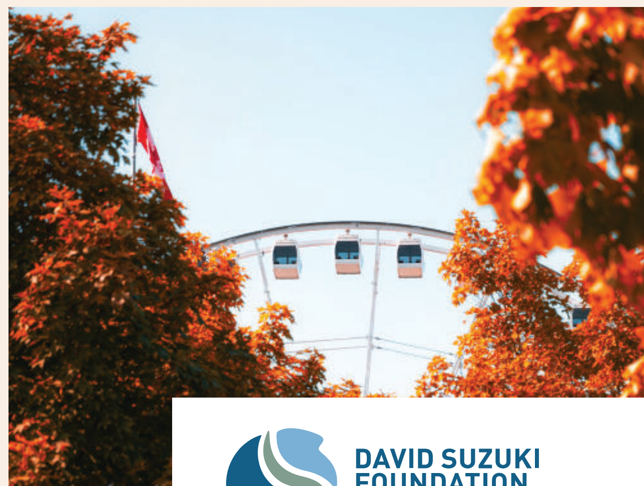
Executive Summary



DAVID SUZUKI FOUNDATION
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Increasing Equitable Adaptation to Climate Change:

Scenarios for Planting 500,000 New Trees in Montreal

Executive Summary

In today's era of global change, urban forests are exposed to a variety of stressors. Volatile climate conditions, pest insects, and exotic diseases, for instance, are all factors contributing to forest decline. The situation is all the more alarming as, in addition to their aesthetic, recreational and heritage value, urban forests provide ecosystem services that are essential to our wellbeing and support adaptation to climate change—particularly in urban settings (Ordóñez and Duinker 2014).

In its Climate Plan 2020–2030, the City of Montreal sets out climate goals that prioritize adaptation, equity, and resilience to climate change. The city's key adaptation and resilience measure involves planting 500,000 new trees in heatwave-vulnerable areas by 2030 and working toward a tree canopy target of 26% by 2025 (City of Montreal 2020; 2022). There are a number of prerequisites to reaching those targets, however, including identifying priority planting sites and selecting species. Given that little is known about the development and success of climate change adaptation measures in cities, this study aims to optimize the planting of the 500,000 trees using socio-economic and ecological indicators to quantify ecosystem benefits and maximize long-term adaptation. The methodology proposed is intended to support cities wishing to improve the equity and resilience of their urban forests according to each neighbourhood's socio-economic and ecological needs. This study is part of the David Suzuki Foundation's efforts to fight climate change by improving knowledge and providing tools to decision-makers.

This methodology is intended to support cities wishing to adapt to climate change and increase the equity and resilience of their urban forest.

This study answers three important questions associated with tree planting as a climate adaptation measure in municipalities:

- Where can trees be planted?
- Which locations should have priority for planting to address social equity and climate change resilience issues?
- Which tree species should be chosen to ensure the long-term viability of urban forests and of the ecosystem services they provide?

To do so, the study examines an optimized planting scenario using eight socio-economic and ecological criteria, including vulnerability to five climatic hazards (heat waves, droughts, heavy rainfall, floods and storms), residents' level of deprivation, the canopy, and the functional diversity of trees. The study also creates an "adaptation and resilience" scenario, which selects tree species based on functional diversity and their resistance to the dominant local climate hazard, and examines its effect on functional diversity, ecosystem services improvement, and resistance to climate hazards.

This report examines an optimized planting scenario using eight socio-economic and ecological criteria.

Working within set theoretical parameters applied to the City of Montreal, the research has led to the following findings:

- Priority areas and the number of trees to be planted to increase equity and resilience vary significantly from one borough to another. Some boroughs need to plant much more than others to expand the tree cover and make sure residents can enjoy all the benefits an urban forest provides. A map showing the number of trees to be planted as a priority across the city is provided in Appendix G of the full report and can be downloaded on the David Suzuki Foundation website.
- Selecting new tree species based on their resistance to the main local climate hazard and their functional diversity (adaptation and resilience scenario) increases the functional diversity index of Montreal's overall urban forest from 3.7 to 8.2 (out of 9). A highly diversified canopy would be more resilient to climatic and biotic threats and reduce the risk of mortality over the medium and long term.
- Under the same scenario, increasing functional diversity would also increase canopy and resistance to heatwaves, drought and storms (high winds). However, this scenario provides for decreased resistance to heavy rain and flooding and a slight reduction in certain ecosystem services, such air pollutant removal, stormwater runoff retention, and carbon sequestration and storage. This is due in part to the current over-representation of the Acer (maple) species, whose extent is reduced in the "adaptation and resilience" scenario to provide greater functional diversity and make the urban forest more resilient in the long term.
- Resident and private sector participation is essential to increasing Montreal's canopy, as over 60% of all potential suitable area for planting is located on private land and more than one third of unpaved surfaces are located on residential property.

Increasing functional diversity would also increase canopy and resistance to heatwaves, drought and storms.

This study provides a robust methodology for cities to develop a planting strategy aimed at equitable climate adaptation and increased long-term resilience of urban forests. It demonstrates that cities can accelerate climate change adaptation efforts and maximize their benefits using socio-economic and ecological criteria, such as climate vulnerability, canopy and functional diversity. Since the approach is based on a theoretical and scalable model, it can be tailored by adjusting the model's parameters according to the constraints and objectives defined by city managers, making it even more effective and realistic. For example, this approach could be used to optimize the planting of species that are tolerant of de-icing salts and can substantially improve air quality along major roads, or to avoid planting allergenic species in densely populated neighbourhoods.

The full report is available here (French only)

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