

Case study: Dubbo Heat Island Amelioration

COUNCIL NAME

Dubbo Regional Council

WEB ADDRESS

dubbo.nsw.gov.au

SIZE

7,536 square kilometres

POPULATION

50,077

FUNDING PROGRAM

Building Resilience to Climate Change

Overview

The Dubbo CBD Heat Island Amelioration project was designed to improve the level of shade that currently exists within the Bultje Street medical precinct, which is one of the hottest streets in the CBD of this inland regional city. This design incorporated Water Sensitive Urban Design principles by including a water capturing system in the stormwater gutters. Japanese Elm (*Zelkova seratta*), attractive trees that produce a high broad dome, were planted. Over time these trees will produce a canopy of between 10 - 12m diameter each. It is estimated that this will increase the percentage of shade in the immediate area by 300% and reduce land surface temperature by 20 degrees.

Background

The Dubbo City CBD is subject to the urban heat island (UHI) effect in which hard surfaces such as roads and buildings absorb heat but do not store water, leading to higher urban temperatures. Urban heat is projected to increase with an additional 27 days per year over 35° by 2070. A cost-effective solution can be as simple as improving and promoting the coverage of green spaces within our cities. Increasing vegetation, especially trees, is an effective approach to reduce urban heat through evapotranspiration and shading.

Dubbo Regional Council is committed to increasing the urban tree canopy within the CBD via the Dubbo Street Tree Masterplan. The masterplan identified Bultje Street, with high heat exposure and high pedestrian traffic, as being a high priority (Priority 1) for increasing urban canopy. The project aimed to:

- Reduce ambient summer temperatures by increasing shading to road and footpaths
- Reduce the risk of heat exposure and related illnesses and mortality to vulnerable communities
- Reduce heating and cooling energy costs to occupants of buildings along Bultje Street
- Increase longevity of local road infrastructure
- Reduce and /or delay stormwater peak flows and nutrient loads.

Implementation

Firstly, a survey of Bultje Street between Brisbane and Darling streets was carried out. The Steering Committee (Manager Horticultural Services, Manager Civil Infrastructure, Manager Works Services, and Design Engineers) identified the tree locations to avoid future conflicts with services, parking etc. The i-Tree Canopy Tool from the United States Department of Agriculture established that this area had an existing canopy cover of 2.8% of the total area.

As Bultje Street is part of the original village of Dubbo, council's intent is to use plants that maintain the heritage value of the precinct. To achieve this aim, Council replaced the existing *Brachychiton populneus* (Kurrajong) with *Zelkova serrata* 'Green Vase' cultivar. It grows to a height of 14 m, with a canopy width of 10m. Although not native to Australia, it maximises shade in the warmer months and solar access in the winter months. Its shape and structure minimises the risk of damage to the branches by vehicles. It is extremely hardy and adaptable to the urban environment, tolerating heat, air pollution and periods of drought.

The design incorporated Water Sensitive Urban Design and establishment of under road tree vaults.

Community consultation with stakeholders was undertaken and included one public meeting. Project information was disseminated through the local paper, social media and throughout the Splash and local government network.

Outcomes

The project will increase Bultje Street's existing tree canopy by up to 300% by planting the selected street tree species. This will increase the shading of the asphalt surface significantly, reducing the ambient heat trapped and retained within the streetscape. Over time, the trees will also decrease ultraviolet (UV) exposure to pedestrians.

The project uses Water Sensitive Urban Design to capture stormwater runoff from the nearby streets to provide a passive and non-potable source of water for irrigating the trees. Providing an alternate source of water is essential for dry climates like that experienced in Dubbo.

This urban heat amelioration project is expected to reduce heat in Bultje Street during heatwaves from 58°C near hard surfaces including buildings, roofs and asphalt to 38°C under and near tree canopies. The tree pits also provide a stormwater function by reducing water quantity and pollutant loads discharging to the Macquarie River. In this way, strategic planting of trees within the urban landscape can benefit the local community and environment in many ways.

Key Learnings

It was intended to replant a minimum of eight trees to replace the existing trees. However due to site constraints, including underground services, sight lines and the higher than expected cost of installing the water sensitive urban design pits (due to old sandstone kerb and guttering) the project was reduced to seven trees. It is still expected that these trees will meet the stated objectives.

The water sensitive urban design component was an integral part of this project and a decision was made to install it as designed. The design section also identified an issue with vehicular sight lines, with the original placement of the trees complying with current standards. Council found strategic tree placement is important, because some locations will yield greater benefits than similar planting in other locations.

Collaboration across Council can solve multiple problems. Working together rather than in traditional silos allows valuable funding and resources to be combined and leveraged to solve multiple problems. At the same time as the trees in Bultje Street were being replanted, additional road infrastructure works enabled effective and efficient tree pits and stormwater drains to be installed. These works also alleviated localised stormwater issues by reducing runoff volume and velocity and pollutant discharge to the Macquarie River.

Water security is important. When planting street trees to cool your urban environment, be sure to include a water sensitive urban design structure to capture water to passively water the new plantings. The tree species selection is crucial as they need to withstand current climatic conditions and also withstand future climatic conditions which are likely to be more extreme.

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This project was the 2019 winner of the Climate Change Adaptation Award at the LGNSW Excellence in the Environment Awards