

Exemplar Greener Places



Melbourne's Urban Forest

The City of Melbourne's Urban Forest consists of open space areas such as the Royal Botanic Gardens and Fitzroy Gardens along with over 70,000 other public trees within road reserves and other Council managed spaces (City of Melbourne 2012). These areas are supported by the 2012-2032 City of Melbourne Urban Forest Strategy which aims to increase tree cover in the city to 40% by 2040.



Central Park, New York; an urban forest area in a metropolis

Central Park, located in Manhattan, New York is a 341 ha urban forest. It was officially opened in 1857 with almost every one of the 25,000 trees contained within being planted. Each year Central Park attracts over 37 million visitors who visit the park for walking, relaxing and attending concerts (Central Park Conservancy 2015). Central Park directly contributes to the employment of 453 people and indirectly a further 1345 full time positions associated with ancillary activities such as restaurants and other tourism operations (Central Park Conservancy 2015). From these, the value of Central Park towards the US economy has been estimated to be worth around one billion US dollars per year (Central Park Conservancy 2015).



Gothenburg's Urban Forest

Gothenburg is Sweden's second largest city, home to around half a million inhabitants. Around 70% of the Gothenburg urban area is open space, with those areas containing around 50% tree cover. It also contains numerous areas of open space and supports a large urban forest, as well as street trees. Examples of open space that forms part of the Gothenburg urban forest includes Slottskogen which is a 137 ha urban forest which was officially opened in 1874. It contains mature plantings of European trees such as Oak and Beech along with numerous walking trails. On a summers day Slottskogen is a favourite among locals who use the park for picnics under shady trees.



Current status

The Central Coast contains a unique environment with a high level of tree cover. This level of tree cover contributes to several unique suburbs, such as Pearl Beach. Approximately 74% of the Central Coast consists of native vegetation, of which around half occurs in conservation areas managed as Council reserves, State Forests and National Parks that provide are important habitat for a range of threatened species such as the Yellow-bellied Glider and Powerful Owl.

A technical study was completed to determine the level of vegetation cover across 94 suburbs, being those that contained residential areas. This study also determined the level of impervious surfaces and opportunities for planting such as within areas that contain lawns was conducted in

2018 (Technical Study report Appendix 2). This process was tenure blind, meaning that the area of canopy in public compared to private ownership was not determined. One of the limitations of the suburb-based canopy mapping is that some suburbs contain large areas of National Park or State Forest which may increase the relative level of tree cover. For instance, the suburb of Woy Woy includes a large area of Brisbane Water National Park. Whilst the urban area has relatively low levels of canopy cover, the inclusion of the National Park lands gave a higher level of canopy cover for Woy Woy suburb.

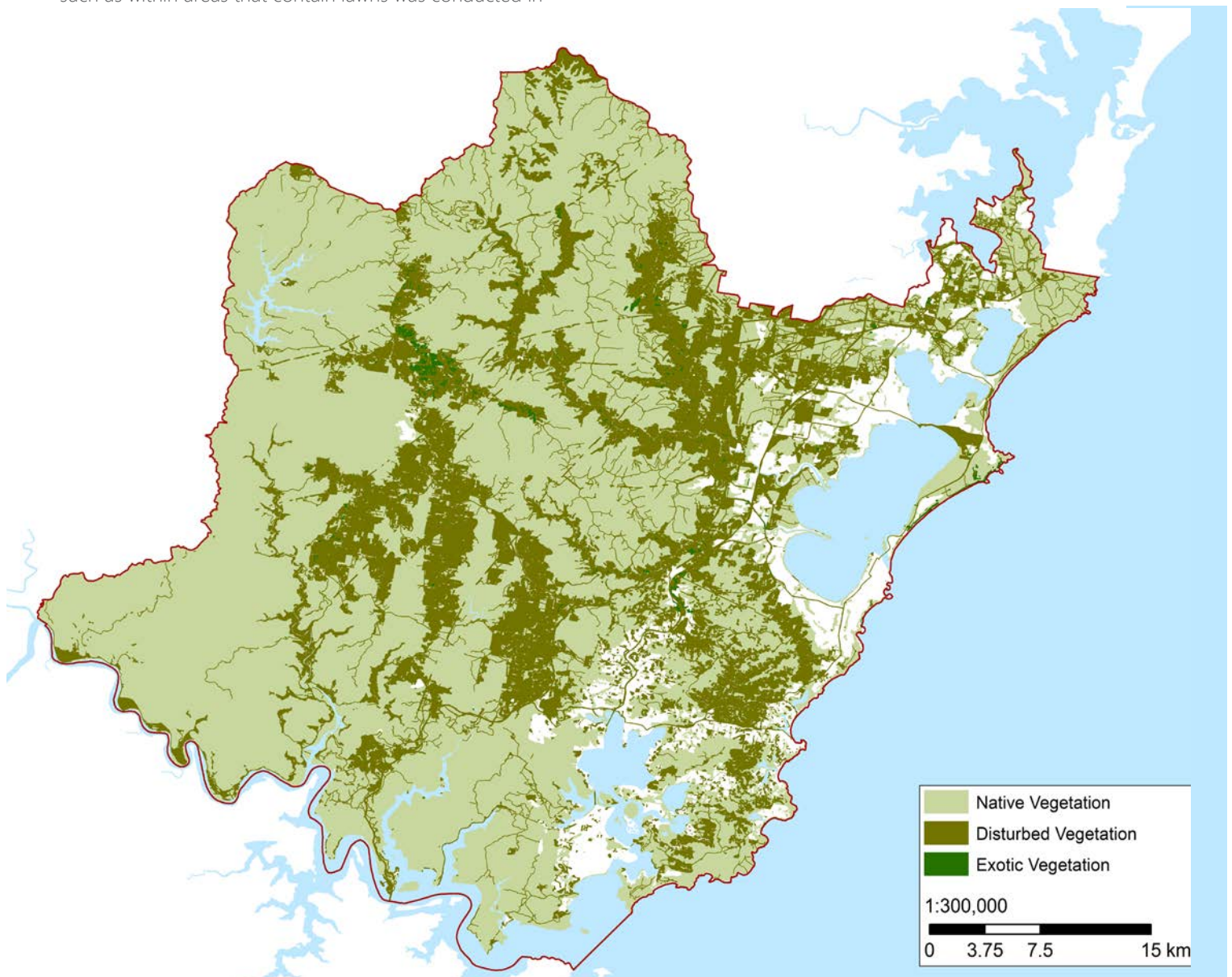


Figure 3: Distribution of native vegetation and other vegetation in the Central Coast



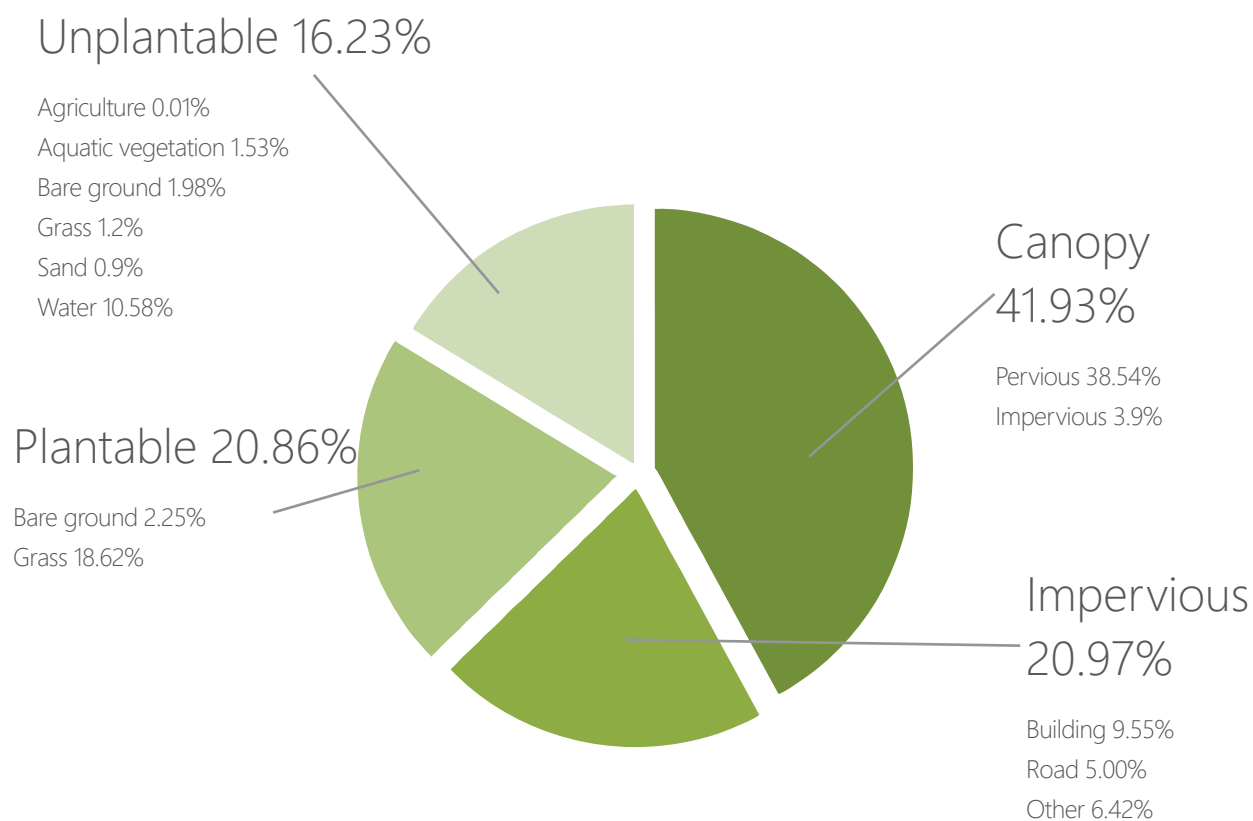


Figure 4: Overall land use breakdown for the 94 predominantly urban suburbs considered for urban canopy mapping.

Suburb scale vegetation cover

Figure 4 illustrates the findings from the technical study for the 94 suburbs considered. An overall canopy cover of 42% was determined, with a further 21% of land containing impervious surfaces. This is comparable to the national urban canopy which when assessed in 2014 had an average coverage of 39%, however is lower than northern Sydney Council areas such as Hornsby and Pittwater which recorded overall average canopy coverage of 59% (2020 Vision 2014). Overall, 21% of Central Coast suburbs contained grass or bare ground that

could be planted, which may include grazing lands. Lastly 16% of the land area of these suburbs were unsuitable for planting, including around 1% that consisted of grass with other purposes such as sporting fields.

On the individual suburb scale, tree canopy cover ranged from around 7% at Booker Bay through to almost 90% at Ourimbah, however this included a large proportion of Ourimbah State Forest. A number of suburbs recorded levels of canopy cover of less than 15% including Blue Bay, Davistown, Ettalong Beach, Gorokan, Point Frederick, St Hubert's Island, The Entrance and The Entrance North. Generally, these are suburbs that are relatively established and do not contain large areas of bushland. Further information on the level of tree cover in each suburb is contained within the Appendix 2.





Case study: changes in canopy cover at Woy Woy between 2005 and 2014

An investigation occurred as to changes in tree canopy cover and number of impervious surfaces at Woy Woy between 2005 and 2014 (see Appendix 2). Over this time, canopy cover declined by 173 hectares, while the area of impervious surface increased by 84 hectares and unplantable space increased by 113 hectares (Figure 5). This effect may be difficult to counteract as the area of plantable space only increased by 24 hectares (Figure 5).

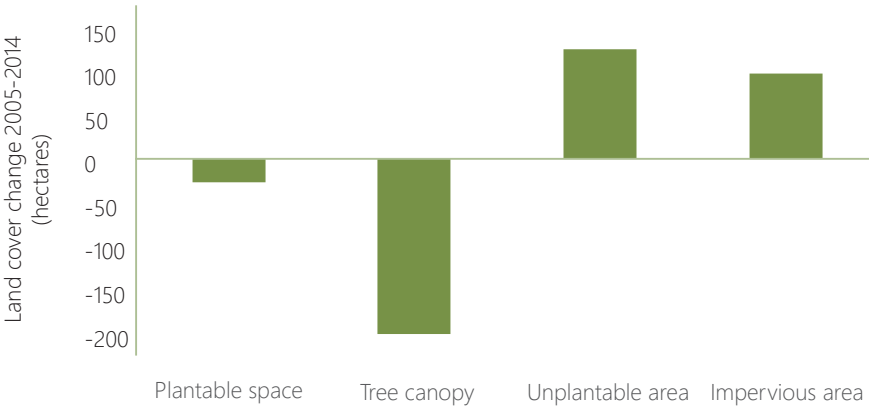


Figure 5A: change in land cover categories between 2005 and 2014 for the suburb of Woy Woy.

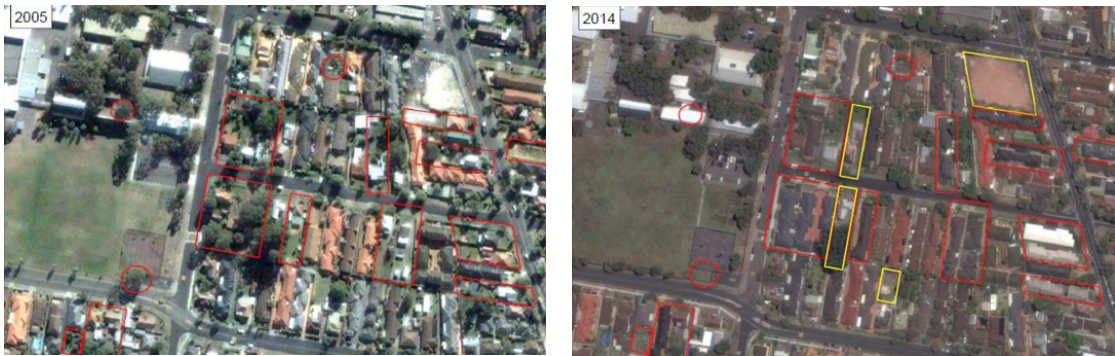


Figure 5B: Illustration of changes in land use in a representative area of Woy Woy between 2005 and 2014. Those marked with a red outline indicate canopy loss as a result of whole of site urban development, while the yellow outline indicate incidental canopy loss of part of site urban development.



How many public trees are there on the Central Coast?

Surveys occurred across 80 passive recreation reserves of the Central Coast, with the aim of understanding the density of trees across these areas. The surveys recorded a median tree density of 78 trees per hectare in the public recreation reserves. As Council owns 663 ha of recreation reserves, it's likely that around 50,000 trees are contained within these reserves.

The density for street trees and park trees will vary depending on the predominant purpose of the location and the type of species chosen. In general planting densities in this strategy will be at a maximum of around 150 trees per hectare, which is the density recorded in heavily vegetated parks that still maintain grass cover underneath. However, any planting program must occur through appropriate

place-based planning that considers all users of the park, how tree planting will complement those uses and enhance the user experience including considering the future size of planted trees. As such, parks should be assessed on a case by case basis by relevant subject matter experts before planting commences.

Planting design will be linked to open space design and delivery programs, such as the installation of play equipment, in combination with understanding the biodiversity benefits the planting may provide in the future.

This may instead translate to a planting density of between 50-100 trees per hectare or through trees, shrubs and groundcovers being planted in defined mulched planting areas with surrounding land being maintained as lawn.

Street tree planting is often constrained due to the presence of underground services, powerlines, footpath and kerb and gutter, which may allow for less than 0.5 metres of planting width. In these situations, smaller trees and large shrubs should be considered to ensure that damage to infrastructure does not occur in the future, if lines of sight are maintained (see Figures 6 & 7). Alternatively, smaller shrubs, grasses and groundcovers may be used in areas of high visual prominence where taller trees and shrubs may not be suitable and in areas where future maintenance will not be excessive.



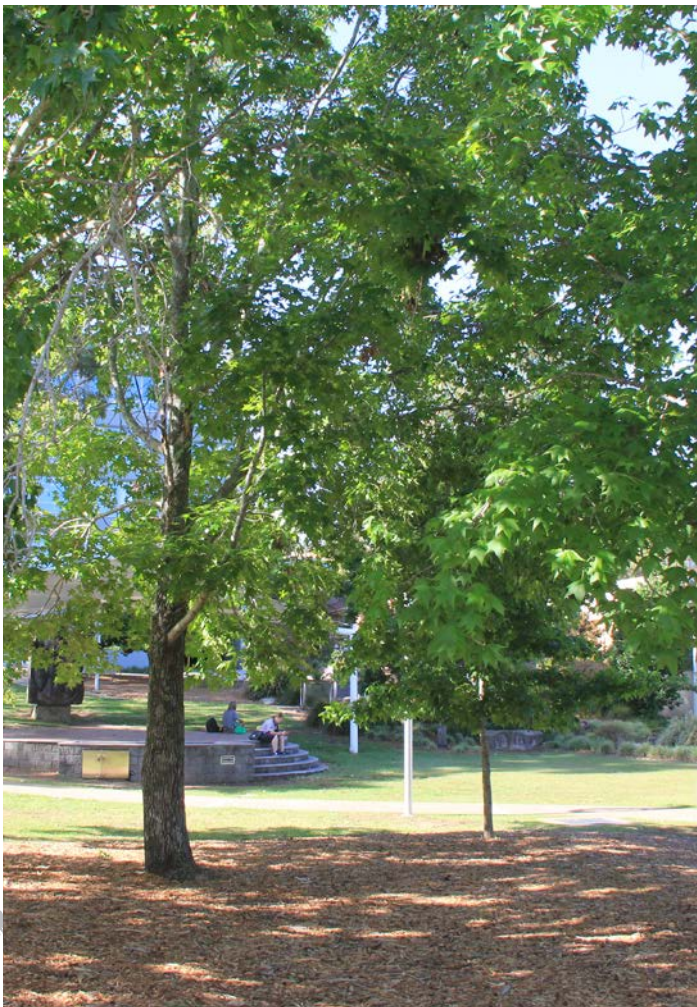


Figure 6: photo of a park that includes a high tree density which provides shade to park users.



Figure 7: smaller street trees in Hamilton near Newcastle allow for canopy establishment in a paved footpath area while also providing shade to the footpath and parked vehicles.



What is the Urban Heat Island Effect?

An Urban Heat Island occurs when the urban area is significantly warmer than the surrounding less developed areas, such as rural lands and forests (Oke 2011). Heat islands develop due to urban materials such as concrete, asphalt, tiled roofs and gravel absorbing rather than reflecting heat which occurs when the area is more heavily vegetated (Oke 2011).

The concept of the Urban Heat Island has been in existence for over 50 years (Bornstein 1968), however as society becomes more urbanised, greater emphasis needs to be placed upon the effect during urban planning. Figure 8 demonstrates the effect of development at Erina shows the heat island effect compared to surrounding vegetated areas, which were on average 3°C

hotter. This means houses and other buildings will be hotter in areas where the Heat Island Effect is operating which will translate to higher cooling costs or alternatively less comfortable conditions indoors if cooling does not occur.

Furthermore, on hot days taking a walk outdoors will be much warmer than if canopy cover is present over footpaths.

Urban Heat Island mapping was conducted across the Central Coast (see the Technical Study included as Appendix). Open source Landsat imagery was used to determine differentials on a hot day in January 2018 and a hot day in March 2013. These analyses found that a number of urban and agricultural areas are more than 4°C above background levels (Figure 9). When considering change in the operation of heat islands over the past five years, the analysis found that large areas of agricultural land in the west of the Central Coast had become significantly warmer, along with some isolated areas of greenfield residential subdivision across the Central Coast (Figure 9). However,

minor warming differentials also occurred on the Woy Woy peninsula, Kariong, Gosford city and in the greenfield suburb of Woongarah (Figure 9).

Urban Heat Island mapping has shown that on hot days, the Central Coast's 10 hottest suburbs are between 3.4 and 5.7°C above background levels (see appendix for the technical report). For example, the forest within Blackwall Mountain is more than 4°C cooler than nearby urban housing in Ettalong Beach. Between 2013 and 2018, ten suburbs became more than 1.5°C hotter compared to background levels that occurred in bushland, including an increase of 2.6°C at Ettalong Beach, 1.9°C at Blue Haven and Woongarah, 1.8°C at East Gosford and Booker Bay and 1.72°C at Point Frederick. Over time unabated, the effects of the Urban Heat Island will continue and possibly intensify as a result of continued development intensification of the urban centres.



Figure 8: an example of the operation of the urban heat island effect at Erina where areas of vegetation are on average 3°C cooler than adjacent developed areas. Areas in red are hotter than areas that are blue.



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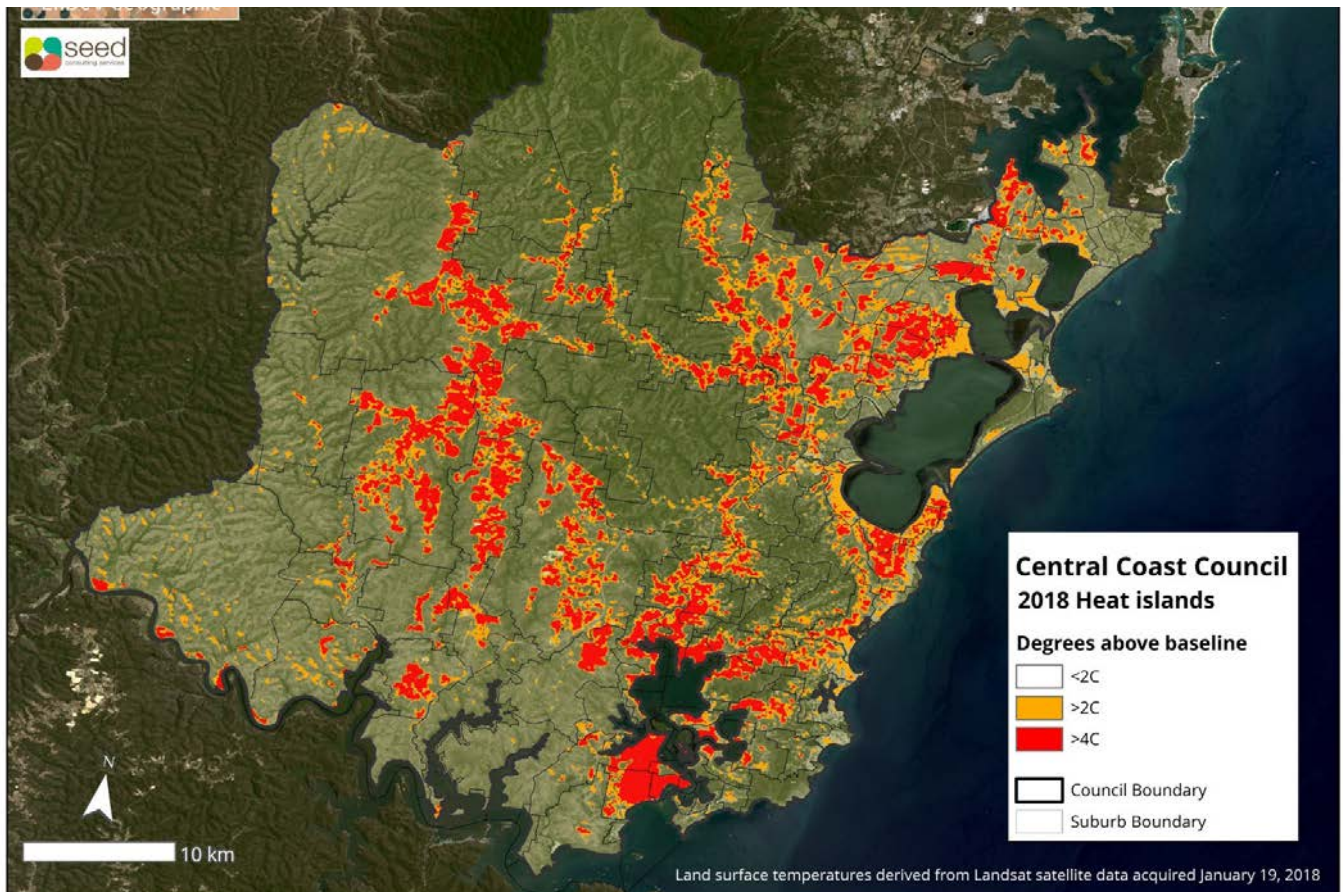


Figure 9: Areas where heat islands are more than 2°C and 4°C above baseline temperatures on a hot day in January 2018.

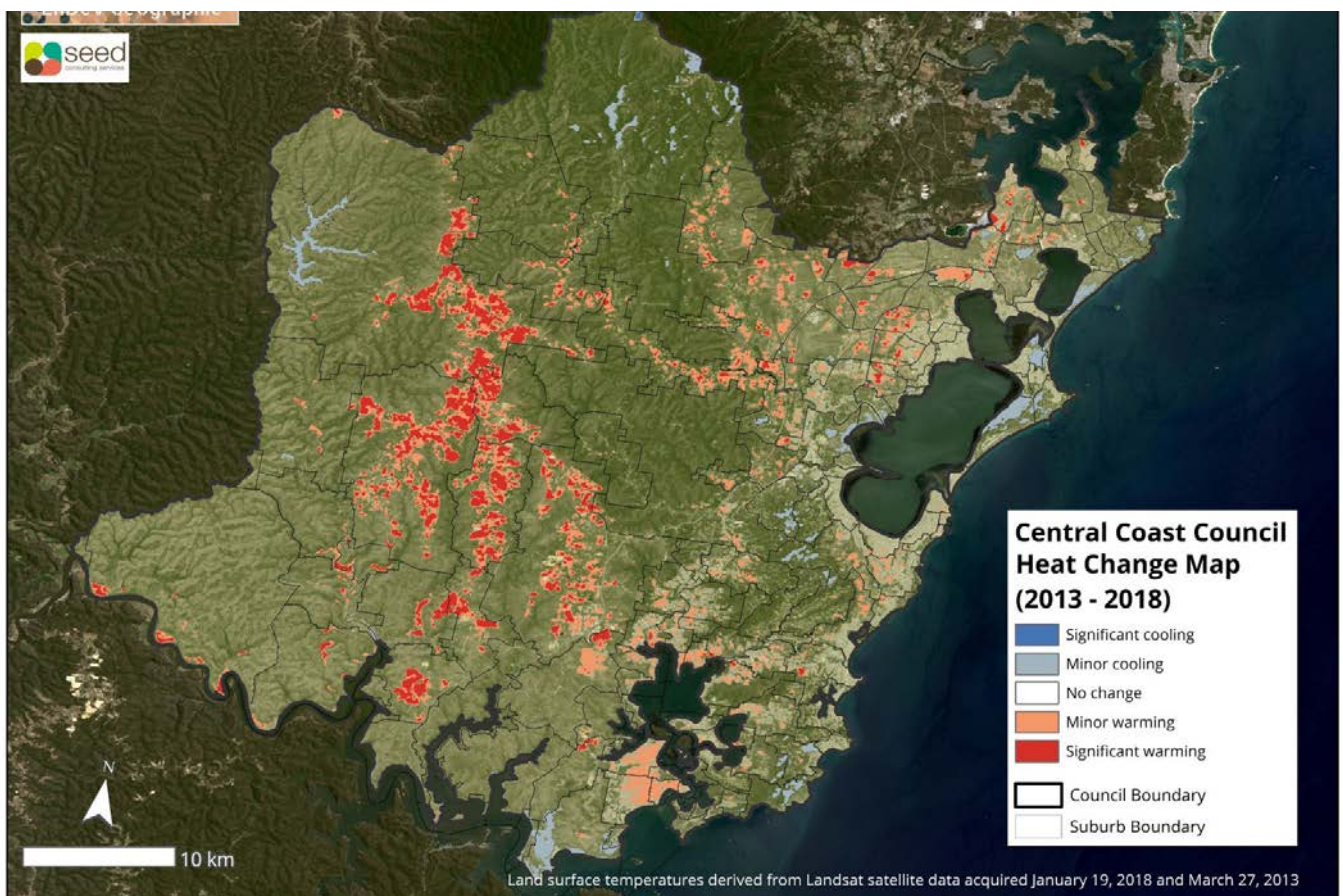


Figure 10: changes in heat islands between 2013 and 2018 for the Central Coast Local Government Area.

Mitigating Urban Heat Island Effects: priority suburbs for urban greening

The urban heat island mapping indicated 19 suburbs for priority planting to mitigate urban heat island effects. For suburbs that have low levels of tree cover, it is anticipated that an aim of an increase of canopy cover by a further 5% will occur around 30 years after the initial installation. Where suitable public locations cannot be found for the specified number of trees, alternative mechanistic approaches such as providing trees and large shrubs to schools, health facilities, private open space providers such as golf courses and private residents where their land will strategically address the urban heat island effect and a guarantee can be provided that the tree will be maintained into the future.

Bateau Bay
Blackwall
Blue Bay
Booker Bay
Davistown
Ettalong Beach
Gorokan
Kariong
Killarney Vale
Lake Haven
Long Jetty
Point Frederick
St Hubert's Island
The Entrance
The Entrance North
Toowoon Bay
Umina Beach
Woy Woy
West Gosford

