



Town of Newmarket

Agenda

Council Workshop

Date: Monday, January 14, 2019
Time: 9:00 AM
Location: Council Chambers
Municipal Offices
395 Mulock Drive
Newmarket, ON L3Y 4X7

Pages

1. Notice

In accordance with the Town's Procedure By-law, no decisions are to be made but rather this meeting is an opportunity for Council to have informal discussion regarding various matters.

2. Additions & Corrections to the Agenda

3. Declarations of Pecuniary Interest

4. Items

- | | | |
|-----|--|----|
| 4.1 | Town Challenges & Initiatives for Climate Change Adaptation | 1 |
| | Note: Rachel Prudhomme, Director, Engineering Services will be in attendance to present on this matter. | |
| 4.2 | Climate Change Liability for Municipalities in Ontario | 9 |
| | Note: Laura Zizzo of Zizzo Strategy will be in attendance to present on this matter. | |
| 4.3 | Low Impact Development/Stormwater 101 | 53 |
| | Note: Jay Michels of Emmons & Olivier Resources (EOR) will be in attendance to present on this matter. | |
| 4.4 | Town of Newmarket Partnerships with the Lake Simcoe Region Conservation Authority | 97 |
| | Note: Mike Walters, CAO, Lake Simcoe Region Conservation Authority (LSRCA) will be in attendance to present on this matter. | |

5. Adjournment

COUNCIL WORKSHOP

LID / Climate Change



January 14, 2019, 9:00 a.m. to 12:00 p.m.

Rachel Prudhomme, M.Sc., P.Eng.
Director, Engineering Services

1. THE RISK

- **FLOODING** = Newmarket's highest climate change risk!!
- Extreme weather is now the norm; "Once Per Century" storms now occurring much more frequently
- Risk is heightened by increase in hard surfaces with development (parking lots, rooftops, roads, etc.) and loss of natural green spaces
- Municipalities that do not address the effects of climate change on stormwater management are being held liable (class-action lawsuits)
- Municipal Councils must start considering the strategic importance of climate change adaptation as a priority to reduce flooding, improve the environment and manage the risk of liability

2. WHAT IS NEWMARKET DOING?



- Partnering to address risk (LSRCA, MECP, FCM, YR, NRCan, ECan...)
- Created dedicated position, “Sr. Climate Change Specialist”, funded partly by LSRCA in 2014-16 and now sustainable through storm charge
- Implemented Low Impact Development (LID) – e.g.: bioswales, raingardens, rooftop storage, greenroofs, underground tanks, porous pavement, porous concrete, permeable pavers, etc.
- Changed a culture internally (paradigm shift)
- Applying for many grants (received upwards of \$2 Million in 2017-18)
- Implemented a municipal stormwater charge in 2017 (led by Finance)
- Newmarket now considered a leader in the Lake Simcoe Watershed for new ways to look at Stormwater Management for flood control

3. LID INSTALLATIONS

Pre-2015: (1998 Municipal Offices, 2007 Rodeo Homes, 2012 Mosaik)

2015:

- Woodland Court: Bioswale
- Tom Taylor Trail in Fairy Lake Park: Bioswale & permeable concrete

2016:

- Arnold Crescent: Four bioswales
- Tom Taylor Trail Davis Drive Underpass: Grassed infiltration area
- Forest Glen Road Demonstration Project: Bioswales & raingardens

2017:

- Ray Twinney Rec. Complex: Bioretention and permeable pavers
- Fairy Lake East parking lot: Rain garden
- Queen Street Traffic Calming Pinch Point: Bioswale
- Lundy's Lane: Bioswale

2018:

- Magna Centre: Five enhanced swales before pond (done by LSRCA)
- Lions Park: Naturalized wetland

<https://www.youtube.com/watch?v=iYZy5ytxao0>

4. WHERE DO WE GO FROM HERE?



- Continue our efforts and not lose risk management momentum
- Consider LID and climate change adaptation as a priority
- Ensure that funding continues (we expect grants to become more scarce due to new Provincial policies and upcoming federal election)
- Engage the private sector (Residential, ICI) through education, the creation of incentives and the enforcement of by-laws and policies
- Reduce reliance on SWM ponds to help improve water quality
- Monitor pilot projects for continuous improvement
- Look at a macro-economic approach across municipal borders



5. TODAY'S SPEAKERS

LAURA ZIZZO*

Founder & CEO of Zizzo Strategy, Bay St., Toronto

JAY MICHELS*

Principal, Emmons & Olivier Resources (EOR), Minnesota, USA

MIKE WALTERS*

CAO, Lake Simcoe Region Conservation Authority, Newmarket

**NOTE: Question period after each speaker's presentation*



Laura Zizzo

Founder & CEO

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www.zizzostrategy.com

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 Toronto, Ontario M5R 2A9

BIOGRAPHY

Laura Zizzo is a lawyer and strategic advisor with over a decade of experience leading organizations towards a low-carbon and climate-adapted future through the application of law and policy. Laura started her legal career with a prominent Bay Street law firm before founding the first law firm in Canada focused on climate change in 2009. In 2015 she founded a strategic consultancy to advise clients on identification, management and disclosure of climate risks and opportunities.

She is a frequent writer and speaker on the move to the low-carbon economy and has become a leading voice on the legal imperative to adapt to climate change. Laura has contributed to numerous research and policy papers on legal liability related to climate change adaptation, the use of existing legal mechanisms to address climate change, and the role of markets and flexibility mechanisms in driving emissions reductions.

Laura has worked in the strategic research division of the Ontario Ministry of Finance and as co-editor-in-chief of the Journal of International Law and International Relations. She is co-founder of the Climate Change Lawyers Network, a member of the International Union for the Conservation of Nature (IUCN) committee on Environmental Law, a member of the University of Toronto's Environmental Finance Advisory Committee and sits on the board of the Clean Air Partnership. She has a degree in Environmental Studies from the University of Waterloo and a law degree from the University of Toronto. Laura is called to the Bar of Ontario.

Full CV available upon request.



The Business Imperative of Climate Change for Municipalities

Climate Change Liability

January 14, 2019

Laura Zizzo

laura@zizzostrategy.com

CEO, Zizzo Strategy

About Zizzo Strategy

Climate Change is Re-defining Risk Management, Legal Liabilities and Business Imperatives

Multi-disciplinary Strategic Consulting Firm

Law & Policy,
Engineering,
Accounting &
Science

Extensive Networks
with leading climate
scientists and
climate adaptation
experts

Understanding
critical issues

Recognized by
global leaders as a
trusted advisor on
climate-related
issues

Climate risks and opportunities are top of mind

- Extreme weather events in Canada are intensifying, highlighting the financial and social cost of climate change.
- Global temp has already increased by $\sim 1^{\circ}\text{C}$
- Global leaders are calling for a fundamental shift toward a financial system that will support a sustainable, climate-resilient economy.
- The transition will be shaped by changes to investor behaviours, policy and technology.
- Winners and losers will emerge.

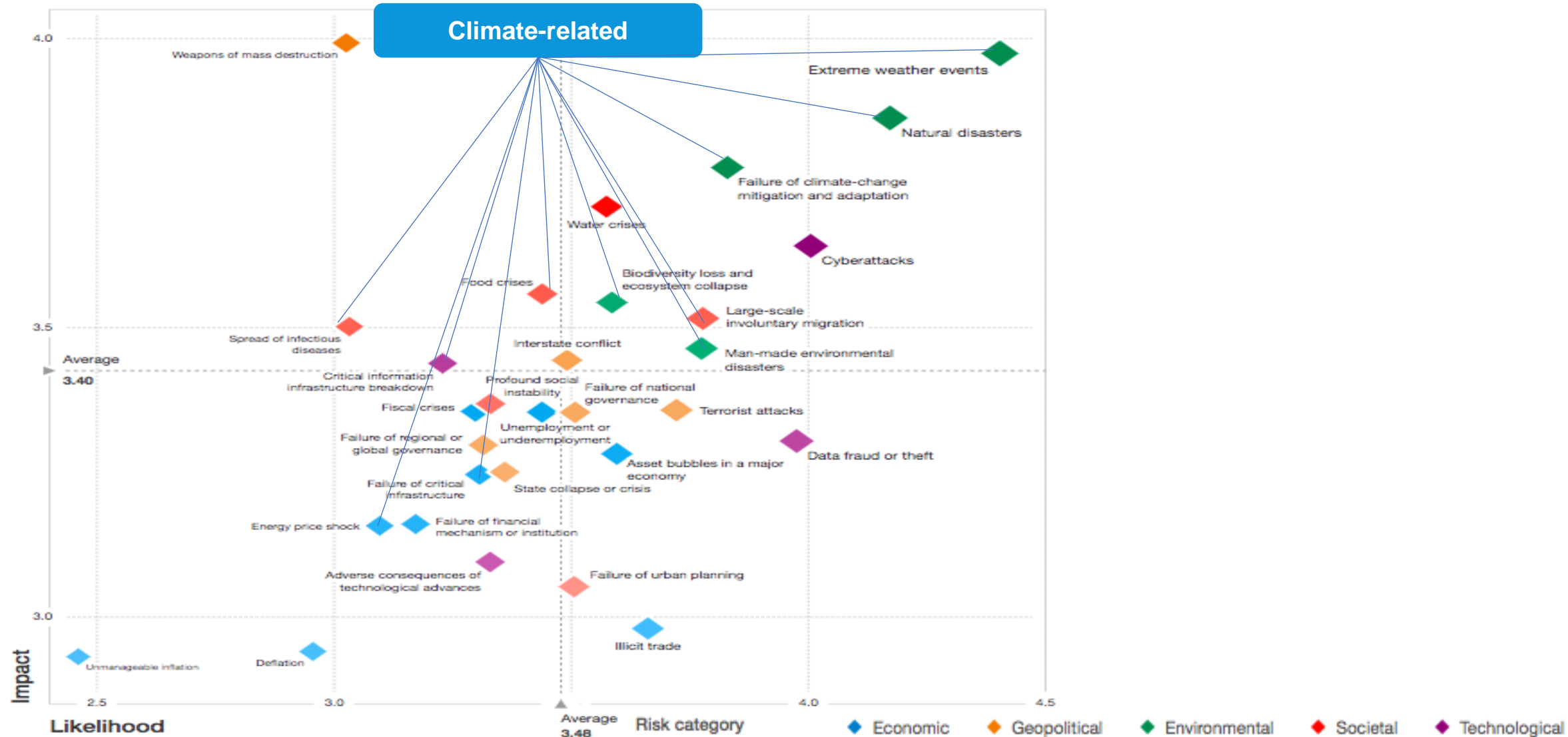


Zizzo Strategy helps organizations stay ahead of the curve and gain competitive advantage in the transition to a low carbon economy.



Risks

World Economic Forum: The Global Risks Report 2018



World Economic Forum: 2018¹⁶ Global Risk Report

Figure 1. Evolving risk landscape 2008-2018

	2008	2013	2018
Top 5 Global Risks in terms of likelihood	Asset price collapse	Severe income disparity	Extreme weather events
	Middle East instability	Chronic fiscal imbalances	Natural disasters
	Failed and failing states	Rising greenhouse gas emissions	Cyberattacks
	Oil and gas price spike	Water supply crises	Data fraud or theft
	Chronic disease, developed world	Mismanagement of population ageing	Failure of climate-change mitigation and adaptation
Top 5 Global Risks in terms of impact	Asset price collapse	Major systemic financial failure	Weapons of mass destruction
	Retrenchment from globalization (developed)	Water supply crises	Extreme weather events
	Slowing Chinese economy (<6%)	Chronic fiscal imbalances	Natural disasters
	Oil and gas price spike	Diffusion of weapons of mass destruction	Failure of climate-change mitigation and adaptation
	Pandemics	Failure of climate-change mitigation and adaptation	Water crises

● Economic
● Environmental
● Geopolitical
● Societal
● Technological

Climate Change Impacts Business

Significant Economic Impacts of Climate Change Increasingly Recognized

- Bank of Canada warns that estimated **cost of inaction could be \$21-43 billion/year by 2050**
- “Trillions” at stake in move to low-carbon economy
 - **Global low-carbon market of >\$5.8T and projected to grow at 3% per year**
- Investors, stock exchanges, securities regulators, rating agencies pushing for **enhanced climate-related disclosure**
- Financial Stability Board – Task Force on Climate Related Financial Disclosures
 - Mandate to improve and standardize the integration of climate change in financial reporting

Calgary

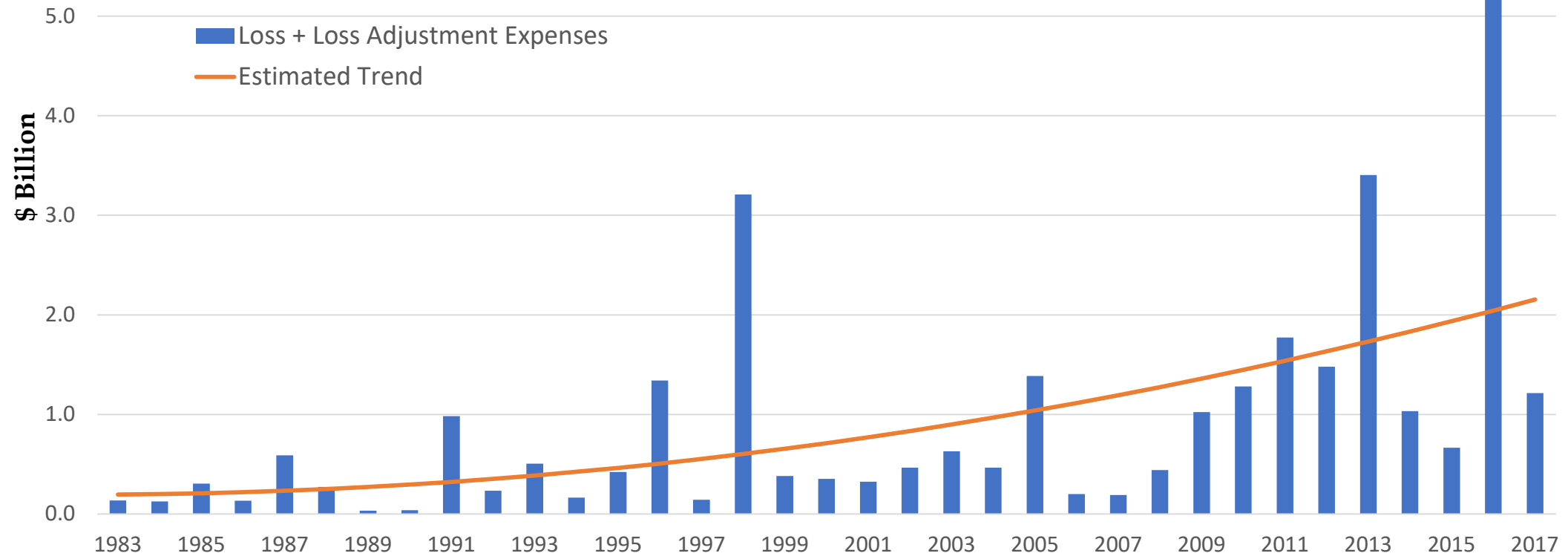


Photo courtesy of Andy Clark, Reuters

Federal and provincial policy developments responding to these trends and showing opportunity for Canadian leadership in the transition to a low-carbon and climate resilient economy

Insured Losses: Risks Related to Climate Impacts

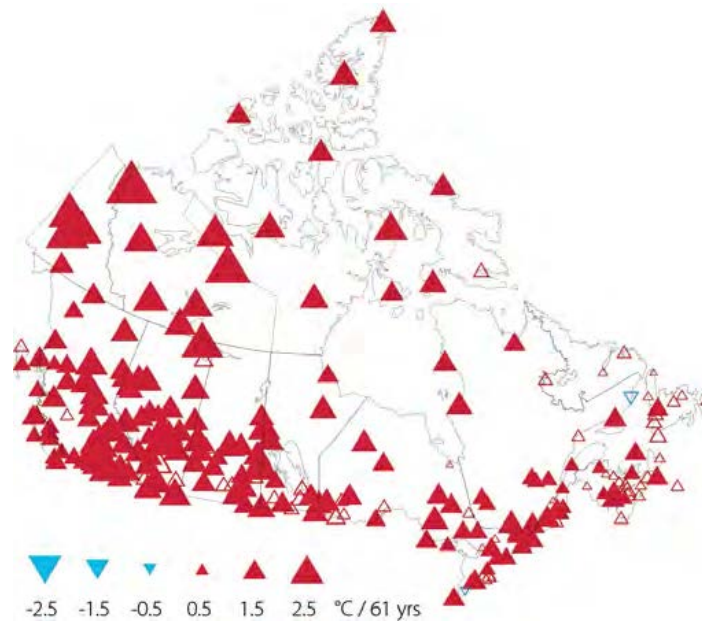
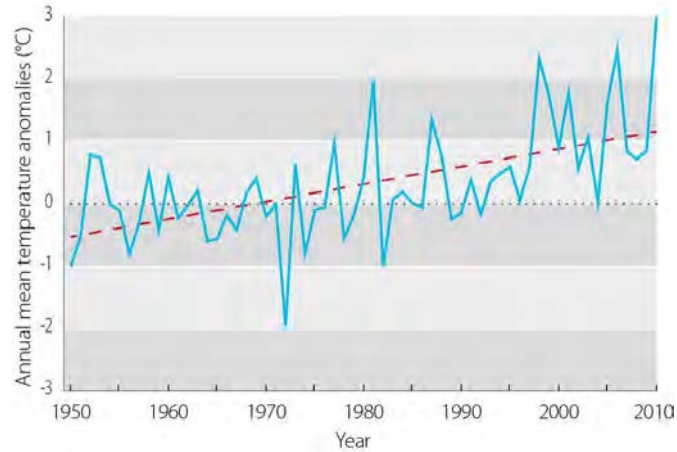
2017 Insured Catastrophic Losses in Canada (Source: IBC)



\$2017 - total natural-catastrophe losses normalized by inflation and per-capita wealth accumulation (Source: IBC)

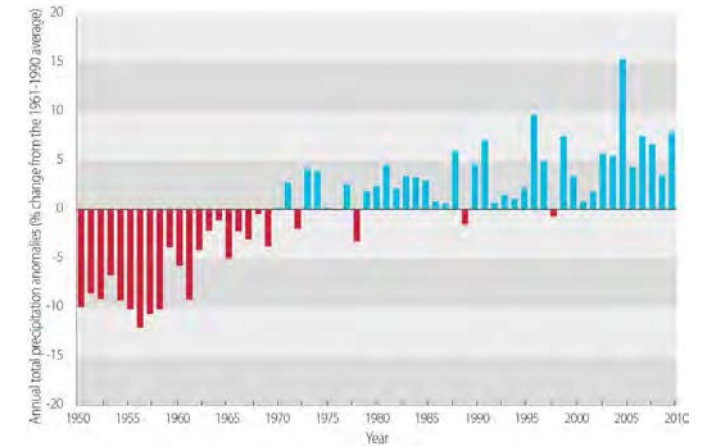
Canada's Changing Climate

1.5 degree warming trend



Warming across Canada

Increasing precipitation



Potential Climate Impacts



- Increasing precipitation & intensity of storms
- More frequent severe freezing/thawing cycles
- More frequent intense summer heat days
- Fluctuations in water availability and quality
- Sea level rise



- Increased costs due to impacts on physical assets & potential legal liability
- Significant need to adapt

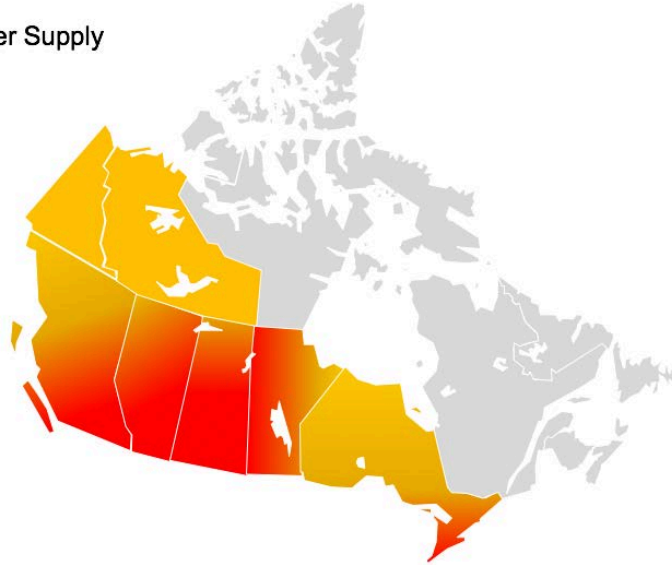
Climate Trends

Red text = increasing

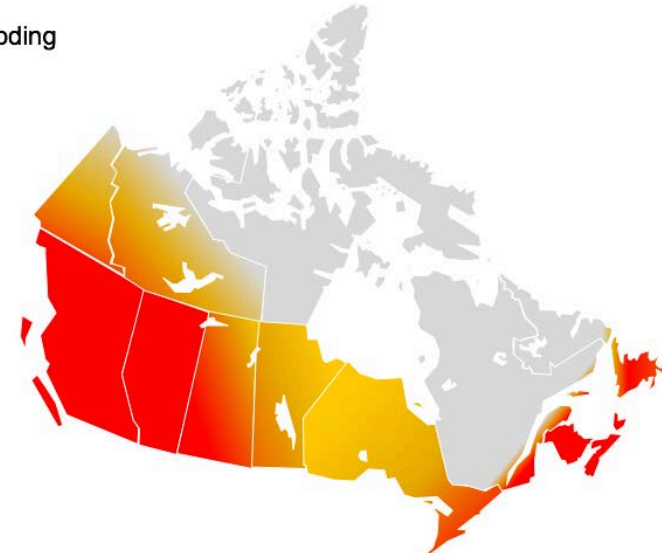
Event Category	Climate Parameter	Trends
Drought Freeze-Thaw	Frequency of Drought	No Trends
	Freeze-Thaw Cycles	Slight increase based on increasing winter precipitation and average temperatures
Humidity	High Humidity Periods	Slight increase based on increasing precipitation from analysis of all models, and increase in temperatures
Rain	Frequency of Rainfall	Trend is unclear due to unknown distribution of rain events in future projections
	Heavy Rain	Slight increase based on higher rainfall volume in the summer season
	Total Rainfall	Increase of ~50mm annually above historic baseline
	Freezing Rain Rain on Snow Events	Slight increase in temperature will create a vertical temperature profile that is conducive to rain on snow or freezing rain events
	Rain and Wind	Generally, winds are decreasing but summertime events have the potential for gustier conditions due to increase in atmospheric energy for thunderstorm events
	Flash Freeze Event	Trend is unclear due to unknown distribution of rain events in future projections
Snow	Snowmelt & Accumulation	Trend is unclear due to unknown distribution of precipitation events in future projections
Sun	Sunny Days	Trend is unclear due to lack of information on future dynamics (cloud cover)
Temperature	Extreme Heat and Cold	Slight increase in extreme heat, slight decrease in extreme cold
	Cooling Degree Days and Heating Degree Days	Slight increase in cooling degree days, slight decrease in heating degree days
	Average Temperature	Analysis of all models indicates an average increase of ~2.5°C above historic baseline for all three sites
Wind	High Winds	Slight decrease in wind speed

Example of Physical Risks Across Canada

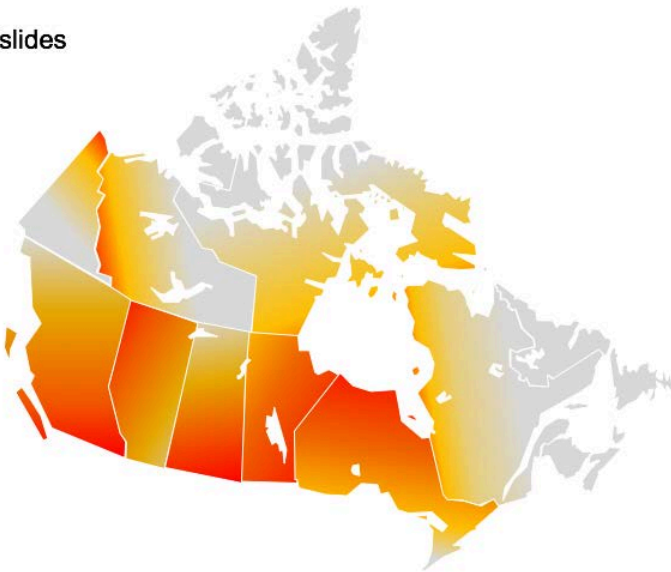
Water Supply



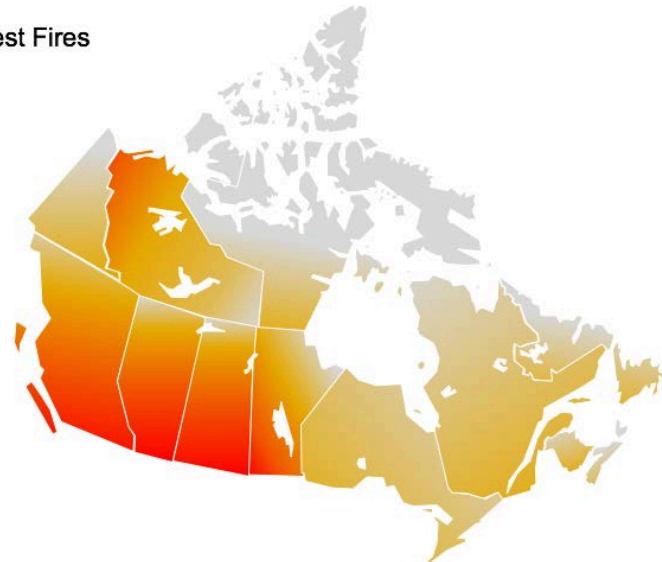
Flooding



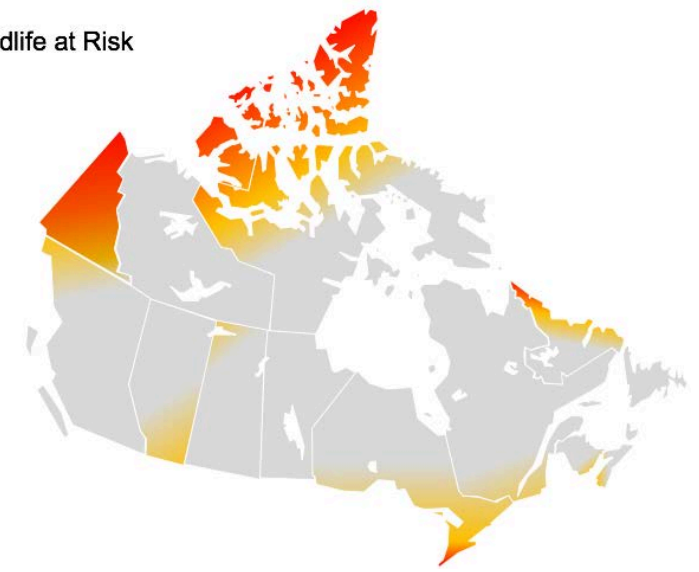
Landslides



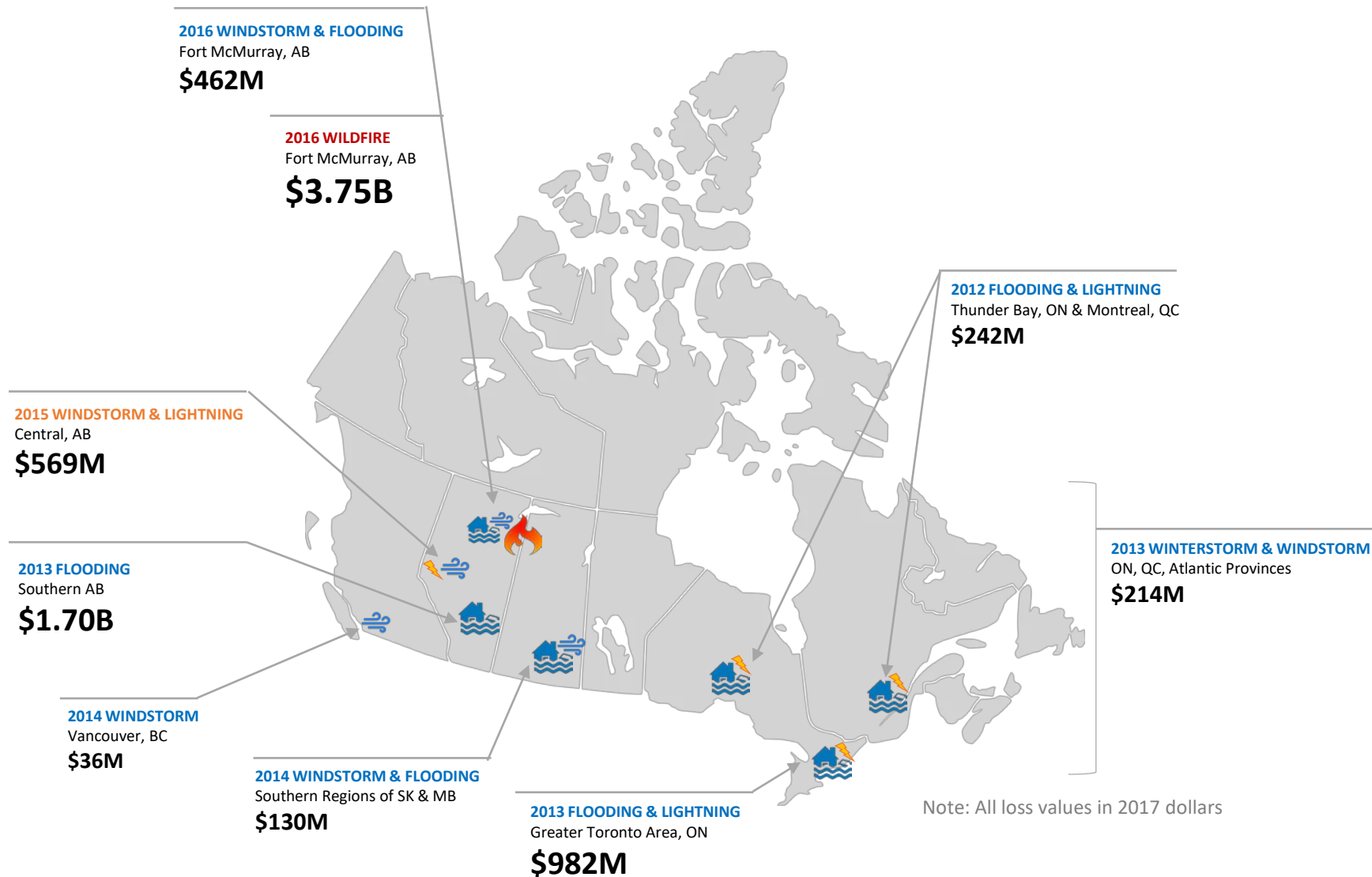
Forest Fires



Wildlife at Risk



Damage Costs from Extreme Weather Events

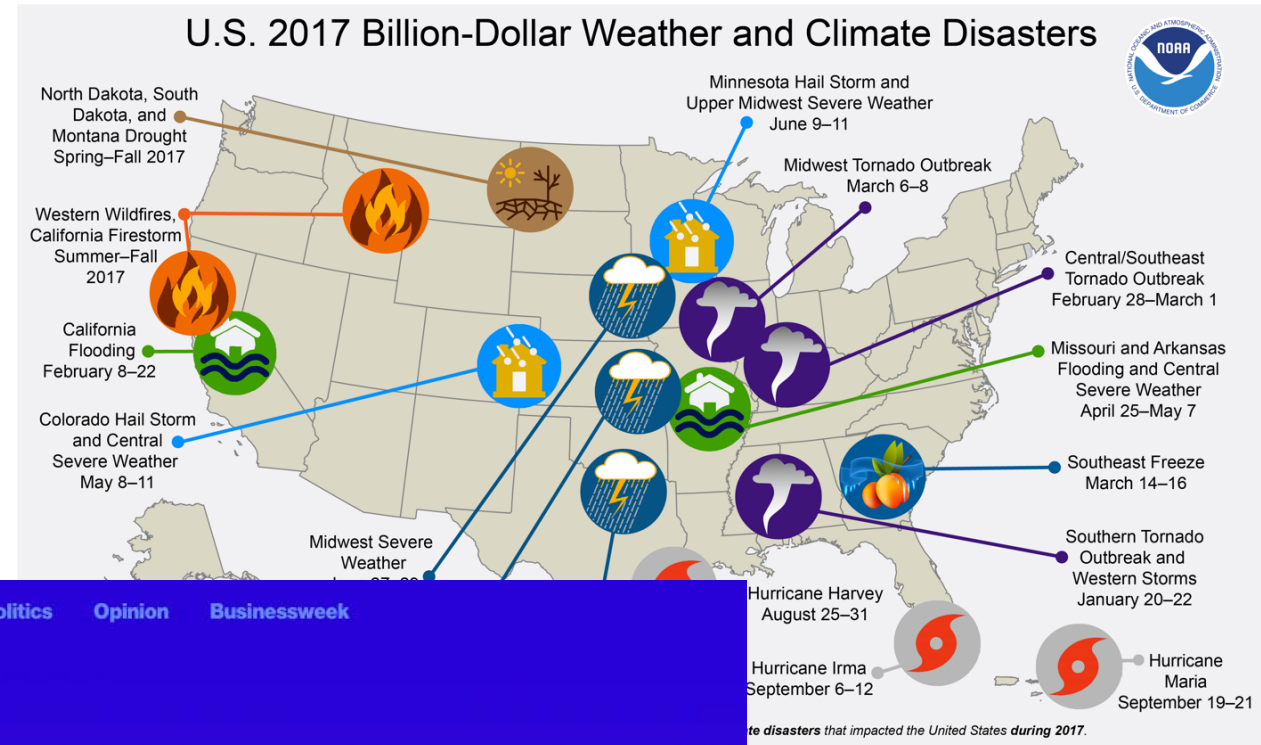
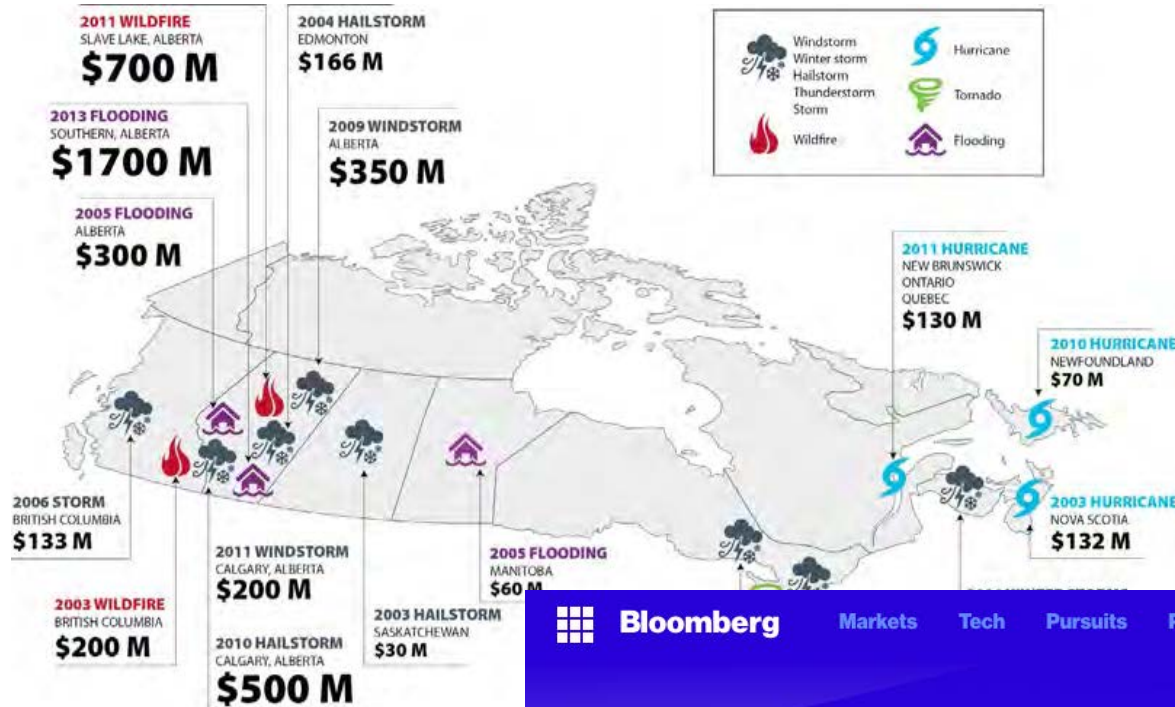


10 YEAR TREND

YEAR	LOSS
2008	\$0.43B
2009	\$0.93B
2010	\$1.20B
2011	\$1.70B
2012	\$1.42B
2013	\$3.34B
2014	\$1.03B
2015	\$0.65B
2016	\$5.14B
2017	\$1.21B

TOTAL LOSS
1983 to 2017
\$21.16B

Climate Change Impacts Business



Bloomberg

Markets

Tech

Pursuits

Politics

Opinion

Businessweek

Moody's Warns Cities to Address Climate Risks or Face Downgrades

By **Christopher Flavelle**

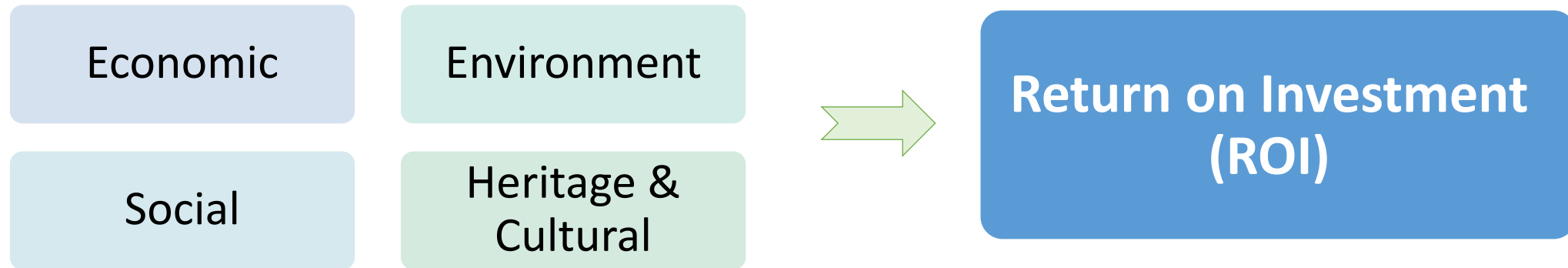
November 29, 2017, 4:00 AM EST

From **Climate Changed**

Municipalities Are Trying to Understand Physical Risks

Infrastructure Type	PIEVC Vulnerability Assessment Case Studies
Water Resources	Toronto & Region Conservation Authority Claireville and G. Ross Water Control Dams
Stormwater & Wastewater	Assessment of Town of Welland's Stormwater and Wastewater Collection and Treatment System
Roads & Associated Structures	The City of Greater Sudbury - Ontario; and the City of Edmonton Quesnell Bridge Refurbishment - Alberta
Buildings	Infrastructure Ontario/ Ministry of Infrastructure - Three Public Buildings
	285 Shuter Street Apartment Tower
Electrical Transmission & Distribution	Toronto Hydro-Electric System Limited Climate Change Vulnerability Assessment - Distribution Sector
	Assessment of Toronto Hydro Electrical Supply and Delivery Infrastructure

Accounting for Damage Costs in ROI



Climate-related risks affecting companies today...



Regulatory Risk

Broad regulatory changes are affecting costs and demand, and stranding assets.



Performance Risk

Like any other financial risk, climate-related risk can have material impact to company value, and should be part of investment decisions and client dialogue.



Extreme Weather Risk

Affects property values, insurance availability, business continuity, asset security, etc.



Market Risk

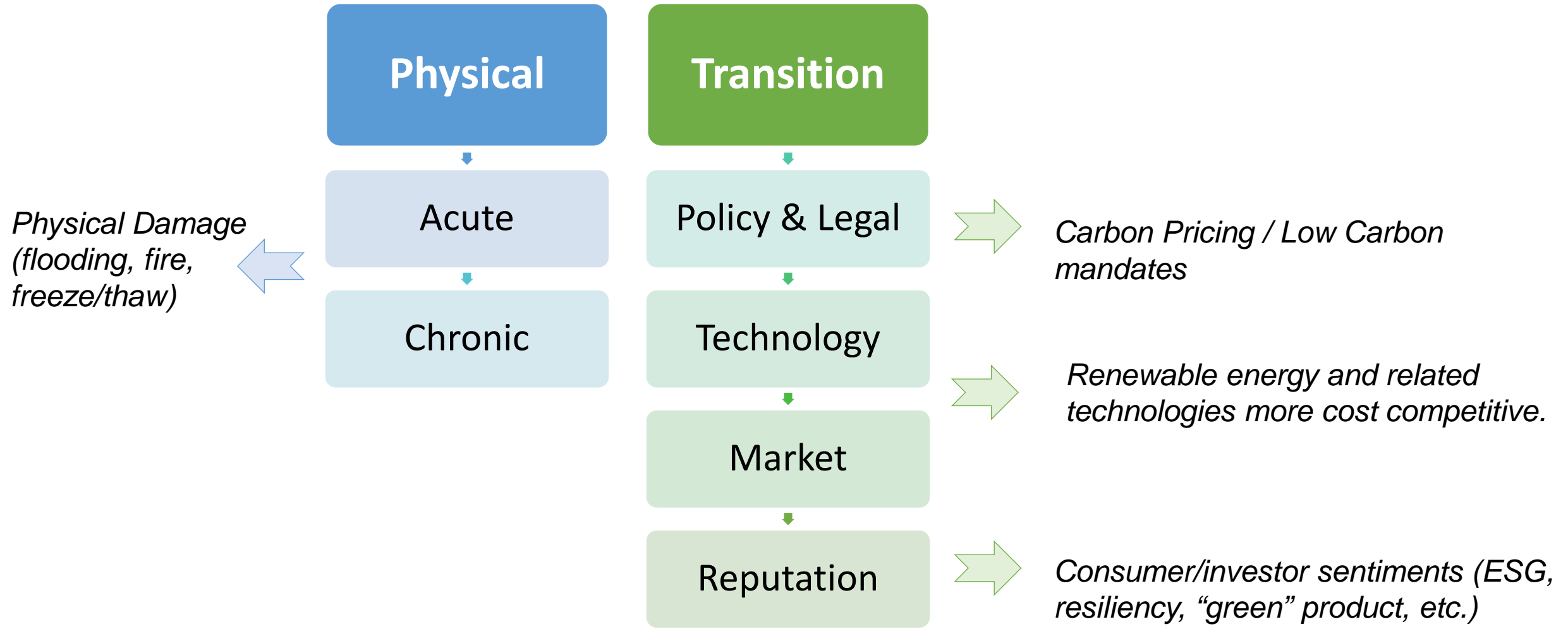
Investors are demanding better transparency of climate risk strategy and exposure.



Litigation and Technology Risk

Rapid innovation and stakeholder awareness mean opportunity for those who can stay ahead of the curve.

How to Think About Climate Risks and Opportunities



Mitigation vs Adaptation



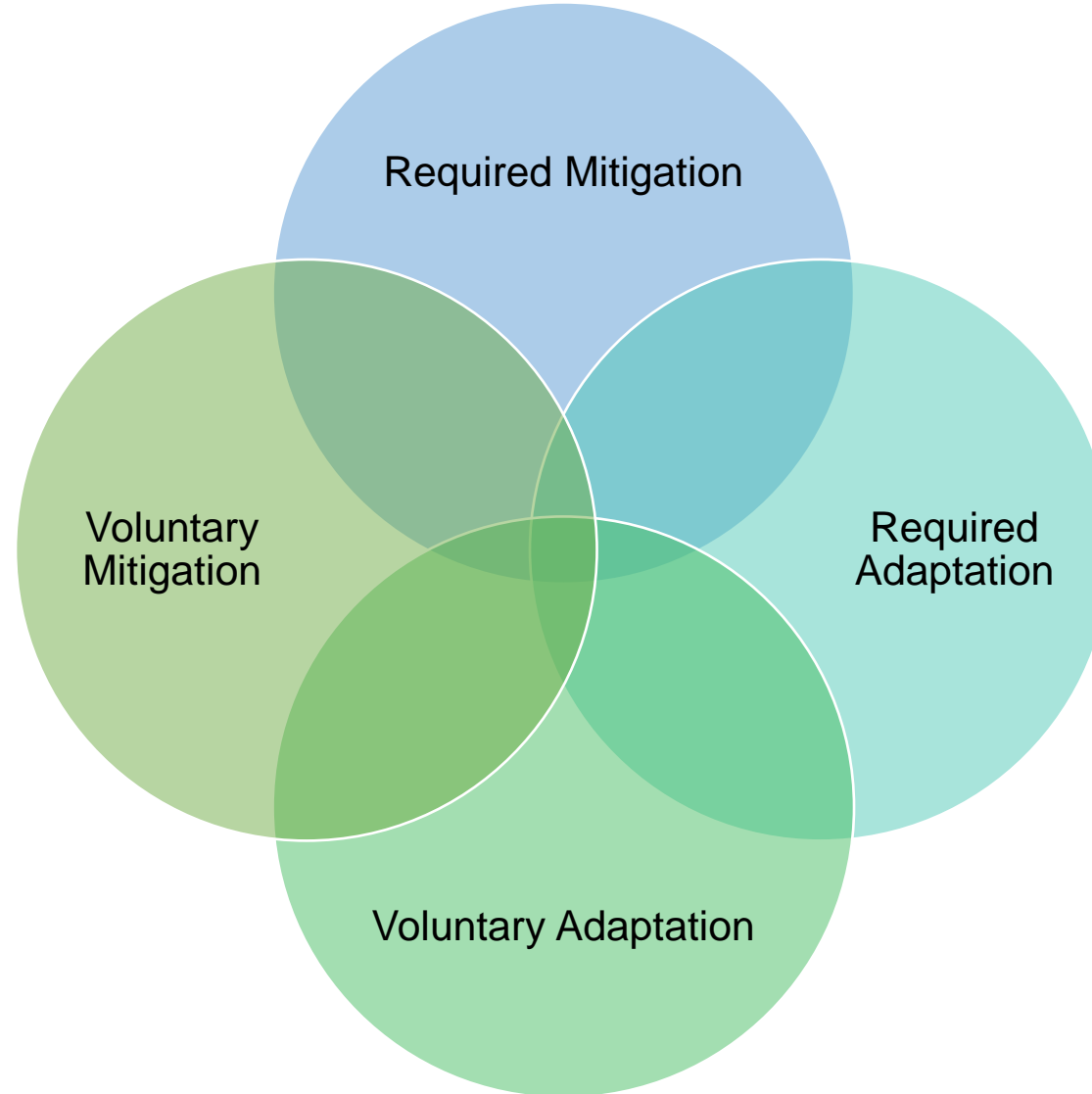
Climate change **mitigation**:
actions taken to reduce the
sources of greenhouse gas
(GHG) emissions or enhance
the sinks



Climate change **adaptation**:
responding to actual or
expected climatic changes or
their effects in a way that
moderates harm or takes
advantage of potential
opportunities



Response to Climate Change

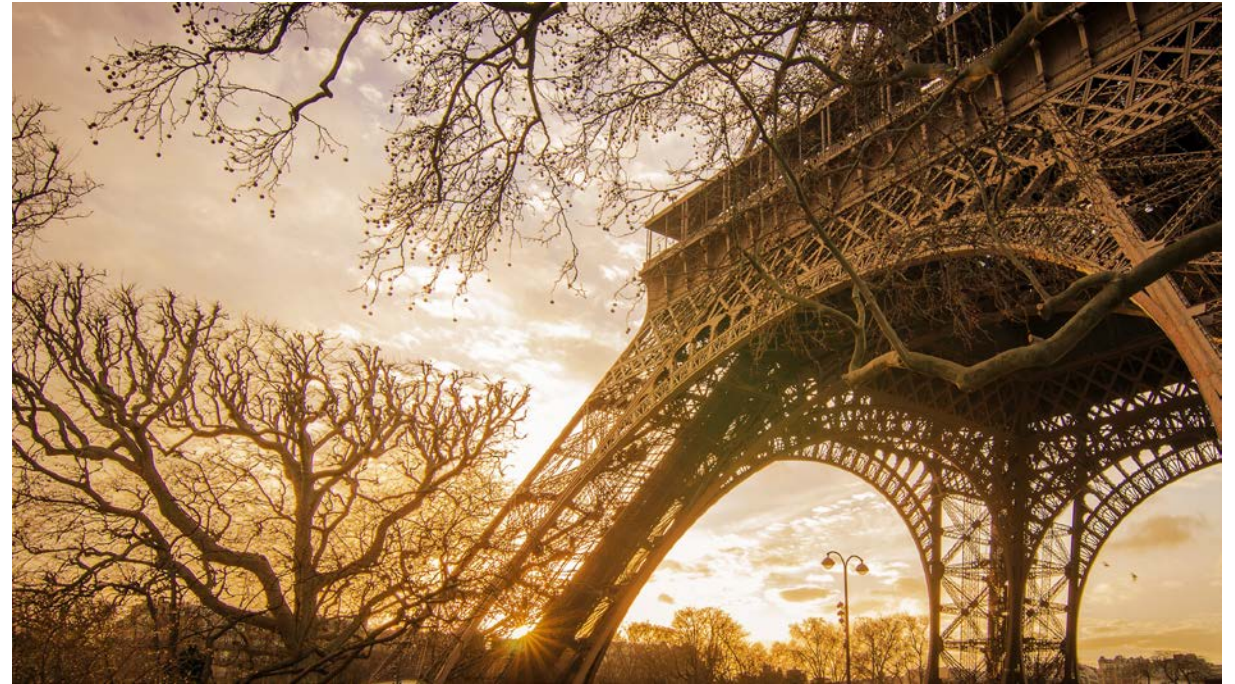






Paris Agreement: Universal Agreement & Market Signal

- *Universal* Agreement to address climate change
 - Goals:
 - Limit warming to well below 2°C above pre-industrial levels and pursue efforts to limit increase to 1.5°C
 - Decarbonization of economy in second half of century
 - Nationally determined contributions
 - 5-year global stocktakes, transparency through UNFCCC secretariat
 - Global direction + collective movement



Climate Change and Cities

70% of all cities are already experiencing climate change impacts.

For many reasons, cities have emerged as leaders on climate action:

- Cities are **in touch with local needs and capacities**, making them well-positioned to direct investments and see what is working on the ground.
- They **sit at a nexus of key players in the climate action arena**—from federal and provincial governments to private sector insurers and lenders, to community organizations and residents.
- Finally, cities are **hubs of innovation, creativity and technology**. They are where solutions are most likely to be dreamed up and tested out.
- Initiatives Emerging e.g.



Source: <http://427mt.com/2015/01/20/city-adaptation-spotlight-nd-gain-adds-index/>

Legal and policy drivers to reduce GHGs

Command and control

Market approaches

Litigation

Regulatory tools

Performance standards

Litigation Related to GHG Reduction



Lawsuits forcing government action

- Urgenda lawsuit against Netherlands re GHG emission reduction targets

Lawsuits against large emitters

- San Francisco and Oakland sue major oil companies around sea level rise
- New York City sues five largest publicly-traded oil companies

Litigation Related to Failure to Adapt to Climate Change



Flood-related class action lawsuits

- City of Muskoka (2016, \$900M)
- City of Thunder Bay (2012, \$300M)
- City of Stratford (2010, settled for \$7.7M)

Defendants include:

- Owner or occupier (including government)
- Government entities
- Engineers, architects and other design professionals
- Contractors

Standard of Care Under Constant Evolution

Reasonable

Foreseeable

Information
Accountability

Competent

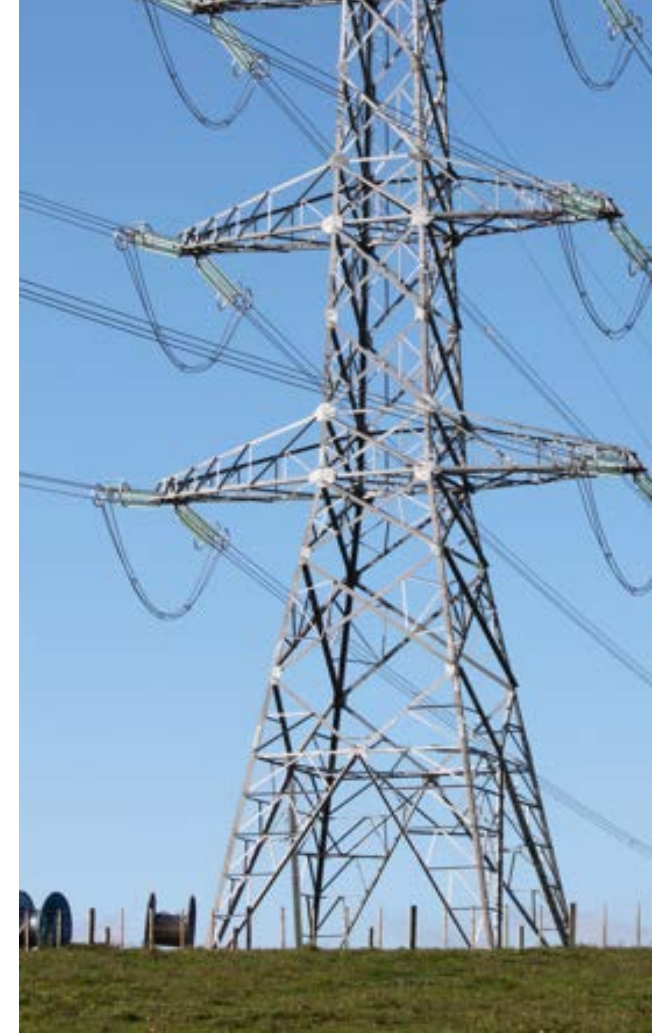
Current

Potential for liability

- Negligence: Injury to person(s) or property because another failed to take reasonable care
 - Duty
 - Standard of Care
 - Causation, Foreseeability, Damages

Duties and Responsibilities Are Evolving in Various Sectors

- Delivery of safe electricity
- Owner of land / infrastructure
- Keeping roads safe and fit for use
- Clean drinking water
- Adequate inspection
- Proper emergency response systems in place





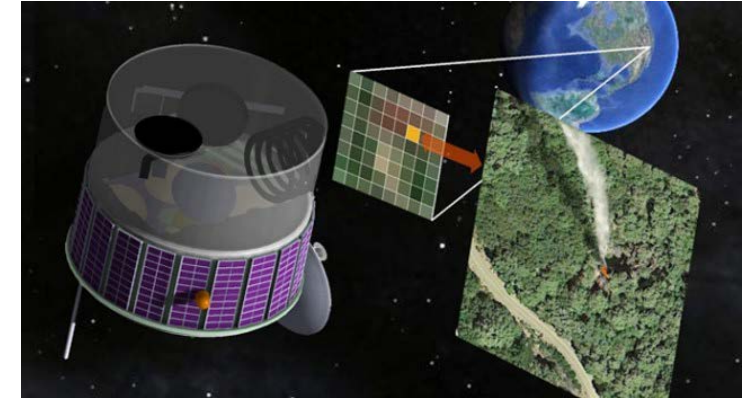
Opportunities

Climate-Resilient Economic Sectors

Tourism



Agriculture



Information & Communication Technology

Smart Investment and Operational Efficiency

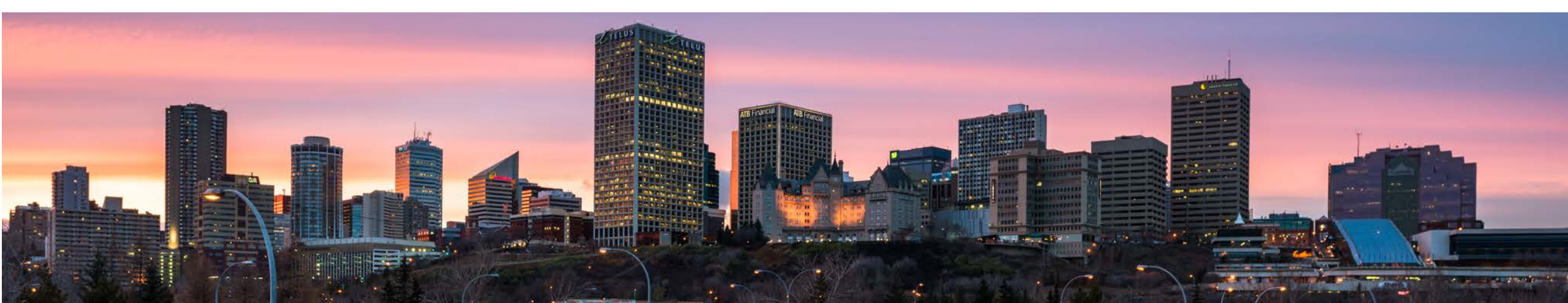
- Renewal=opportunity for a smart investment
- Avoiding response and recovery spending and being better prepared for emergencies
- Evolved understanding of operation and maintenance



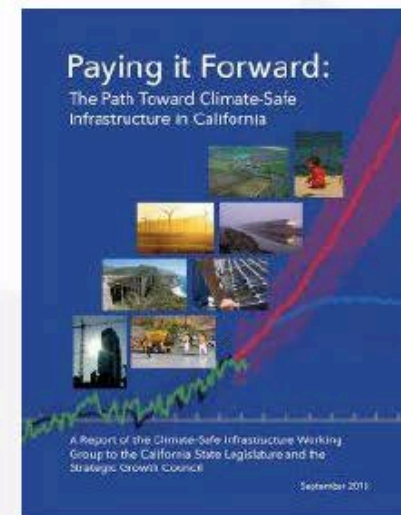
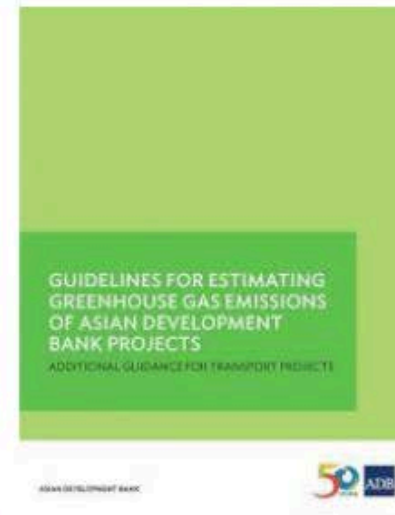
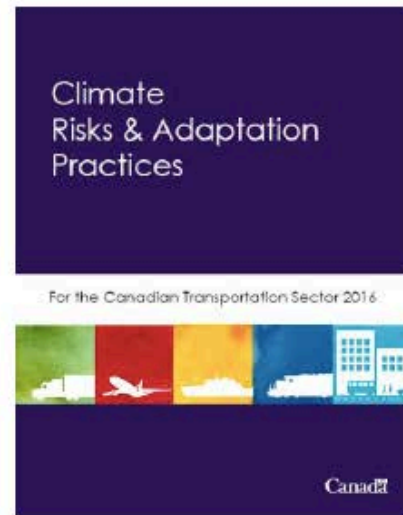
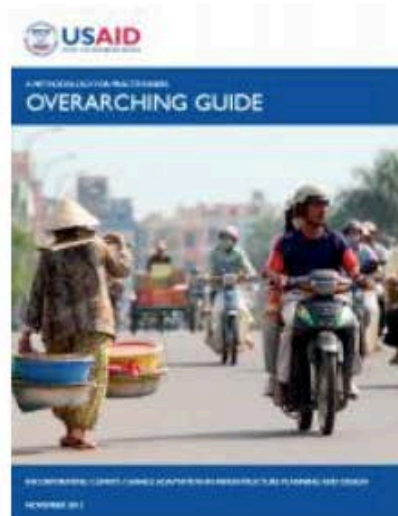
Source: <http://427mt.com/2015/01/20/city-adaptation-spotlight-nd-gain-adds-index/>

Increasing Access to Capital

- Improved credit rating and interest rates
- Attracting business, investment and talent
- Green bonds and public-private partnership (PPP)



International & National Momentum



Infrastructure Canada Funding Streams

INVESTING IN CANADA \$180 + BILLION INFRASTRUCTURE PLAN OVER 12 YEARS



Investments to support Canada's long-term infrastructure plan will flow through:

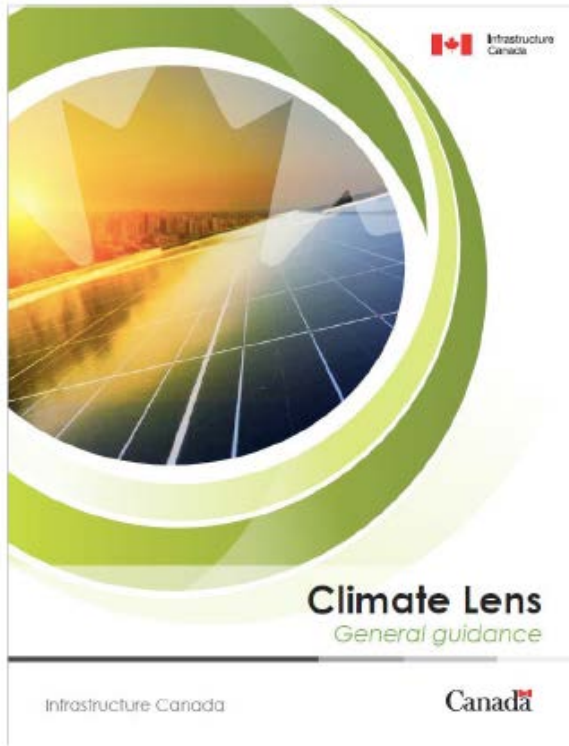
Bilateral agreements with provinces and territories

A series of national programs

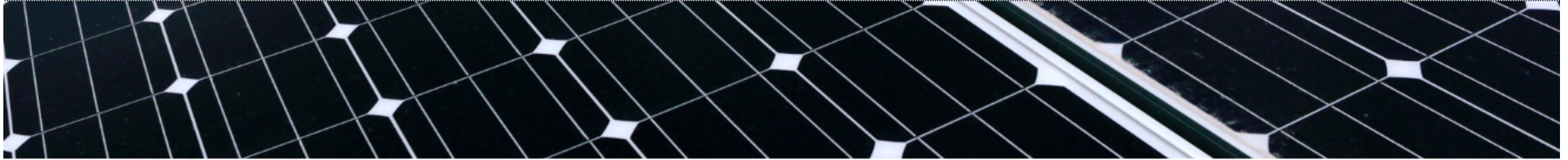
Canada Infrastructure Bank

Innovative Challenges

Climate Lens Guidance



Programs and Streams	GHG Mitigation Assessment	Climate Change Resilience Assessment
Investing in Canada Infrastructure Program (Integrated Bilateral Agreements)		
Green Infrastructure – Climate Change Mitigation sub-stream	All projects <u>(eligibility requirement)</u>	If total eligible project costs are \$10M or greater
Green Infrastructure – Adaptation, Resilience and Disaster Mitigation sub-stream	If total eligible project costs are \$10M or greater	All projects <u>(eligibility requirement)</u>
Other streams and Sub-streams (Environmental Quality, Public Transit, Culture and Recreation, Rural and Northern Communities)	If total eligible project costs are \$10M or greater	If total eligible project costs are \$10M or greater
National Programs		
Disaster Mitigation and Adaptation Fund	All projects	All projects
Smart Cities Challenge (Winner)	If total eligible project costs are \$10M or greater and project is a mitigation project	If total eligible project costs are \$10M or greater and project is a climate change resilience project



Photographer: Yuzuru Yoshi

Markets

Canada Pension Sells \$1.2 Billion Green Bond in Global First

By Maciej Onoszko

June 13, 2018, 10:25 AM EDT Updated on June 13, 2018, 1:25 PM EDT

- ▶ CPPIB priced C\$1.5 billion of inaugural green bonds due 2028
- ▶ This is the largest Canadian green bond offered in single sale

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Utilities



The New York Times



Power Companies' Mistakes Can Cost Billions. Who Should Pay?

Utilities say they must be shielded from liability or the electric grid will suffer. Critics say that puts the burden on ratepayers, not investors.



Benefits of identifying and managing climate impacts

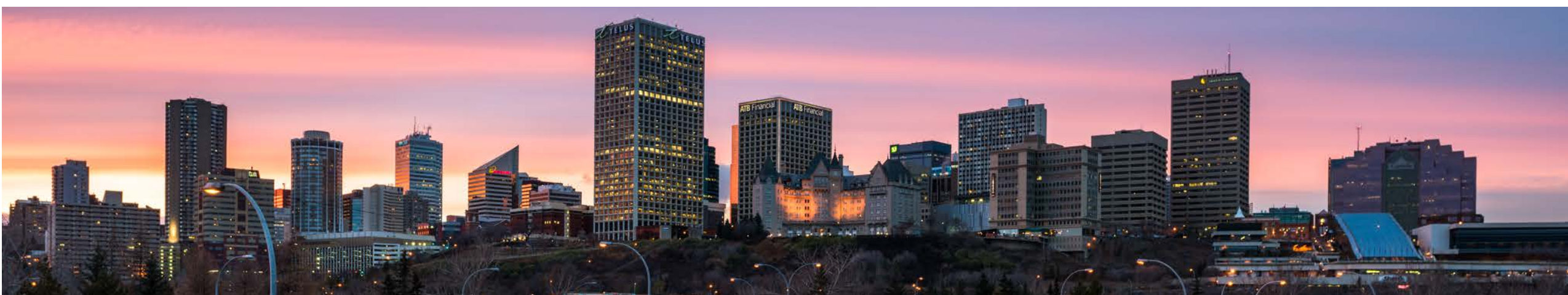


With the Paris Agreement,
\$20+ trillion in opportunities

- + Better informed investment decisions
- + Readiness for regulatory and economic change
- + Internal capacity to respond to climate change
- + Robust and sustainable enterprise risk management
- + New investment opportunities and revenue streams
- + Optimized operational costs
- + Asset and supply chain security
- + Ability to communicate climate resilience to stakeholders

Key Takeaways

- Climate change presents risks, but also opportunities
- Leverage strengths of partners for transformational change
- With proper foresight, cities can thrive



Thank You!

Let's work together to help avoid the
unmanageable and manage the inevitable

.

LAURA ZIZZO | FOUNDER & CEO



✉ laura@zizzostrategy.com

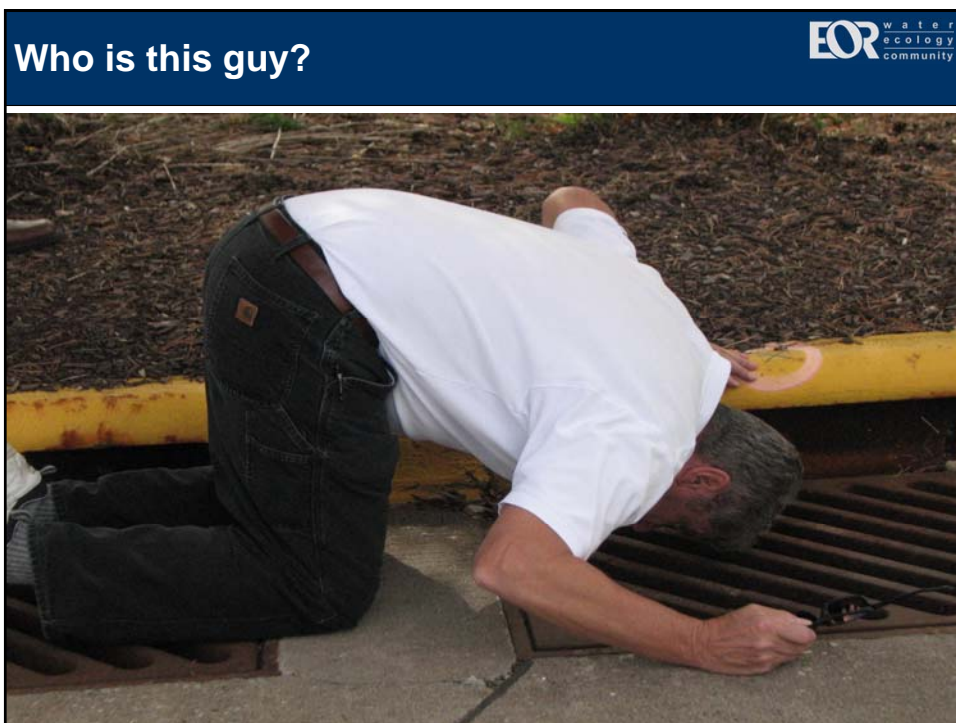
☎ 1.888.664.7723

📍 1255 Bay Street | Suite 801 |
Toronto


Jay Michels - Biography



Jay Michels is a Senior Project Manager with Emmons & Olivier Resources in Oakdale, MN with over 30 years of experience in construction management, erosion control and stormwater management. He is a Certified Professional in Erosion and Sediment Control (CPESC) and has garnered numerous accolades in the world of innovative stormwater management. The emphasis of his work is in LID design and implementation, ordinance and storm water policy and outreach and education development. Jay is known for his work throughout the upper Midwest USA and Canada, much of it in the LSRCA watershed, as an educator on LID, stormwater management and erosion and sediment control. He is a sought-after speaker on LID and innovative stormwater management.



Introductions




A collaborative group of environmental and design professionals
passionate about protecting our waters, restoring healthy ecosystems,
and enhancing our community's unique sense of place.

www.eorinc.com



water

watersheds and water resources



ecology

ecosystem restoration



community

civil engineering & landscape arch.





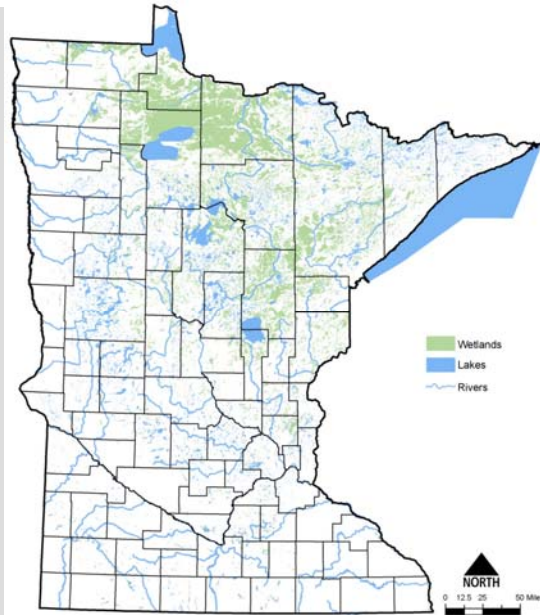


The Land of 10,000 Lakes

11,642 lakes > 10 acres

69,200 miles of rivers/ streams

9.3 million acres of wetland



TOURISM

Boating, fishing, hunting, camping, swimming, wildlife watching, and more...





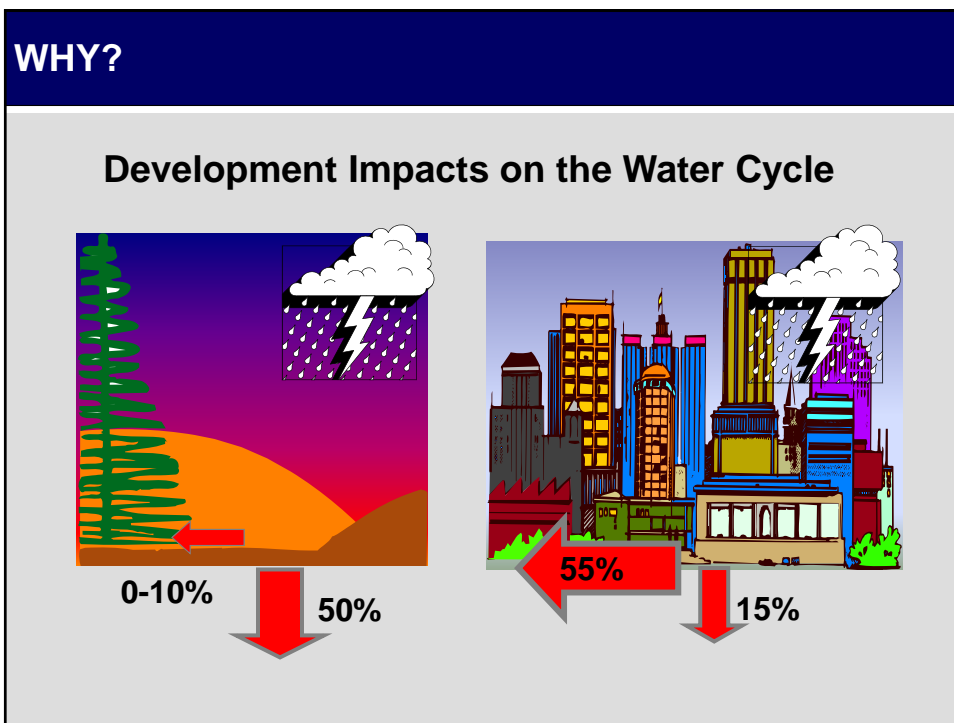


But all is not well...



40% OF MINNESOTA SURFACE WATERS ARE FOUND TO BE IMPAIRED

- **2008 Impaired Waters List (303d)**
▪ 2,575 impairments
- **2010 Impaired Waters List (303d)**
▪ 3,049 impairments
- **2012 Impaired Waters List (303d)**
▪ 3,638 impairments
- **2014 Impaired Waters List (303d)**
▪ 4,122 impairments
- **2016 Impaired Waters List (303d)**
▪ 4,607 impairments

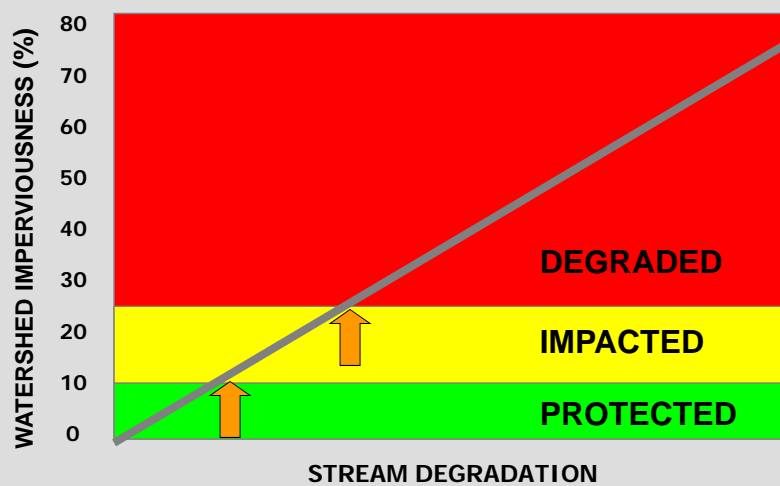


IMPERVIOUS SURFACES



Materials like cement, asphalt, roofing, and compacted soil that prevent percolation of runoff into the ground.

WATERWAY HEALTH & IMPERVIOUSNESS



ADAPTED FROM SCHUELER, ET. AL., 1992

WATER QUANTITY IMPACTS

- Disruption of Natural Water Balance
- Increased Flood Peaks
- Increased Duration of Flows
- Streambank Erosion
- Habitat Loss
- Lower Summer Base Flows



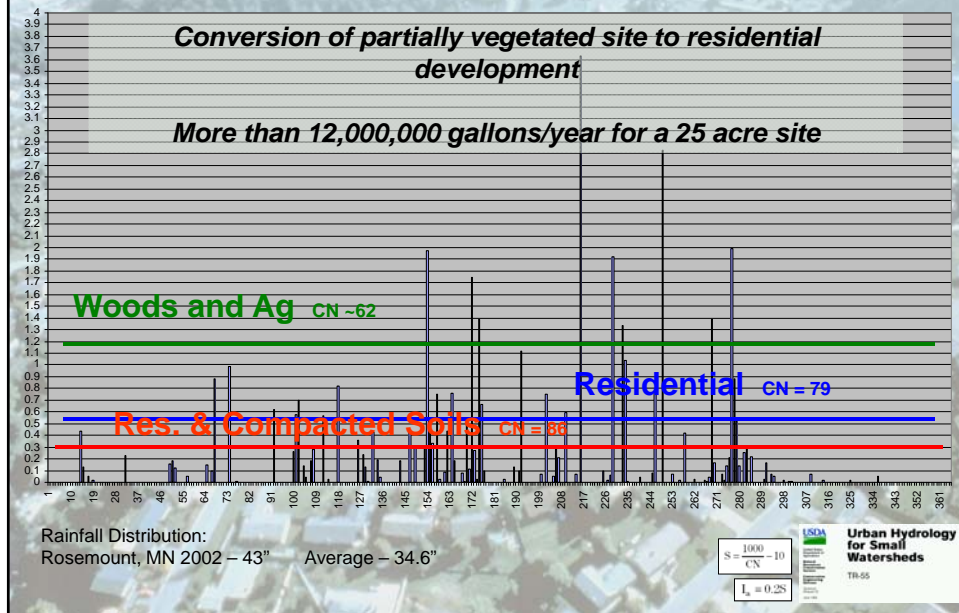
WATER QUALITY IMPACTS



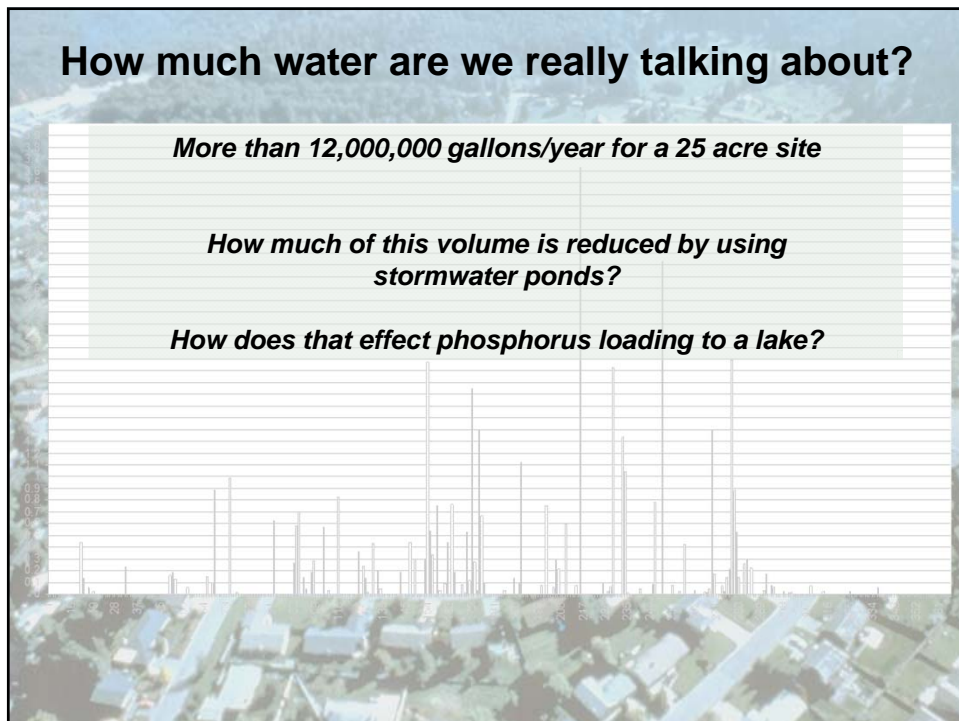
A BIG IMPACT...



How much water are we really talking about?



How much water are we really talking about?



THE BEGINNING OF MANAGEMENT

National Urban Runoff Program



1983

- Technical studies that compiled data about urban runoff
- Resulted in treatment recommendations and easy to apply standards for design and review
- Led to proliferation of ponds

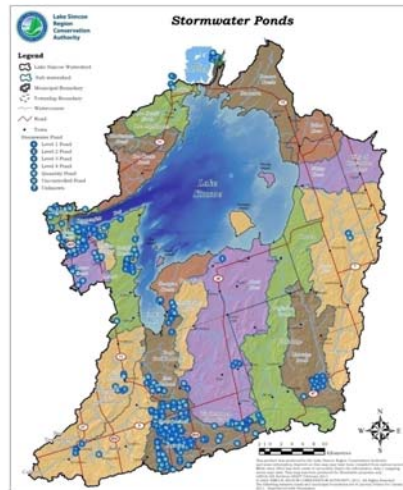
FACT: A Canada Goose Can poop up to 92 times a day

FACT: One adult goose drops 2 lbs of poop per day



Need for Change: Current SWM Practices

- Since 1995 all new development has been required to install stormwater controls, (stormwater ponds),
- Despite this the health and quality of many urban rivers and streams continues to decline,
- In 2010 a study was conducted to answer the question: Are stormwater ponds working?



Are Stormwater Ponds Working?

Maintenance

- Lack of pond maintenance decreases the available storage volume increasing the risk of flooding.



- 56 of the 98 ponds require maintenance at an estimated cost of \$18.5 million.
- Assumes the 50,000 m³ is not contaminated.

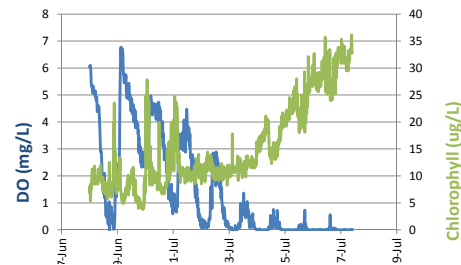
Nutrient Attenuation

- Lack of maintenance results in 1.1 T/y loading increase, 1.5% of total annual phosphorus load,



Anoxic Nutrient Release

- Under low oxygen soluble phosphorus can be released from the sediment turning stormwater ponds into nutrient sources.



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Lake Simcoe Region Conservation Authority • A Watershed for Life

Risk Management and Liability

- Municipalities and CA's have a legal obligations,
- Section 21 of the Conservation Authorities Act the LSRCA has the power to control surface waters to reduce their adverse impact and prevent flooding,
- Climate change is dramatically increasing this risk.



30

Lake Simcoe Region Conservation Authority • A Watershed for Life

Recent Litigation

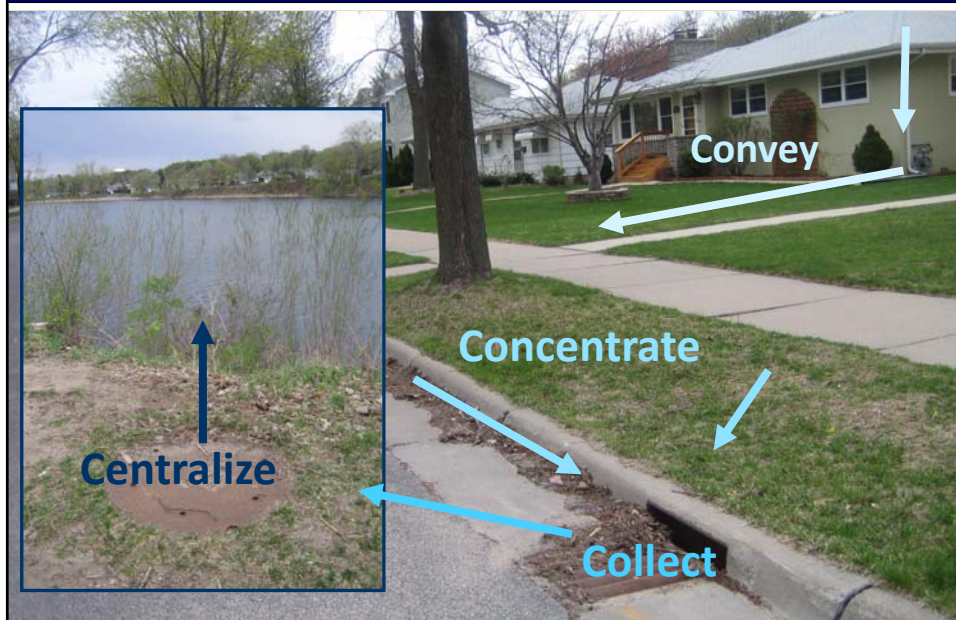
Minnesota cities sue refiners over cost of cleaning up polluted stormwater ponds

Seven cities say cleanup of carcinogenic chemicals should rest with manufacturers.

By [Chris Serres](#) Star Tribune

JANUARY 2, 2019 — 8:21PM

Traditional Stormwater Management



Urban Stormwater Management in the United States

The rapid conversion of land to urban and suburban areas has profoundly altered how water flows during and following storm events, putting higher volumes of water and more pollutants into the nation's rivers, lakes, and estuaries. These changes have degraded water quality and habitat in virtually every urban stream system. The Clean Water Act regulatory framework for addressing sewage and industrial wastes is not well suited to the more difficult problem of stormwater discharges. This report calls for an entirely new permitting structure that would put authority and accountability for stormwater discharges at the municipal level. A number of additional actions, such as conserving natural areas, reducing hard surface cover (e.g., roads and parking lots), and reorienting urban areas with features that hold and treat stormwater, are recommended.

Stormwater has long been regarded as a minor culprit in urban flooding, but only in the past 30 years have policymakers appreciated its significant role in degrading the streams, rivers, lakes, and other waterbodies in urban and suburban areas. Large volumes of rapidly moving stormwater can harm species habitat and pollute sensitive drinking water sources, among other impacts. Urban stormwater is estimated to be the primary source of impairment for 13 percent of assessed rivers, 18 percent of lakes, and 32 percent of estuaries—significant numbers given that urban areas cover only 3 percent of the land mass of the United States.

Urbanization—the conversion of forests and agricultural land to suburban and urban areas—is proceeding at an unprecedented pace in the United States. Stormwater discharges have emerged as a problem because the flow of water is dramatically altered as land is restructured. Typically, vegetation and topsoil are removed to make way for buildings, roads, and other infrastructure, and drainage networks are installed. The loss of the water-retaining functions of soil and vegetation causes stormwater to reach streams in short concentrated bursts. In addition, roads, parking lots, and other “impervious surfaces” channel and speed the flow of water to streams. When combined with pollutants from lawns, motor vehicles, discarded animals, industries, and other urban sources that are picked up by the stormwater, these changes have led to water quality degradation in virtually all urban streams.

In 1987 Congress wrote a new section into the Clean Water Act's National Pollutant Discharge Elimination System to help address the role of stormwater in impacting water quality. This system, which is enforced by the U.S. Environmental Protection Agency (EPA), has focused on reducing pollutants from industrial process wastewater and municipal sewage discharges—“point sources” of pollution that are relatively straightforward to regulate. Under the new “stormwater program,”

“Past practices...have been ineffective at protecting water quality in receiving waters and only partially effective in meeting flood control requirements”

THE NATIONAL ACADEMIES
REPORT
IN BRIEF

Photo by Roger Branstetter

National Academy of Sciences • National Academy of Engineering • Institute of Medicine • National Research Council

THE NATIONAL ACADEMIES

“Stormwater control measures that harvest, infiltrate, and evapotranspire stormwater are critical to reducing the volume and pollutant loading of small storms”

Urban Stormwater Management in the United States

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THE NATIONAL ACADEMIES
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IN BRIEF

Photo by Roger Branstetter

National Academy of Sciences • National Academy of Engineering • Institute of Medicine • National Research Council

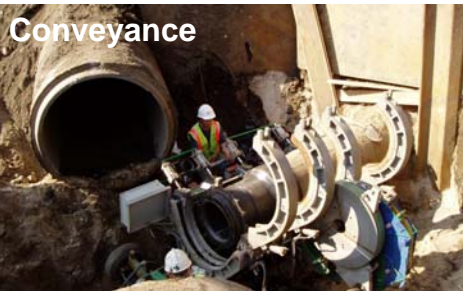
THE NATIONAL ACADEMIES

STORMWATER MANAGEMENT

Infiltration



Conveyance



Filtration



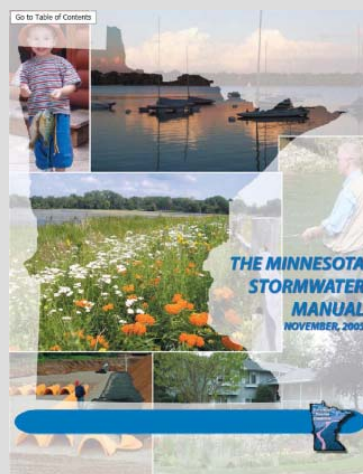
Temporary Storage



A PARADIGM SHIFT

Now changing to focus on water quality, primarily through small event volume control.

Rain events between .5 and 1.5 inches are responsible for about **75% of runoff pollutant discharge** – “First Flush”



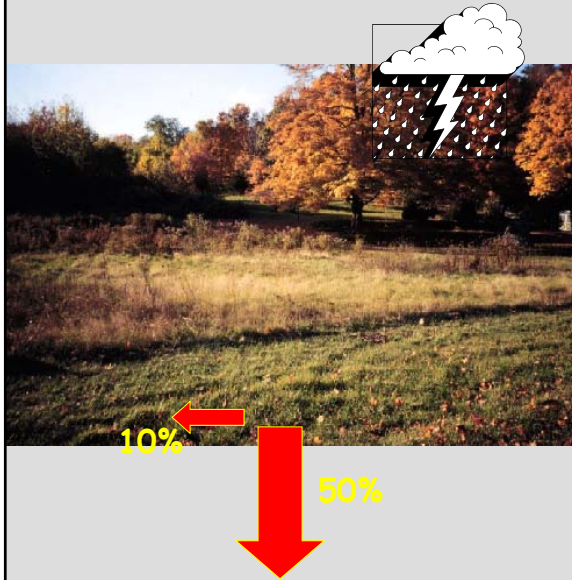
THE CHALLENGE: How do you make this...



Function like *this*?

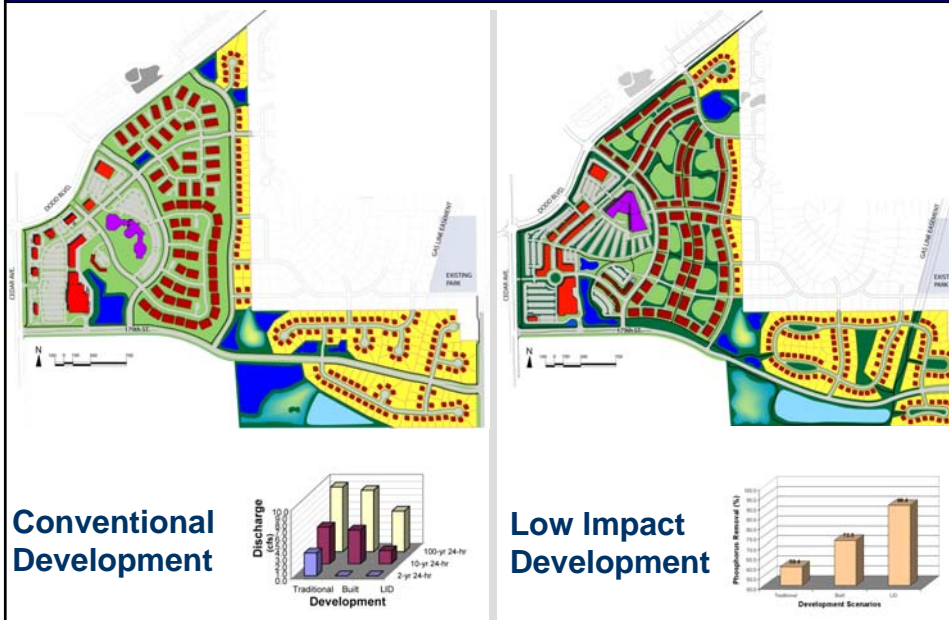


DESIGN PRINCIPLES



**Retain & Restore
the Natural
Landscape**

Low Impact Development (LID)



PRIMARY GOAL OF LID

Design each development site to protect, or restore, the natural hydrology of the site so that the overall integrity of the watershed is protected. This is done by creating a “hydrologically” functional landscape.

Low Impact Development (LID)

Conserve natural areas and maintain natural drainage patterns



Minimize development impacts



Keep soils healthy



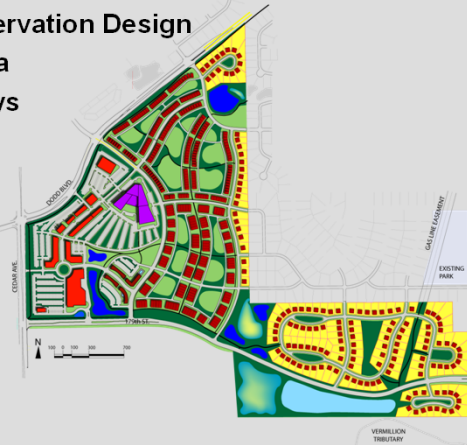
Treat stormwater at the source to mimic natural hydrology

Non-Structural LID Tools

Planning/ Design

Cluster Development, Conservation Design

- Minimize total disturbed area
- Protect natural flow pathways
- Protect riparian buffer areas
- Protect sensitive areas
- Reduce impervious areas
- Impervious disconnection



Structural LID Tools

Infiltration practices

- Bioretention (rain gardens, urban forestry)
- Infiltration trenches
- Detention basins with infiltration design

Vegetated swales, filter strips, biofiltration

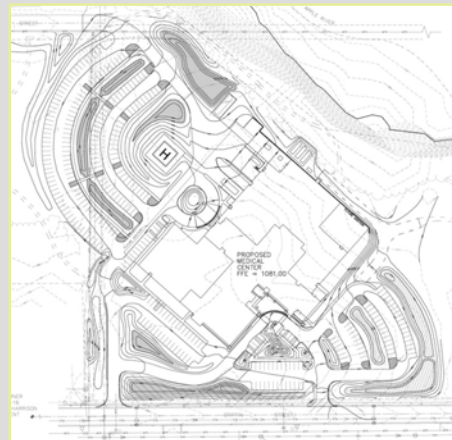
Vegetation: native landscaping, trees (uptake and evapotranspiration)

Green Roofs

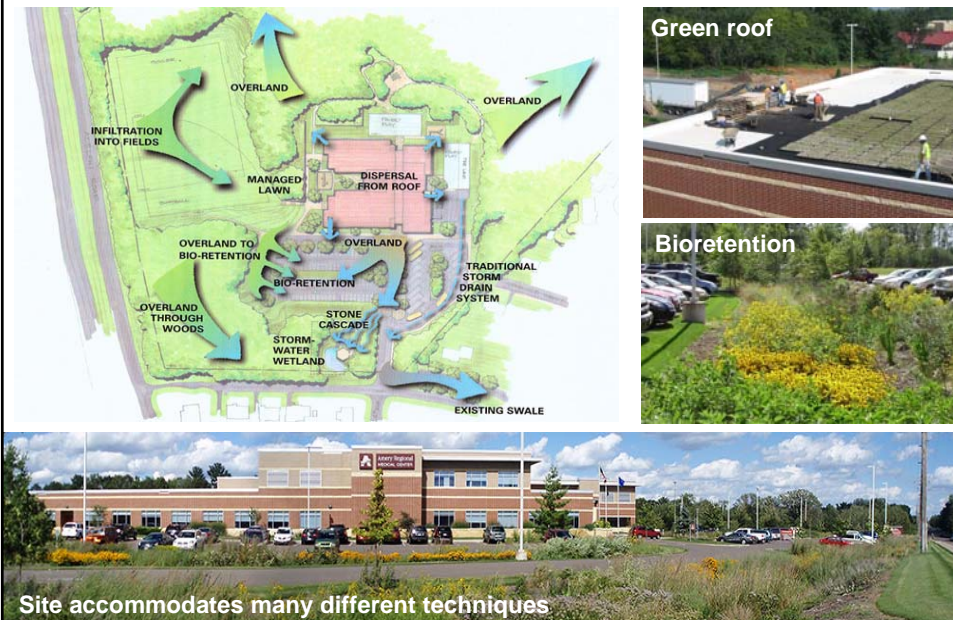
Capture / Reuse (cisterns, rain barrels, ponds)

Permeable hard surfaces (pavers, roads, parking, driveways, sidewalks)

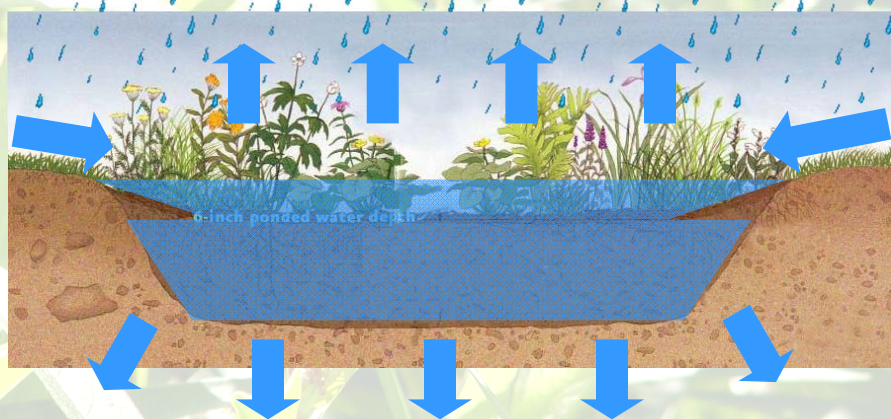
Landscaping Soil Quality: protection or restoration (amendments, de-compaction)



Creating Functional & Sustainable Landscapes

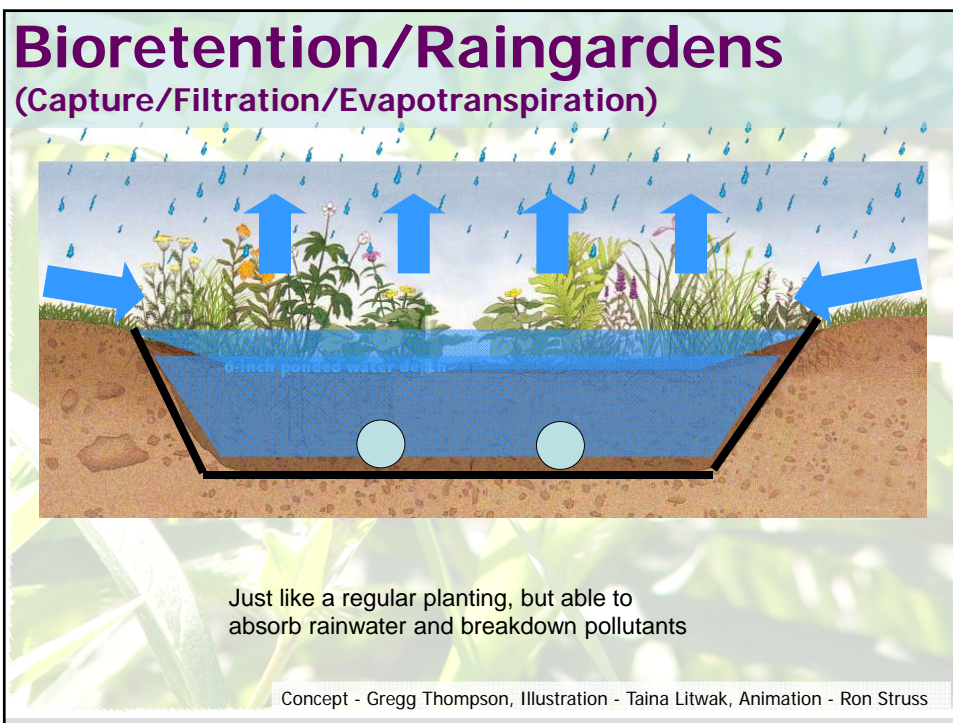
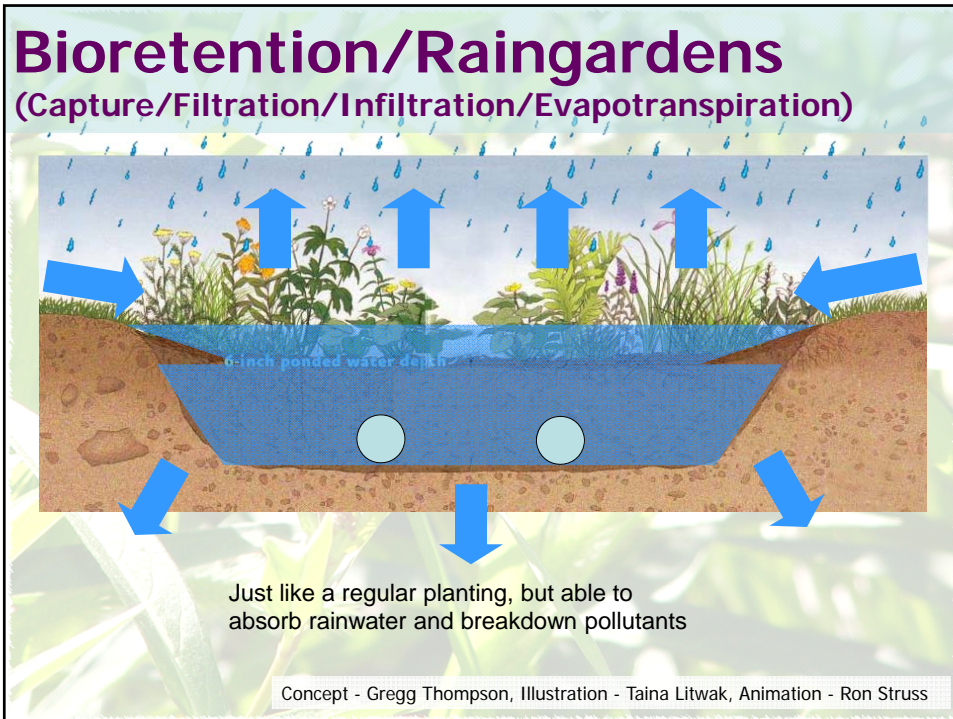


Bioretention/Raingardens (Capture/Filtration/Infiltration/Evapotranspiration)



Just like a regular planting, but able to absorb rainwater and breakdown pollutants

Concept - Gregg Thompson, Illustration - Taina Litwak, Animation - Ron Struss



BIG BENEFITS



Research increasingly shows the benefits of:

vegetated vs. piped systems



open vs. closed systems

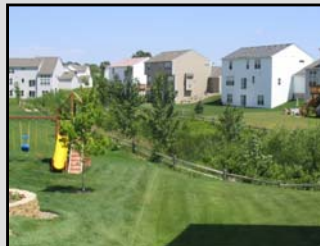


Infiltration/retention vs. detention

Engineered Swales



- Open, above-ground systems are easier to maintain & troubleshoot
- Installation costs are favorable compared to piped drainage

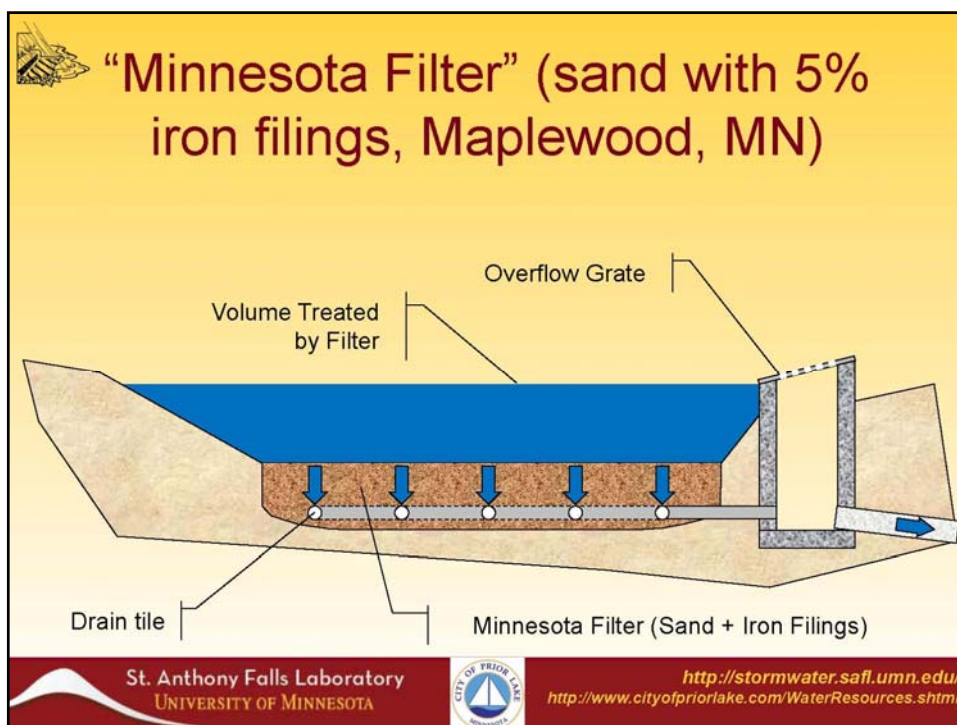
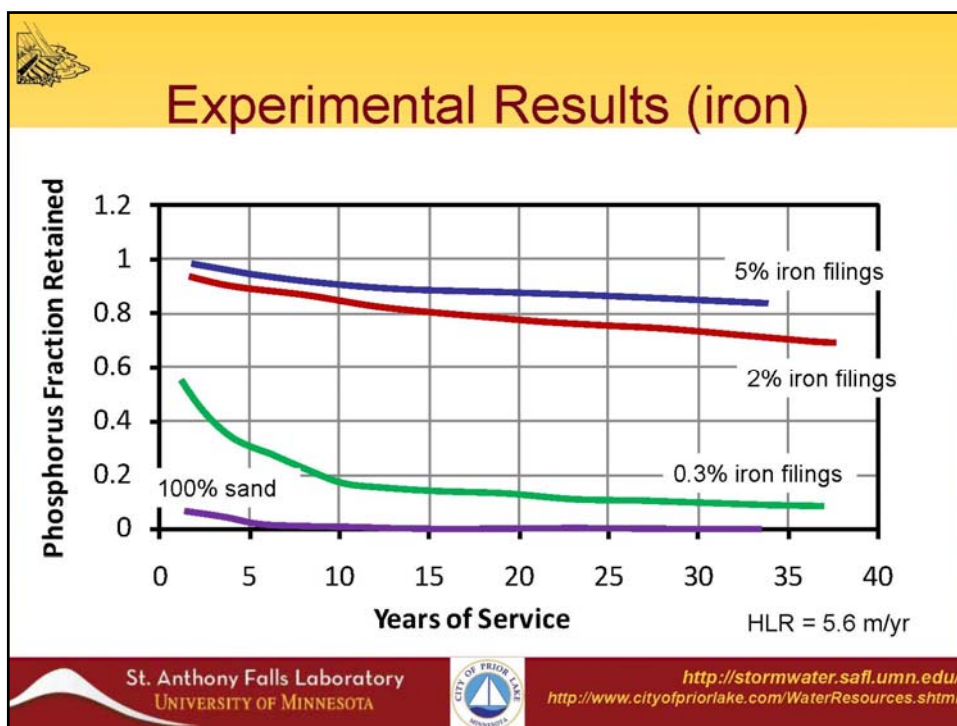


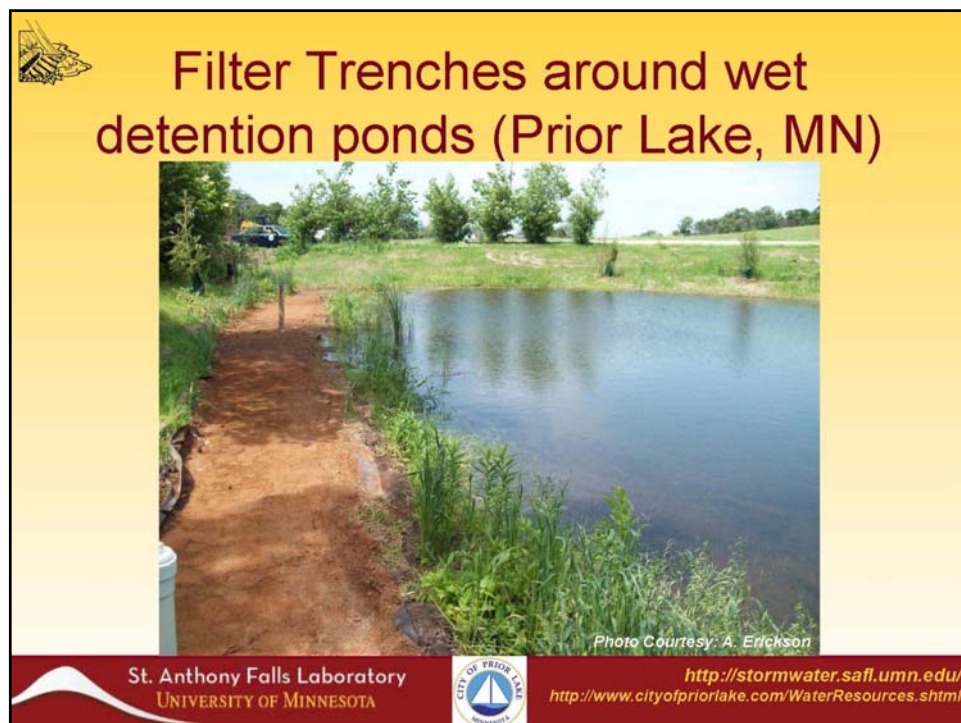
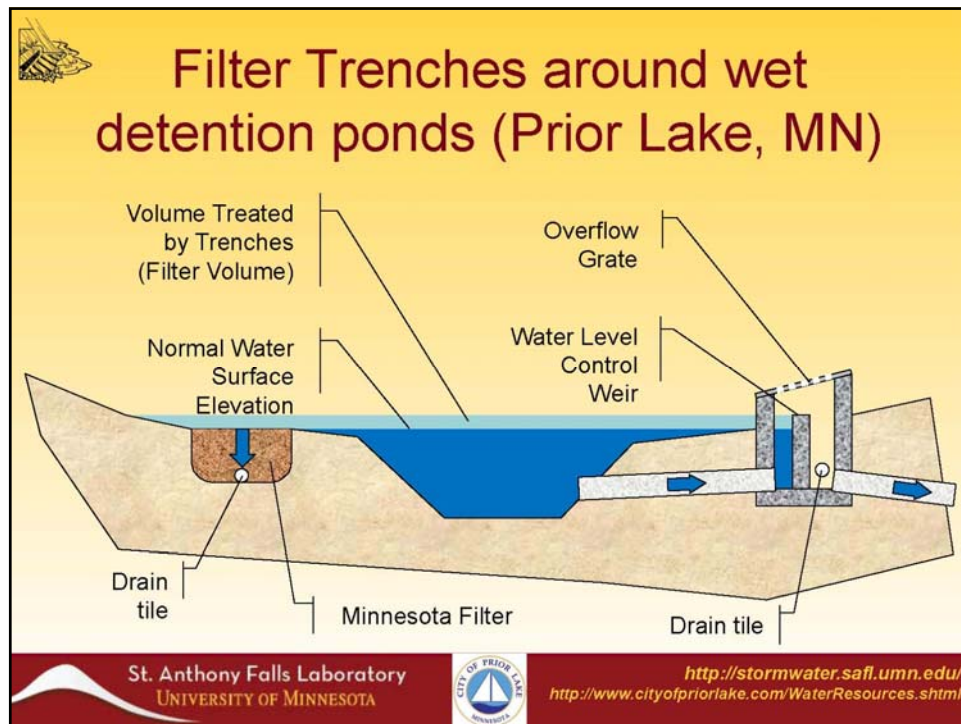
Vegetated Buffers



Constructed Filter Systems





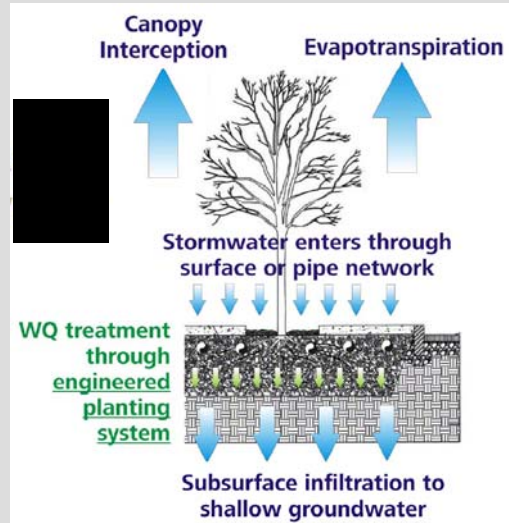


Pervious Pavement

Pervious Asphalt
Pervious Concrete
Interlocking Concrete Pavers

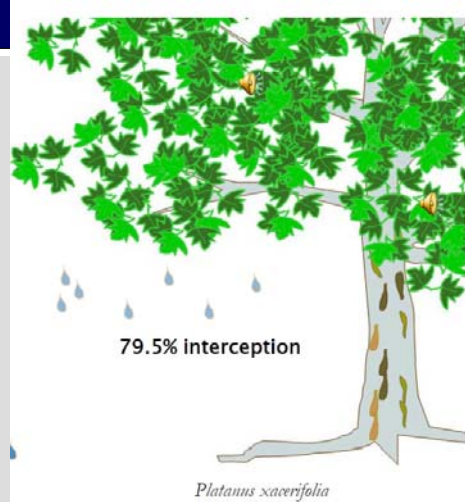
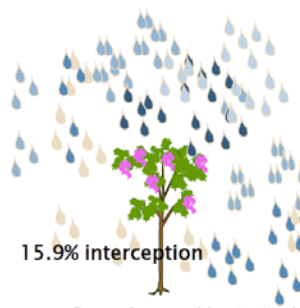


Urban Forestry



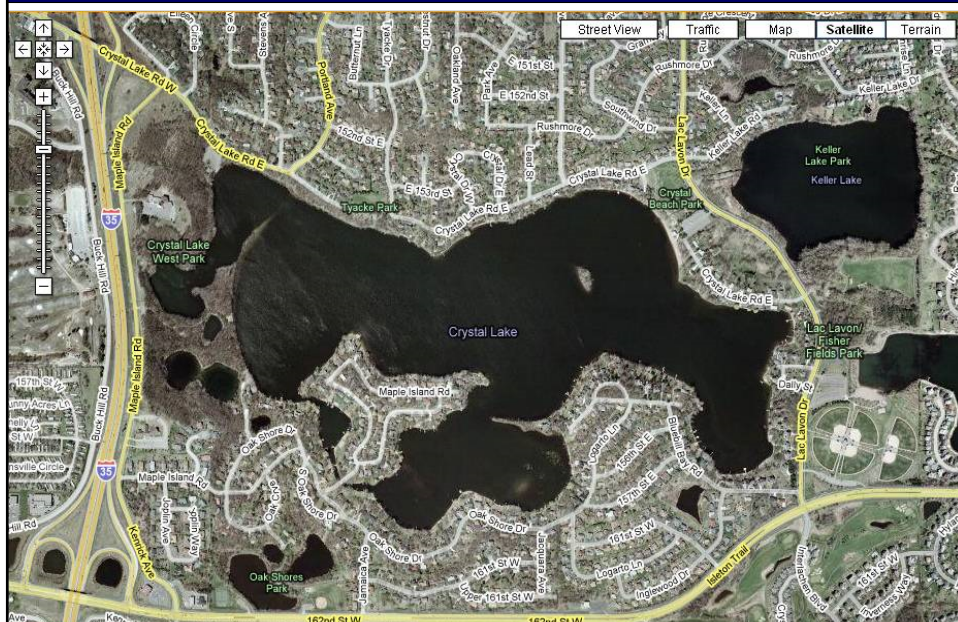
Urban Forestry

~1 inch rainfall event (24 h)



Xiao Q., and E.G. McPherson. 2003. Rainfall interception by Santa Monica's municipal urban forest. Urban Ecosystems

CRYSTAL LAKE: A Case Study



Burnsville, MN: Rushmore Street



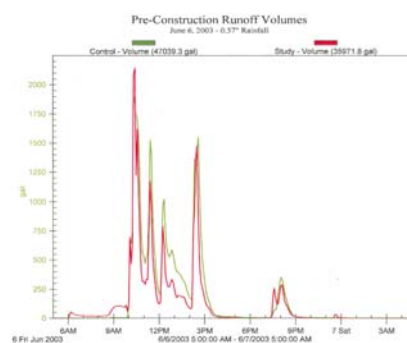
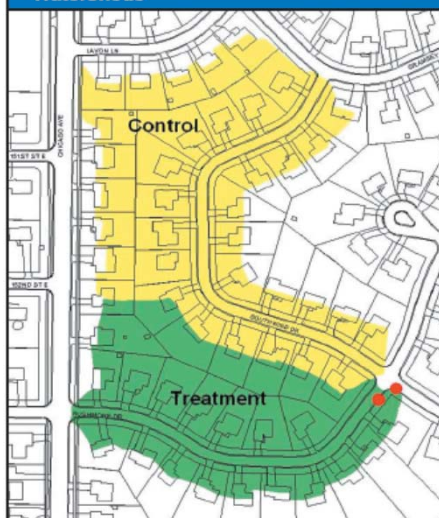
Burnsville – Rushmore Street

5.3 acres – 25 homes – 17 raingardens

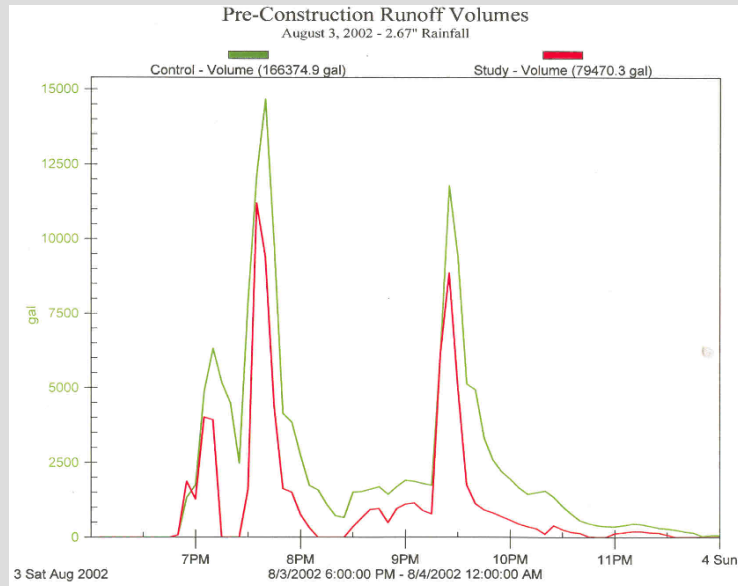
Designed by: Barr Engineering

MONITORING RESULTS

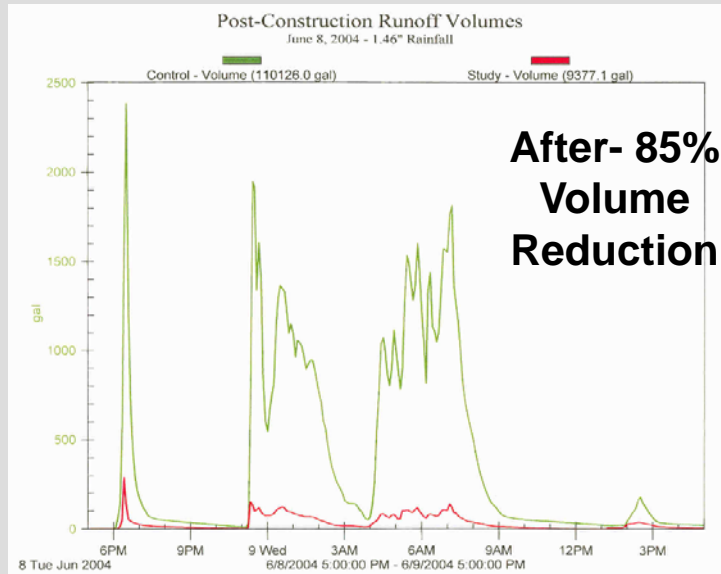
Figure 14.2 Control and Treatment Watersheds



Pre-Construction Runoff Volumes



Post-Construction Runoff Volumes





THE GREEN LINE: A Case Study

University Avenue
Light Rail Project

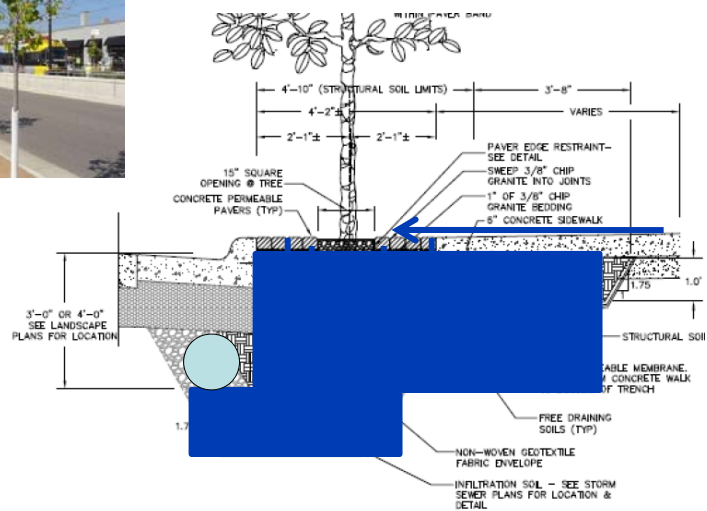
Connecting
Minneapolis to
Saint Paul

6-mile Linear
Project

Ultra Urban



LINEAR TREE TRENCHES



MAPLEWOOD MALL: A Case Study



BEFORE:

7 Acres Impervious

**Severely
compacted soils**

1974: Mall Opened

2010: Parking Lot Stormwater Retrofit



Photos: Ramsey Washington Metro Watershed District

SUBURBAN PARKING LOT RETROFIT



- 55 Rainwater gardens (19 enhanced sand filters)
- 6,733 SF Permeable Pavers
- 1 Mile of Tree Trenches
- 375 New Trees
- 20 million gallons of stormwater intercepted each year (67% of total)



Photos: Ramsey Washington Metro Watershed District

Minimal Impact Design Standards (MIDS)

The development of **Minimal Impact Design Standards** is based on **low impact development (LID)** — an approach to stormwater management that mimics a site's natural hydrology as the landscape is developed. Using the low impact development approach, stormwater is managed on site and the rate and volume of predevelopment stormwater reaching receiving waters is unchanged. The calculation of predevelopment hydrology is based on native soil and vegetation. (Minnesota Statutes, section 115.03, subdivision 5c).

Minimal Impact Design Standards (MIDS)

Minimal Impact Design Standards (MIDS) represents the next generation of stormwater management and contains three main elements that address the following challenges:

- A higher clean water **performance goal** for new development and redevelopment to provide enhanced protection for Minnesota's water resources.
- New **modeling methods and credit calculations** that will standardize the use of a range of innovative structural and nonstructural stormwater techniques.
- A **credits system and ordinance package** that will allow for increased flexibility and a streamlined approach to regulatory programs for developers and communities.

MIDS Workgroup



MIDS: Performance Goals

New development

Redevelopment



Linear Projects

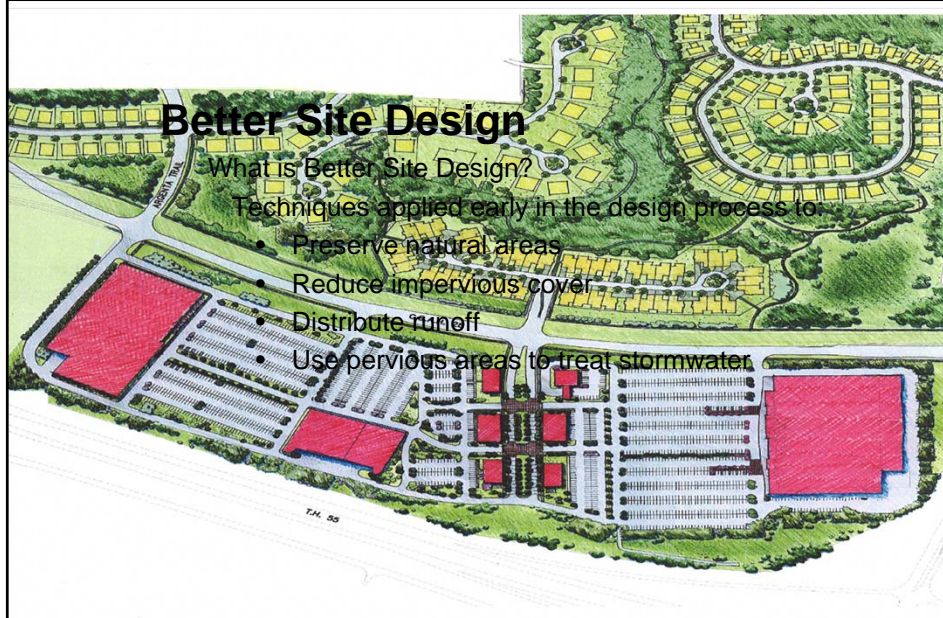
Flexible Treatment options — when a site just cannot meet the goal.

MIDS: Community Assistance Package

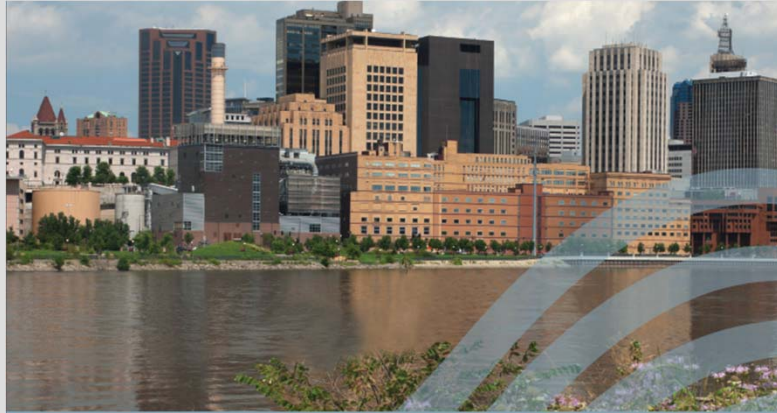


- Background on MIDS
- How to use the package
- Long form stormwater and erosion control ordinance
- Short form stormwater and erosion control ordinance
- Illicit discharge ordinance
- Subdivision ordinance
- Conservation subdivision ordinance
- Shoreland standards (forthcoming)
- Development checklist
- Planning process checklist
- Sample adoption resolution for ordinance changes

MIDS: Stormwater & Erosion Ordinance



The Beginning of the Lake Simcoe Effort



2013 International
Low Impact Development Symposium

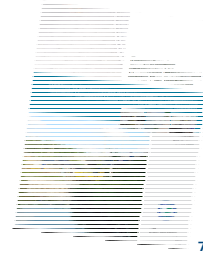
Lake Simcoe Stormwater Management Policy Working Group

BILD & Local Consulting Firms
City of Barrie
City of Kawartha Lakes
City of Orillia
EOR
LSRCA
Ministry of the Environment
Municipal Affairs and Housing
Ryerson University
Town of Aurora

Town of Bradford West-Gwillimbury
Town of East Gwillimbury
Town of Georgina
Town of Innisfil
Town of Newmarket
Town of Uxbridge
Town of Whitchurch-Stouffville
Township of Brock
Township of King
Township of Oro-Medonte
University of Guelph
York Region

Policy Becomes Rule

- Stakeholder group meets monthly to contribute to and review draft language
- Model By-law (ordinance) developed
- Policy becomes effective September 1, 2016
- Sets the path for implementation of Lake Simcoe Phosphorous Offset Program January 1, 2018
- Requires developers to work toward zero phosphorous from new development
- Offset charge of establishes funding pool for retrofit of existing infrastructure



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Lake Simcoe Region Conservation Authority • *A Watershed for Life*



Low Impact Development Stormwater Management Guidance Manual

Ministry of the Environment , Conservation and Parks

We can do this, lets make it happen!



Mike Walters - Biography



Michael Walters is the Chief Administrative Officer at the Lake Simcoe Region Conservation Authority (LSRCA) and reports to the Chair and Board of Directors (BOD).

The CAO has the full charge and direction of all employees and is responsible for providing the leadership in all operational matters pertaining to the LSRCA's mandate. The CAO provides information and acts as liaison to 20 member municipalities, Federal and Provincial agencies, and stakeholders. Michael is also responsible for providing recommendations on policy and operational matters to the BOD, coordination of strategic planning, visioning, long term business and annual work plans, the Corporate Culture initiative and performance measures. The CAO also attends meetings and provides presentations to advance the work of the LSRCA soliciting support and funding from multiple stakeholders.

Michael graduated in 1983 with an Honours Degree in Physical Geography from the University of Western Ontario and has co-authored a number of research and journal publications, and a book on watershed monitoring. Throughout his thirty year career, Michael has applied his expertise locally and internationally, developing and implementing strategic plans, pollution control strategies, planning policy, integrated watershed plans, and subsequently implemented programs to protect and improve ecosystem health.

Michael is currently serving on the Federal Great Lakes Science Annex, Provincial Lake Simcoe Protection Plan Coordinating Committee, Conservation Ontario Council and Conservation Authorities Moraine Coalition. He is a member of the International Water Association (IWA) and Canadian Water Resources Association (CWRA), and the Water Environment Federation (WEF).

Specialties: Strategic and Business Planning, Water Management, Land Use Planning, Research and Development, Watershed Modeling and Monitoring.

Lake Simcoe Region Conservation Authority Improving Storm Water Management January 14, 2019

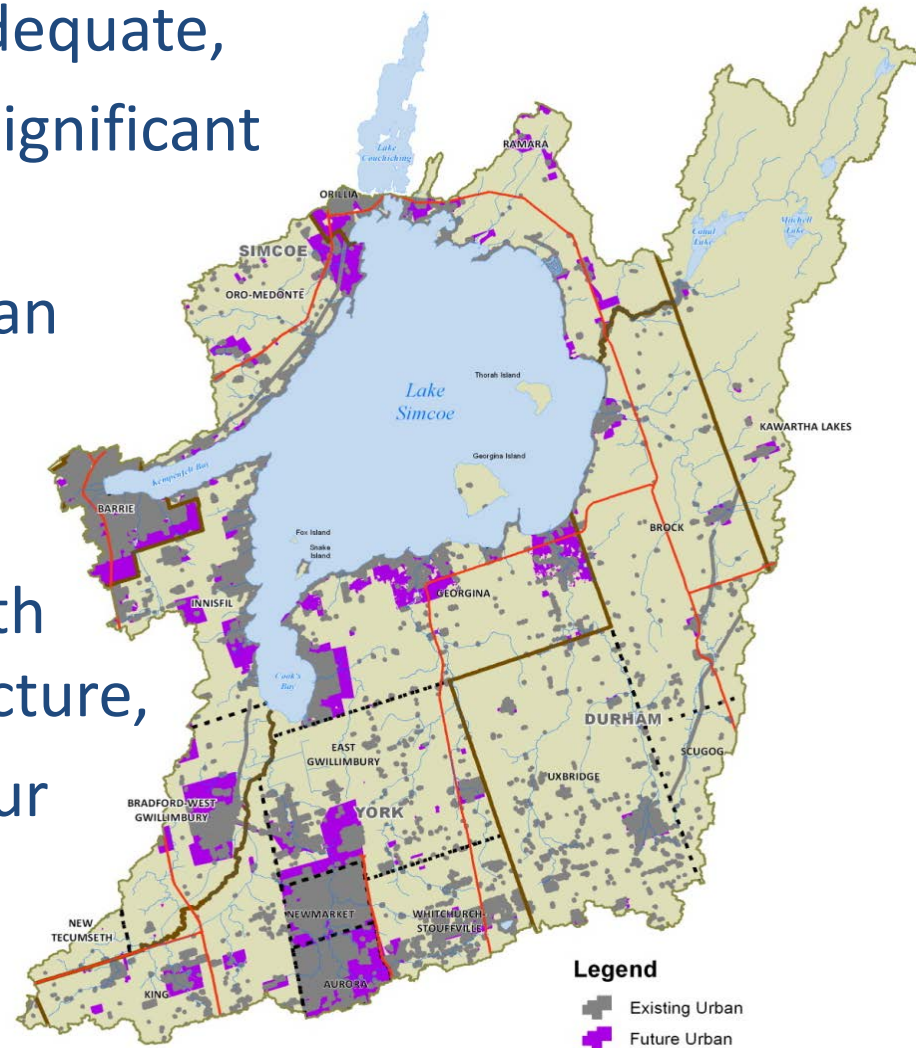


Lake Simcoe Region
conservation authority

Michael Walters
Chief Administrative Officer

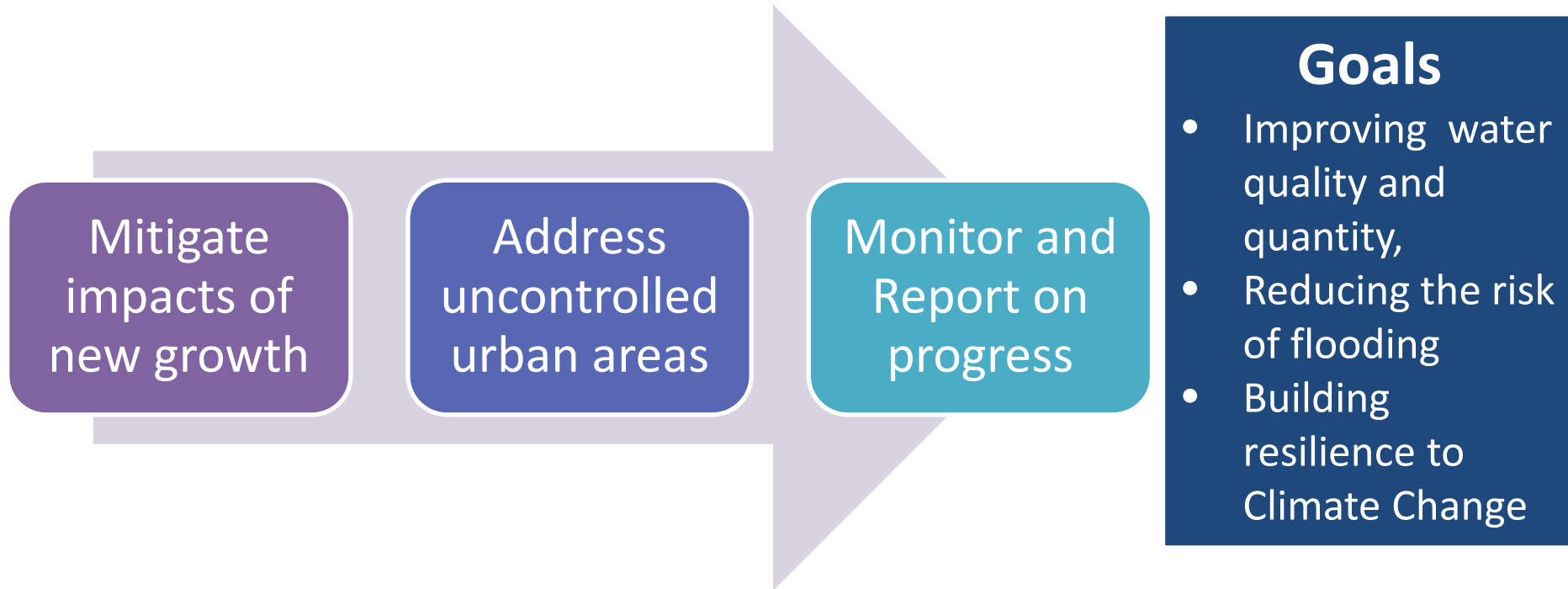
Stormwater Management (SWM)

- Past/present SWM Policy is inadequate,
- The watershed is experiencing significant growth,
- Approx. 60% of the existing urban area is “uncontrolled”,
- Climate change significantly increases the risk associated with inadequate or missing infrastructure,
- It's important that LSRCA and our watershed municipalities make SWM a priority to reduce risk and associated liability.



Changing the SWM Paradigm

Working with our municipal partners, BILD and the province, the LSRCA has partnered to improve implementation of stormwater management within the Lake Simcoe watershed.



Accomplishments¹⁰²

- Launched new stormwater guidelines (July, 2016) to better control SWM from new development,
- Instituted mandatory pre-consultation and offered design charrettes to improve service and SWM design,
- Reduced SWM approval timelines by 6 to 9 months through a delegation of Environmental Compliance Approvals (ECA) to LSRCA,
- Developed the Lake Simcoe Phosphorus and Water Balance Offsetting programs to address inadequate and missing SWM infrastructure in existing urban areas,

While these accomplishments are significant more can be done to safeguard watershed residents!

Partnerships¹⁰³

Town of Newmarket has been a premier partner, not only in changing the SWM Paradigm, but also by leading implementation of LID and acknowledging Climate Change;

- Implemented (5) SWM demonstration projects to promote the benefits of Low Impact Design,
- First municipality to delegate SWM approvals to LSRCA in partnership with the province,
- Partnered with LSRCA to have a 'Climate Change Specialist' on Town staff which has evolved into a full time position,
- Initiated monitoring programs to demonstrate the benefits of LID measures (Western Creek) to reduce peak flows and flooding,
- Currently partners in a study that optimizes SWM works to achieve the best return on investment.

Projects: Ray Twinney Rec. Centre



Projects: Forest Glenn



Thank you

For more Information visit our website at
www.lsrca.on.ca