



Enhancing urban tree health in New Zealand's urban areas

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KEY MESSAGES

Trees are essential urban infrastructure. They provide multiple benefits to cities and their inhabitants, such as improved air quality, heat mitigation, aesthetics, flood mitigation, and increased resilience to the impacts of climate change.

To sustain these benefits urban trees must be healthy, but they face multiple challenges. These include physical constraints from surrounding infrastructure, artificial lighting, physical damage, inadequate stormwater management, surface sealing, and limited root zones.

To improve tree health and maximise the benefits trees provide, key management options include providing above-ground space for trees, mitigating the impacts of artificial lighting, improving stormwater system performance (to reduce runoff volumes, runoff speeds and peak flows), adopting permeable surface treatments to allow greater water infiltration, and allowing space to expand root zones.

Careful planning can create a supportive environment for urban trees, ensuring their vitality and, in turn, the well-being of urban residents amidst the challenges of climate change.

BACKGROUND

Urban trees are essential for fostering healthy, sustainable cities. They provide numerous benefits, including improved air quality, heat mitigation, and stormwater moderation. However, urban trees face critical challenges in New Zealand, particularly in high-use pedestrian areas. By addressing six key factors that negatively affect tree health, urban planners, arborists and local councils can take the actions needed to create more resilient and thriving urban greenspaces, streetscapes and people.

This policy brief uses urban trees in Wellington City, New Zealand, to illustrate both the challenges and the steps needed to preserve the health of urban trees and sustain the benefits they provide. Wellington's urban environment, characterised by its compact design, high pedestrian traffic and constrained space for infrastructure, faces significant pressures that can hinder the growth and health of urban trees.

As climate change intensifies, the need for robust urban arboricultural practices becomes increasingly urgent. The impacts of planning and maintenance practices on urban tree health outlined in this brief are complemented by a case study of 34 trees in key pedestrian areas of Wellington.

THE IMPORTANCE OF URBAN TREES

Urban trees play a vital role in:

- **improving air quality** – trees absorb pollutants and trap particulates, enhancing overall air quality
- **mitigating urban heat** – tree canopies provide shade, reducing summer surface temperatures and combating the urban heat island effect
- **enhancing aesthetics and public safety** – trees in green spaces improve visual appeal and can enhance safety by physically separating pedestrians from traffic
- **water quality and flood mitigation** – trees intercept rainfall and promote water infiltration, helping to slow and reduce stormwater runoff.

CHALLENGES TO URBAN TREE HEALTH

Our analysis identified six key factors affecting the health of urban trees (Figure 1).

1. **Above-ground space constraints.** Many street trees experience physical restrictions due to surrounding infrastructure, such as street furniture,

lights, awnings and signs, which limit their canopy growth. This not only affects their ability to provide ecosystem services but also increases maintenance costs, e.g. pruning.

2. **Artificial light at night.** Night-time illumination can disrupt natural growth patterns and weaken trees over time. Artificial light at night may also alter the interactions local pollinators have with trees.
3. **Physical damage.** Urban trees are often physically damaged by vehicles, and during construction and maintenance of nearby infrastructure, both above- and below-ground. Such damage increases their vulnerability to disease and results in declines in tree health.
4. **Stormwater runoff management.** Many trees have stormwater diverted away from their root zones, exacerbating drought stress and limiting the benefits

trees could provide. Improved management of stormwater runoff is essential for tree health.

5. **Surface sealing and soil compaction.** Impermeable or compacted surfaces surrounding tree bases prevent water infiltration, increasing drought stress and creating hostile below-ground conditions. These restrict root growth but also limit nutrient cycling.
6. **Underground root volume constraints.** Many trees have restricted root zones due to co-located infrastructure and high proportions of sealed surfaces, reducing their resilience to urban stressors.



Figure 1. Factors affecting urban trees. The effects are often not linear: some have tipping points, while others interact to exacerbate or mitigate stress

RECOMMENDATIONS FOR ACTION

To address these challenges and enhance urban tree health we propose the following actions.

1. **Prioritise above-ground space.** Ensure that planning protects the predicted mature canopy extent and trunk girth of trees. This includes placing street lighting and signs outside the tree dripline (the outer extent of the branch spread).
2. **Mitigate the impact of artificial lighting.** Reassess the placement of streetlights and other artificial lighting to minimise their impact on tree health. Use downward-facing, directional lighting using 'warmer' wavelengths that reduce impacts on trees.
3. **Enhance infrastructure management.** Implement regular inspections and maintenance of tree-related infrastructure to minimise physical damage. Create guidelines that deliver space for trees and other infrastructure by using technologies that reduce the potential for impacts on and by tree roots. For example, replace clay or concrete tile sewers with continuous pipes such as HDPE, and/or install root barriers around linear infrastructure.
4. **Improve stormwater management.** Design stormwater systems that promote water infiltration to free-draining tree-root zones. Utilise permeable surfaces around trees to facilitate natural water flow.
5. **Adopt resilient surface treatments.** Transition to permeable and preferably organic surface materials that support tree health, e.g., bark chips (Figure 2). Increase planting under trees to maintain infiltration, reduce compaction, and promote nutrient cycling.
6. **Expand root zones.** When planting new trees or upgrading infrastructure, expand and maximise root zone volumes to reduce stress and improve overall tree resilience. Trees can be connected to adjacent landscaped or grassed areas using root trenches, and strong, rigid grids that protect soils from compaction while supporting surface infrastructure.

The valuable benefits that trees provide will increase over time if the constraints they face in urban settings can be alleviated. Arborists understand what healthy trees need in order to grow, so they should have a core role in urban planning and infrastructure design projects. Urban trees are invaluable assets to New Zealand cities, contributing significantly to their ecological health and the overall liveability of cities.



Figure 2. Treescape renovated to reduce tree stress by de-paving, mulching, and underplanting. The tree now has a larger, cooler root zone.

New research is uncovering the multiple ways urban trees can reduce stress and enhance the health of urban people. By implementing these recommendations, local councils can make the most of this essential infrastructure, enhancing tree health and resilience against climate change.

Investing in urban forestry practices (and arborists) not only protects these vital resources but also ensures that New Zealand cities remain vibrant and green for future generations. If local councils prioritise the health of urban trees in planning and maintenance practices, New Zealand cities will be increasingly resilient and will improve the well-being of their residents.

FURTHER READING

Parliamentary Commissioner for the Environment 2023. Are we building harder, hotter cities? The vital importance of urban green spaces. Wellington, Parliamentary Commissioner for the Environment.

Edwards P, Simcock R, Absalom E, Diprose G 2024. Human impacts on the wellbeing of urban trees in Wellington, New Zealand. Societal Impacts 3: 100045.

<https://doi.org/10.1016/j.socimp.2024.100045>

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