

Cool Cities Need Tough Trees

By Arnav Tiwari – LinkedIn friend of HOPE Inc.

When a heatwave hits Sydney, the hottest places are rarely the leafiest. Dark roads, roofs and car parks soak up the sun and release the heat slowly overnight, creating an "urban heat island" that leaves built-up suburbs warmer than greener surroundings. A 2022 study found that heatwaves cause about 117 deaths a year in Sydney, and that without the urban heat island, over 90% of heatwave days would not have reached heatwave thresholds. Under the highest-emissions scenario, heatwave days could almost quadruple.

Trees as natural air conditioners

Trees cool a city in two ways: they shade surfaces, and their leaves release water vapour that cools the air around them. The Sydney study found that neighbourhoods with more than 90% tree cover had a heat island about half as strong as those with less than 10%. This is not just a Sydney story. Satellite data from 806 cities show that the cooling gained from each extra 1% of tree cover rose in more than 90% of them between 2000 and 2015. Tall, dense canopies cool the most, especially in hot, dry places where the trees can get enough water.

Under 10% tree cover

Bare, sealed streets



Strong urban heat island

Sydney areas with the least tree cover

Over 90% tree cover

Leafy streets



About half as strong

Sydney areas with the most tree cover

Figure 1: In Sydney, areas with over 90% tree cover had an urban heat island about half as strong as areas with under 10% tree cover. Original illustration based on Chaston et al. (2022).

But the trees are struggling too

The catch is that trees feel the same heat we do. A global study of 3,129 tree and shrub species growing in 164 cities found that 56% already experience temperatures hotter than those in their natural range. By 2050, 76% of the species will be at risk from rising temperatures and 70% from changing rainfall, with cities closer to the equator hit hardest.

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Based on 3,129 tree and shrub species in 164 cities across 78 countries (Esperon-Rodriguez et al. 2022)

Figure 2: Many city trees are already outside their comfort zone. Original illustration based on Esperon Rodriguez et al. (2022).

That sets up a vicious circle. When street trees weaken or die, the shade and cooling disappear, the city gets hotter, and the next heatwave stresses the survivors even more. Fewer trees also means less carbon stored, leaving more carbon dioxide in the air to drive further warming.

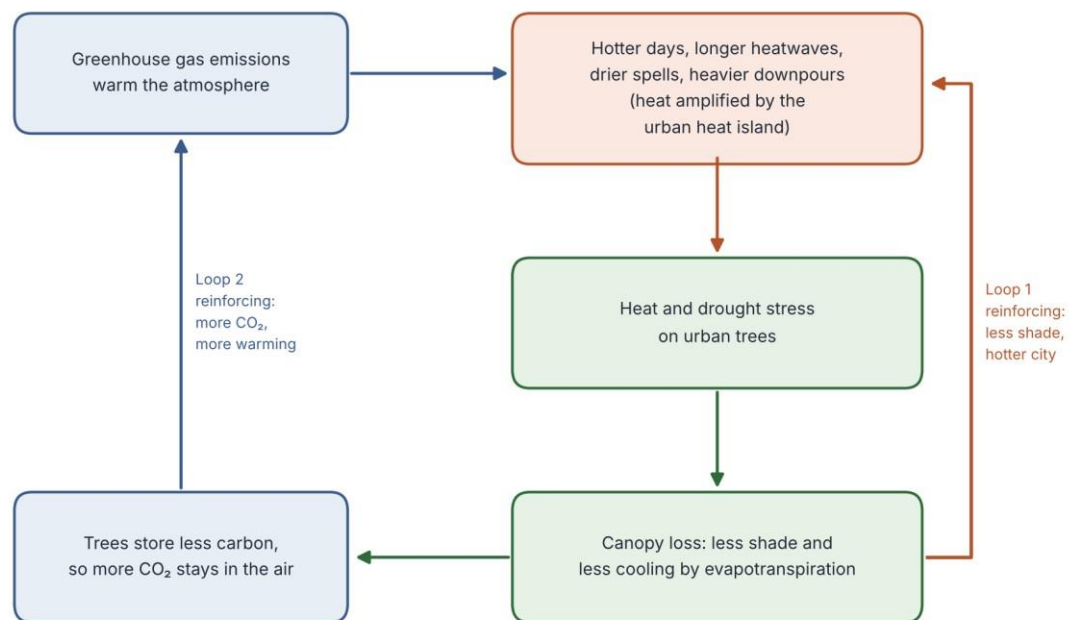


Figure 3: Why losing trees makes cities hotter. Heat stress kills trees, and fewer trees means less shade and more carbon dioxide, which drives further warming. Original diagram based on Chaston et al. (2022) and Esperon-Rodriguez et al. (2022).

More than a heat story

Heat also harms wildlife. Since 1994, more than 30,000 flying-foxes, which roost in trees, have died in 19 heat events across Australia. On one day in January 2002, temperatures above 42°C killed more than 3,500 in New South Wales.

Water is another pressure. Trees cool best where water is available, so keeping them alive through longer dry spells takes more irrigation, while intense downpours run off hard surfaces instead of soaking in.

Even air quality is affected. In hot weather, some common street trees, including oaks, poplars and willows, release more of a gas called isoprene. It reacts with traffic pollution to form ground-level ozone, which is a lung irritant. On very hot days in Berlin, emissions like these may account for up to 60% of peak hourly ozone, compared with about 12% on average.

What we can do

- **Choose tough, varied species.** Trees planted today must cope with the climate of 2050. Heat- and drought-tolerant species that release little isoprene are a smart bet.
- **Plant where canopy is thin.** The biggest cooling gains come from adding trees where there are few.
- **Look after them.** Water young trees through dry spells and protect the soil around them, because dry soil weakens a tree's cooling.
- **Layer the planting.** Mixing trees with shrubs and grass strengthens local cooling.
- **Speak up.** Ask your council about its tree canopy targets and how it will protect mature trees.

Trees are not a silver bullet: researchers caution that they cannot solve the heat problem alone, and cutting the emissions behind it matters too. But a well-chosen, well-cared-for tree is one of the cheapest and most effective defences our cities have, and it needs our help to survive the heat it is trying to fix.

Sources

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