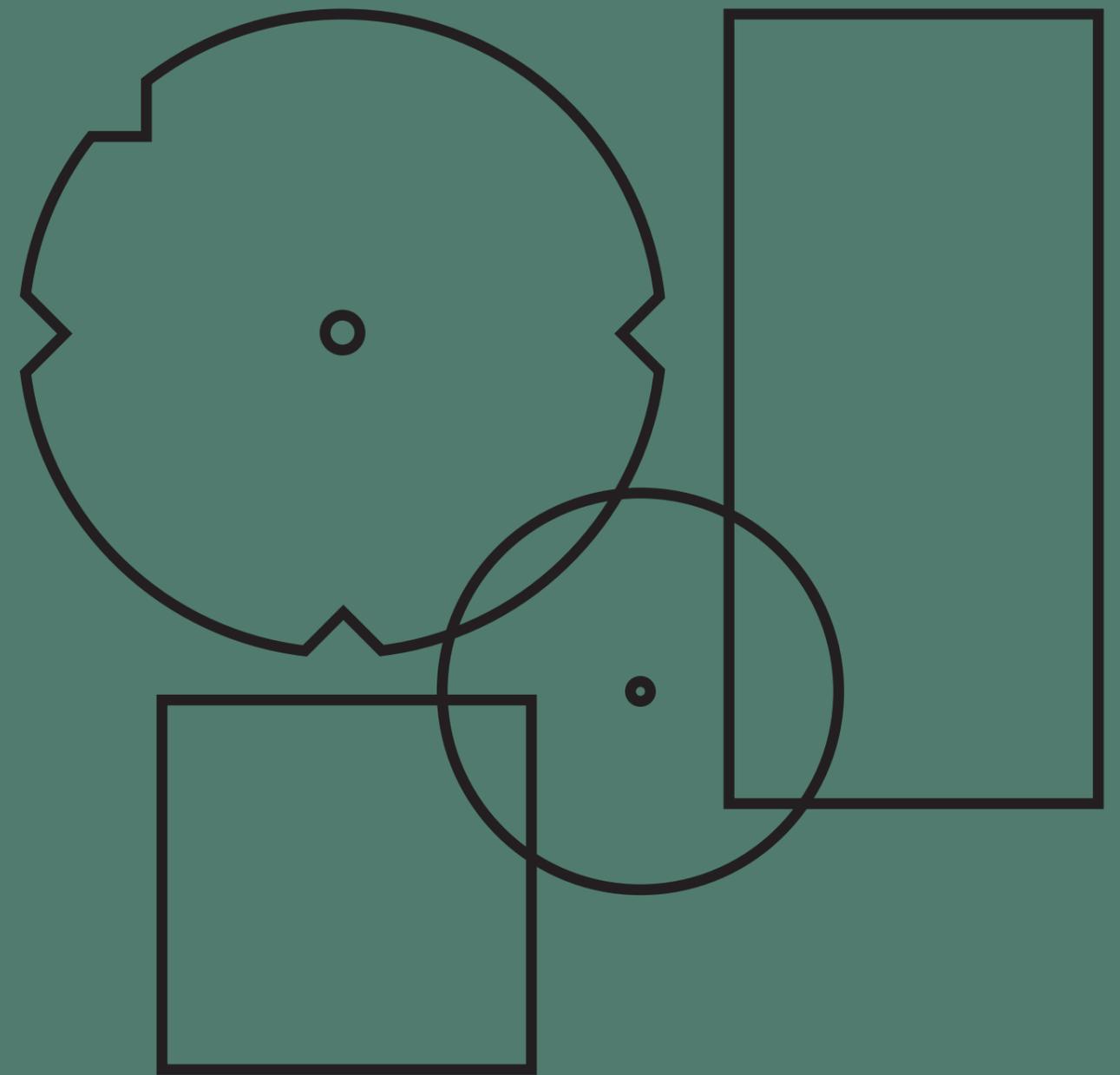
To encourage Australians to plant trees and connect with nature and their local community.

Our Vision

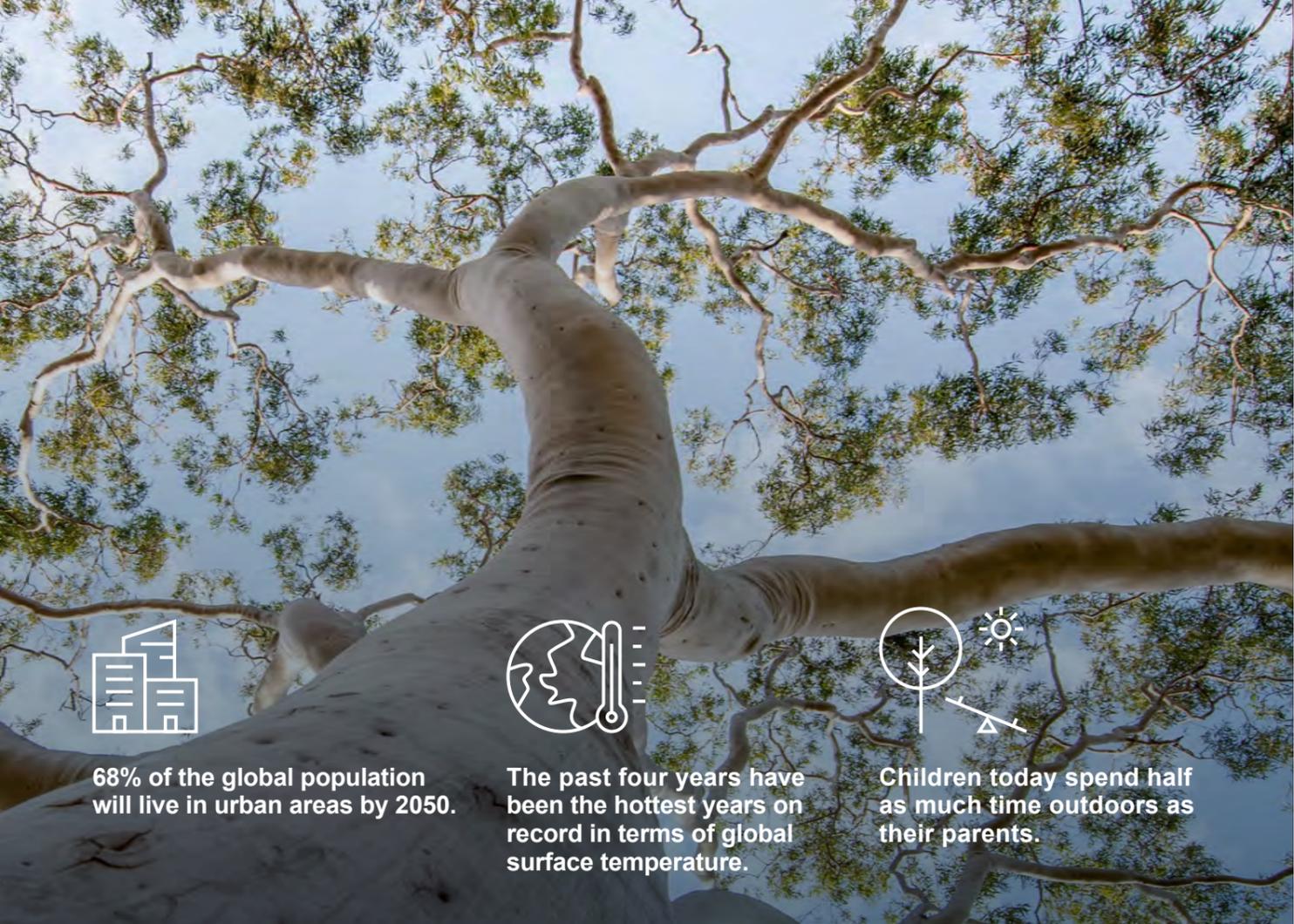
Care

To create a society in which people have contact with nature, understand its value and participate in its care.

Trees in the Urban Environment



Trees improve the liveability of our cities for countless reasons. From mental health and wellbeing, physical fitness and social cohesion to their visual appeal, trees and green spaces are a crucial element of our urban environment.



68% of the global population will live in urban areas by 2050.



The past four years have been the hottest years on record in terms of global surface temperature.



Children today spend half as much time outdoors as their parents.

Trees in the Urban Environment

Despite these extensive benefits, for many years tree canopy and green space in our urban areas have been decreasing. Whether it be from infrastructure developments, housing expansion or just the impact of urban sprawl, we are losing trees in our cities in a big way. This is made even more significant by the rapid urbanisation happening the world over, with the United Nations predicting 68% of the global population will live in urban areas by 2050¹.

Large mature trees which reach the end of their lives or must be removed for other reasons are often replaced with smaller species – if at all. These replanted trees then struggle to establish and reach maturity due to the demands of paving that surrounds them.

According to a survey from the UK-based organisation National Trust, despite the many benefits of play in nature children today spend half as much time outdoors as their parents did².

This means our connection with nature has essentially been halved over the space of a single generation. At the same time there has been a rapid increase in levels of stress and depression, with depression-associated disability costing the Australian economy \$14.9 billion a year³.

At the same time, the destructive impacts of climate change are becoming more apparent by the day. In Australia, we are experiencing hotter and more regular heatwaves, longer bushfire seasons and more irregular precipitation patterns causing floods and droughts⁴. The past four years have been the four hottest years on record in terms of global surface temperature, with the 20 hottest years on record occurring within the last 22 years⁵.

Whilst not a prescription to end these ailments, there is a simple solution to these dangerous trends that needs to be part of the equation: planting more trees.



History of Tree Clearing in Australia

Western civilisation has a long history of tree clearing for urban and agricultural development. Throughout the Americas and Europe, the advance of civilisation came with massive tree loss as settlers used timber for building material and heating.



Australia was no exception, with the arrival of the European settlers resulting in large-scale changes to Australia's natural landscape, tree cover and biodiversity.



Approximately 90% of native vegetation in the temperate parts of eastern Australia has been removed for agriculture, industry, transport and human habitation since European settlement.



About 50% of Australia's rainforests have been cleared, with the proportion of Australia covered by forest or woodland reduced by more than one third⁶.

“That slim creek out of the sky
the dried-blood western gum tree
is all stir in its high reaches:
its strung haze-blue foliage is dancing
points down in breezy mobs, swapping
pace and place in an all-over sway.”

Les Murray, extract from Flowering Eucalypt in Autumn

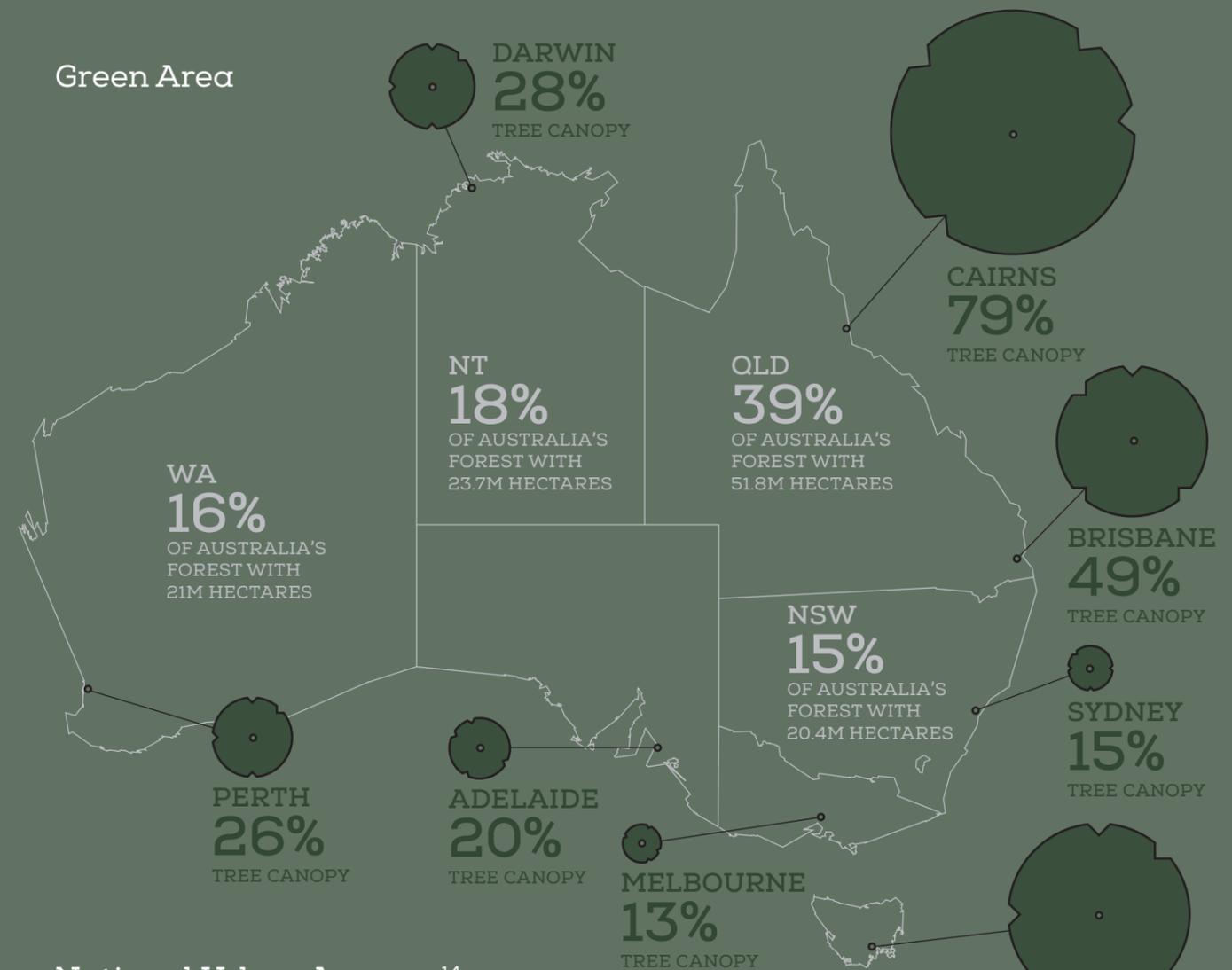
Contemporary Statistics on Green Tree Cover

Forests comprise 134 million hectares, or approximately 17%, of Australia’s total land area⁷. Queensland has the largest area of Australia’s forest (51.8 million hectares – 39% of Australia’s forest), with the Northern Territory (23.7 million hectares – 18%), Western Australia (21.0 million hectares – 16%), and New South Wales (20.4 million hectares – 15%), making up much of the balance⁸.

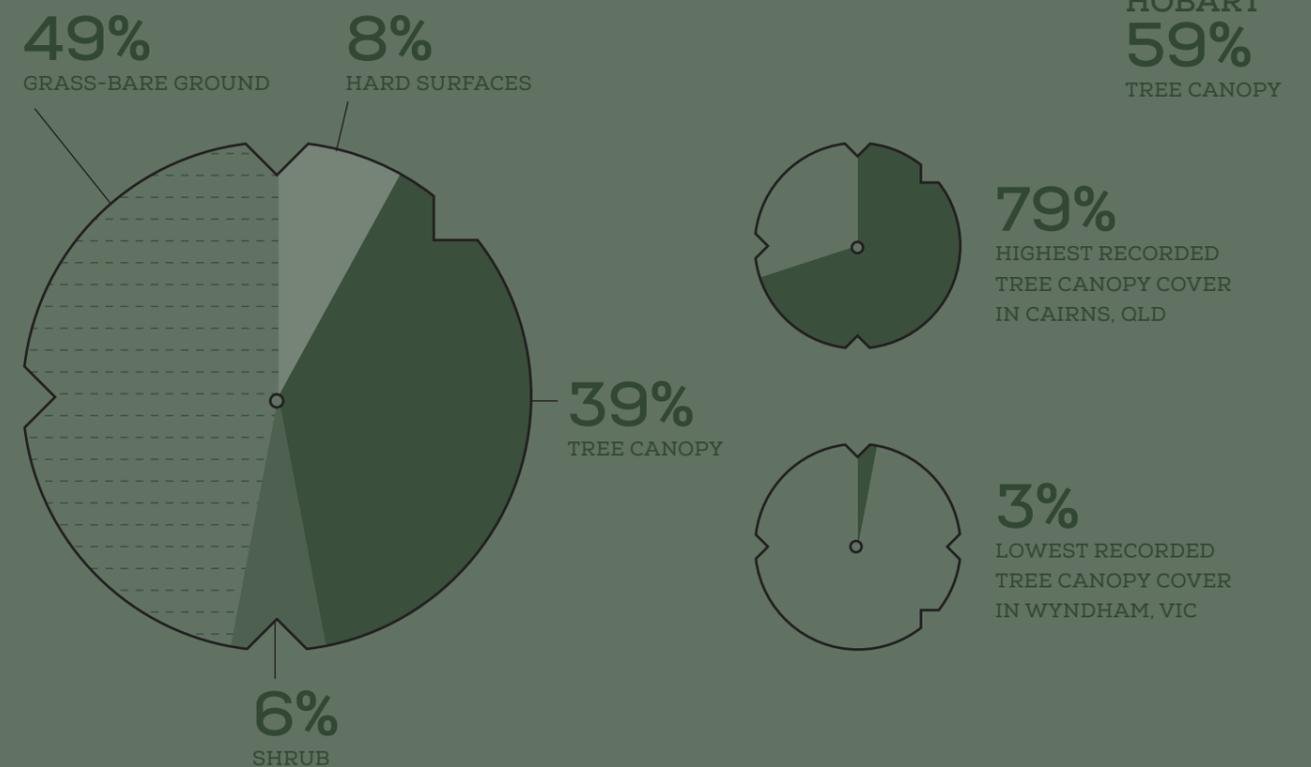
The good news is that in recent years Australia has experienced a small increase in overall tree cover. In the five-year period from 2011 to 2016, there was a net increase in forest area of 3.9 million hectares⁹. Even more positive is that the majority of this increase was in forest area defined as ‘native forest’. In the era of climate change where deforestation has become a significant global concern, we have every reason to be proud of the progress Australia’s forestry industry has made in recent times.

Unfortunately, this good news does not extend to tree cover in our urban environment. Between the period of 2008 and 2017, Australia’s major metropolitan regions cumulatively lost 2.6% of total vegetation in the urban environment¹⁰. This may not sound like much, but it’s actually equivalent to 1,586 square kilometres – a larger area than the City of Brisbane. It’s even more significant given the majority of the Australian population now lives in an urban setting. Close to half of all local governments (54 out of the 139 – 39%) studied had experienced statistically significant losses in total green space since 2008¹¹.

Hobart was the most tree-filled capital city in the country, with an impressive 59% of the Tasmanian capital covered by tree canopies¹². Brisbane, at 49%, and Darwin, at 28%, make up the top three cities while Melbourne and Sydney, Australia’s biggest and most populous cities, took out the bottom two positions, at 13% and 15% respectively¹³.



National Urban Average¹⁴



The Benefit of Trees



HAPPINESS &
WELLBEING

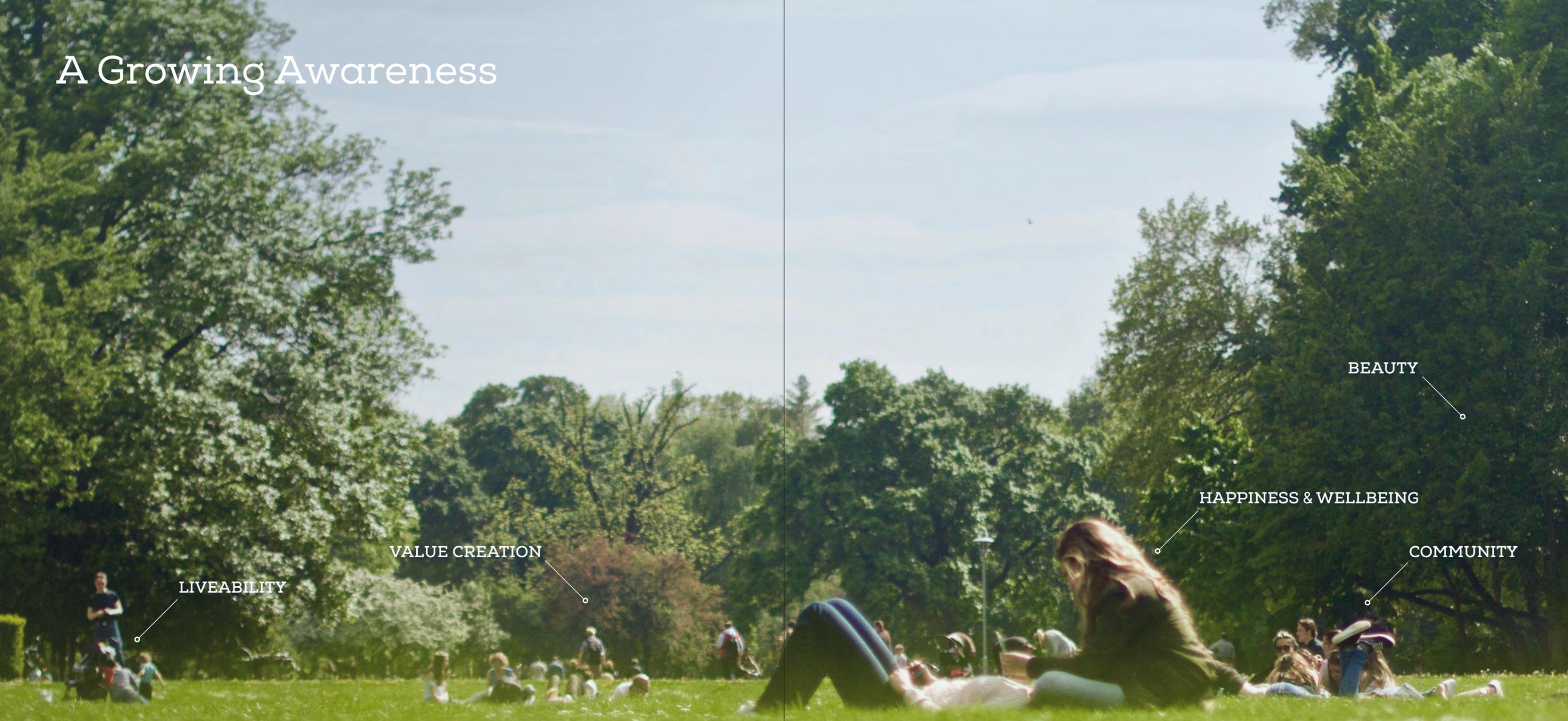
URBAN PLANNING &
LIVEABILITY

CLIMATE CHANGE &
OUR ENVIRONMENT

They might seem to be just part of the cityscape, but trees in our urban environment improve the liveability of our cities for countless reasons: from the happiness and wellbeing of their inhabitants, to the environmental and economic value of our cities, to addressing the biggest international issue of our time, climate change.

In the words of UN Secretary-General Antonio Guterres, “planting trees is one of the most important things we can do to contribute to the health of the planet”¹⁵. Our research reveals 70% of Australians agree their individual actions can have an impact on global environmental issues such as climate change. It’s time to make those actions count by greening the world around us.

A Growing Awareness



LIVEABILITY

VALUE CREATION

BEAUTY

HAPPINESS & WELLBEING

COMMUNITY



The amalgamation of the physical and mental health benefits leads to positives within the wider social sphere that academics, urban planners and politicians are becoming more and more aware of:

ENCOURAGING SOCIAL INTERACTION

In urban areas, green spaces also provide the locations for recreation, leisure, social and family gatherings, and opportunities for increasing community cohesion and building sense of place, and place attachments¹⁶.



CONNECTION WITH NATURE

A strong connection to nature makes people more likely to feel passionate about relationships with their friends and family¹⁷.



MODERATING INCIVILITY

People with less green space in their area feel lonelier and that they have less social support¹⁸. Urban green space also linked to positive indicators of functioning societies (reduced fear and crime)¹⁹.



Happiness



Wellbeing

Happiness & Wellbeing

There is a vast amount of scientific evidence pointing to the propensity for trees to make us feel happy and improve our wellbeing. This is related to the biophilia hypothesis, which suggests that humans possess an innate tendency to seek connections with nature and other forms of life²⁰. In improving our health and wellbeing, urban trees and greenspaces also present numerous social benefits encouraging greater connectivity and cohesion amongst residents.

Firstly, trees provide a great number of positive impacts on our physical health. Through provision of spaces for physical activity, time in nature has been proven to reduce a person's chances of developing a range of diseases, including diabetes by 43%²¹, cardiovascular disease and stroke by 37%²² and depression by 18-23%²³. Indeed just 10 minutes' relaxing outside has proven to significantly reduce blood pressure²⁴. Trees and other plants also have an exceptional ability to capture and filter multiple air pollutants, with one study showing just one large healthy tree can absorb and remove around 1.4kg of air pollution over the course of a year²⁵.

Whilst existing canopy cover in cities removes significant amounts of air pollution, increasing tree cover in urban areas will lead to greater pollution removal. This effect is even more pronounced in enclosed environments, with studies showing indoor plants can remove 75-90% of airborne pollutants depending on the plant and type of pollutant²⁶. But it's not just in terms of physical health where trees provide enormous benefits.

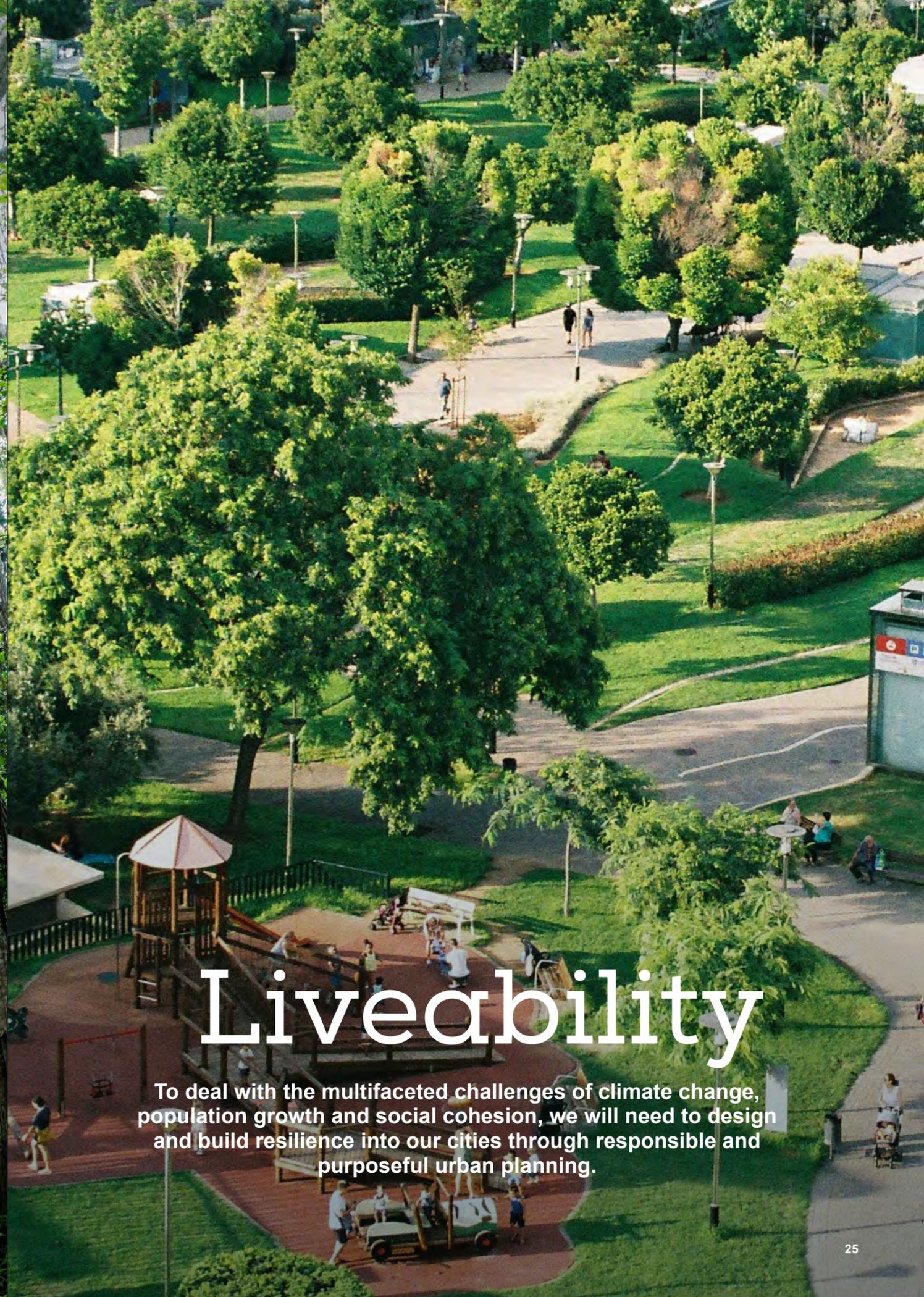
In recent years an increasing number of studies have illustrated the benefits of trees in the urban environment for the mental health and wellbeing of residents. Nature induces positive feelings through a number of physiological mechanisms, including activating the brain's dopamine reward system²⁷. Australians are well aware of these benefits, with 83% of Australians seeing green space as a place for relaxation and taking time out and 73% seeing their garden as a sanctuary for their mental wellbeing.

This effect is particularly relevant for our younger generations, as exposing children to environments that reduce stress and increase wellbeing has long-term effects on the structure of the brain and happiness later in life. A combined Australian and British study that analysed over one-hundred peer-reviewed research papers globally found that children learning outside the classroom achieved higher scores in class tests, had greater levels of physical fitness and motor skill development, increased confidence and self-esteem, showed leadership qualities and were more socially competent and environmentally responsible²⁸. Another source concluded that the benefits of nature contact for children are extensive, ranging from better physical health to better psychological wellbeing to better cognitive function²⁹. Children who engage in just one third more outdoor activities than their peers grow up to be happier adults³⁰ and children surrounded by high amounts of green space have up to a 55% lower risk of developing a mental disorder³¹.

Students who take part in outdoor learning programs perform better in reading, writing, maths and science, with 77% of teachers reporting student improvement in standardised tests³². In his seminal book *Last Child in the Woods*, Richard Louv discusses the concept of "nature-deficiency disorder", where children are at risk of numerous learning and development issues due to their lack of contact with nature³³.

Beauty

Trees not only provide a source of aesthetic beauty and interest in the otherwise bleak urban landscape, they also have crucial environmental and socio-economic benefits within our cities.



Liveability

To deal with the multifaceted challenges of climate change, population growth and social cohesion, we will need to design and build resilience into our cities through responsible and purposeful urban planning.



Community

Social Benefits

Trees help to regulate ambient temperatures in our urban environment. Extreme heat is the most dangerous climate change impact facing all Australians, with heat stress now accounting for more deaths than cyclones, floods, bushfires and storms combined³⁴. Researchers have found that green infrastructure, such as street trees and parkland, can significantly reduce direct and ambient temperatures in the urban environment, which will be crucial in a warming world³⁵. Just a 5% increase in tree cover can reduce daytime temperatures by as much as 2.3°C³⁶. It is therefore expected that urban greening can substantially improve the resilience of cities to climate change, potentially cooling cities by up to 8 °C in summer whilst also alleviating the impacts of flooding and providing shelter from extreme weather events³⁷.

The provision of trees and green spaces can also help to reduce thermal inequity and eco-gentrification, new areas of study that will only increase in relevance as our world heats up. People who live in urban environments are particularly susceptible to Urban Heat Islands (UHI), which are created in built up areas through storage and reflection of the solar radiation from building and construction materials³⁸. As a result of uneven social geographies, urban heating disproportionately impacts lower income and ethno-racially marginalised populations – a phenomenon termed ‘thermal inequity’³⁹. Poorer suburbs are often dense with much lower levels of greenery, and residents consequently suffer more heat stress than people living in areas with a greater concentration of green spaces. In essence, thermal inequity describes the concentration of poorer people in hotter places⁴⁰. Carefully planned urban greening is seen as a key measure for addressing thermal inequity by providing trees and green spaces where they are needed most.



Value Creation

Economic Benefits

Whilst the social benefits of urban greening alone should be sufficient to encourage such activity, there are also a great number of economic benefits gained through the provision of trees in the urban environment.

Firstly, there are the significant cost reductions for infrastructure management associated with having nearby tree canopy. Planting trees around buildings can result in huge reductions in energy consumption and, cumulatively, billions of dollars in savings by regulating ambient temperatures around buildings⁴¹. They also dramatically reduce the costs of managing stormwater runoff, something of crucial importance with precipitation patterns changing rapidly in the face of climate change. For every 5% of tree cover, storm water runoff is reduced by 2%⁴².

However, there are also less explicit economic benefits from the planting of trees in the urban environment. Studies have proven contact with natural elements has a positive impact on employee mental health and work attitudes, resulting in greater productivity at work⁴³. When applied across an entire city, this could have a dramatic impact on overall output. At the same time, greening the urban environment also increases property values through their aesthetic quality⁴⁴.



Resilience

Climate Change & Our Environment

Climate change represents the single greatest threat to human civilisation, with the United Nations describing it as the “defining issue of our time”⁴⁵. Since the industrial revolution humans have been responsible for directly contributing to increased concentrations of greenhouse gases in Earth’s atmosphere, resulting in effects ranging from shifting weather patterns to rising sea levels and increased risk of natural disasters.

Whilst the impact of climate change on the natural environment is often the primary focus of climate change research, climate change will also affect the urban environment in a big way. These impacts are felt by both people and the built infrastructure within that environment. For example, it is estimated that the European summer heat wave in 2003 claimed 35,000 lives⁴⁶, while the cost in terms of disruptions to infrastructure services of the 2009 Melbourne heatwave was estimated to be over \$800 million⁴⁷.

Flooding is another potential impact of climate change as rising sea levels cause changes in precipitation patterns and increased prevalence of storm surges and king tides. This can also result in both human health impacts and infrastructure damage⁴⁸. The biophysical features of greenspace in urban areas, through the provision of cooler microclimates and reduction of surface water runoff, offer potential to help cities adapt to climate change. Designing resilience into our cities to future-proof them against the potential impacts of climate change is an absolute necessity, and trees provide one of the simplest and most effective remedies.

There is a range of ways through which trees can help our cities mitigate the worst effects of climate change, including many of the temperature and water management mechanisms outlined previously. Most significantly however, we can look to the process of photosynthesis undertaken by all members of the plant kingdom, through which carbon dioxide is absorbed from the atmosphere and oxygen is produced as a by-product.

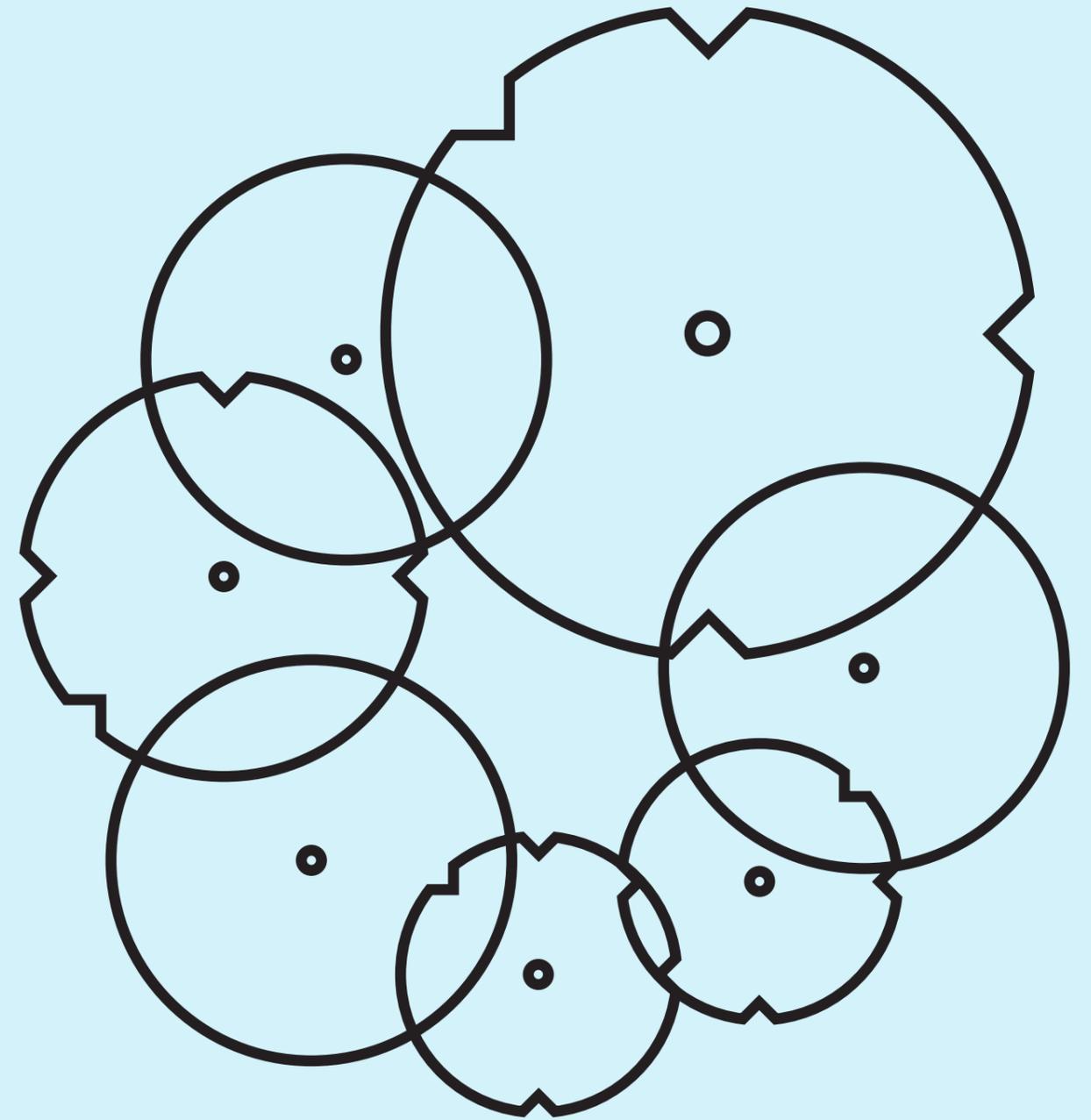


Mitigation

Due to this process, trees act as carbon sinks, meaning increasing tree canopy cover can help to mitigate the effects of climate change by sequestering carbon from the atmosphere⁴⁹ whilst also maintaining suitable levels of oxygen in our urban environment⁵⁰. The carbon removed from the atmosphere is then stored within the biomass of the trees themselves. One study carried out in Chicago found that small healthy trees are estimated to sequester around 1kg of carbon from the atmosphere each year, whilst very large healthy trees can sequester up to an incredible 93 kg of carbon every year⁵¹. These results are echoed by a more recent study on carbon sequestration in the urban forests of Alabama. The research project found the average carbon sequestration per tree ranged from 3 kg/year for very small trees to over 50 kg/year on average for trees with a diameter of over 77cm⁵². This is why responsibly sourced timber is one of the most environmentally friendly building materials on the market.

Trees are not only critical for the health and wellbeing of humans in the environment, but also the many bats, birds, insects and mammals that we share our cities with. A growing body of research shows urban areas can contain surprisingly high levels of biodiversity, including many endangered species that have grown to rely on urban greenery⁵³. This is because the ecosystem services trees provide, including cooling local climates, absorbing excess soil nutrients, reducing runoff and providing shelter, are just as important for other animals as they are for us⁵⁴. Large urban trees in particular are considered ‘keystone structures’ as they provide the habitat and resources critical for the survival of other flora and fauna in the area⁵⁵. Increasing the amount of green spaces within our cities therefore increases the potential of our cities to safeguard and even promote biodiversity, particularly if urban planners pay particular focus to increasing tree coverage.

Our Future



In a time when the environment and its importance to human civilisation is well and truly in the international spotlight, planting trees and engaging with nature is more important now than ever as National Tree Day approaches a quarter of a century of campaign action. We are so proud of what we've achieved since our humble beginnings in 1996, but we couldn't have done it without the hard work of our amazing volunteers around the country. It's this kind of collaborative effort to care for nature that can help us reverse the tide of environmental degradation and provide a safe and stable environment for future generations.

Our Goals Moving Forward



NATIONAL TREE DAY

National Tree Day is a call to action for all Australians to put their hands in the earth and give back to their community. Each year, about 300,000 people volunteer their time to engage in environmental activities that educate individuals about the world around them. It's a day to venture outdoors and get to know your community, and most importantly, to have fun!



MOVING FORWARD

Planet Ark will continue to pursue our primary aim of encouraging greater connection with nature and community amongst all Australians. For National Tree Day, this will involve increasing the scope of the campaign to include a greater number of activities that foster engagement with nature, while also maintaining our target of one million trees planted each year.



202020 VISION

Much of the research included in this report is informed by the excellent work of 202020 Vision, which is a collaborative project aimed at making our urban areas 20% greener by 2020. Planet Ark will continue to work with the organisation until 2020 and beyond, with our collaborative aim being the encouragement of greater connection with nature.

Why We Need Tree Day



Delve In

We live in a world where the distinction between humans and nature is becoming more and more emphasised. This is despite overwhelming evidence suggesting connecting with nature, whether out in wilderness or in the urban environment, makes us happier, healthier and more productive.



Celebrate

National Tree Day offers us the opportunity to recognise and celebrate our innate and unbreakable connection to the natural world while treasuring some of its most beautiful inhabitants... trees!

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