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The impact of green space on heat and air pollution in urban communities: a meta-narrative systematic review

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It is widely understood that urban green spaces have a natural ability to filter pollution from the air and reduce local air and ground temperature. This report analyzed 102 peer-reviewed studies published over the past five years that explored the role of urban green space in providing cooling effects and reducing air pollution.

Not surprisingly, the report found that urban green spaces — from trees and parkettes to green roofs and large natural spaces — generally provide significant health benefits for residents and the community. It also found that these ecological benefits are directly related to the size, quality and density of the green space.

Why is it important to reduce urban heat effects and air pollution? It is estimated that tens of thousands of Canadians die prematurely each year due to acute air pollution and that high summer temperatures lead to increased illnesses, hospitalizations and deaths, especially among older adults. As the Canadian population ages and extreme heat waves become more common across the country, urban green spaces can provide essential, natural protection.

This report examined various types and scales of green space, and generally found that urban green space can provide cooler, cleaner air at the site, neighbourhood and city level. Emerging evidence also suggests that closely spaced and connected smaller green spaces can provide greater cooling effects to adjacent urban areas than large individual parks with open grass areas.

It found that the density and spatial configuration of an urban forest — the sum of all urban trees, shrubs, lawns and pervious soils located in an urban setting — clearly affect land surface temperatures in the city and that these elements are critical for improving urban air quality. In general, the research suggests that balancing urban forest density, particularly in areas with low green space density, would greatly improve both local and city-wide urban air quality.

Various plant species provide heat and pollution-mitigating capacities, and compact multi-layering of diverse plant species can help improve overall resiliency to drought, heat and pollution. Among plant types, trees have an exceptional ability to capture and filter multiple air pollutants, including ground-level ozone, sulphur dioxide, nitrogen oxides and particulate matter. Trees are also significantly associated with improved thermal comfort and relief from heat stress at the street level and neighbourhood scale, particularly during hot seasons and times of day.

The report also highlighted growing evidence of disproportionate heat- and air-pollution-related health burdens associated with unequal distribution of green space in urban neighbourhoods. Further investigation is needed regarding the prevalence of green space-related health inequalities, considering evidence in Canada that dense, low-income inner-city neighbourhoods are generally more vulnerable.

The report concludes with recommendations that include improving the quantity, quality and connectivity of green spaces; prioritizing green strategies for vulnerable urban areas; and integrating greening policies with broader health and land-use planning policies.