

URBAN HEAT ISLANDS

THE IMPORTANCE OF RANDWICK'S MORETON BAY FIGS

The State Government seeks to reduce Sydney's carbon footprint by increasing density around existing public transport nodes and introducing new light rail to new high density residential areas.

This is considered good urban planning but in the case of inner and eastern Sydney, it has generated more problems than it has solved.

The light rail route has removed the very trees that were doing an outstanding job ameliorating climate impacts.

In terms of the new high rise areas, researchers are showing urban design and planning practices disregard the impact of the residential towers on their microclimates, and thus on energy consumption. As a result, these precincts are creating the adverse effects of urban heat islands due to climate change.



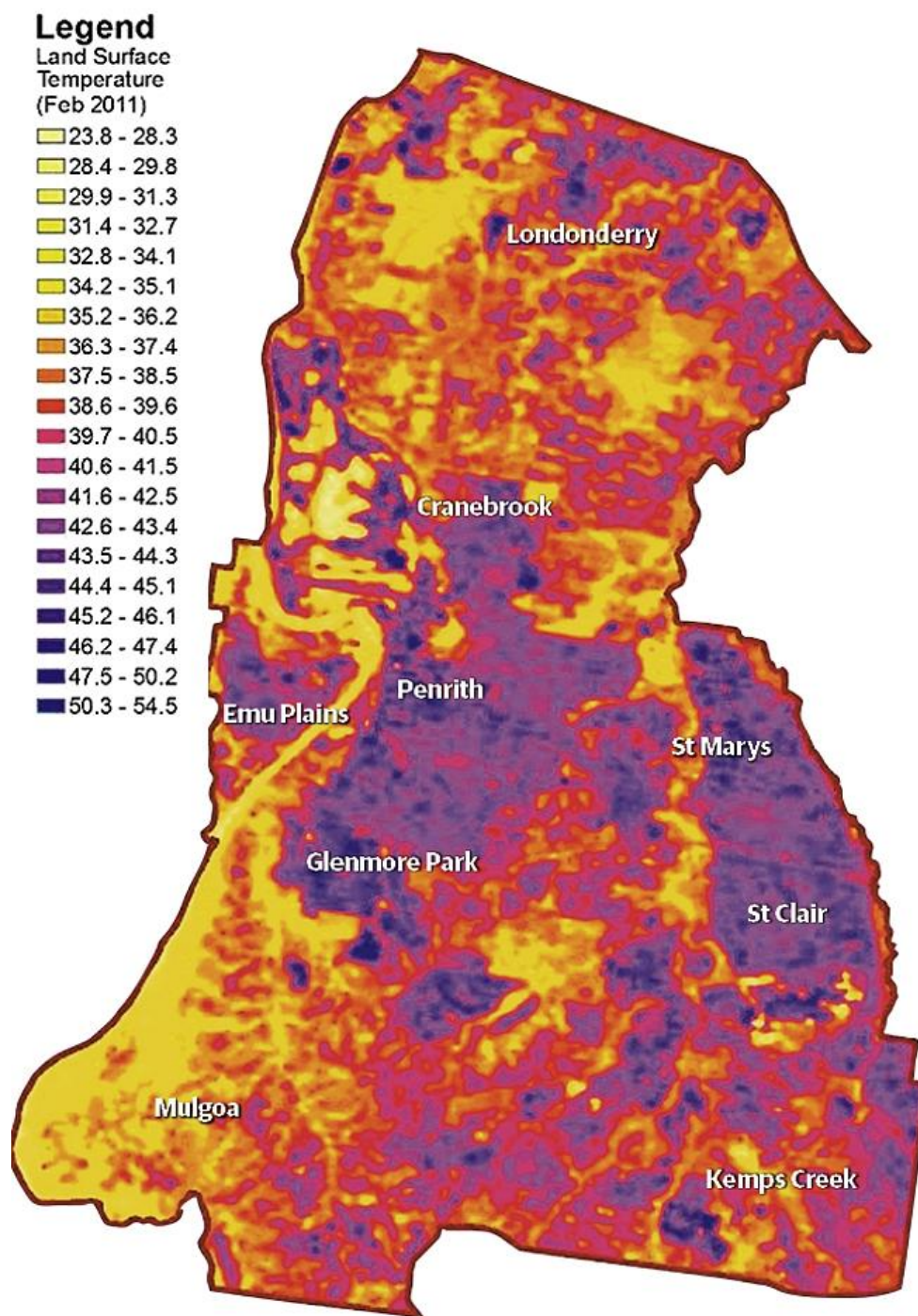
Urban heat islands in Zetland near Randwick

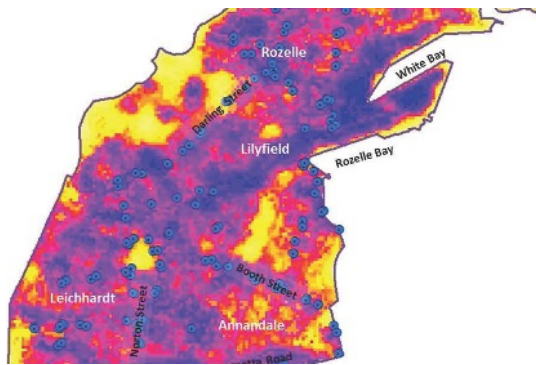
As well, a new study has found a lack of tree coverage is making suburbs feel hotter for longer. It found;

- Tree coverage in parts of Sydney among lowest in the country
- Some western and south-east areas have as little as 12% tree coverage
- Randwick has 14.2% coverage and the City of Sydney, 15.2%.
- Bankstown has 17.1%, Sutherland 42.1%, Warringah 58%
- The study is by the 2020 Vision which is a collaboration of all levels of government with industry that aims to increase green space in cities by 20% by 2020.
- A separate study by the CSIRO has found that boosting green spaces can help reduce the number of heat wave related deaths among the elderly in the city.

The following image is a heat map of Penrith done by UTS researchers in February 2011. Can you imagine what the temperatures of 54⁰ would have been this February? From focus groups by researchers at Western Sydney University, we have found that as recently as this April mothers could not push their strollers along local footpaths because of the heat.

We also learned that children in Day Care cannot go out to play after 9.00am in some areas of Penrith because of the heat.



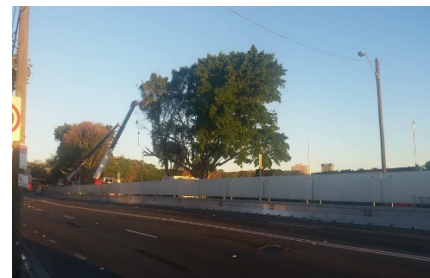


This recent heat map for the inner west, while not giving us temperatures, uses the same colour bands as the Penrith map. The purple and dark blue range from 42.5° to 54.5°.

Internationally, **trees** are increasingly recognised as the most effective way to address the **Urban Heat Island**, while at the same time they,

- Assist with flood alleviation and management, especially in Kensington
- Improve stormwater quality
- Provide a positive impact on health through walking and cycling
- Provide habitat and biodiversity benefits
- Positively enrich the beauty of the city for residents and tourists
- Improve mental well-being.

Urban Trees: Worth More Than They Cost



Felling of the Moreton Bay figs in Anzac Parade and Allison Road, Sydney
www.savingsydneytrees.com

Removing these large mature urban figs represents a massive loss of sequestered carbon. Such an outcome is environmentally irresponsible and highlights the need for those managing urban vegetation to appreciate the larger environmental picture.

Urban trees are assets that require the expenditure of resources – labour, energy, and even water - for their proper management. G. M. Moore from Burnley College in Victoria has asked

“What is the \$ value of the benefits that are provided by trees and what does society get in return?”

For example,

- What is the value of shade provided by trees that drop temperatures by up to 8C, reduce air conditioner use and reduce carbon emissions? Estimates put the savings on air conditioning alone at between 12-15% per annum. Planting 11 million trees in the Los Angeles basin saves US\$50 million per annum on air conditioning bills.
- What is the value of reduced wind speeds of up to 10% due to the presence of trees under a climate change scenario when winds will be stronger?
- What is the value of removing pollutants from the air of Australian cities? In New York in 1994 the value of the city's trees in removing pollutants was estimated at US\$10 million per annum.
The value returned to the City of Melbourne by its approximately 70 thousand public trees alone would be more than \$14 million per annum.
- What is the value of trees in holding and absorbing water during intense rainfall events under a changed climate? Such a role has profound implications for the behaviour of storm water systems in cities. What is their value in reducing localized flooding?

This has been costed by G. M. Moore in the table below:

Estimates of environmental economic values for 100,000 large mature urban trees growing in an Australian city (Moore,2009)

Parameter	Value per tree	Quantity	Unit Price AUD\$	Value AUD\$
Carbon sequestered in trees	12.5 tonne	1.25million tonne	\$20 per tree	\$25 million
Street Tree value	\$ AUD200 per annum			\$20million per annum
Electricity saving	30KWh	3 million kWh	\$0.17 per kWh	\$510,000 per annum
Carbon emissions saved	1.2Kg for each kWh	3,600 tonne per tree	\$20 per annum	\$72,000 per annum
Water saving from electricity generation	30 kWh per tree at 100L per kWh	300 mill L	\$1.50 per kilolitre	\$45000

Notes on estimations and calculations:

- The estimate of 12.5 tonne is for a large mature urban tree
- The price of AUD\$20 per tonne is based on the Australian carbon market price
- The electricity saving is based on reduced energy use due to shade from trees
- The price used for electricity is based on a rounded Victorian rate per kWh
- Value of prolonged bitumen is based on an extended life from 20 to 30 years
- 100L of water is used to generate each kWh by brown coal powered generators
- Water valued at \$1.50 per kilolitre
- Assumes tree canopy of 75m² shading bitumen covering 30% of its canopy area

To sum up

- Mature trees have a significant place in urban landscapes and they must be managed to ensure that they remain healthy and fulfil the full potential of their lifespans.
- As climate changes, the impact of vegetation on stormwater runoff could save billions of dollars in infrastructure costs to Australia's cities.

It is not economically possible to retrofit larger stormwater drains and alter the levels at which they enter waterways. However, trees hold rainwater on their canopies, and through transpiration significantly reduce the amount of water entering drains. Estimates suggest that trees may hold up to 40% of the rain water that impacts on them and that as little as 40% of water striking trees may enter drains. Furthermore, tree root systems may act as effective bio-filters of the storm water before it enters water tables or river systems.

- Given that carbon dioxide is the most significant of the greenhouse gases, especially for the states of South Eastern Australia, and considerable electricity is derived from coal powered generators, the canopy of urban trees must be retained.

The public is becoming increasingly aware that power generation is producing large volumes of greenhouse emissions and that the clearing of trees for powerlines and general tree pruning, plus the removal of trees for the Light Rail, is reducing the level of carbon sequestered in the canopy structures of urban trees.

Thus the State Government, power generating and distribution companies and authorities are compounding their contributions to the greenhouse effect and global warming.

Governments through their agencies are still major clearers of trees, forests and ecosystems. In most States, management policies for road side vegetation at a time of climate change are inappropriate.

- Trees and roadside ecosystems are assets that fix carbon, provide shade, filter air and protect from wind, and provide wildlife corridors and habitat just to mention a few of the obvious benefits.

*Are these benefits properly costed for road related projects, including **Light Rail**, where a balance of safety, cost and the environment has to be achieved?*

- It is to be hoped that the old engineering philosophy, that trees and roads are incompatible, is no longer the reigning paradigm at a time of climate change. *However, roadside vegetation is still being cleared right across the country, despite the fact that it sequesters massive amounts of carbon that could be used to partially offset the carbon produced by the vehicles that use the roads. Again it is clear that the real and full economics of the situation have not been properly considered.*
- It is highly likely that the Australian Government will become a signatory to the post-Kyoto successor. Consequently, it would seem that the present situation, which substantially undervalues trees and urban vegetation, will change once the impact of the protocols on greenhouse gas emissions are recognized.

The economic algorithms and paradigms that have applied to the management of trees and public open space in urban environments are changing rapidly. As a consequence the economic imperatives that apply to managing trees will change under a thorough cost/benefit analysis.

- The current role of trees in the urban landscape is being redefined by those who have little interest or expertise in urban vegetation management and are driven by other imperatives. It is time to address some of these issues before changes are made that degrade the landscape, and which could take decades to remedy.

As a truly Australian urban landscape, which values trees and recognizes aridity and changed climate, emerges, it will be understood that urban trees and landscapes are worth much more than they cost and that they are the keys to urban sustainability.

Prepared by Professor-Emeritus Helen Armstrong, May 2016

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