

THE NEED FOR LIVING GREEN INFRASTRUCTURE IN CANADA'S INFRASTRUCTURE INVESTMENTS

Recommendations for Phase 2 of the Government of Canada's Infrastructure Plan

Introduction

The Green Infrastructure Ontario (GIO) Coalition supports the federal government's plan to invest \$120 billion over the next 10 years to address infrastructure gaps across our country. To ensure sustainable and cost-effective infrastructure spending, we strongly urge the Government of Canada to integrate living green infrastructure into its new infrastructure plan.

Living green infrastructure can save capital costs, reduce lifecycle costs, and provide a range of services that make substantial contributions to address climate change impacts, human health, and quality of life in communities. Living green infrastructure has also been shown to create green jobs and can be a cost-effective complement to traditional grey infrastructure. Living green infrastructure is a practice that is well-established and rapidly spreading in Europe, the United States, and elsewhere, and in Canada it is best defined by the Government of Ontario in its Provincial Policy Statement (PPS 2014):

"Natural and human made elements that provide ecological and hydrological functions and processes. Green infrastructure can include components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces, and green roofs."

The GIO Coalition is a multi-sectoral alliance comprised of private sector companies, industry associations, municipal and regional governments, community groups, and not-for-profit organizations. Together, we promote the implementation of living green infrastructure by providing a united voice for this vital and growing sector.

We strongly advise that living green infrastructure be an essential feature of federal infrastructure investments, and we propose three specific recommendations that will help provide cost-effective infrastructure funding to communities across the country:

1. Implement a 'consider living green infrastructure first' policy for infrastructure funding.
2. Allocate 15% of infrastructure funds to a dedicated funding stream for living green infrastructure.
3. Work with partners to develop and implement a national living green infrastructure strategy.

Cost Effective Stormwater Infrastructure

Many water supply, wastewater, and stormwater infrastructure systems are approaching the end of their planned service life and require major capital investment for rehabilitation or replacement. Stormwater drainage systems in established urban areas are increasingly overtaxed given they are at the end of their lifespan and are often inadequately maintained. Additionally, surprisingly many urban areas lack flood management systems altogether. The damaging impacts of urban stormwater are becoming more severe as a result of increased volumes due to urban intensification and climate change.

A separate, but related issue is that many well-established Canadian communities have combined sewers where stormwater and human sewage are carried through the same pipes to sewage treatment plants. During heavy rainfalls, the large volume of stormwater runoff exceeds the system's capacity and raw sewage is released untreated, directly into environmentally sensitive waterways.

Living green infrastructure can deliver cost savings to municipalities facing expensive infrastructure repairs and replacements. It provides capital cost savings, with lower up-front project construction costs for the same level of service. It also provides long-term cost savings for cities through lifecycle cost savings. Estimates indicate that green infrastructure is 5%-30% less costly to construct and about 25% less costly over its lifecycle than conventional infrastructure of comparable performance.¹ Cities across the US are investing billions of dollars in living green infrastructure approaches.

An example of capital cost savings:

Cincinnati is using green infrastructure to reduce the number of combined sewer overflow (CSO) events as a cheaper alternative to the initial proposal of a deep tunnel to temporarily store rainwater and sewage during rain events. The total cost estimate for using living green infrastructure to achieve the same reduction in CSO events was nearly \$200 million less expensive than the deep tunnel.

An example of long-term cost savings:

Lancaster, Pennsylvania (a city of 60,000 people) is implementing a green infrastructure plan that will result in \$122 million in avoided capital costs and reduce operations costs (wastewater pumping and treatment) by \$661,000 per year.

Living Green Infrastructure Stormwater Ecosystem Services

- Water quantity: Living green infrastructure intercepts, absorbs, and holds stormwater, helping to reduce the amount of runoff entering sewers during rain events. By absorbing rain where it falls, living green infrastructure also helps sustain infiltration to aquifers, recharge groundwater reserves and maintain base flow in rivers, thereby relieving stress on local water supplies and reducing the need to import potable water. It also decreases the untreated runoff discharged into water bodies from sewer system overflows.

¹ Green Infrastructure and Issues in Managing Urban Stormwater. Congressional Research Service. Online: <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R43131.pdf>

- **Water quality:** Through its absorption and storage processes, living green infrastructure filters pollutants, treating runoff before it enters sewers, reducing pollutants such as toxic contaminants, oil and grease, organic material, and other substances.
- **Flood protection:** Many forms of living green infrastructure, including wetlands, intercept and retain rainfall and runoff, lowering the chance of urban flooding and reducing flood flows in urban areas, rivers and streams.²
- **Erosion:** Living green infrastructure reduces soil erosion at source, limits the delivery of sediment to water courses, protects river banks from erosion, and encourages sediment deposition within the floodplain. Woodlots and trees provide this service through canopy cover, which reduces the intensity of the rain when it reaches the ground and acts as a windbreak. Tree root systems also help bind soil together, and the decomposition of tree roots improves soil texture as well as stormwater infiltration, helping to prevent erosion.

Climate Change

As more intense weather events, urban heat, food insecurity, and dwindling water supplies stress Canadian communities, living green infrastructure offers an important and underutilized tool to increase resiliency and adaptability in the face of climate change. It also helps governments make sensible infrastructure investments in the context of uncertainty and volatility of future climate. In this regard, it offers an opportunity to integrate and complement two key government-wide priorities to invest in Canada's infrastructure while also enhancing resilience and adapting to the climate challenges facing Canadian communities.

Living Green Infrastructure Climate Change Ecosystem Services

- **High temperatures:** Living green infrastructure reduces air temperatures through both providing shade and evapotranspiration, combating the urban heat island effect and the associated environmental and health impacts. It also reduces water thermal pollution by cooling stormwater through the filtering process, before it enters naturally cool waterbodies.
- **Energy use:** When less rainwater flows into sewer systems, municipalities reduce their pumping and treatment demand, thereby saving energy. By reducing temperatures and shading building and surrounding surfaces, living green infrastructure also lowers building energy demands for air conditioning cooling in the summer. This also creates comfortable microclimates that encourage walking and cycling, resulting in decreased vehicle use and in turn, greenhouse gas emissions.
- **Food production:** Living green infrastructure approaches include protection of agricultural lands and supporting local food production in urban and peri-urban centres. Local food production helps reduce the impact of climate change on Canada's food supply and reduce emissions from the transportation of food to processing plants and markets. Urban agriculture also has the potential to generate revenue and provide long-term employment.

Such practices are increasingly recognized as a desirable 'win-win' approach to tackling climate change, because they also help to deliver multiple other social, economic and environmental benefits.

Multi-functional Investment and Secondary Services

² Rooftops to Rivers. Green Strategies for Controlling Stormwater and Combined Sewer Overflows. Natural Resources Defense Council. Online <https://www.nrdc.org/water/pollution/rooftops/rooftops.pdf>

When living green infrastructure is dovetailed into other planning or infrastructure projects, it provides a multi-functional investment that is practical and financially effective.³ For example, the introduction of new transit infrastructure is an opportune time to introduce living green infrastructure stormwater management practices such as permeable pavements, bioswales, or new tree planting. This ensures infrastructure funding supports both the main service (transportation) while also contributing to stormwater management and community livability. This is particularly relevant in the context of climate change, where infrastructure funding needs to contribute to community resilience, wherever possible.

Living green infrastructure solutions are flexible in terms of scale and can be integrated into retrofit and new projects for buildings and neighborhoods, as well as a system of solutions spread across entire municipalities or watersheds (linking urban, suburban, and rural areas). When living green infrastructure projects are implemented (either as alternatives or complementary approaches), they provide many secondary services. These co-benefits include supporting biodiversity, human health, and public realm improvements. A more fullsome list is set out below:

Secondary Services of Green Infrastructure⁴

Environmental

- Improved air quality
- Increased land use efficiency
- Added recreational space
- Protected drinking water
- Replenished groundwater
- Improved watershed health
- Pollination enhancement (increases biodiversity)
- Improved connectivity of green spaces (and habitats for birds and wildlife),

Social

- Improved human health and well-being
- Establishment of urban greenways
- Pedestrian and bicycle access
- Improved skin cancer protection from natural tree shade providing protection from ultra-violet radiation
- Improved mental health
- Healthy childhood development with increased access to nature
- Improved aesthetics - creates attractive streetscapes and rooftops that enhance livability
- Educates the public about their role in stormwater management

Economic

- Creates jobs and business opportunities
- Save hundreds of millions of dollars in flood losses
- Diversification of local economy
- Reduces hard infrastructure construction costs
- Increases property values
- Encourages economic development
- Reduces energy consumption and associated costs
- Increases hard infrastructure life cycle cost savings

³ http://ec.europa.eu/environment/nature/ecosystems/docs/Green_Infrastructure.pdf

⁴ http://www.sustainablecitiesinstitute.org/Documents/SCI/Report_Guide/Guide_EPA_GICaseStudiesReduced4.pdf

Recommendations

We strongly recommend that the Ministry of Infrastructure and Communities direct federal investments towards living green infrastructure. Specifically, we propose three recommendations that will help provide sustainable and cost-effective infrastructure funding to communities across the country:

RECOMMENDATION 1: Implement a ‘consider living green infrastructure first’ policy for infrastructure funding.

The federal government should require that all infrastructure proponents consider whether a living green infrastructure approach will help to address the community’s needs. Instead of defaulting to familiar grey solutions like dikes and pipes, or building more water filtration systems, local governments should be required to first consider the potential for restoring wetlands, implementing low impact development solutions to reduce stormwater runoff, or rehabilitating upstream watersheds. Proponents should identify both green and grey infrastructure opportunities to invest in nature-based solutions when building new assets.

Rationale

Most public development or redevelopment projects, from roadwork to buildings, to multi-billion dollar light rail transit systems (LRTs), have the potential to further benefit communities through integrating green infrastructure, yet the vast majority do not consider it. This recommendation would require it be considered in all projects, ensuring that agencies and local governments are choosing the wisest approach best suited to their needs.

Agencies responsible for the delivery of transportation or water services can often view living green infrastructure as involving natural elements, with projects seen as the responsibility of environmental departments (who do not have funding for capital works) rather than being funded and managed as core infrastructure assets.

The planning and design phase of infrastructure projects is the opportune time to consider implementing living green infrastructure. To provide the maximum economic benefits, living green infrastructure needs to be integrated into project proposals from the beginning, not as an afterthought.

RECOMMENDATION 2: Allocate 15% of infrastructure funds to a dedicated funding stream for living green infrastructure.

The Government of Canada should drive investment in climate resilient infrastructure through protection and creation of living green infrastructure assets by dedicating a percentage of annual infrastructure spending to these practices. This would include funding for specific living green infrastructure projects and for projects where living green infrastructure is integrated as a complementary practice (e.g., transit, street retrofits). Municipalities should be permitted to use at least some of this dedicated funding towards long term maintenance in order to maximize cost savings.

Rationale

None of the funding distributed through the federal green infrastructure fund (2009 – 2014) went directly to living green infrastructure. A dedicated fund would promote green infrastructure as a valid form of municipal infrastructure and would help communities invest in climate change resilience.

Funding and support for living green infrastructure should go beyond construction and monitoring to include ongoing operations and maintenance activities. As with traditional infrastructure, long-term maintenance is critical to the performance and longevity of green infrastructure practices.

Expanding the living green infrastructure networks in our communities will provide many benefits outlined above, but there is also a critical need to invest in the protection of our existing living green infrastructure assets. Urban forest in the Greater Toronto Area (GTA), for example, is currently expected to lose a total of 10% of its trees to an invasive pest outbreak.⁵ This will be felt by GTA communities through a decrease in stormwater management, public health, and other important services provided by its urban forest.

RECOMMENDATION 3: Work with partners to develop and implement a national living green infrastructure strategy.

The Federal government should take leadership in working with the provinces, the Federation of Canadian Municipalities, trade and professional associations and other key partners to develop a national living green infrastructure strategy designed to systematically address barriers and solutions to the widespread adoption of green infrastructure. Elements would include:

- high level policy commitments to preserve and enhance natural ecosystem services as a leading element in the response to climate change and other challenges.
- capacity building among decision-makers at all levels of government, professionals, contractors, and the workforce.
- research and information about business cases, best practices, costs, benefits, maintenance and support to institutions that provide training.
- integration of green infrastructure into lifecycle asset planning and management.

Rationale

Capital implementation and operations and maintenance of living green infrastructure require a focused and dedicated multi-departmental effort within municipal governments. There is an increasing understanding of living green infrastructure as critical to water management and climate change challenges. Yet the need for integrated planning, new standards, new processes, training and agreements (eg. for maintenance) remains one of the key obstacles to its widespread implementation. Its distributed nature results in the need to develop multidisciplinary workforce skills and cross-departmental collaboration.⁶ The unique nature of these partnerships and collaborations mean implementers benefit from capacity-building, research, knowledge sharing and best practices from higher levels of government. The US federal government, for examples, provides

⁵ http://www.greeninfrastructureontario.org/sites/greeninfrastructureontario.org/files/GTA_Urban_Forest_Report.pdf

⁶ <http://stormwater.wef.org/2015/11/evolving-green-infrastructure-asset-management/>

significant support to living green infrastructure implementation across the country, including information on how to build projects, many learning venues, and partnership resources.

Early adopters have demonstrated the viability of living green infrastructure approaches in Canadian communities. Many other communities are receptive to living green infrastructure, but still require additional technical and institutional information and supportive arrangements for successful implementation. Research and widespread promotion of key concepts and best practices would help encourage the use of living green infrastructure practices. As an example, the US White House recently issued memorandum on [Incorporating Ecosystem Services into Federal Decision Making](#) that directs agencies to develop and institutionalize policies to promote consideration of green infrastructure.

Conclusion

Living green infrastructure would provide rapid, multifaceted and visible impact to Canada's infrastructure plan. It would also help communities adapt to the impacts of climate change while increasing livability and cost-efficiency of projects in communities of all sizes. The Government of Canada can demonstrate important leadership by incorporating living green infrastructure into federal infrastructure investments using one or more of the approaches described above. The GIO Coalition would be pleased to provide any additional information or input that could support this effort.

Green Infrastructure Ontario Coalition Background

The Green Infrastructure Ontario Coalition is a collaborative alliance working to promote green infrastructure in Ontario. Its steering committee members include:

Conservation Ontario | Evergreen | Green Communities Canada | Green Roofs for Healthy Cities | Landscape Ontario Horticultural Trades Association | LEAF (Local Enhancement and Appreciation of Forests) | Ontario Association of Landscape Architects | Ontario Parks Association | Toronto and Region Conservation | Forests Ontario

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