Trees help to cool the city environment

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Anecdotally, we all know that trees help to cool the city environment whether we're consciously aware of it or not. After all, it's hard to deny the satisfaction that comes from a sprawling tree's shady refuge on a hot summer day. But what are the less obvious ways that trees cool a city? And how much do they actually have a cooling effect?

An important topic to introduce up front is the urban heat island (UHI) effect. Simply put, this warming effect occurs in areas with a high concentration of human activity. Grey infrastructure lends to a "bubble" of heat, where the sun's radiation is absorbed during the day and re-emitted into the environment at night. Trees help to reduce this effect through shading as well as evapotranspiration. These positive effects are amplified when planted in clusters or a park setting, and don't necessarily have to be large in size to help combat UHI (but of course, the bigger the better). According to a study in Tel Aviv, a park of only 1500 square metres had an average cooling effect of 1.5 degrees Celsius and at noon reached a 3 degrees Celsius difference (Shashua-Bar and Hoffman 2000). Nonetheless, this demonstrates the importance of a coordinated effort to increase urban canopy. A network of green pockets could go a long way to regulating a city's temperature, especially as we experience rising averages.

Through evapotranspiration, trees absorb sunlight and then release water into the air through their leaves. Like us humans, it's as if the tree is sweating in hot weather. Not only does this cool them down, it also reduces the amount of energy left to heat up the air around it. While it's quite difficult to measure the effect of evapotranspiration separately from shading, the combined effects have been measured in many cases. In even more cases, research has shown that the effect of shade alone leads to significant energy cost savings (the exact numbers vary quite a bit across the research, so I won't report specifics here) (Ko 2018). The point is, if you were on the fence about planting that tree in your yard, the cost savings are certainly significant enough to make it worth it!

However, it's important to note that the best cost savings come from healthy trees, growing in optimal conditions. So if we want to maximize the cooling benefits, we can't just stick a tree in the ground and call it quits. Thinking about the right trees in the right place and caring for them throughout their lifetime is all part of a successful process. Furthermore, when it comes to energy cost savings, most research has been for detached homes. We have much to learn about how shade and evapotranspiration can cool down terraced homes and apartment blocks, where many less well-off people live, and air conditioning is less common.

If trees are so effective in cooling city environments, why isn't this a higher priority? While the answer to this question isn't so simple, it certainly needs attention. Developing in a region such as the Greater Toronto Area, which was formerly agricultural land, of course means that there

were no trees to begin with. So, upon the installation of a new development it would be sensible to integrate widespread tree planting into the site design. Unfortunately, in many parts of the country developers often shift this to the back burner (for various reasons, potentially including added cost for the developer, lack of compliance and enforcement, or lack of tree requirements to begin with). Nowadays, the way new developments are constructed on a large scale often means widespread soil compaction. It's questionable as to whether small, newly installed trees will ever grow to their maximum potential, and there's also not much space for additional trees (see photo). We also often see missed opportunities in industrial areas (see photo), where trees aren't planted at all to begin with. Tree installation plans need to be deeply embedded in site design, which would help to enable a robust network of cooling potential such as those pictured in Winnipeg and Halifax.

References

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