Health, Prosperity and Sustainability:

THE CASE FOR GREEN INFRASTRUCTURE IN ONTARIO

Green Infrastructure ONTARIO COALITION

ecojustice

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The **Green Infrastructure Ontario Coalition** is an alliance of organizations that share a common vision for a healthy, green Ontario where the environmental, social, economic, and health benefits of green infrastructure are fully realized.
greeninfrastructureontario.org

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The steering committee members of the Green Infrastructure Ontario Coalition are:

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Executive summary

THE GREEN INFRASTRUCTURE ONTARIO COALITION is an alliance of organizations that share a common vision for a healthy, green Ontario where the environmental, social and economic benefits of green infrastructure are fully realized.

For the purposes of this report, green infrastructure is defined as natural vegetation, vegetative systems, soil in volumes and qualities adequate to sustain vegetation and absorb water, and supportive green technologies that replicate ecosystem functions. Ontario is already reaping the benefits of green infrastructure: the economic impact created by the more than 140,000 people employed in the private sector horticultural industry and public sector parks departments; the tax dollars saved by effective stormwater management; and the health and quality of life benefits of cleaner air and more liveable cities that come from urban forests, community gardens and green roofs. Despite this compelling evidence, green infrastructure remains inadequately promoted and protected.

This report makes a strong case for green infrastructure in the context of Ontario's changing economic and social dynamics. The province faces specific challenges that will occupy policy makers, businesses, and citizens for the next decade or more. These challenges include a struggling global economy and a post-industrial provincial economy, an aging population and obesity epidemic and their associated health care costs, greater urbanization and population densities alongside aging and inefficient water and energy infrastructure, and of course, climate change. Green infrastructure makes a positive contribution to the management of these challenges. Multiple case studies from across North America demonstrate the potential for improved quality of life and hundreds of millions of dollars in savings and benefits.

Since its official launch in 2010, the Green Infrastructure Ontario Coalition has delivered workshops in five communities across the province and conducted an extensive online survey. More than 400 individuals with direct experience in green infrastructure participated in this consultative process. As of early 2012, more than 80 organizations, agencies and businesses have joined the coalition.

This report draws on input from diverse stakeholders and existing research to present a strong case for improved policies and investments to support green infrastructure in the province. It also offers the following specific, practical recommendations that the Government of Ontario can undertake to realize the multitude of environmental, social and economic benefits provided by green infrastructure. The time to act is now.

Recommendations for the Government of Ontario

RECOMMENDATION ONE: Change the definition of public infrastructure to incorporate green infrastructure.

The Ministry of Infrastructure, Ministry of Municipal Affairs and Housing, Ministry of Energy, Ministry of Environment, Ministry of Natural Resources, Ministry of Transportation, and Ministry of Agriculture, Food and Rural Affairs should all refine their definitions of infrastructure to include green infrastructure.

RECOMMENDATION TWO: Fund green infrastructure projects through various mechanisms such as:

- eligibility for public infrastructure funds;
- stormwater fees/utilities; and
- incentive programs.

RECOMMENDATION THREE: Capture opportunities to incorporate green infrastructure into existing legislation, policy and programs. Priorities include:

- incorporate green infrastructure into the Planning Act and the updated Provincial Policy Statement and make green infrastructure a consideration in planning and development;
- update the MOE's Stormwater Management Planning and Design Manual so that new development and redevelopment projects require a creative suite of lot and conveyance (low impact development) as well as end-of-pipe measures that address local needs and provide multiple benefits;
- feature green infrastructure prominently in regulations of the Ontario Water Opportunities and Water Conservation Act;
- feature green infrastructure prominently in the proposed Great Lakes Protection Act; and,
- employ green infrastructure as a means to reach provincial energy conservation targets in Ontario's Long Term Energy Plan.

RECOMMENDATION FOUR: Improve intergovernmental coordination and cooperation, specifically among: the Ministry of Infrastructure, Ministry of Municipal Affairs and Housing, Ministry of Energy, Ministry of Environment, Ministry of Natural Resources, Ministry of Transportation, and Ministry of Agriculture, Food and Rural Affairs.

RECOMMENDATION FIVE: Assemble a group of experts to gather information on existing research and programs, and create a comprehensive plan to eliminate barriers and develop provincial targets for green infrastructure.

RECOMMENDATION SIX: Establish a research and development fund to support green infrastructure planning, evaluation and implementation activities such as:

- i-Tree Eco studies;
- ecosystem services valuation studies; and,
- Sustainable Technologies Evaluation Program (STEP).

Kanchan Maharaj / LEAF

Introduction

Bioretention Cell, Elm Drive LID Retrofit, Mississauga

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THE GOVERNMENT OF ONTARIO INVESTS BILLIONS IN PUBLIC INFRASTRUCTURE EVERY YEAR and is planning to spend $35 billion over the next three years.[1] These investments are designed to create jobs, keep our transportation system functioning, keep the lights on, and ensure safe and healthy drinking water. The responsibility for our infrastructure is shared with municipal governments, who also invest heavily in infrastructure. Between 2003 and 2008, $11 billion was invested in municipal water systems, much of which came from municipal governments.[2] As traditional stormwater infrastructure nears the end of its useful life in Ontario's older cities, and as climate change and urban expansion persist, associated expenses will only increase if governments continue with traditional stormwater infrastructure. Green infrastructure is an economically viable tool that can help Ontario meet many of its infrastructure needs in this time of great change and uncertainty. It complements and extends the life of many types of traditional infrastructure, while also providing society with a broad array of benefits.

> **"It's a fundamental shift in thinking…to get governments to regard green infrastructure as they do other infrastructure investment"**
>
> John Griffin, Former Maryland Secretary of Natural Resources

In *Building Together*, the Government of Ontario's 10-year infrastructure investment plan released in 2011, the province indicates it will invest more than $35 billion over the next three years on public infrastructure. Green infrastructure is mentioned in this plan and examples of provincial leadership are provided. This is an important and encouraging first step, but much more is required.

"As well as saving costs, green infrastructure solutions can have multiple other benefits, including removing undesirable chemicals from stormwater, increasing green space in urban environments, converting carbon dioxide into oxygen, and providing natural habitat." *Building Together*

This report by the Green Infrastructure Ontarion Coalition provides the Government of Ontario with a strong rationale for improved green infrastructure policy and investment. It includes details of emerging partnerships, leading research, inspiring case studies and presents a list of recommendations for the provincial government to create a healthy, prosperous and sustainable Ontario through increased green infrastructure investment.

Green Infrastructure

"If you stare at too much concrete you forget the earth's alive."
Bruce Cockburn, 1978

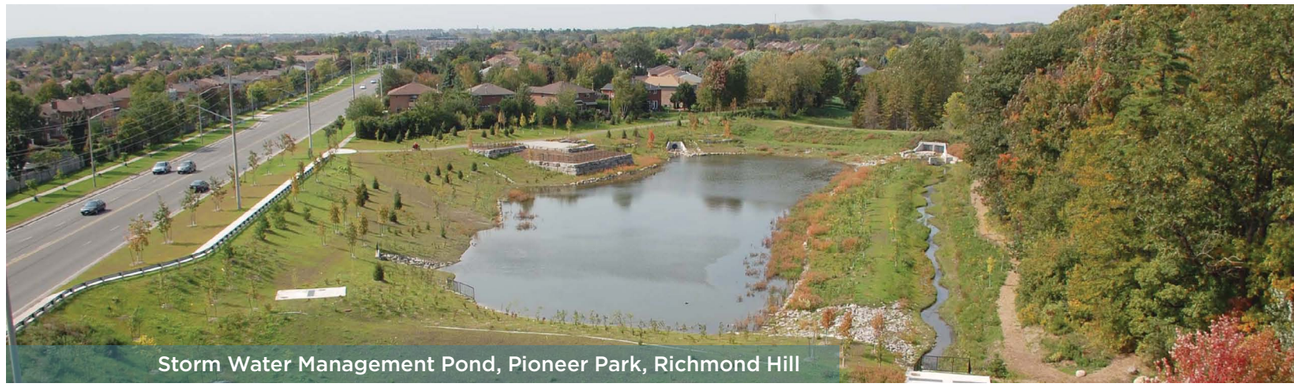
The term green infrastructure is gaining popularity in urban development, land-use planning and conservation dialogues. For the purpose of this report, green infrastructure is defined as natural vegetative systems and green technologies that collectively provide society with a multitude of environmental, social and economic benefits.

Green infrastructure takes many forms including the following:

- urban forests and woodlots
- wetlands, waterways and riparian zones
- meadows and agricultural lands
- green roofs and green walls
- parks, gardens and landscaped areas
- bioswales, engineered wetlands and stormwater ponds

It also includes soil in volumes and qualities adequate to sustain green infrastructure and absorb water, as well as technologies like porous pavements, rain barrels and cisterns, which are typically part of green infrastructure support systems. The technologies in this definition replicate the functions of ecosystems, such as stormwater storage and filtration.

In contrast, public infrastructure is the network of built structures and technologies that society relies on for transportation, stormwater management, sewage and solid waste management, health care, education, electricity production and distribution and more. This infrastructure is essential to our well-being. It is also extraordinarily expensive to build and maintain. In 2010–11, the Government of Ontario spent $14.1 billion in



Storm Water Management Pond, Pioneer Park, Richmond Hill

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an ongoing effort to confront the province's infrastructure deficit and boost the economy.[3] In addition, the province expends money in an effort to keep up-to-date inventories on the state of its public infrastructure. The current replacement value of Ontario's public infrastructure is $400 billion.[4] There is no comparable value figure for green infrastructure in Ontario because the provincial government does not regularly assess the quantity and quality of green infrastructure.

Green infrastructure can be implemented at multiple scales, ranging from regional networks of open spaces and natural areas to site-specific practices such as green roofs, porous pavements and rain gardens. And, there is flexibility as to when and how it is integrated into developed areas. Green infrastructure is also multi-functional, which differentiates it from traditional infrastructure. For example, storm sewers reduce flooding in wet weather, but a collection of green infrastructure — such as urban trees, green roofs and bioswales — provide the same type of flood protection while affording society with additional benefits.

These benefits are most significant in urban areas where large populations share limited green space. By pairing the conservation and enhancement of natural systems with the implementation of green infrastructure technologies, cities and towns can reduce the adverse impacts of development and improve the well-being of citizens. Protecting natural systems and their functions is the crucial first step in any green infrastructure strategy.

Despite the growing body of scientific and economic research demonstrating the multitude of green infrastructure benefits, these benefits are overlooked by our current economic system and government funding programs. However, efforts are underway to assign economic value to green infrastructure benefits and to instill this awareness into infrastructure decision-making.

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TorieGervais / LEAF

Green Infrastructure Benefits

These benefits are interconnected, making the grouping of them a somewhat arbitrary process. Additional details of these benefits and associated economic implications are provided in Section 3 of this report.

Environmental Benefits

- Improved air quality through reduced street-level particulates and airborne pollutants
- Carbon storage and sequestration
- Reduction of combined sewer overflows, a problem in older cities
- Stormwater retention and ground water recharge
- Surface water purification
- Soil protection
- Reduced urban heat island effect
- Climate change mitigation and improved adaptability to associated impacts such as severe heat and storm events
- Support for biodiversity and pollination

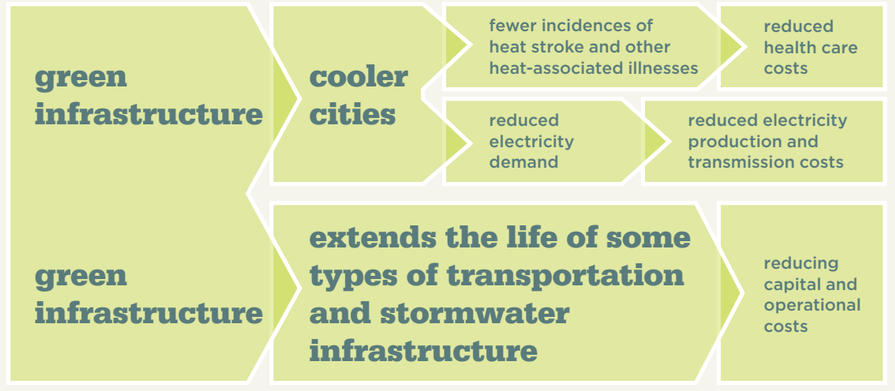
Social Benefits

- Improved beauty and liveability of communities
- Fewer incidences of pollution and heat-related illnesses
- Reduced obesity rates
- Increased opportunity for recreation and interactions with nature, and associated psychological and restorative benefits

Economic Benefits

- Energy cost savings
- Health care cost savings
- Infrastructure cost savings
- Increased workplace productivity
- Improved marketability of buildings
- Increased tax revenue from higher property values
- Employment opportunities in the green economy

GREEN INFRASTRUCTURE BENEFITS



Green Infrastructure Ontario Coalition

In 2009, leaders in the green infrastructure field initiated the Green Infrastructure Ontario Coalition to advocate for green infrastructure across the province. Since its formal launch in November 2010, the coalition has steadily grown in size. As of February 2012, more than 80 organizations, agencies and businesses have joined. It is a diverse group, with some representatives based in small towns and others in big cities. Some study and protect natural systems including woodlots and wetlands, while others design, install and monitor vegetative technologies, including green roofs and rain gardens. What unites our members is a shared awareness of the great potential of green infrastructure to move Ontario towards a healthy, prosperous and sustainable future.

The Green Infrastructure Ontario Coalition is led by a seven-member steering committee with representatives from Local Enhancement and Appreciation of Forests, Landscape Ontario, Ontario Parks Association, Toronto and Region Conservation Authority, Green Roofs for Healthy Cities – North America Inc., Evergreen and the Ontario Association of Landscape Architects. The steering committee provides leadership and contributes significant time and resources to the coalition.

The coalition is building a strong and convincing case for a shift in public and private policies and investment towards green infrastructure protection, enhancement and development. Elements of the coalition's work include a consultative process with representatives from diverse sectors, a policy and legislative scan, a literature review and government relations.

A Vision for Green Infrastructure in Ontario

Imagine communities and governments that understand the value of natural forms and functions, and invest in their protection and enhancement. Green infrastructure is no longer viewed as a pleasant add-on but as an essential component of a healthy and sustainable Ontario.

Dense tree canopies shelter us from sun and wind, purify the air we breathe, reduce our heating and cooling costs and provide habitat and food for wildlife. Trees, green roofs and walls, swales, rain gardens and healthy soil capture stormwater, improving water quality while reducing flooding and the costly expansion of traditional stormwater infrastructure.

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Consultative Process and Legislative and Policy Review

In 2011, the Green Infrastructure Ontario Coalition carried out an extensive consultation process. This process, consisting of a survey and workshops, engaged a large and diverse group of green infrastructure professionals.

From January to April, 198 people completed an online questionnaire, providing important information about the state of green infrastructure across the province and the opportunities and challenges to its advancement. In addition, throughout March and April, 219 people attended the workshop “Creating a Green Infrastructure Strategy for Ontario,” which the coalition delivered in partnership with the City of Windsor, EcoSuperior (Thunder Bay), Grand River Conservation Authority (Cambridge), Peterborough Green-Up and Toronto and Region and Conservation/LEAF (Toronto). Participants provided valuable information about the state of green infrastructure in their communities and demonstrated strong support for a province-wide coalition.

Also in 2011, the Green Infrastructure Ontario Coalition and Ecojustice conducted an analysis of legislative instruments that provide opportunities or act as barriers to the mainstream use of green infrastructure in Ontario. The results were paired with the experience of steering committee members and feedback from workshop and survey participants to develop a list of recommendations for the province, found in Section 4 of this report.

Opportunities and challenges facing green infrastructure in Ontario today

Evergreen

ONTARIO IS EXPERIENCING GREAT CHANGE AND UNCERTAINTY. To begin with, its population is growing, aging, diversifying and becoming more urban. As an example, roughly 10.3 million people are expected to live in the Greater Golden Horseshoe area by 2021.[5] The provincial government is investing in public infrastructure that will meet the demands of this changing population.[6] Investment plans must also consider major climatic and economic shifts such as more frequent and severe storm events and globalization. Green infrastructure is an economically viable tool that can help Ontario meet several of its infrastructure needs. Both opportunities and challenges to making this happen were uncovered through the coalition’s consultative process and legislative and policy review.

Opportunities

From a legislative and policy perspective, opportunities exist to increase the mainstream use of green infrastructure. These include the recent enactment of progressive legislation, the revision of established legislation and the proposed *Great Lakes Protection Act*. Green infrastructure is also bolstered by the advancement of research in ecosystem services valuation and urban forests, as well as cost-benefit analyses of traditional versus green infrastructure approaches to stormwater management and community development.

Lake Simcoe Protection Act

In December 2008, the Government of Ontario passed the *Lake Simcoe Protection Act*. In June 2009, after months of consultation with citizens and organizations, the Ontario Ministry of the Environment released the Lake Simcoe Protection Plan. The Act and plan address the ever-increasing phosphorus loading of Lake Simcoe from urban runoff. The plan encourages the use of green infrastructure to reduce phosphorus loading through vegetative uptake and filtering of runoff. It estimates that green infrastructure could prevent 2.7 tonnes per year of phosphorus from entering Lake Simcoe.[7]

Bluffers Park Wetland, Toronto

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Water Opportunities and Water Conservation Act

In 2010, The Government of Ontario passed the *Water Opportunities and Water Conservation Act*, which recognizes the need for integrated long-term planning of water and stormwater. This Act represents an excellent opportunity to establish green infrastructure as an important means to achieve water conservation as well as an opportunity to develop Ontario-based technologies and create jobs. The Act is supported by the Showcasing Water Innovation Program, which will provide $17 million over three years to projects that demonstrate leading-edge and cost-effective water management solutions.

Provincial Policy Statement Review

The Provincial Policy Statement (PPS), 2005, provides policy direction on matters of provincial interest related to land-use planning. Policies and definitions within the PPS reflect the consolidated priorities of all ministries involved. The Government of Ontario is undertaking a five-year review of the PPS, as required by the *Planning Act*. The goal of the review is to ensure that the province's land-use planning policies are effectively protecting Ontario's best interests, and to determine if changes are required. Workshop and survey participants identified this review as an opportunity to advance green infrastructure by specifically incorporating it into the text of the PPS.

Planned Legislative Reviews

The Government of Ontario has passed progressive legislation to protect and enhance the province's rich natural heritage and the functions that it provides. Examples include the *Oak Ridges Moraine Conservation Act*, the *Niagara Escarpment Planning and Development Act* and the *Greenbelt Act*. Each of these pieces of legislation requires a 10-year review. Such reviews present an opportunity for the coalition and partners to advocate for the greater inclusion of green infrastructure in legislation and policies.

Proposed Great Lakes Protection Act

The Speech from the Throne, which passed in the Ontario legislature on December 7, 2011, announced that a *Great Lakes Protection Act* will be drafted. This represents an excellent legislative opportunity for mainstreaming green infrastructure. The speech acknowledged that Ontario's wealth is in large part found in the abundance of natural beauty and resources, and that the provincial government must do more to protect this wealth. With this promise, Ontario is poised to become a leader in water innovation.

Ecosystem Services Valuation Studies

There is a long-held assumption that if an item or process does not contribute to the Gross Domestic Product (GDP), it does not have value. Although most goods have a GDP value, most ecosystem services do not. Ecosystem services are the benefits that individuals and communities obtain from functioning ecosystems. Examples include recreation, pollination, erosion control and air and water purification. Another assumption is that ecosystem protection comes at a cost to the economy. Ecosystem services valuation challenges both these assumptions by employing peer-reviewed and tested methodologies to estimate the economic value of ecosystem services. Put simply, valuation makes a business case for ecosystem protection and enhancement. It is a tool that helps decision-makers understand society's dependence on natural systems and the costs paid by society and governments when these systems are degraded. It allows for more complete accounting when making decisions about resource allocation and land-use planning.

Ecosystem services valuation has been gaining ground in Ontario, with interest and investment from provincial ministries, conservation authorities and non-governmental organizations. In 2011, local experts and enthusiasts in the field of ecosystem services formed a group called Ontario Network for Ecosystem Services (ONES). ONES' mission is to advance research and the exchange of knowledge and information related to ecosystem services in Ontario. The group aims to influence policies and programs and to increase awareness and provision of ecosystem benefits to society. Its focus and work are aligned with those of the Green Infrastructure Ontario Coalition.

Urban Forest Studies

In 2006, the U.S. Department of Agriculture's Forest Service introduced i-Tree Eco (originally called the Urban Forests Effects Model or UFORE), a state-of-the-art, peer-reviewed software suite that analyzes urban forests and assesses their benefits carbon sequestration and storage, air pollution removal and energy savings. A number of southern Ontario towns and cities have employed i-Tree Eco, including Ajax, Brampton, Caledon, Markham, Mississauga, Oakville, Pickering, Richmond Hill, Toronto and Vaughan. This standardized approach to urban forest research allows for comparisons among jurisdictions as well as the sharing of knowledge and expertise.[8]

Ontario Residential Tree Benefits Estimator

While i-Tree Eco analyses demonstrate the value of urban forests, a new interactive tool has been developed by Ryerson University for LEAF, a founding member of the Green Infrastructure Ontario Coalition. The Ontario Residential Tree Benefits Estimator is an online tool that describes and quantifies the ecological services provided by a single tree. With simple inputs of tree species, size and location in relation to the house, the estimator quantifies the conserved energy (kilowatt hours), instantaneous demand

Habitat Pond, Willowfield Gardens Park, Massey Creek Subwatershed Regeneration, Toronto

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ECOSYSTEM VALUATION STUDIES IN ONTARIO

The following is a sampling of recently completed studies that demonstrate the value of ecosystem services in Ontario communities.

Lake Simcoe Basin's Natural Capital: The Value of the Watershed's Ecosystem Services
By Sara J. Wilson, Natural Capital Research & Consulting for David Suzuki Foundation, Friends of the Greenbelt Foundation and Lake Simcoe Region Conservation Authority, 2008
The Lake Simcoe basin in central Ontario covers an area of 3,307 square kilometers with 2,502 square kilometres in total land area. It is home to 360,000 permanent residents but experiences a large influx of people in the summer. This study estimated the economic value of ecosystem services to be a minimum of $975 million per year, which translates to $2,780 per capita annually.

Ontario's wealth, Canada's future: Appreciating the Value of the Greenbelt's Eco-services
By Sara J. Wilson, Natural Capital Research & Consulting for David Suzuki Foundation, 2008
In 2005, the province of Ontario established the Greenbelt to protect 1.8 million acres of prime farmland and natural areas in the densely populated and rapidly expanding Greater Golden Horseshoe in southern Ontario. This study estimates the Greenbelt's contribution of non-market ecosystem services to be a minimum of $2.6 billion per year, with an average value of $3,487 per hectare.

Natural Credit: Estimating the Value of Natural Capital in the Credit River Watershed
By Mike Kennedy and Jeff Wilson for the Pembina Institute and Credit Valley Conservation, 2009
The Credit River watershed in southern Ontario covers 1,000 square kilometres and is home to 757,600 people. Its headwaters are in Orangeville and its mouth at Port Credit in Mississauga. This study estimates the economic value of ecosystem services to watershed residents to be a minimum of $371 million per year.

Estimating Ecosystem Services in Southern Ontario
By Spatial Informatics Group, A. Troy and K. Bagstad, 2009
The Ontario Ministry of Natural Resources commissioned this valuation study to estimate the economic value of ecosystem services in southern Ontario. Instead of conducting an expensive and lengthy primary valuation study of this area, consultants relied on the peer-accepted value transfer methodology. This permitted authors to generate yearly value estimates of ecosystem services for southern Ontario and an estimated total yearly value for ecosystem services of over $84 billion.

savings (kilowatts), carbon sequestration, stormwater runoff mitigation and air quality improvement. It models future benefits of a newly planted tree as well as the current and accumulated benefits of an existing tree.

Cost-benefit Analyses

The ecosystem valuation and i-Tree Eco studies detailed above demonstrate that it is possible, at least to some degree, to monetize diverse ecosystem services. Cost-benefit analyses take the evaluation of green infrastructure a step further by comparing the costs and savings associated with green development to those associated with a business-as-usual approach. Three examples are provided below.

Economic Value of a Sustainable Development Approach in the Rouge Watershed

In 2010, MOE commissioned consultants to compare the costs and benefits of two land development scenarios in the Rouge River Watershed, located on the eastern edge of the Toronto.[9] The two scenarios — referred to as the Sustainable Communities (SC) scenario and the Full Build-Out (FBO) scenario — differed in their relative land cover types and intervention strategies. The SC scenario incorporated the protection, maintenance and enhancement of green infrastructure.

Despite the limitations of the analysis, explained in the report, it is determined that the minimum value of net benefits of implementing the SC scenario over the FBO scenario range from $416 – $960 million, with a most likely estimate of $687 million. The benefit-cost ratio ranges from 1.6 – 2.4 in favour of sustainable development.

Cost-benefit Study of Toronto Green Standards

The City of Toronto developed the Toronto Green Standard (TGS) to address negative impacts associated with urban growth. TGS is a set of performance measures with supporting guidelines related to sustainable site and building design for new development.[10] The standards are designed to work with the regular development approvals and inspections process. A 2008 cost-benefit study of TGS found that the benefits derived from green development overwhelmingly outweigh the associated costs.[11] Marginal additional costs upfront significantly improve the environmental, social and economic outcomes of development both for the city and the region in which it is situated.

Cost-benefit Study of Philadelphia's Green Infrastructure Plan

Philadelphia's Green Infrastructure Plan[12] was approved in 2011, and is one of the most ambitious and innovative green infrastructure plans to date. The 20-year, US$1.6 billion plan proposes to manage Philadelphia's stormwater using green infrastructure. The focus is on the management of stormwater runoff at the source through street tree planting

Opportunities and Challenges
Facing Green Infrastructure
in Ontario Today

Matthew J. W. Higginson / LEAF

case study:

GREEN INFRASTRUCTURE FOR CLEAN WATER ACT

In 2009, federal green infrastructure legislation was introduced in the United States that would provide a minimum standard for stormwater management. The *Green Infrastructure for Clean Water Act*[14] encourages the Environmental Protection Agency (EPA) to integrate green infrastructure into permitting and other regulatory programs, codes and ordinance development. The legislation would provide grants to states, localities and other qualified entities to design and implement green infrastructure projects that address stormwater management and other water quality and quantity issues. One hundred million U.S. dollars would be authorized annually for planning and development, with an additional US$200 million set aside for implementation.

The legislation would also establish Centers of Excellence in planning, implementation and policythat provide technical assistance to states and local governments and conduct related research. The bill has been referred to committee and is awaiting further action.

programs, preserved open spaces, restored streams and incentives for green infrastructure on private land. The plan lays the groundwork for the revitalization of the city in areas of public health, recreation and housing, and is the first of its kind to adopt an approach that addresses stormwater management together with multiple social benefits, while also complying with Clean Water Act requirements.

In developing the plan, the city conducted a cost-benefit analysis[13], comparing traditional infrastructure techniques to a green infrastructure approach. The study found that US$400 million in benefits could be expected from the avoidance of 1.5 billion pounds of carbon dioxide emissions, air quality improvements resulting in avoided asthma attacks and premature deaths, massive reductions in electricity and fuel, and five to eight billion gallons of combined sewer overflows avoided per year. Other community benefits included ecosystem restoration, enhanced recreational opportunities and job creation.

These and other studies conducted around the world confirm that green development is not doing without, but doing better with less. In the United States and Europe, comprehensive cost-benefit analyses of green infrastructure are influencing policy and investment decisions. Such analyses, and the tools required to conduct them, require a long-term investment of funds and expertise, as well as an openness to accept and apply the results.

Challenges

Despite the opportunities presented above, there are considerable challenges to the widespread adoption of green infrastructure in Ontario. These challenges were identified through the extensive consultative process and legislative scan detailed in Section 1.2. Specific challenges are described below.

Restrictive and Outdated Policy Lexicon

Members of the Green Infrastructure Ontario Coalition identified the restrictive and outdated language of policies as a major obstacle to green infrastructure. In 2011, the coalition submitted an Application for Review under the Environmental Bill of Rights to request that six ministries include green infrastructure in their definition of infrastructure. The application was denied. In his 2010-2011 Annual Report[15], the Environmental Commissioner of Ontario made mention of this oversight and recommended that the Government of Ontario introduce green infrastructure into its policy lexicon.

Insufficient Coordination among Provincial Ministries

There is no clear provincial mandate for green infrastructure in Ontario. There are many players in the field at all levels of government, and a high degree of fragmentation among and within jurisdictions. The result is a lack of provincial guidelines and weak linkages among ministries with responsibilities for aspects of green infrastructure.

The lack of coordination is also a problem at the national level. Peeling Back the

Linear Wetland, Durham College UOIT, Oshawa

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case study:

EPA LEADERSHIP AND THE GREEN INFRASTRUCTURE PARTNERSHIP

In 2007, the Green Infrastructure Partnership was formed between the United States Environmental Protection Agency (EPA) and four national organizations to promote green infrastructure as a cost-effective and environmentally preferable approach to stormwater management and the reduction of combined sewer overflows. In 2008, this partnership produced the Managing Wet Weather with Green Infrastructure Action Strategy that demonstrates how municipalities can bring green infrastructure approaches into mainstream use. They have also produced a series of municipal handbooks on green infrastructure incentive mechanisms, retrofit policies and funding options.[17]

In 2011, the EPA released the Strategic Agenda to Protect Waters and Build More Livable Communities through Green Infrastructure.[18] This document outlines activities that the agency will undertake to help communities implement green infrastructure. It clarifies how green infrastructure can and should be used within the regulatory and enforcement contexts, including outreach and information exchange, financing, tool development and capacity building.

Pavement[16], a 2011 report by the POLIS Project of University of Victoria, identified the fragmented responsibility for watersheds across and within jurisdictions as an obstacle to reinventing stormwater management.

With federal and provincial funding going almost exclusively to traditional infrastructure, municipalities and conservation authorities are left to assess, protect and enhance green infrastructure on their own.

Insufficient Provincial Guidance and Funding

While there is federal and provincial funding available for infrastructure upgrades and maintenance, there is insufficient funding for green infrastructure across Ontario.

In 2009, the federal government announced the Green Infrastructure Fund, with a commitment of $1 billion over five years.[19] This fund specifically targets projects that improve the environment and help create a more sustainable economy. In theory and name, it supports green infrastructure. However, only traditional infrastructure has been supported to date. The Federal Gas Tax Fund is designed to support a great diversity of infrastructure projects including public transit, drinking and wastewater infrastructure, community energy systems, solid waste management and more.[20] It is unclear whether green infrastructure is eligible for this funding, but it does not appear to be considered. Further, the majority of spending under Canada's 2009 Economic Action Plan has gone to traditional infrastructure.[21]

Provincial government funding programs also favour traditional infrastructure for stormwater and sewage treatment. In 2009-10, the provincial expenditure on "community/environment" infrastructure was $1.87 million; only 27 per cent was for "water/environment", and the vast majority of that was for upgrades to sewage and wastewater treatment plants and sewer separations.[22] With federal and provincial funding going almost exclusively to traditional infrastructure, municipalities and conservation authorities are left to assess, protect and enhance green infrastructure on their own.

The lack of provincial investment and guidance in green infrastructure, and the strain it puts on cities, is evident in the management of urban forests. Currently, there is no support for municipalities in their efforts to assess, protect and enhance urban forests, despite the growing awareness of the multiple benefits provided by this type of green infrastructure. Some municipalities are undertaking these activities on their own, but many lack the expertise and resources required to do so. This challenge is compounded by the onslaught of invasive exotic pests such as Emerald Ash Borer. Set to devastate ash populations across Ontario, this crisis is one that municipalities are left to deal with on their own.

Outdated Policies and Regulations

Feedback from workshop and survey participants identified outdated policies and regulations, specifically the Provincial Policy Statement and stormwater management

Opportunities and Challenges
Facing Green Infrastructure
in Ontario Today

Tom Arban

case study:

STATE OF ILLINOIS GREEN INFRASTRUCTURE GRANT PROGRAM[23]

In 2010, the Illinois Environmental Protection Agency (EPA) launched the Green Infrastructure Grant Program for stormwater management.[24] Grants are available to local units of government and other organizations to install green infrastructure best management practices to control stormwater runoff. Under this program, green infrastructure includes any stormwater management technique or practice employed with the primary goal of preserving, restoring, mimicking or enhancing natural hydrology. Projects vary in cost, length of time to develop and complexity, and are placed into one of three categories: CSO rehabilitation, stormwater retention and infiltration and green infrastructure small projects. Since 2010, the agency has awarded approximately US$5 million to projects designed to reduce stormwater runoff and discharges into Illinois waterways.

The grant program came out of the Clean Water Act, passed in 2009, and was developed by an Illinois EPA-designated steering committee of representatives from numerous organizations. The Center for Neighborhood Technology, the Natural Resources Defense Council, the Metropolitan Planning Council and the University of Illinois-Chicago are key partners with Illinois EPA in program implementation. The grants are estimated to result in 250 weeks of work for construction workers and the manufacturing trades, as well as to create 130 weeks of work for the professional engineers and public works staff needed to design best management practices, develop and submit permits and supervise construction.

regulations, as barriers to the implementation of green infrastructure. As an example, the approvals process for development separates infrastructure planning from environmental, land-use and landscape planning. Municipalities should integrate green infrastructure into the community design so that parks and open spaces, natural heritage systems and stormwater management facilities function as an integrated system that provides multiple benefits to the community. Stormwater management deserves equal consideration when compared to lot level and conveyance controls as has been done for end-of-pipe measures.

Specifically, the Ministry of the Environment's *Stormwater Management Planning and Design Manual*[25] was produced in 2003 and is based on work from the 1990s that promotes a conveyance and end-of-pipe approach. Although the manual does provide information on source or lot level control, the need for stormwater volume control has not been adequately addressed, nor is there any mechanism to require source controls.[26] In the sense of its broader definition, including urban forests and natural features, green infrastructure has not been addressed in the manual.[27]

In response to an Application for Review submitted in 2007 under the Environmental Bill of Rights[28], the Ontario Ministry of the Environment completed a review of the need for a new policy, act or regulation to deal with stormwater management in light of climate change. The review concluded that a new policy framework is required and that the manual requires updating to include best practices for stormwater management, including those for source control.[29] Although MOE has reviewed the manual in light of climate change, they are not yet revising it to deal with water quality concerns.

case study:

NEW YORK CITY'S GREEN INFRASTRUCTURE VISION

Released in 2010, New York City's Green Infrastructure Plan aims to reduce the City's sewer management costs by US$2.4 billion over 20 years.[30] The plan estimates that a combination of green infrastructure, cost-effective grey infrastructure and other program elements valued at this amount will result in a net reduction in combined sewer overflows of 40 per cent by 2030 while saving US$2.4 billion through costly investments in traditional infrastructure such as tanks and tunnels. The plan estimates that every fully vegetated acre of green infrastructure will provide total annual benefits of US$8,522 in reduced energy demand, US$166 in reduced CO_2 emissions and US$1,044 in improved air quality and US$4,725 in increased property value.[31]

In 2011, New York State Department of Environmental Protection announced that it will allocate US$3 million in grants for community-based green infrastructure projects as part of the plan.[32] Private property owners, businesses and not-for-profit organizations are eligible for funding for green infrastructure projects that reduce stormwater runoff. After a 20-year period, the department estimates that New Yorkers will receive US$139-$418 million in additional benefits through reduced energy bills, increased property values and improved health.

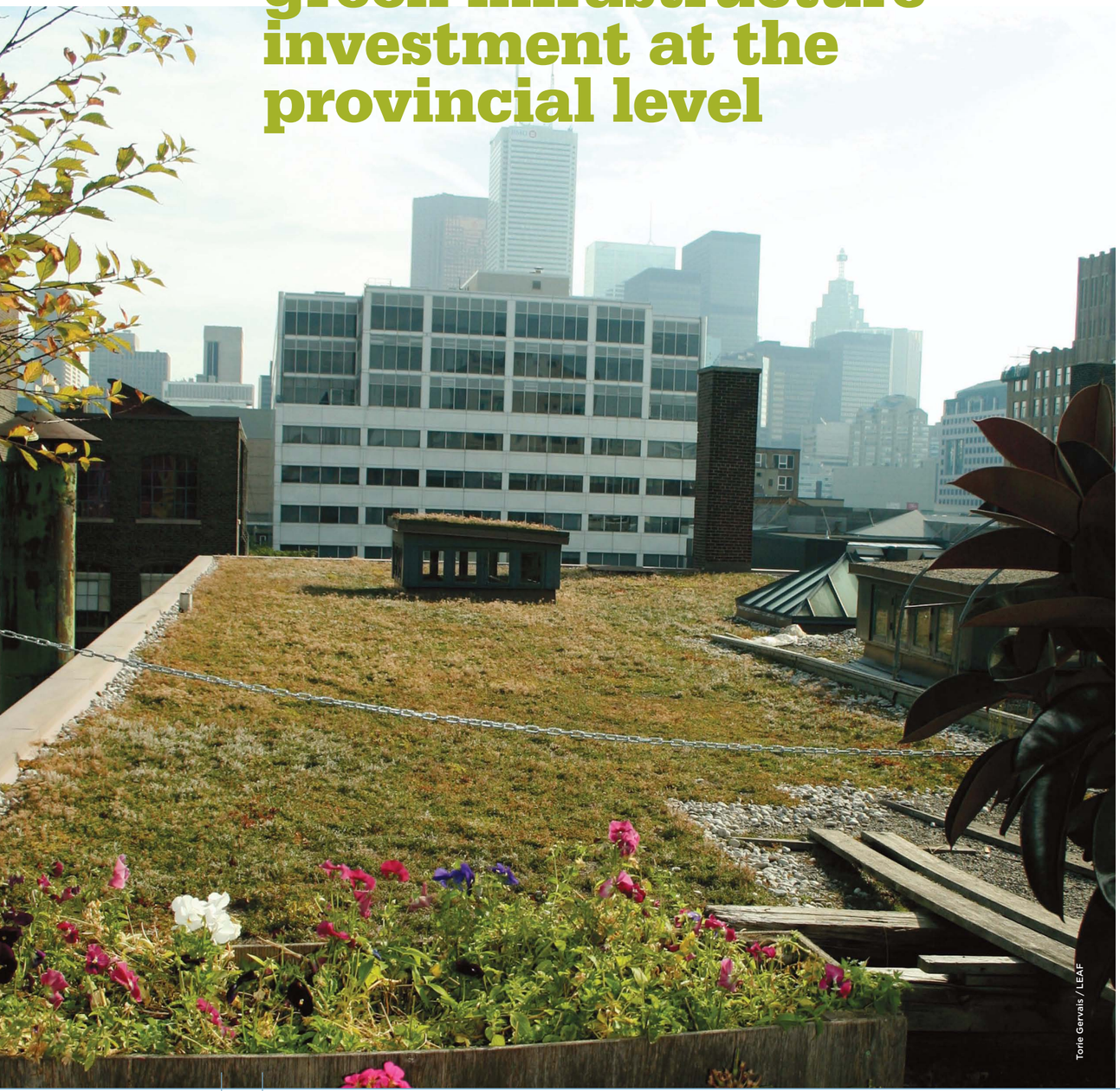
The Undetermined State of Green Infrastructure in Ontario

Many municipal parks employees who participated in the workshops and survey identified the widespread lack of knowledge about Ontario's green infrastructure — both its extent and its quality — as a serious challenge. Some municipalities, conservation authorities and trade associations do conduct inventories of specific green infrastructure types for their jurisdictions, but there is no effort and no support from the province to conduct a more thorough inventory of the state of green infrastructure in Ontario. Without baseline data, it is difficult to establish targets, set priorities and determine the success of protection and enhancement efforts.

Biofilter, Durham College UOIT, Oshawa

Scholen & Company Inc.

The business case for green infrastructure investment at the provincial level



Tonie Gervais / LEAF

A STRONG ECONOMIC CASE CAN BE MADE FOR GREEN INFRASTRUCTURE INVESTMENT AT THE PROVINCIAL LEVEL. Studies conducted recently in southern Ontario and case studies from other jurisdictions demonstrate that green infrastructure saves governments and taxpayers money while also creating jobs and contributing to a strong economy. Specific types of cost savings and other economic benefits are detailed below.

Energy Cost Savings

Green infrastructure has a large role to play in Ontario's transition to a culture of conservation. Well-planned and maintained green infrastructure, specifically green roofs and urban forests, reduce electricity consumption, thereby reducing government spending on electricity generation and transmission.

The Ontario Ministry of Energy recently produced *Ontario's Long-Term Energy Plan*, which discusses the electricity sector's outlook and requirements over the next decade. Energy conservation is a key priority because it postpones the costly expansion of Ontario's energy infrastructure. The province is targeting an overall demand reduction of 28 terawatt hours by 2030.[33]

Much research has been conducted on the energy conservation benefits of green roofs. Studies show savings at 15-45 per cent of annual energy consumption, mainly from lower cooling costs.[34] A Ryerson University study estimated the initial benefits of a Toronto-wide green roof installation program, including but not limited to energy savings and urban heat island mitigation, to be valued at $313 million.[35] Toronto's green roof bylaw, enacted in 2009, has already led to 1.2 million square feet of new green roof area, which has an estimated savings of 1.5 million kilowatt hours of energy.

Much research has also been conducted on the energy conservation benefits of urban forests. i-Tree Eco analyses demonstrate that residents of Peel Region's urban areas save $2.5 million annually in heating and cooling through shading and windbreak[36], while Toronto residents save $9.7 million annually.[37]

Urban trees, green roofs, and high-albedo (white or reflective) surfaces in paving and rooftops can offset or reverse the heat-island effect. In the United States, it has been estimated that investing in these measures can reduce national energy use for air conditioning by about 20 per cent, with national monetary energy savings estimated to be US$10 billion per year.[38] Money used to build new power plants to manage peak loads could instead be spent on green infrastructure to cool cities and save energy.

Health Care Cost Savings

The price tag of environmental degradation and its ensuing health effects is enormous. A 2008 Canadian Medical Association study[42] found that air pollution costs Ontario — in terms of lost productivity, healthcare costs, quality of life and loss of life — almost $4 billion.

Toronto and Region Conservation Authority

THE URBAN HEAT ISLAND EFFECT

In urban environments, much natural groundcover, including trees and meadows, has been replaced with pavement and buildings. These hard surfaces absorb more radiation and are incapable of evapotranspiration, and therefore lead to higher temperatures. This effect is referred to as the urban heat island (UHI) effect.[39]

All cities with a population of greater than 100,000 experience some degree of UHI effect.[40] Ontario cities are no exception. Little is being done to alleviate this problem despite the fact that it results in greater electricity consumption and a host of other problems. An unpublished study by Environment Canada of Ontario cities' climate and energy data found that for every additional one degree centigrade, the resulting increase in energy consumption is almost four per cent.[41] This represents hundreds of millions in additional expense for energy production and distribution. The UHI effect also contributes to the formation of smog and other air quality problems, which negatively impact quality of life and increase hot weather related hospitalizations.

The Business Case for
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at the Provincial Level

In its decision to phase out coal-fired electrical generation, Ontario recognized that environment and health are inextricably linked.[43] This is a major step forward in public policy, and sets a progressive precedent.

The body of evidence demonstrating a strong connection between environment and health is large and mounting. This connection is a priority for many health-focused agencies and organizations including municipal public health departments, the Ontario Lung Association, Ontario Medical Association, the Ontario College of Family Physicians and the Canadian Medical Association. The Ontario Medical Association has written many reports on the health effects of air pollution in Ontario. One such report states that approximately 60,000 Ontarians are admitted to emergency rooms due to air pollution exposure annually.[44] And 17,000 are admitted to hospitals for chronic health problems stemming from exposure to air pollution. The association estimates that these rates will increase to 88,000 and 24,000 by 2026. This problem is exacerbated as workers with chronic illnesses attributable to air pollution take time off, thereby adding to the overall burden of health care and social services. In 2005, economic losses due to lost productivity, healthcare costs, pain and suffering and loss of life associated with air pollution exposure were estimated at $7.8 billion. This total is expected to increase to over $12.9 billion by 2026.[45]

> **There is more than ample evidence that our health is determined – to a large extent – by the environment we live in. This includes physical, chemical, and biological factors, and the social milieu we happen to be in.**
>
> Dr. John Ascah MD, FRCP, MPH, Eco-leader with Canadian Association of Physicians for the Environment

Green infrastructure has the potential to improve air quality through the removal of air pollutants and the storage and sequestration of carbon. Recent i-Tree Eco studies reveal that Peel Region's urban forest removes 855 tonnes of air pollution annually[46], while Toronto's urban forest removes 1,430 tonnes.[47] Respective annual values for this service are $9.1 million and $16.1 million. These studies also demonstrate the extent of carbon sequestration and storage by urban forests. Peel Region's urban forest sequesters 19,000 tonnes of carbon annually and stores 400,000 tonnes.[48] These services are valued at $550,000 and $11.5 million respectively. Toronto's urban forest sequesters 46,700 tonnes of carbon annually and stores 1.1 million tonnes — the equivalent of annual carbon emissions from 733,000 automobiles.[49] These services are valued at $1.3 million and $31.6 million respectively.

The urban heat island (UHI) effect, described previously, is a rising health concern in Ontario's large and growing cities. By employing green infrastructure in heat island hot-spots, cities can mitigate adverse health effects such as heat stroke, and reduce the formation of ground level ozone, a lung tissue irritant. This is of particular benefit to vulnerable members of society, especially children, elderly citizens and those with compromised respiratory health.

Another obvious health benefit of urban forests is shade. Tree canopies reduce society's exposure to ultraviolet radiation, a major cause of skin cancer. The City of Toronto is one of the first municipalities in Canada to plan for shade. In 2002, the Toronto Cancer

Prevention Coalition (TCPC) developed an action plan[50] to stop cancer before it starts, and established working groups to implement the strategies in the plan. This document acknowledges that trees provide excellent sun protection while also serving many other environmental and aesthetic functions. TCPC also developed a set of shade guidelines that provide practical tools for ensuring adequate shade in public spaces.

Well-planned and maintained green infrastructure can also counter the rise in obesity, a condition that increases an individual's risk of developing diabetes, hypertension, cardiovascular disease and some forms of cancers.[51] Data from 2007-2009 showed that across Canada roughly 25 per cent of adults and nine per cent of children aged six to 17 are obese.[52]

Obesity is extremely costly to Ontario's health-care system. Each year, the province spends $1.6 billion on related costs.[53] A study of physician costs in Ontario found that obese male and female adults incurred physician costs that were 14.7 and 18.2 per cent greater than those of their normal-weight peers.[54] Physical activity is associated with obesity and is a key factor in its prevention. Outdoor environments strongly affect behaviours. Local trees, green spaces and other green infrastructure types are proven to encourage physical activity.[55] Studies also demonstrate that urban forests reduce pain and stress in hospital patients[56], reduce neighbourhood crime levels[57] and improve psychological well-being[58].

In addition, green infrastructure provides Ontario's increasingly urban population with ample opportunity for nature appreciation and interaction. Research by social scientists and psychologists shows that, for both adults and children, regular encounters with nature — a green view from an office window, a lunchtime stroll through a nearby park, well-tended landscapes around schools — restore the ability to concentrate, calm feelings of anxiety and reduce aggression.[59] In addition, a Chicago study links tree and grass cover to fewer property crimes, fewer violent crimes, stronger ties among neighbours, more frequent use of common neighbourhood spaces and a greater sense of safety.[60]

Studies also demonstrate that views of plants have a positive effect on job satisfaction and performance. Employees with an outside view of plants experience less job pressure and greater job satisfaction than those without such a view, and these employees also report fewer headaches and other ailments.[61] Greater job satisfaction, higher productivity and psychological benefits such as an increased sense of control and awareness of one's surroundings, were the results of having some form of contact with nature.[62]

Municipal public health departments across Ontario are exploring the connection between the built environment and human health. In April 2011, The Clean Air Partnership released a report demonstrating how these departments promote healthy and sustainable communities through land-use and transportation planning[63]. Most of the 10 departments featured in this report are promoting policies to establish trails, parks and other green space and some of the recommended actions involve green infrastruc-


Kanchan Maharaj / LEAF

ture. For example, it is recommended that cities use permeable pavement and bioswales to recharge groundwater tables and reduce stormwater runoff. In addition, green roofs, street trees and parks should be required to reduce the urban heat island effect.

These ideas are not new. In 2003, St. Leger, the editor of *Health Promotion International*, wrote a piece titled "Health and nature—new challenges for health promotion".[64] In this essay, he challenged health promoters worldwide to examine the growing evidence of health benefits — both personal and community — produced by nature. He presented a summary of the key theories and research findings from the 1970s onward and made the argument that natural areas address numerous health issues, thereby making their protection and enhancement a cost-effective health promotion strategy. He writes: "As groups of professionals, we may need to be more proactive in making sure abundant open areas, where citizens can easily experience contact with plants and animals, [exist] in the communities in which we live."

Infrastructure Cost Savings

The typical urban landscape contains a high degree of impervious surfaces including paved roads, parking lots, sidewalks and roofs. These hard surfaces cause greater volumes of stormwater runoff to be discharged into local water bodies and combined sewers during wet weather. Combined sewers are an antiquated system, found in many older cities, which transport both sanitary sewage and stormwater in the same pipes. During heavy rains and snowmelts, the volume of flow commonly exceeds the capacity of the sewer system. Untreated sewage mixes with stormwater and is released directly into local water bodies. This is referred to as a combined sewer overflow (CSO)[65].

Much of Canada's underground water and wastewater piping networks have already exceeded their design life. Each year as governments in Canada delay maintenance and repairs, an infrastructure deficit is incurred, adding to our overall infrastructure debt.[66] The infrastructure funding shortfall for existing water and wastewater facilities is estimated to be $31 billion. When considered in combination with new demands, an additional investment of $56.6 billion is needed.[67] A 2005 report estimated that Ontario's water and wastewater infrastructure would need $30 to $40 billion in investment over the following 15 years just to keep it in a state of good repair.[68] Ontario's debt continues to climb and local governments are forced to contribute an increasing amount of overall spending. Green infrastructure has a major role to play in reversing this trend and saving government funds in the long run.

Economic analyses clearly show that green infrastructure is a cost-effective means of reducing storm runoff and CSOs by capturing runoff and retaining it before it can reach the sewer system.[69] Natural Resources Development Council's 2011 report entitled *Rooftops to Rivers* details 14 cities that are leaders in innovative stormwater management. All employ green infrastructure to reduce the quantity and improve the quality of stormwater runoff while saving money and beautifying cityscapes. Once viewed as a nuisance, stormwater is transformed into a community resource. This report complements a 2007 U.S. Environmental Protection Agency study that found that green infrastructure saved money for developers, property owners and communities, while also protecting and restoring water quality.[70]

Green infrastructure is generally cost-effective when incorporated into large re-development projects and major infrastructural improvements, and the cost is often minimal

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case study:

STORMWATER UTILITY FEES

Stormwater utility fees place a local public service charge on property owners based on the area of impervious surfaces on their lots (e.g. parking lots, driveways, rooftops), which is a good indicator of how much runoff a property contributes to the storm sewers. Stormwater fees are popular because of the ability to provide incentives, such as fee discounts for properties with on-site stormwater management. A stormwater fee can be dedicated exclusively to a stormwater management program, and a preference for green infrastructure could be identified[76]. This removes stormwater management from general revenue funding, which is variable because it competes with other general taxation programs.

Hundreds of jurisdictions in the United States have stormwater utility fees, and though the idea is relatively new in Canada, a growing number of municipalities have adopted or are considering this structure. Halifax, Regina, Saskatoon, Edmonton, Calgary, London, St. Thomas and Aurora have long-standing stormwater fees. In 2011, Kitchener and Waterloo transferred stormwater management funding from property taxes to a user-fee program,[77] providing a sustainable source of funding for stormwater management. After extensive research, Kitchener determined a tiered flat fee was an equitable approach to stormwater management fees, and a series of rate tiers was established based on property type and size. Properties with a high percentage of impervious surfaces, such as industrial and commercial parks, typically create more stormwater runoff and therefore pay higher rates than residential properties. Property owners qualify for stormwater rate credits if they demonstrate that existing or proposed stormwater facilities or practices on their land save the city money on stormwater management.

Though some cities are taking their own initiative to introduce stormwater fees, full cost pricing for water and wastewater infrastructure in Ontario has long been recognized as a needed reform.[78] Securing a dedicated and adequate source of funding for stormwater management in Ontario is critical to improve stormwater management practices, and is a certain way to facilitate support and funding for green infrastructure.

relative to the scope and price of the overall project.[71] Further, the flexible and decentralized nature of green infrastructure allows it to be incorporated into developed areas on a site-specific basis. New developments that use green infrastructure often cost less to build because of decreased site development and traditional infrastructure costs, and are more attractive to buyers because of environmental amenities. For example, the Laurel Springs residential subdivision in Jackson, Wisconsin, was developed as a conservation design community. It features preserved open spaces and bioretention and vegetated swales to replace conventional stormwater infrastructure. This approach resulted in a cost savings of roughly US$504,000, or 30 per cent of the conventional construction cost.[72]

Green roofs can eliminate anywhere between 10 to 90 per cent of the stormwater runoff from buildings depending on composition, depth, slope and rainfall patterns. The green roof on Chicago's City Hall can retain 75 per cent of the runoff of a one inch rainfall.[73] As mentioned previously, a Ryerson University study has estimated the value of a Toronto-wide green roof installation program to be $313 million in terms of stormwater, combined sewer overflow, air quality, building energy and urban heat island benefits, with an additional operating-cost savings of $37 million annually[74]. The Toronto green roof bylaw, enacted in 2009, has already led to 1.2 million square feet of new green roof area, capable of capturing 435,000 cubic feet of stormwater.[75]

Green infrastructure also helps preserve transportation infrastructure. For example, the shade provided by urban forests reduces pavement fatigue, cracking, rutting and other distresses.

Biodiversity

An investment in green infrastructure is an investment in biodiversity, a declared priority of both the provincial and national governments. In 2010, Canada met with almost 200 nations in Japan and agreed on 20 biodiversity conservation targets to be achieved by 2020. However most of the responsibility for meeting these targets falls to provincial governments, including Ontario.[79] In 2011, the Ontario Biodiversity Council, a third-party group of stakeholders, released a renewed biodiversity strategy.[80] This strategy contains a number of recommendations to protect and restore the province's biodiversity and use biological assets in a sustainable manner. Green infrastructure policy and investment at the provincial level complements this strategy and can be used to address specific threats to biodiversity including habitat degradation, climate change and pollution.

Increased Property Values and Tax Revenue

Green space on or near buildings directly contributes to property values, thereby increasing local tax revenues. Numerous studies indicate that property value increases anywhere from 5 to 30 per cent depending on the size and type of green space, the type of housing and the distance from the green space.[81] A study in Boulder, Colorado


Tonia Gervais / LEAF

indicated that parks significantly influence property values with values decreasing by US$4.20 for each additional foot between a property and a park.[82] Other studies have found that homes adjacent to public parks have roughly 20 per cent higher property values than similar homes distant from parks.[83]

Studies also show that residential properties with trees are valued higher than comparable properties without trees.[84] In addition, well-treed commercial areas attract more shoppers and property owners are generally able to charge higher rents for offices that overlook well-landscaped areas. This, in turn, results in higher tax revenues.

Well-designed and maintained green roofs can offer some of the same value-added benefits as parks, including views and the opportunity to interact with nature and neighbours. Assuming that having a productive rooftop garden is tantamount to abutting an at-grade community garden, the value of the long-term benefit accrued to the owner of the property is estimated at seven per cent of the value of the property. This is based on findings that, on average, properties abutting typical community gardens increased in value by 7.4 per cent by five years after the construction of the garden.[85]

In 2004, Philadelphia undertook an innovative and large-scale study to evaluate the economic benefits of green infrastructure and community investment for the city.[86] It focused on place-based investment strategies and the measurements of impacts on neighbourhoods and neighbourhood revitalization. It found that vacant land improvements result in surrounding housing values increasing by as much 30 per cent. New tree plantings increase surrounding housing values by approximately 10 per cent. This translates to a US$4-million gain in property value through tree plantings and a US$12-million gain through lot improvements. The study concluded that curb appeal was increased, population loss was decreased and new residents were attracted to the greened areas.

Local Food Production

Urban centers import a large amount of food on a daily basis to meet the needs of their populations. The average food product on North American supermarket shelves travels 2,254 km before reaching consumers.[87] The large distance between food producers and consumers increases the vulnerability of food systems to the fluctuations and uncertainties of global politics and issues related to peak oil and future water shortages. As a result, many cities are beginning to look for ways to generate food within their boundaries, increasing their economic self-sufficiency and exploiting the many related socio-economic benefits. Urban food production creates jobs, reduces the ecological footprint associated with food transportation, supports a more active and healthy lifestyle, and contributes to long-term food security.

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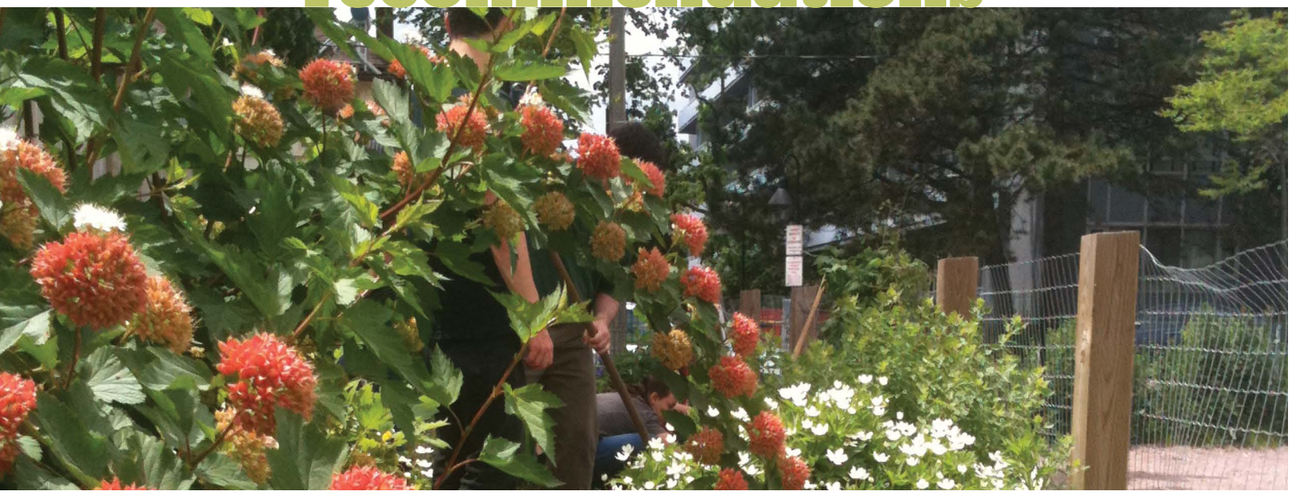
Employment

By investing in green infrastructure, the Government of Ontario will create employment opportunities across the province. Jobs will be created in numerous sectors of the economy, involving ornamental plant growers, planners, architects, landscape architects, designers, ecologists, foresters, engineers, gardeners and construction workers. This great number and diversity of trades people will be required to design, implement, monitor and maintain the growing stock of green infrastructure. New jobs will also be created in associated tourism.

Of course, many Ontarians are already employed in positions related to green infrastructure. A 2009 national study found the annual economic contribution of the private side of the horticultural industry to be valued at $14.48 million.[88] The industry offers close to 200,000 full and part-time positions, roughly 70,000 of which are in Ontario. Many Canadians are also employed in the public side of horticulture for government park systems and conservation authorities, bringing the number of jobs to 140,000 in Ontario and over 280,000 in Canada.[89] As a comparison, Chrysler employs only 5,000 people in Canada. The horticulture industry overall generates $3.8 billion annually in labour income and provides $820 million each year in taxes in Canada. Clearly, the horticultural industry contributes greatly to the economic prosperity of Ontario, while also enriching quality of life. As the Government of Ontario invests in green infrastructure, more horticulture and parks jobs will be created.

A recent analysis of the green roof industry found that for each $1 million spent on green roof projects, 2.8 full-time jobs are created.[90] This study does not include jobs associated with the ongoing maintenance or the supply of materials or products used. Nor does it consider the employment from new uses of this green infrastructure, such as active and passive recreation, tourism and food production. In addition, Toronto's green roof bylaw has already resulted in the creation of 125 new full-time jobs. The province is setting a positive example by installing green roofs on provincial buildings including the Ontario Science Centre in Toronto, Garden City Tower in St. Catharines and the Ottawa Courthouse.

Conclusion and recommendations



Janet McKay / LEAF

THE GOVERNMENT OF ONTARIO HAS ALREADY RECOGNIZED THE ESSENTIAL ROLE OF GREEN INFRASTRUCTURE in the creation of a healthy and sustainable Ontario. It is mentioned in Infrastructure Ontario's Building Together and it forms the basis for various Acts described earlier in this report. This acknowledgement is an important first step, but far more is required.

As detailed in this report, Ontario is already reaping immense environmental, social and economic benefits from green infrastructure. And there is tremendous potential to secure even more benefits through increased protection and investment. Many governments in North America and around the world have acknowledged this fact and are investing heavily in green infrastructure. Ontario must do the same. The Green Infrastructure Ontario Coalition is committed to working with the provincial government to more fully employ green infrastructure for a healthy, prosperous and sustainable Ontario.

Recommendations

The Green Infrastructure Ontario Coalition has presented a strong case for green infrastructure policy and investment at the provincial level and provides the following recommendations to the Government of Ontario.

Recommendation One: Change the definition of public infrastructure to incorporate green infrastructure.
The Ministry of Infrastructure, Ministry of Municipal Affairs and Housing, Ministry of Energy, Ministry of Environment, Ministry of Natural Resources, Ministry of Transportation, and Ministry of Agriculture, Food and Rural Affairs should all refine their definitions of infrastructure to include green infrastructure.

Recommendation Two: Fund green infrastructure projects through various mechanisms such as:
- eligibility for public infrastructure funds;
- stormwater fees/utilities; and
- incentive programs.

Recommendation Three: Capture opportunities to incorporate green infrastructure into existing legislation, policy and programs. Priorities include:
- incorporate green infrastructure into the Planning Act and the updated Provincial Policy Statement and make green infrastructure a consideration in planning and development;
- update the MOE's Stormwater Management Planning and Design Manual so that new development and redevelopment projects require a creative suite of lot and conveyance (low impact development) as well as end-of-pipe measures that address local needs and provide multiple benefits;
- feature green infrastructure prominently in regulations of the Ontario Water Opportunities and Water Conservation Act;
- feature green infrastructure prominently in the proposed Great Lakes Protection Act; and,
- employ green infrastructure as a means to reach provincial energy conservation targets in Ontario's Long Term Energy Plan.

Recommendation Four: Improve intergovernmental coordination and cooperation, specifically among: the Ministry of Infrastructure, Ministry of Municipal Affairs and Housing, Ministry of Energy, Ministry of Environment, Ministry of Natural Resources, Ministry of Transportation, and Ministry of Agriculture, Food and Rural Affairs.

Recommendation Five: Assemble a group of experts to gather information on existing research and programs, and create a comprehensive plan to eliminate barriers and develop provincial targets for green infrastructure.

Recommendation Six: Establish a research and development fund to support green infrastructure planning, evaluation and implementation activities such as:
- i-Tree Eco studies;
- ecosystem services valuation studies; and,
- Sustainable Technologies Evaluation Program (STEP).

Kanchan Maharaj / LEAF

Endnotes

Imagine Ontario cities with more green infrastructure.
Hughson Street South & Main Street East, Hamilton, Ontario

Grace Yang

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