

SUBMISSION RE REDUCTION OF AIR POLLUTION BY TREES TO VICTORIAN GOVERNMENT March 2021

From:

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Every year 3,000 Australians die from exposure to toxic air pollution, while thousands of others suffer from asthma, emphysema, chronic bronchitis and other respiratory diseases, according to the Australian Conservation Foundation. Sources of pollution include emissions from industry, transport and coal power plants, as well as fine particulate emissions like dust and smoke from construction, agriculture, bush fires and other sources.

A cost effective and practical mitigation strategy would be to plant many more trees in cities and urban areas. Trees reduce air pollution by removing noxious gasses and particulates such as ozone, nitrogen dioxide, sulphur dioxide, dust, ash, smoke, and pollen from the air, resulting in lower rates of asthma, respiratory heart disease, and cancer. They also remove CO², the greenhouse gas, from the air, and give off oxygen, via photosynthesis.

The results from one very large study give an example of the protective role trees play in regard to human health, especially lung diseases. Conducted by US Forestry Service, the study found a link between major tree losses and human mortality from heart and lung disease (G.H. Donovan and others, 2013). Over an 18 year period from the mid 1990s, around one million trees died in 15 north-eastern states of the US, due to an invasive insect pest, the emerald ash borer. The study compared human death rates in areas where many trees had died with areas with fewer losses, and found there were over 21,000 excess (i.e., greater than expected) human deaths from cardiovascular and respiratory illnesses in the areas with greatest tree losses. Controlling for socio-economic status and other demographic factors did not weaken the link.

A later study by Donovan and others (2018) of almost 50,000 New Zealand children, again over an 18 year period, found children who lived in greener areas (with more vegetation), were less likely to suffer from asthma. The authors commented that the finding adds to the growing evidence that the natural environment provides major public health benefits.

In 2016 a survey of international evidence by the Nature Conservancy concluded that: **“Planting trees is a cost-effective way to tackle urban air pollution, which is a growing problem for many cities.”** (emphasis added)

The report, entitled *Planting healthy air: a global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat*, looked at the use of trees in 245 cities around the world. Lead author Rob McDonald told BBC news that city trees were already providing a lot of benefits to people living in urban areas. The report noted that "The average reduction of particulate matter near a tree is between 7 - 24%...." Particulate matter (PM) pollution could claim an estimated 6.2 million lives each year by 2050, the report stated.

The report said street trees can be a part of a cost-effective portfolio of interventions aimed at controlling particulate matter pollution. As well they can mitigate the urban island heat effect, dangerously high temperatures in cities. While trees cannot and should not replace other strategies to make air healthier, the authors recommended they be used in conjunction with other strategies to help clean and cool the air.

It should be added that larger and evergreen trees will obviously be more effective than smaller or deciduous trees: large trees have more foliage mass to work on neutralising pollution; evergreen trees can be effective for the entire year, versus only 9 to 10 months for deciduous species, which would not be effective while leafless.

Trees provide a multitude of other benefits to residents of urban areas. A large number of scientific studies have found that the health of people living near trees and parks is better than those further away; mental health is also positively linked, while some studies have found crime rates and violence in treed areas are lower. Even just a view of trees seems to have positive effects on health, as has been indicated by studies of office workers, prisoners, patients in hospital and inhabitants of aged care homes. More detail on these findings is given in the Appendix below, which is a summary of some of the evidence linking trees and human health, prepared by this author (Freya Headlam)

References and further reading

Donovan, G.H., Butry, D.T., Michael, Y.L., Prestemon, J.P., Liebhold, A.M., Gatzliolis, D., and Mao, M.Y., “The Relationship between trees and human health: evidence from the spread of the emerald ash borer”, *American Journal of Preventive Medicine* 44(2): 139 – 145 (2013).

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McDonald, Rob and others, *Planting healthy air: a global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat: a report by the Nature Conservancy in collaboration with C 40 cities*. October 2016.

<https://www.bbc.com/news/science-environment-37813709>

“What do Sydney and other cities have in common? Dust” by Malini Sur and Eric Kerr, in *The Conversation*, 22.11.2019..“

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APPENDIX

“Trees and health : a review of some evidence”: unpublished paper by Freya Headlam , 2018

Trees protect our health in many ways. We’re more likely to keep fit by walking or exercising in green and leafy surroundings. Trees’ shade and foliage giving off water vapour cools down summer

temperatures around streets and buildings, reducing deaths and illness from heat exhaustion - an increasingly common problem in built-up areas as summers become hotterⁱ. Trees' shade lowers rates of skin cancer and cataracts. Trees remove noxious gasses like vehicle exhausts and fine particles from the airⁱⁱ, hence the incidence of respiratory disease is lower in treed areas.

Research has found that loss or lack of trees or open green space goes along with negative impacts on human health. A huge amount of statistical and research evidence, published in respected peer-reviewed medical and health journals, has found both physical and mental health are affected. ⁱⁱⁱ

Perhaps the most disturbing finding suggests that substantial losses of trees in urban USA were accompanied by significantly increased death rates. This study, using data from 15 states in north-east USA, found areas with high tree losses (from borer attack) experienced significant rises in mortality rates from heart and lung diseases, adding up to 21,000 excess deaths over 18 years. ^{iv}

In other research, a large Dutch survey of 480,000 people found people living further than 1-3 km from parks were more likely to assess their health as poor compared to those living closer to parks; ^v

Several surveys of hospital patients have found those without views of trees or natural settings were slower to recover than others ^{vi vii}, while workers without "green" views were less able to cope with stress ^{viii}, and prisoners without views of trees experienced more stress-related illness. ^{ix}

Dozens of studies attest to the value of gardens for the physical and mental health of residents of aged care homes. ^{x, xi} Walking in a park has been found to help with mental fatigue,^{xii} and people walking in a parklike (versus urban) setting were less susceptible to brain patterns linked with mental illness. ^{xiii} Research has also linked an absence of trees or parks with higher crime rates ^{xiv} and more frequent violence, both in public and private spaces. ^{xv, xvi}

ⁱ 374 people died from heat stroke/exhaustion in Victorian cities and towns as a result of the Black Saturday fires in February 2009, versus 173 who died in the fires. Surfaces shaded by trees can be 11 – 25 degrees C lower, while evapotranspiration from trees can lower temperatures by 1 – 5 C. USA Environment Protection Agency (2015) *Using trees and vegetation to reduce heat islands*.

ⁱⁱ Harmful gases include carbon dioxide, carbon monoxide, and sulphur dioxide. University of North Carolina, *Trees of strength*.

ⁱⁱⁱ Two excellent reviews of the research, which I've drawn on for this article, are: * Maller, C., Townsend, M., Pryor, A., Brown, P., and St Leger, L. (2005) "Healthy nature, healthy people: 'contact with nature' as an upstream health promotion intervention for populations", *Health Promotion International*, 21(1): 45 -54 (Australian authors; a review of the literature); and * Whear, R.R., Thompson Coon, J., Bethel, A., Abbott, R., Stein, K., and Garside, R. (2014) "What is the impact of using outdoor spaces such as gardens on the physical and mental well-being of those with dementia? A systematic review of quantitative and qualitative evidence", *Journal of the American Medical Association* 15(10): 6997 – 705 (Oct.)

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