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How planting trees in cities can save thousands of lives

By **Chelsea Harvey** November 2

Yet another study has reaffirmed the idea that living near nature is good for human health — and can even save lives. A new paper, published Monday by the Nature Conservancy, suggests that planting trees in cities can result in cooler temperatures and reduced air pollution for millions of urban residents. The paper was released at the annual meeting of the American Public Health Association, but it has not been published in a peer-reviewed journal.

The study indicates that a global investment of \$3.2 billion throughout 245 of the world's largest cities — that's about \$4 per resident — could reduce pollution-related mortalities by anywhere from 2.7 to 8.7 percent, saving up to 36,000 lives every year. This level of investment could also reduce temperatures on the hottest days of the year for millions of people, save up to 48 billion kilowatt-hours of electricity annually and avoid up to 13 million tons of carbon dioxide emissions each year.

“Cities usually think of trees just as aesthetic ornamentation,” said lead study author **Rob McDonald**, lead scientist for The Nature Conservancy's Global Cities program. “But we wanted to show there's a lot of benefits. Cities should be thinking about their public health goals as connected to and integrated with their urban goals.”

Previous research has already shown that trees are capable of both cooling and cleaning the air in urban spaces. They provide shade and are able to redirect some of the sun's energy into their own biological processes, lowering the ambient temperature. And they can remove harmful particulate matter from the air around them.

These are important benefits, both in terms of economics and human health. Previous research estimates that exposure to particulate matter leads to about 3 million premature deaths around the world each year. Excessive heat can also lead to heat stroke and even death, declines in productivity and spikes in air conditioning-related energy use.

The new study focused on 245 cities around the world, which are home to about 910 million people, relying on previous research to assess the impact of trees on ambient temperature and air pollution. The paper suggests that existing urban trees already reduce air pollution by at least 1 microgram of fine particulate matter per cubic meter for about 52 million people worldwide. And more than 68 million people are benefiting from a reduction in summer temperature of up to 3.6 degrees Celsius, thanks to the trees.

Planting additional trees will only increase these benefits, the paper goes on to suggest. The authors analyzed a variety of future scenarios, from minimal to large investments in future tree-planting. The maximum tree-planting scenario — that's the \$3.2 billion global investment — showed significant savings in energy and greenhouse gas emissions and tens of thousands of lives saved each year, thanks to cooler temperatures and cleaner air.

The researchers note that the biggest effects of tree-planting are likely to be seen in cities with high population densities and high levels of pollution or heat. The study suggests that Karachi, Pakistan, is likely to see the greatest returns on investment in terms of pollution reductions, and Dhaka, Bangladesh, is the city likely to benefit the most from temperature reductions.

Geoffrey Donovan, a research forester with the U.S. Forest Service, said the paper's approach to looking at temperature and air pollution seemed "reasonable" — but he added that there are many other links between vegetation and health not included in the report. Exposure to nature has also been shown to decrease stress, encourage exercise and promote social connectivity, he pointed out.

"It's very important to realize that you're only looking at the rate of return on two very specific benefits," he said.

Where trees are planted, what species are chosen and how they are arranged also makes a difference in the benefits they confer. In terms of trees' effect on air pollution, for instance, this paper relies on an average impact drawn from several previous research papers. In general, though, the body of literature suggests that trees can have a range of effects on air pollution, Donovan noted, and that any benefits will be highest when trees are planted in densely populated and highly polluted areas.

“You’re not going to get a huge plume of good air quality that goes miles and miles,” he said. “You’re measuring it in a few hundred meters. [So] you want to be near the people and near the pollution source.”

Planting large parks, on the other hand, may do less to reduce pollution-related illnesses (unless the parks are placed next to busy freeways, according to Donovan), but can confer other health benefits, like stress relief and space to exercise. And these benefits can save lives as well. Research has suggested that people who simply live in greener areas, with more vegetation around, may enjoy better health and even live longer lives.

Donovan also added that some trees give off volatile organic compounds, which can interact with other chemicals in the air to produce harmful ozone. Additionally, clusters of trees tend to catch particulate matter on their leaves and bark — and while that does remove the pollutants from the out-flowing air, the effect can also trap higher levels of pollution in small areas.

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In other words, trees do confer broad benefits when it comes to pollution, but there are still complex factors to consider in terms of the types of trees planted and their locations and configurations. On the other hand, there’s also a large body of research supporting the temperature and carbon-saving benefits of urban trees described in the paper.

And when the full range of health benefits are considered, there’s a definite case for investing in more urban tree-planting, Donovan said.

The researchers note that tree-planting, alone, will not solve the world’s temperature and pollution problems. But it’s a cost-competitive way to at least address a fraction of the issue, improving the lives of millions in the process, they say.

“We’re not at all saying trees replace other things,” McDonald said. “But as part of the tools in the toolbox that cities have to deal with these two issues, they make a lot of sense.”

Chris Mooney contributed to this report.