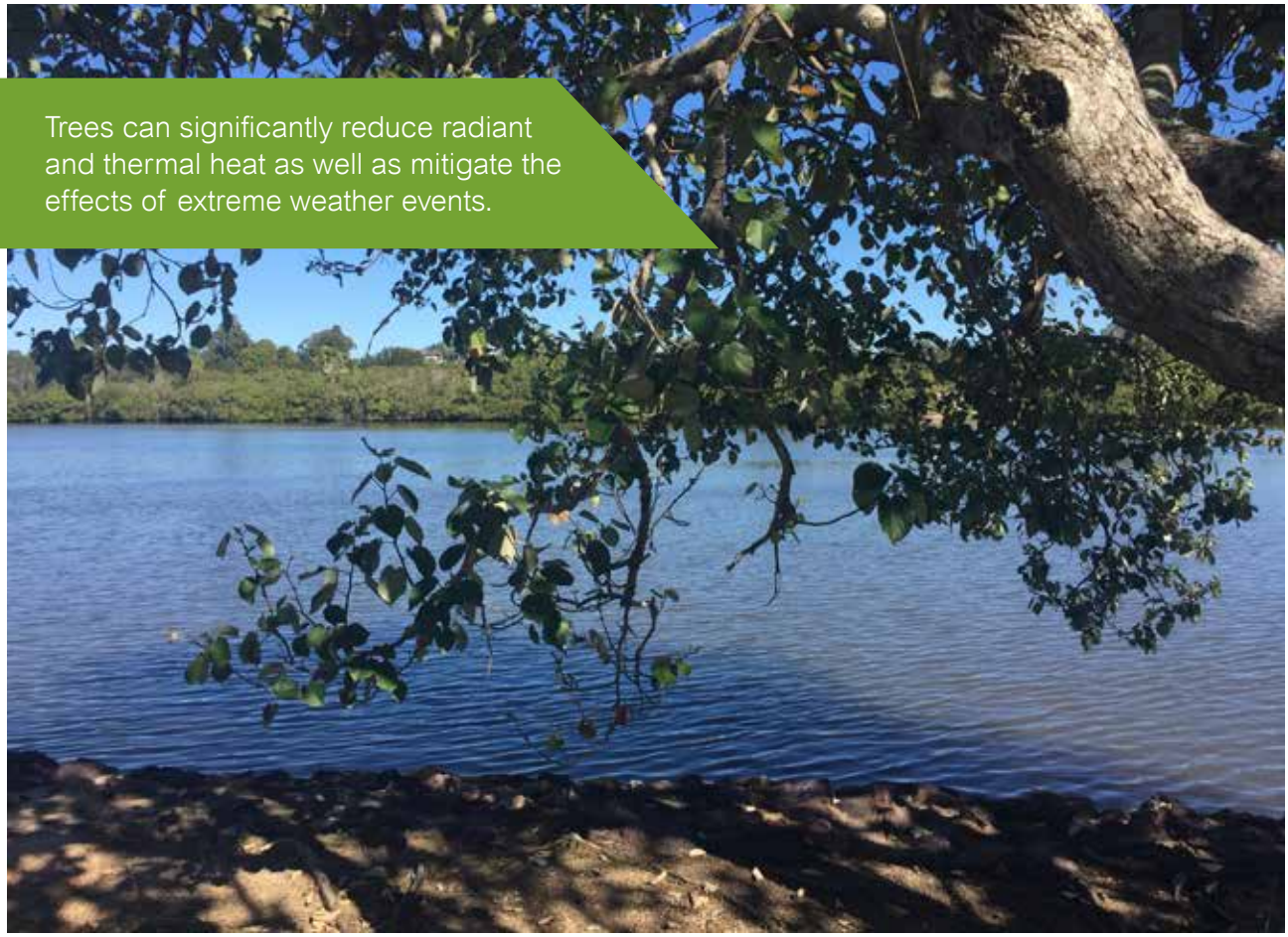


Trees can significantly reduce radiant and thermal heat as well as mitigate the effects of extreme weather events.

The benefits of trees

Trees provide many environmental, visual, social and economic benefits. They have the potential to locally reduce the severity of climate change and in a warming climate, will help to mitigate and manage increased heat with their shading and cooling canopies.

Environmental benefits

Trees perform critical 'ecosystem services' and help to maintain biodiversity. They regulate sunlight to our houses and streets and reduce ambient temperature through the provision of shade and cooling.

Brisbane City Council reported that in 2011/12 its 575,000 trees sequestered 7300 tonnes of carbon to the value of $168,000, air pollution removal to the tune of 87,200 tonnes annually (valued at $44,200) and 653,733m^3 of rainfall interception valued at $1,444,533 (estimated using i-Tree ECO V5 National Urban Forest Alliance 2014).

The many environmental benefits of trees are summarised in *Table 1: The environmental benefits of trees.*

Trees absorb and store carbon, release oxygen, shade and cool their surroundings, reduce and filter storm water run off and bind soils preventing erosion.

Table 1: The environmental benefits of trees

Environmental benefits
Provision of shade (reflection and absorption of solar radiation). Strategically positioned trees can significantly reduce energy consumption for cooling of buildings (air conditioning) (McPherson et al. 2016). Shaded pathways can help increase 'walkability' (Sarker et al. 2015) reducing motor vehicle dependency and as such, greenhouse gas emissions.
Cooling the surrounding air as an outcome of evapo-transpiration. Temperature differentials of between 4.1 °C and 18.7 °C can be experienced beneath clusters of shady trees (Thom et al. 2016).
Sequestration and storage of carbon (carbon dioxide is the main greenhouse gas contributing to enhanced greenhouse effect and climate change).
Production of oxygen (trees convert carbon dioxide to oxygen which is released) and carbon (which is stored in wood as an outcome of respiration).
Absorption and biofiltration of storm water (reducing peak flows, nutrient content and level of pollutants in storm water runoff, helping to mitigate flooding, reducing erosion and drainage infrastructure requirements). In low intensity rain events, street trees can capture and reduce rainfall run off by up to twenty percent (Livesley 2013).
Tree roots bind soils and restrain bank edges, reducing the rate and severity of erosion.
Air quality improvement through pollutant filtration (ozone reduction, dust and chemical particulate removal).
The provision of food and shelter for wildlife (including insects).
Improving soils through decomposition of matter and nutrient recycling and the forming of symbiotic relationships with soil microorganisms.
Wind reduction.

Trees make our streets more attractive and provide a visual edge to the roadway, delineating the road corridor.

Visual benefits

Street trees are well recognised as essential elements of high quality and inviting urban spaces.

Healthy, attractive trees add identity and visual interest to the appearance of our local streets and neighbourhoods. Conversely, neighbourhoods with less tree cover, small or poor quality street trees can undermine an area's image and sense of community pride.

Larger trees can act as landmarks and provide critical 'first impressions' when planted as entry statements. They create attractive, inviting landscapes leading us into our major centres and local towns through gateway and avenue plantings.

Trees can complement or provide relief from the built form. They lend interest to the sides of buildings and can mask the negative effects of development as our region grows.

'Liveable' street treatments, including trees planted between the footpath and roadway, have been found to increase road safety, including fewer vehicle collisions and pedestrian or cyclist injuries (Dumbaugh 2006).

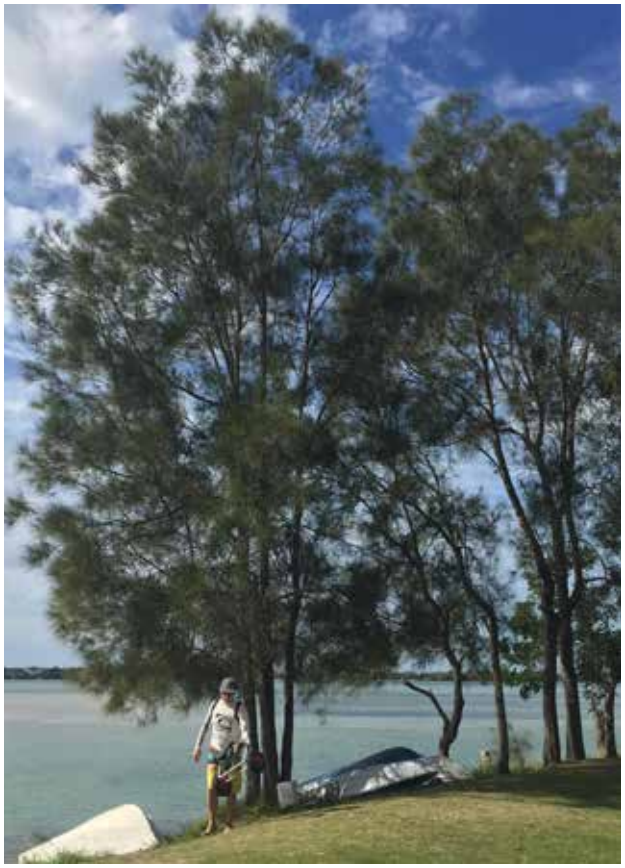
Tree lined roadways improve driver concentration and provide a real and perceived physical barrier between cars and pedestrians (Ely and Pitman 2014).

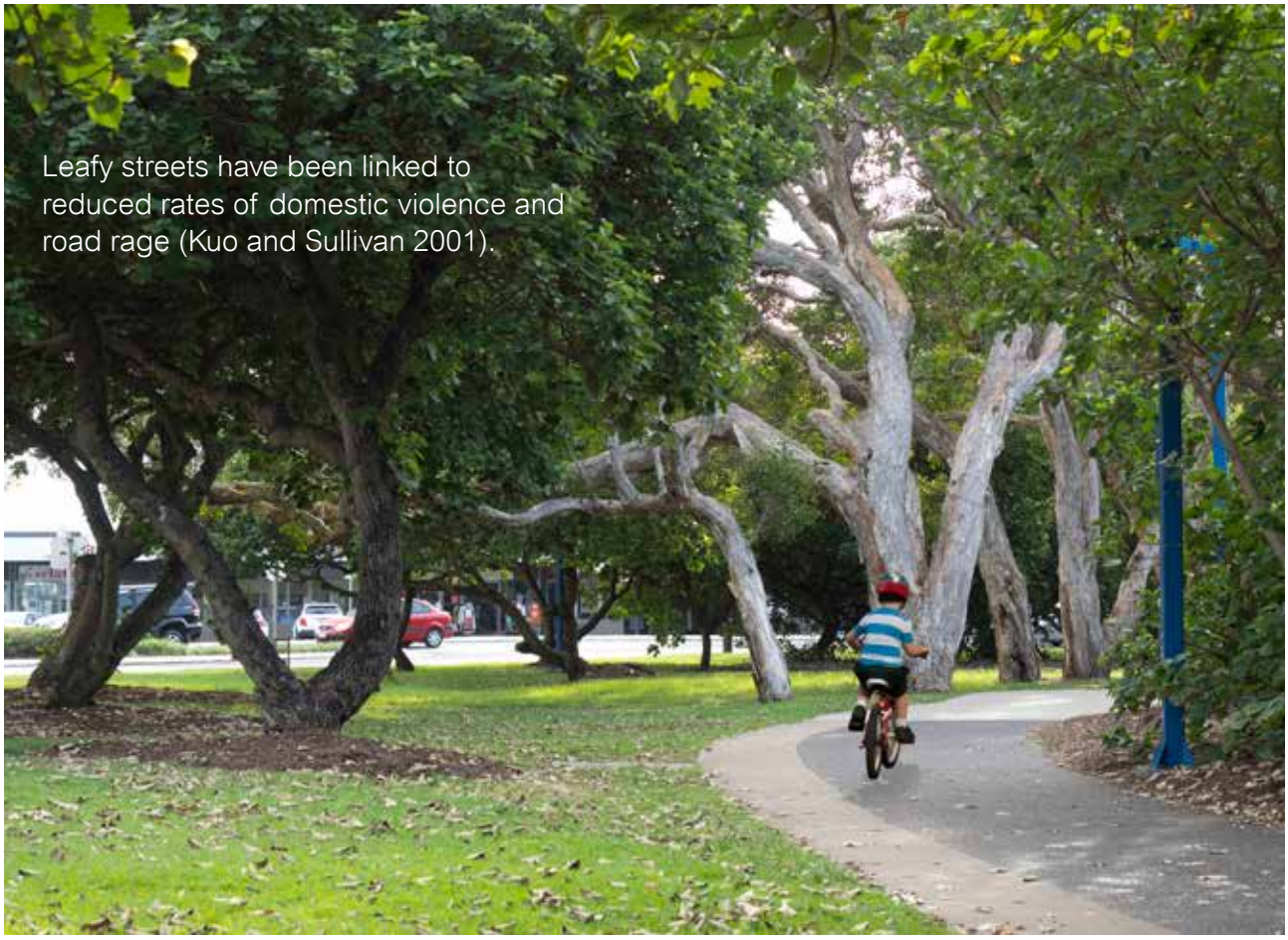
Some of the visual benefits of trees are summarised in *Table 2*: *The visual benefits of trees.*

Table 2: The visual benefits of trees

Visual benefits
Provide visual amenity.
Contribute to placemaking and local character.
Create privacy through screening.
Buffer and soften the built environment.
Mask or moderate the impacts of development.
Frame views.
Provide vertical scale and spatial definition to our streets and high rise localities.
Define paths of travel delineating curves and changes in the road (legibility of routes).
Act as landmarks and legacies from the past.
Provide subtropical ambience.
Contribute to community identity.
Provide seasonal change and interest.
Enhance cultural events.
Bring nature into our urban environments.

Trees make the places we live, visit and travel through more attractive.





Leafy streets have been linked to reduced rates of domestic violence and road rage (Kuo and Sullivan 2001).

Social benefits

Trees significantly contribute to the health and wellbeing of our communities. They connect us to nature and to each other.

Street trees contribute to healthier urban lifestyles (Astell-Burt et al. 2014). The shade they provide makes it easier for us to exercise and walk, encouraging outdoor lifestyles and physical activity. People living in greener areas are forty percent less likely to be overweight or obese (Planet Ark 2016). Leafy settings have been shown to reduce stress, foster recovery and enhance concentration. Participation in tree planting and stewardship activities has also been shown to strengthen local communities (Svendson 2009).

Both the quality and quantity of greenery in streetscapes has been linked to self reported reductions in stress and positive feelings of belonging in adults (de Vries et al. 2013). Office workers may need as little as five minutes of walking through nearby leafy streetscapes to deliver a 'dose of nature' that improves productivity back at work (Largo-Wight et al. 2011). Even more importantly, safe, inexpensive and accessible doses of nature for children can improve learning and reduce symptoms of attention deficit disorder (Kuo and Faber Taylor 2004).

The social benefits of trees are summarised in *Table 3*: *The social benefits of trees*.

Table 3: The social benefits of trees

Social benefits
Psychological wellbeing (trees can provide a sense of peace and calm and reduce stress).
Enhanced walkability of pedestrian networks through shade and cooling (treelined streets surrounding parks, recreation and community facilities for example encourage people to walk rather than drive to these places).
Provide legacies and links to the past and help create community identity.
Encourage feelings of connectedness to nature.
Decrease blood pressure (studies have found traffic calming, reduced domestic violence and crime in general are linked to environments where there is good tree cover).
Encourage outdoor lifestyles, activity and participation in community life (health and well being for the older members of the community and play for young children).
Encourage productivity in workers and the study habits of female students (see information box below).
Minimise noise pollution and extreme heat which have been linked to aggression.
Treed outlooks have been linked to faster rates of recovery for hospital patients and improved mental heath.
Street trees provide a buffer between vehicles and pedestrians and can increase safety, or the perception of safety for pedestrians.

Trees make places. Their presence can encourage activity, connectedness and calm.

Increasing tree canopy cover is one of the most cost effective strategies for cooling buildings and local neighbourhoods (Norton et al. 2013).

Economic benefits

Trees make places. They improve the appearance, economic value and liveability of our towns. Trees create atmosphere and encourage activity. They offer increased vibrancy and comfort to commercial areas. Businesses on tree lined streets have been shown to be more profitable than non-tree lined streets (Wolf 2005) with shoppers in warm climates likely to spend more time and money in cool and leafy locations.

Houses in leafy streets also attract higher sale prices. When separated from other house, property and location features, Brisbane residential home-buyers preference for houses in leafy streets attracted property prices up to 3.73% higher than comparable non-leafy streets (Plant et al. 2017).

Yet the strongest case for leafy streets may come from the energy saving benefits of cooler, tree-shaded streets and neighbourhoods in our warming climate. Reducing peak summer temperature by one degree is estimated to reduce energy usage (through reduced cooling load) by 5% (Norton et al. 2013).

30,500 urban trees located along a 19 kilometre stretch of the Pacific Highway in Northern Sydney store an estimated $1.65 million of carbon (based on a carbon value of $23 per tonne) and have been shown to deliver annual benefits worth $97,770 relating to carbon sequestration, air pollution removal, building energy savings and avoided carbon emissions (Amati 2013).

See Table 4: *The economic benefits of trees* for a summary of cost savings associated with trees.

Table 4: The economic benefits of trees

Economic benefits
Reduced energy consumption for cooling through the provision of shade to buildings and lowered ambient air temperature via evaporative cooling.
Enhanced economic activity or commercial centres shaded by trees are more attractive and comfortable to shoppers (more frequent and longer trips have been recorded in tree lined streets).
Increased streetscape amenity and higher property values.
Extended life of hard surfaces (i.e. asphalt) as an outcome of tree shade.
Reduced loading on storm water infrastructure and associated cost savings.
Enhanced community wellbeing and reduced reliance on health services.

Summary of street tree benefits

Street trees are critical to the future sustainability of the Sunshine Coast. They are directly linked to social wellbeing and positively contribute to the look, feel and prosperity of our region.