

# BREAKOUT 4

# Sustainability



# Breakout Agenda

**5 mins**      **Waterfront Toronto**

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**15 mins**    **Sidewalk Labs**

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**10 mins**    **Q & A**

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**15 mins**    **Table Discussion**

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**5 mins**      **Report Back**

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Roundtable 4 - December 8, 2018

# Sustainability

Breakout Room

Aaron Barter, Innovation and Sustainability Manager

# Waterfront Toronto Quayside RFP Objectives



## 1. Sustainability, Resiliency and Urban Innovation:

Create a globally significant demonstration project that advances a new market model for climate-positive urban developments.



## 2. Complete Communities:

Establish a complete community that emphasizes quality of place, and provides a range of housing types for families of all sizes and income levels within a robust mix of uses, including public open space, culture, recreation, vibrant retail, education-related activities and offices.



## 3. Economic Development and Prosperity:

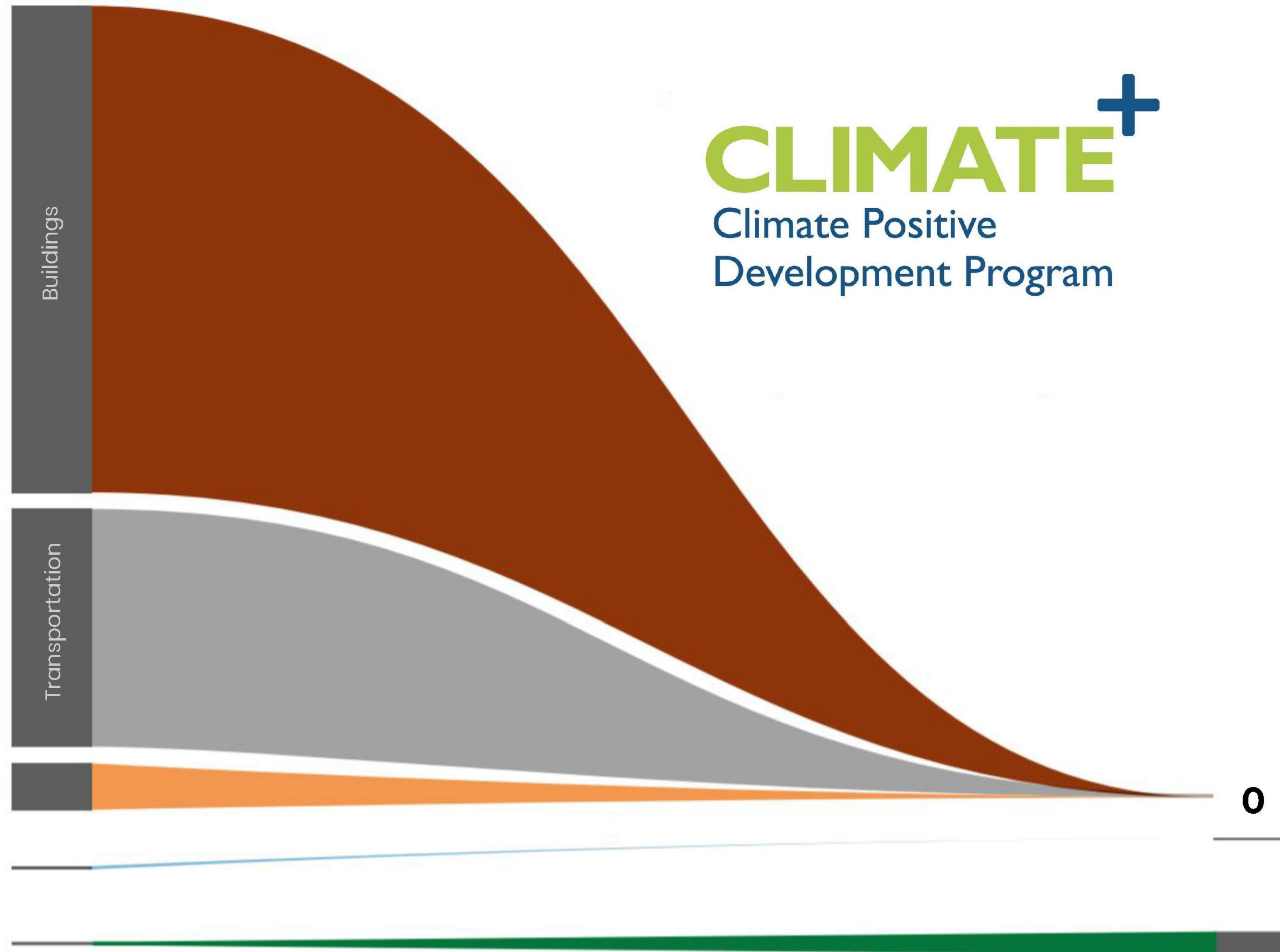
Provide a testbed for Canada's cleantech, building materials and broader innovation-driven sectors to support their growth and competitiveness in global markets.



## 4. Partnership and Investment:

Develop a new partnership model that ensures a solid financial foundation, manages financial risk and secures revenue that funds future phases of waterfront revitalization.

# What is 'Climate Positive' urban development?

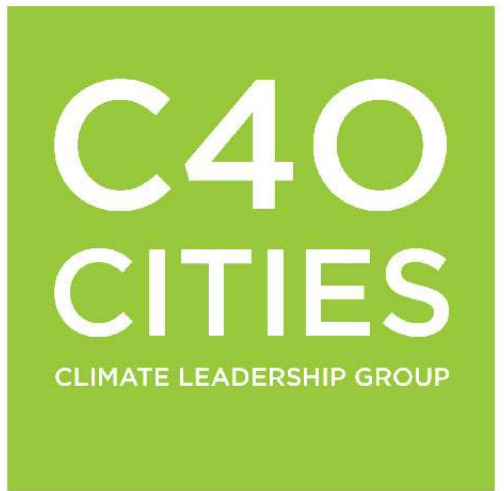


**CLIMATE**<sup>+</sup>  
Climate Positive  
Development Program

The Climate Positive Development Program supports the development of urban projects that seek to meet an emissions target of **net-negative operational greenhouse gas (GHG) emissions** associated with energy, waste and transportation.

This ambitious outcome is achieved by **reducing emissions on-site, and offsetting emissions by reducing carbon** in neighbouring communities.

# What is 'Climate Positive' urban development?



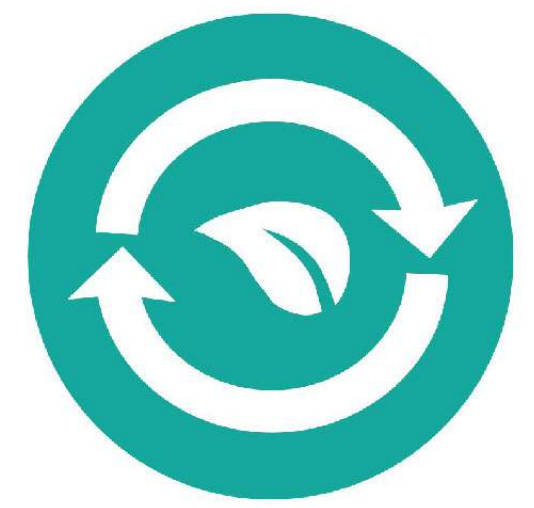
Interested in learning more?

- Aiming to create **replicable models** for large-scale urban communities that reduce GHG emissions to greatest possible extent.
- Seeking to **achieve the highest standards of sustainability** and deploy innovate climate resilient solutions.
- Projects often include **close collaboration with the public sector and private sector** to enable holistic planning and development.
- Currently 18 projects across six continents including the **Stockholm Royal Seaport** in Sweden, **Barangaroo** in Sydney, Australia, and **Elephant & Castle** in London, UK.



*Published May 31, 2017*

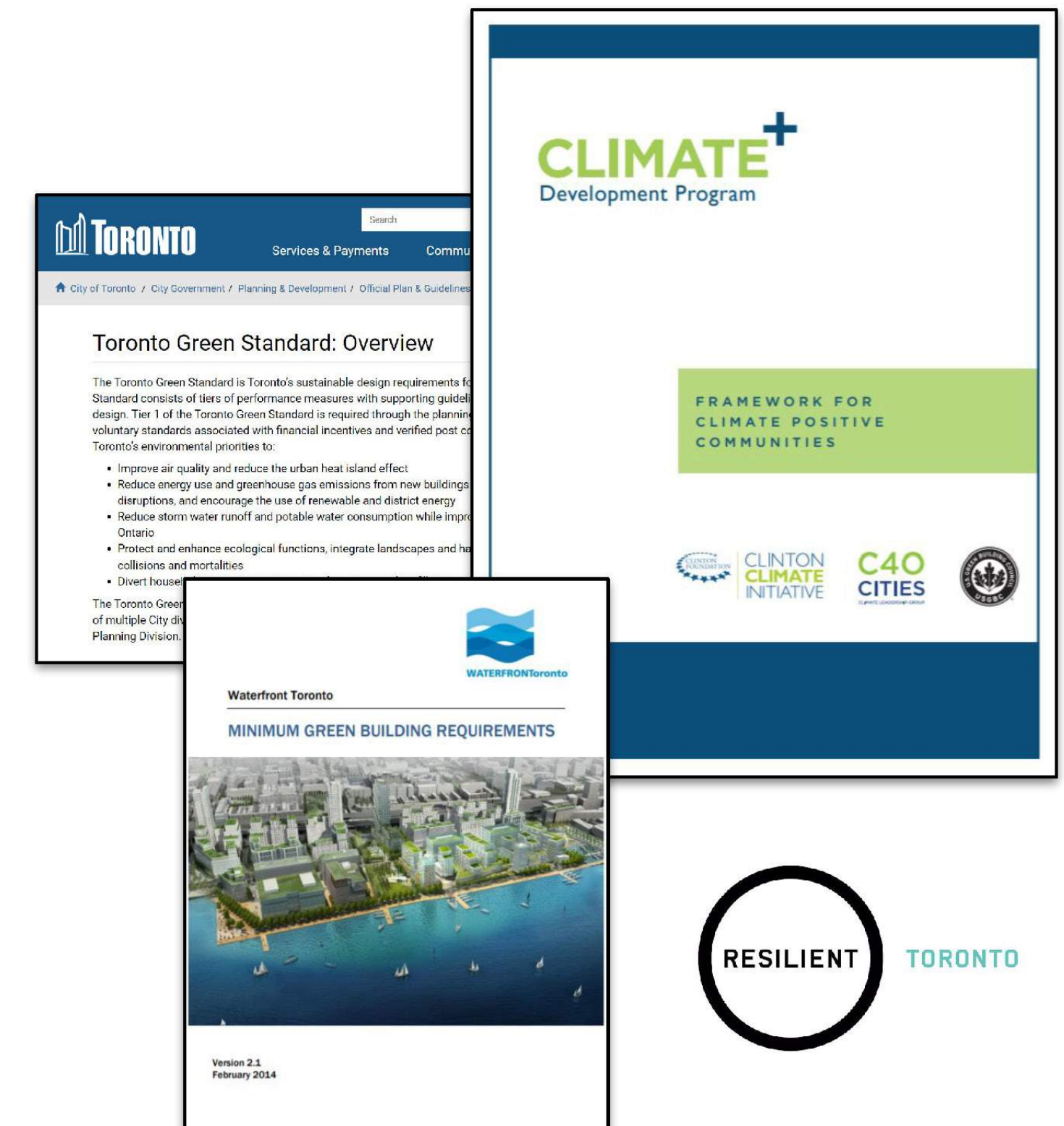
# Waterfront Toronto Priority Objectives



## Sustainability and Climate Positive Development

Enable the development of a neighborhood with below-zero annual greenhouse gas emissions at full build-out, as defined by the C40 Climate Positive Framework, with a further focus on:

- ✓ **Exemplary Building Standards** - Building design that supports Waterfront Toronto's climate positive aspirations, including aligning with the highest tier of the latest Toronto Green Standard. Buildings represent 60% of GHG emissions in Toronto.
- ✓ **Sustainable Mobility** - Infrastructure and policies that enable carbon emitting vehicles to be replaced with electric vehicles to achieve zero emissions and climate positive targets. Transportation represents 32% of GHG emissions in Toronto.
- ✓ **Affordable Utilities** - Ensure levels of affordability comparable to the average cost of utilities in Toronto.
- ✓ **Circular Economy** - Accelerate a local transition towards a circular economy that establishes a pathway to zero operational waste.
- ✓ **Resilient Infrastructure** - Address the Resilient TO initiative by better preparing buildings and infrastructure to survive and thrive in response to a changing climate and in emergencies.

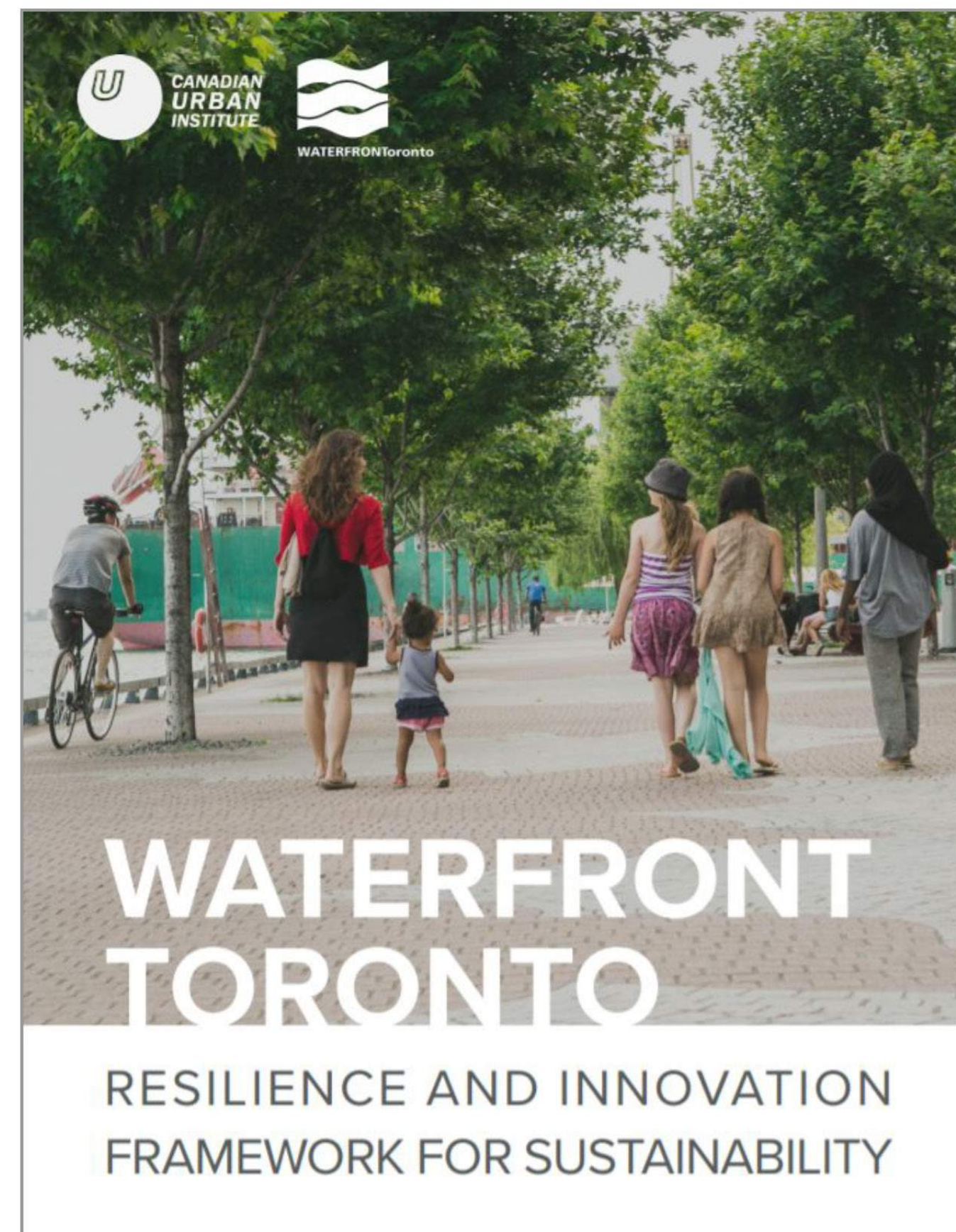


# Waterfront Toronto Priority Objectives



## Sustainability and Climate Positive Development

More background in our 2017 Resilience and Innovation Framework for Sustainability:



SECTION 1: OVERVIEW

**Our Values**

The next ring of the Framework is Our Values, which sets out the priorities that will inform all of Waterfront Toronto's work. These are the leadership drivers for the next stage of revitalization. They are aspirational and their full achievement will be recognized over time.

Waterfront Toronto's priorities for the development and operation of the waterfront include:

**1. CLIMATE POSITIVE:** Guided by the C40 Climate Positive Development Program, Waterfront Toronto's projects and initiatives support the development of low carbon communities with an aspiration to reduce greenhouse gas emissions below zero.

**2. INCLUSIVE RESILIENCE:** Toronto's waterfront is a dynamic, adaptive and flexible environment with the ability to respond to technical, social and environmental changes. Buildings, communities and infrastructure are designed to survive and thrive in response to a changing climate and in times of emergency. Resilience planning considers the built, natural and social environment.

**3. INTELLIGENT + CONNECTED:** Technologies are used to support community needs and improve quality of life. High-speed, resilient connectivity creates reliable connections between people and things. Access and digital inclusion build personal connections to the community.

**4. HUMAN EXPERIENCE-DRIVEN:** Waterfront communities are healthy, safe, just, active, multi-generational, human scale and accessible. Design excellence enriches the human experience.

**5. BIOPHILIC:** The waterfront is a place where people learn from and are inspired by nature. Buildings and infrastructure incorporate natural forms and systems into the design and operations.

Waterfront Toronto Resilience and Innovation Framework for Sustainability 5

SECTION 2

# OUR VALUES

**OUR VALUES**

This section provides more information on Our Values and how each will inform Waterfront Toronto's work.

**1. Climate Positive**

Guided by the C40 Climate Positive Development Program, Waterfront Toronto's projects and initiatives support the development of low carbon communities with an aspiration to reduce greenhouse gas emissions below zero.

Recent studies show that, in addition to substantial and immediate reductions in carbon emissions, we must also remove existing carbon from the atmosphere to keep global warming below 2°C<sup>4</sup>. Recognizing this need to substantially reduce carbon emissions, Waterfront Toronto has joined other world-leading communities in aligning its goals with the Climate Positive Development Program. Under this program, projects must reduce their emissions, sequester carbon on-site and offset the remainder by exporting clean energy or investing in carbon reduction initiatives in the surrounding community. Waterfront Toronto's Lower Don Lands development is one of the 17 inaugural projects included in the C40 Climate Positive Development Program launched in 2009.

The C40 Program is a non-prescriptive program which aims to "create large-scale models for urban development that reduce greenhouse gas emissions below zero in an economically viable manner"<sup>5</sup>. The Program focuses on the three main sources of operational carbon emissions: energy, waste and transportation. To achieve this scale of carbon reductions, Waterfront Toronto must track and set incremental targets for the reduction of carbon on the Waterfront. Developments must include highly efficient buildings, renewable energy, using waste as a resource, access to low-carbon mass transit and creating carbon offsets through sequestration and abating emissions from surrounding communities.

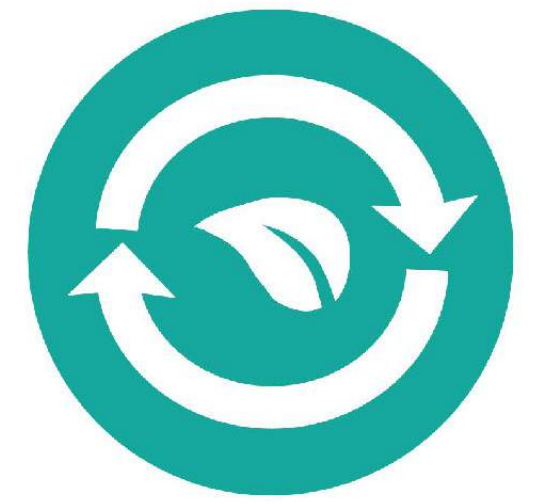
4 Gasser, T., Guivarch, C., Tschir, K., Jones, C.D., & Coia, P. (2015). Negative emissions physically needed to keep global warming below 2°C. Nature Communications, 6, 1-7 (2015). DOI: 10.1038/ncomms8958

5 Roadmaps for Successful Climate Action: C40 Cities Share 100 Case Studies Proven to Work (March 2016). C40 Cities. Retrieved from [http://www.c40.org/blog\\_posts/roadmaps-for-successful-climate-action-c40-cities-share-100-case-studies-proven-to-work](http://www.c40.org/blog_posts/roadmaps-for-successful-climate-action-c40-cities-share-100-case-studies-proven-to-work)

Waterfront Toronto Resilience and Innovation Framework for Sustainability 7



# Waterfront Toronto Priority Objectives



## Snapshot: Alignment with City of Toronto Policy Priorities

### Toronto Green Standard Version 3

### Toronto Green Streets Technical Guidelines

### Long Term Waste Management Strategy

### TransformTO

### Wet Weather Flow Management Guidelines

City of Toronto / City Government / Planning & Development / Official Plan & Guidelines / Toronto Green Standard / Toronto Green Standard: Overview

### Toronto Green Standard: Overview

The Toronto Green Standard is Toronto's sustainable design requirements for new private and City-owned developments. The Standard consists of tiers of performance measures with supporting guidelines that promote sustainable site and building design. Tier 1 of the Toronto Green Standard is required through the planning approval process. Tiers 2 to 4 are higher level voluntary standards associated with financial incentives and verified post construction. The Standard addresses the City of Toronto's environmental priorities to:

**In This Section**

- Toronto Green Standard
- Toronto Green Standard Version 2
- Toronto Green Standard Version 3
- Toronto Green Standard:

**PE19.4** Making buildings more resilient to power

**TORONTO** REPORT FOR ACTION

### TransformTO: Climate Action for a Healthy, Equitable and Prosperous Toronto - Report #2 - The Pathway to a Low Carbon Future

**Date:** April 20, 2017  
**To:** Parks and Environment Committee  
**From:** Chief Corporate Officer  
**Wards:** All

**SUMMARY**

In July 2007, Toronto City Council recognized the far reaching impacts of climate change and unanimously made a commitment to see community-wide greenhouse gas emissions reduced by 80% against 1990 levels by the year 2050. The City's innovation and leadership is why Toronto has seen its greenhouse gas emissions drop by 24%, exceeding our 2012 goal of a 6% reduction. However, our current pace of change is insufficient to achieve the emission reduction goal for 2050.

Analysis shows that the 2050 goal is achievable with existing technologies, but it means bold action is required to transform Toronto's urban systems - buildings, energy, transportation and waste. Where Toronto is already on the correct trajectory, we need to stay the course. In other areas, we need to increase the scale and pace of change.

The path to the 2050 goal is one where many of the low-carbon actions will pay for themselves over the long term. It is also a path that can facilitate achievement of a city that is more healthy, equitable and prosperous. The TransformTO Modelling Advisory Group, consisting of 35 community leaders and City staff have identified how low-carbon actions can drive significant co-benefits. Their report, *Attachment A: TransformTO Modelling Advisory Group Summary Report*, outlines ways to realize these co-benefits.

Initiated in 2015, TransformTO involved the engagement of over 2,000 residents, the input of an inter-divisional steering team and the Modelling Advisory Group, in combination with detailed technical modelling. Getting to Toronto's 2050 goal requires:

- A. Maintaining & Implementing Toronto's Planned Climate Actions
- B. Committing to the Vision - A Low-Carbon, Healthy, Equitable and Prosperous Toronto
- C. Maximizing Community Benefit from Climate Action
- D. Leadership through City Action

TransformTO Report #2 Page 1 of 37

**Waste Strategy Highlights**

### PW14.2 - Attachment 1

Attachment 1 - Final Long Term Waste Management Strategy

#### Waste Strategy Highlights

**Initiation of the City of Toronto's Long Term Waste Management Strategy**

Waste management and diversion programs in the City of Toronto (the City) have significantly evolved over time. In 2013, City Council recognized the need for an updated comprehensive long term waste management plan and commissioned the development of a Long Term Waste Management Strategy (Waste Strategy). Since 2014, the City has been working through a comprehensive technical evaluation process supported by widespread public and stakeholder engagement activities to develop this Waste Strategy document. Policies, programs and technological options and best practices for new and emerging waste reduction, diversion and disposal methods were considered and evaluated. The Waste Strategy recommends waste reduction, reuse, recycling, recovery and residual disposal policies and programs, in that order, that are cost-effective, socially acceptable and environmentally sustainable for the long term.

**Waste Strategy Vision and Guiding Principles to Navigate the Future System**

A successful Waste Strategy reflects the interests of the community that it serves, now and in the future. It is driven by a Vision Statement and Guiding Principles that express a philosophy of what the Waste Strategy will strive to achieve and what will be important in making decisions along the way. The following City Council approved vision statement was developed for the future of the City's Integrated Solid Waste Management System.

*"Together we will reduce the amount of waste we generate, reuse what we can, and recycle and recover the remaining resources to reinvest back into the economy. We will embrace a waste management system that is user-friendly, with programs and facilities that balance the needs of the community and the environment with long term financial sustainability. Together, we will ensure a safe, clean, beautiful and healthy City for the future."*

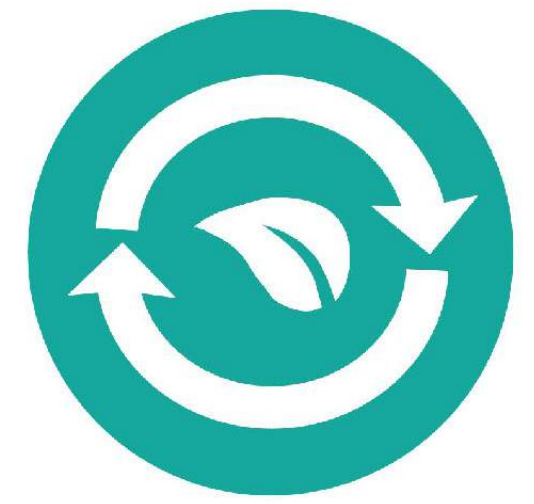
This vision statement will be used in concert with eight guiding principles developed to support decision making in the future as the Waste Strategy is implemented.

**Maximizing the Life of Green Lane Landfill**

The development of the Waste Strategy placed a priority on maximizing the life of Green Lane Landfill by minimizing the amount of garbage sent for disposal. Factors that have led to updated estimates of the life of Green Lane Landfill, to approximately 2040, include:

**TORONTO** Attachment 1 - P.2016\Cluster\SWM\June\2016PW\AFS420276

# Waterfront Toronto Priority Objectives



## Snapshot: Alignment with City of Toronto Policy Priorities

### Toronto Green Standard Version 3

The new **TGS Version 3** builds upon City leadership since 2006 on green building standards, featuring TEUI, TEDI, and GHG targets, as MNECB-based codes (e.g. TGS V2, MGBR V2.1) may not deliver reductions needed for City climate change goals.

### Toronto Green Streets Technical Guidelines

**Version 1.0 of GSTG** from November 2017 highlights the importance of utilizing the ‘treatment train’ of green infrastructure for managing runoff, using tools such as permeable pavers and tree trenches, and refers to operations and maintenance.

### Long Term Waste Management Strategy

**The 2016 LTWM Strategy** targets 70% reduction by 2026 on a City-wide path to zero waste, considering “waste tracking technology to provide data and statistics for MURBs” as well as live tracking of waste, recycling, organic waste volumes.

### TransformTO

**Report #2: Part E (Urban System Transformation)** from April 2017 includes expanding low-carbon mobility and electrification, building energy performance, renewable and community energy approaches, and virtual waste elimination.

### Wet Weather Flow Management Guidelines

The **WWF Master Plan** prioritizes re-establishing a natural hydrologic cycle with green infrastructure, improving water quality in Lake Ontario, water and sediment quality, and eliminating CSO sewage, as well as other key City objectives.

BREAKOUT 4

# Charlotte Matthews

SIDEWALK LABS

# Sidewalk Toronto: Our Vision for Sustainability

A new standard of sustainability that builds on the leadership of the City of Toronto and Waterfront Toronto to create a **blueprint for climate-positive communities.**

# Creating a Blueprint Climate Positive Neighbourhood

## Automated building energy management

identifies and eliminates energy waste while offering energy affordability and tenant comfort enhancements..

## An advanced power grid deploys batteries

batteries to reduce peak demand, manages solar power and sends price signals to reduce use of electricity at peak times

## Connected & green stormwater Infrastructure

that leverages new digital management and optimization systems for monitoring the capture, reuse, and treatment of stormwater

## Diverting solid waste from landfill with vacuum tubes

to whisk garbage away from buildings, better user feedback to dramatically improve recycling, reducing the GHG impact of waste.

## Low carbon building materials

Tall timber construction made sequesters 1 ton of CO<sub>2</sub> per m<sup>3</sup> while the concrete equivalent emits CO<sub>2</sub>. Also other materials are cradle to cradle certified

## A thermal grid to capture clean energy sources

including geothermal wells and building and sewer waste heat to help heat pumps generate heating, cooling and hot water

# Electrification & Clean Energy

Using clean electricity for heating and hot water is a crucial step to achieving climate positive, but to be replicable throughout Toronto, it must also be affordable.

60%



Percentage of Toronto's GHG emissions from buildings, similar to other dense urban environments globally

GTHA GHG Inventory. TAF, 2017

87%



Percentage of building GHG emissions in Toronto are from the combustion of natural gas for heating and hot water

GTHA GHG Inventory. TAF, 2017

5x



Electricity prices are 5x as much as natural gas, but clean electricity is critical to GHG reductions

Published rates, Ontario. 2017

# Sidewalk Toronto's Approach to Affordable Electrification

## No Natural Gas Infrastructure

Use heat pumps and fossil-fuel free thermal grid in lieu of boilers



## Manage Electrical Demands

To fit within existing power grid capacity, by low load buildings and dynamic utility pricing



## Eliminate Energy Waste

Weed out the electricity use no one cares about, to reduce cost



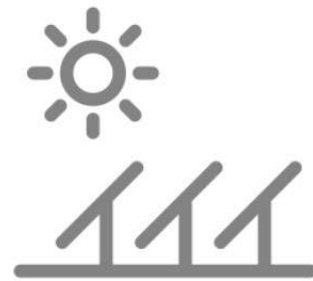
 **Affordable  
Electrification**

# Our Approach to Affordable Electrification

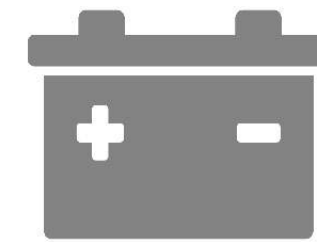
## Technologies & Infrastructure



Toronto Hydro distribution as the primary source of electricity



Rooftop solar PV will provide 9% of neighbourhood peak demand



Energy storage to cover up to 60% of peak demand for 2 hours



Infrastructure to support electric vehicles and light rail (LRT)



Space & hot water heating with heat pumps tied into thermal grid w/ geothermal wells and sewer heat recovery



Toronto Green Standards V3 Tier 3 buildings retain heat through 3-day power outage



New rates to reward load-shifting and use of renewable energy and storage

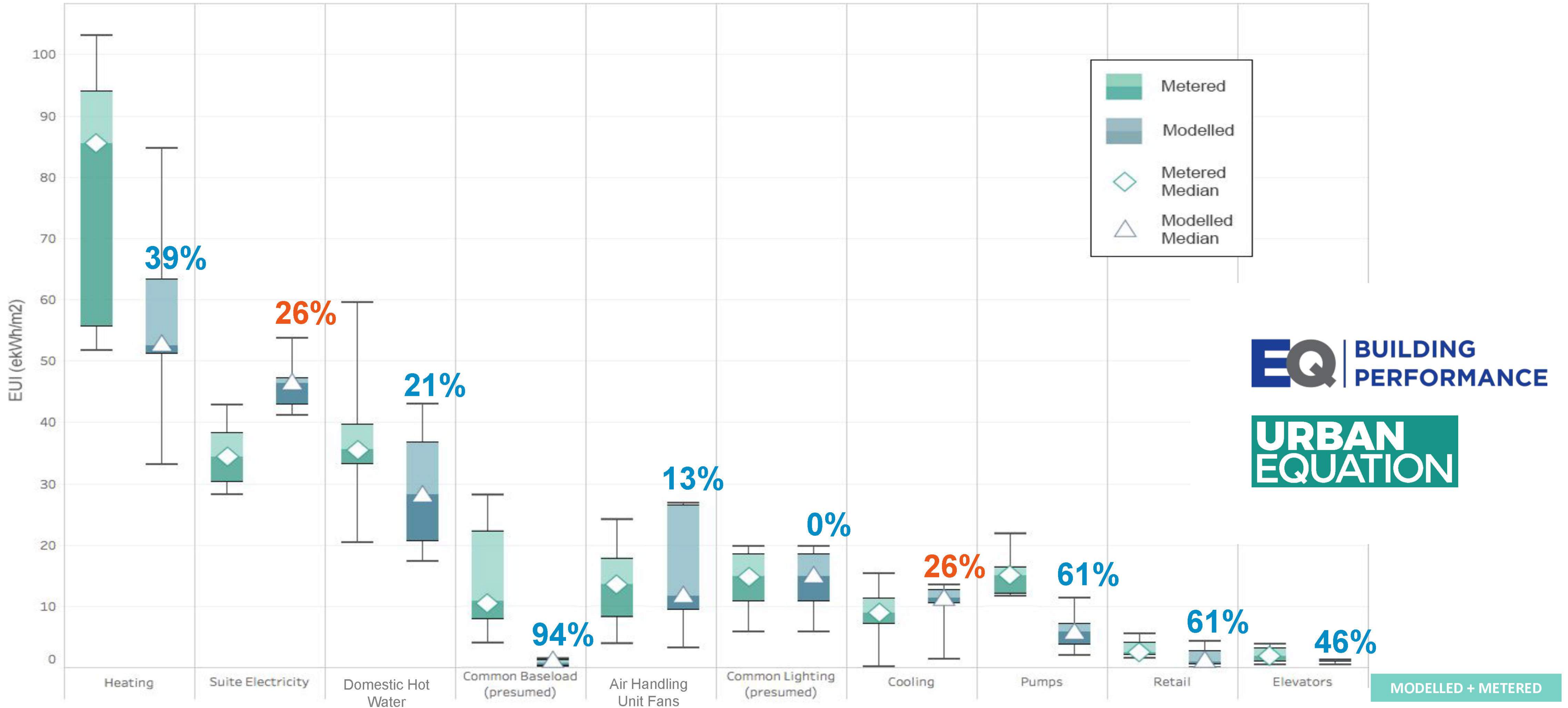


Automated response to energy rates, saving money and reducing GHGs



# Modelled vs. Metered Energy Use of Recent Toronto Multifamily Projects

On average, the studied multifamily buildings used 13% more energy than models predicted.



# What Makes Reducing Building Energy Demands So Hard

Our strategy includes technology development to address these four challenges in delivering energy and utility cost efficiency.

## Developers Demonstrate Code Compliance with Energy Models



Studies show that buildings generally use more energy than their code compliance models and green building ratings predict and energy use intensity (kWh/m<sup>2</sup>) varies widely between buildings, even those of a similar age and rating.

## Tenants Do Not Respond to Utility Price Signals without Automation



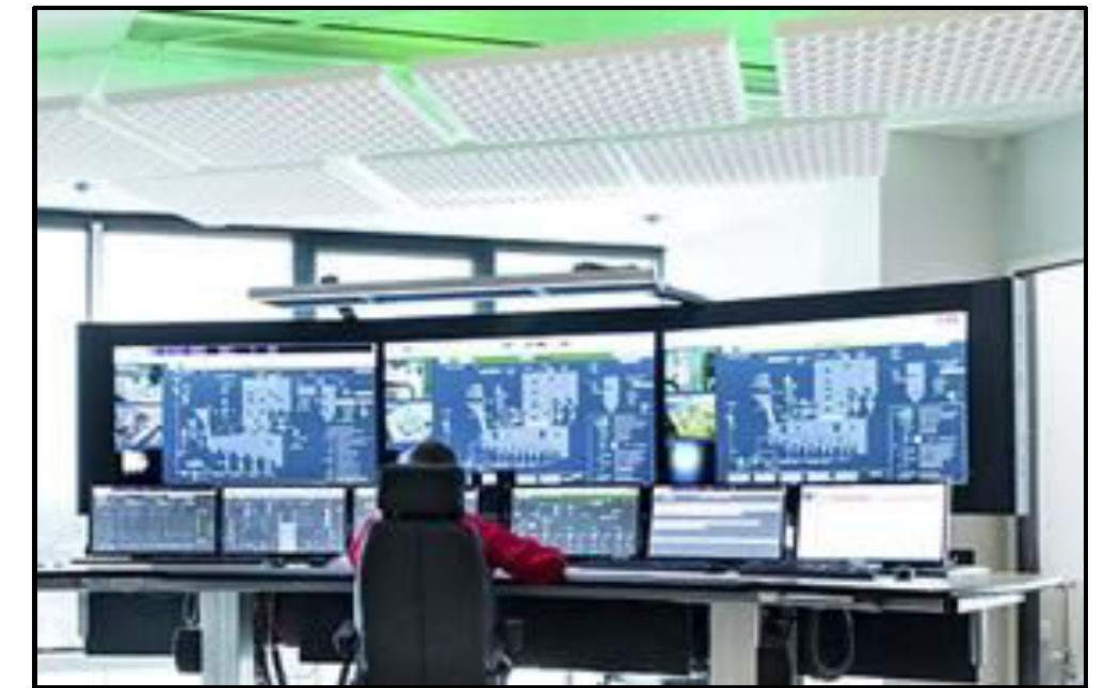
Time-of-use utility rate pilots with automated control of thermostats, water heaters and appliances show significantly greater peak demand reductions and customer cost savings than those without.

## Tenants are Not Actively Controlling the Energy Uses Under Their Control



Well over half of building energy use is attributable to tenant space temperature, hot water, lighting, and plug loads. No one in the office is actively controlling these uses with an eye to waste or cost.

## So Much Equipment Is Operated According to a PreSet or Left On

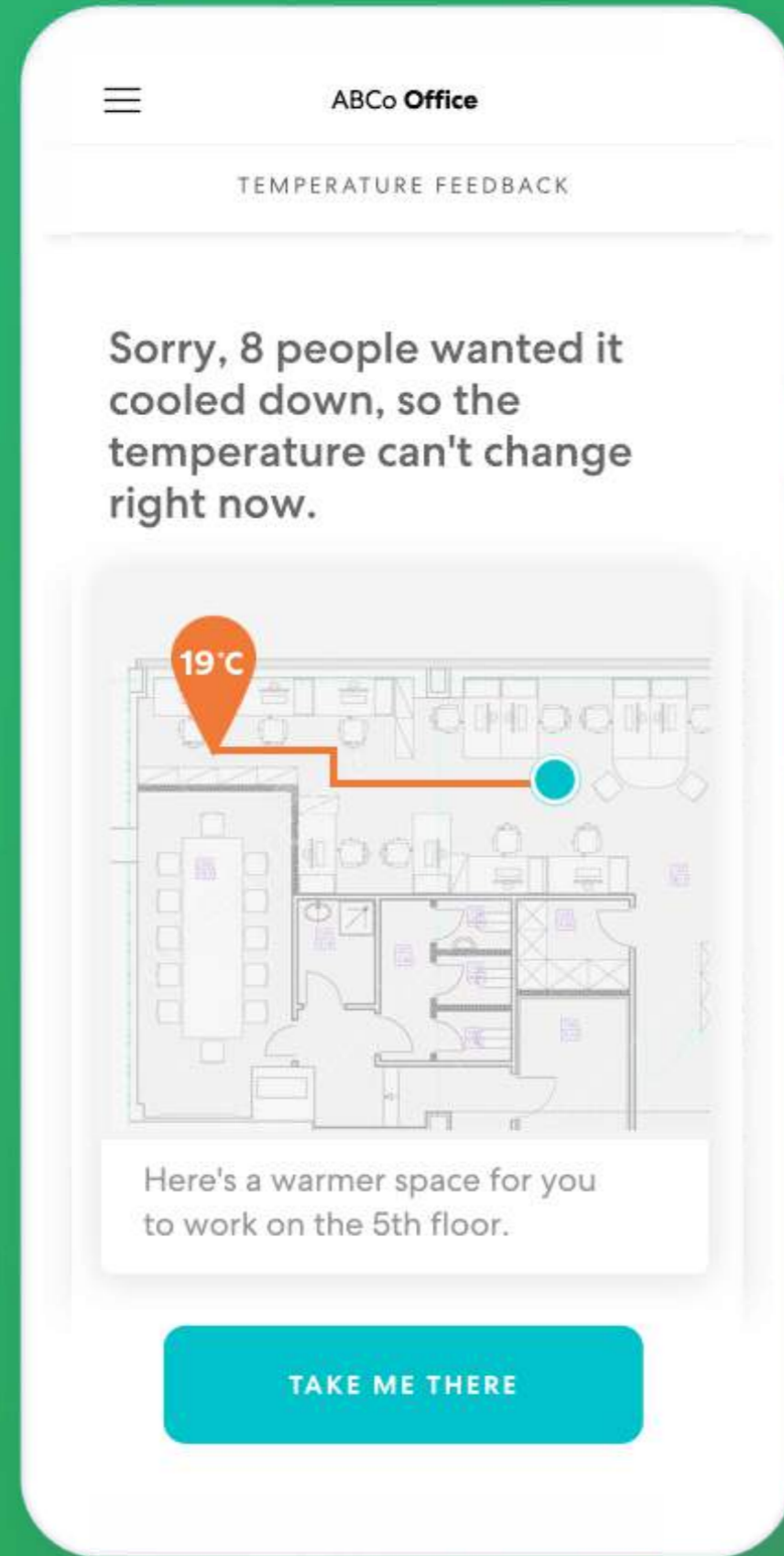


Most equipment is run with a “set it and leave it” approach. This wastes energy and can even degrade comfort in the gap between the programmed setting and schedule and what tenants want and when they want it.

# A New Tool to Eliminate Energy Waste in the Office and Core Systems

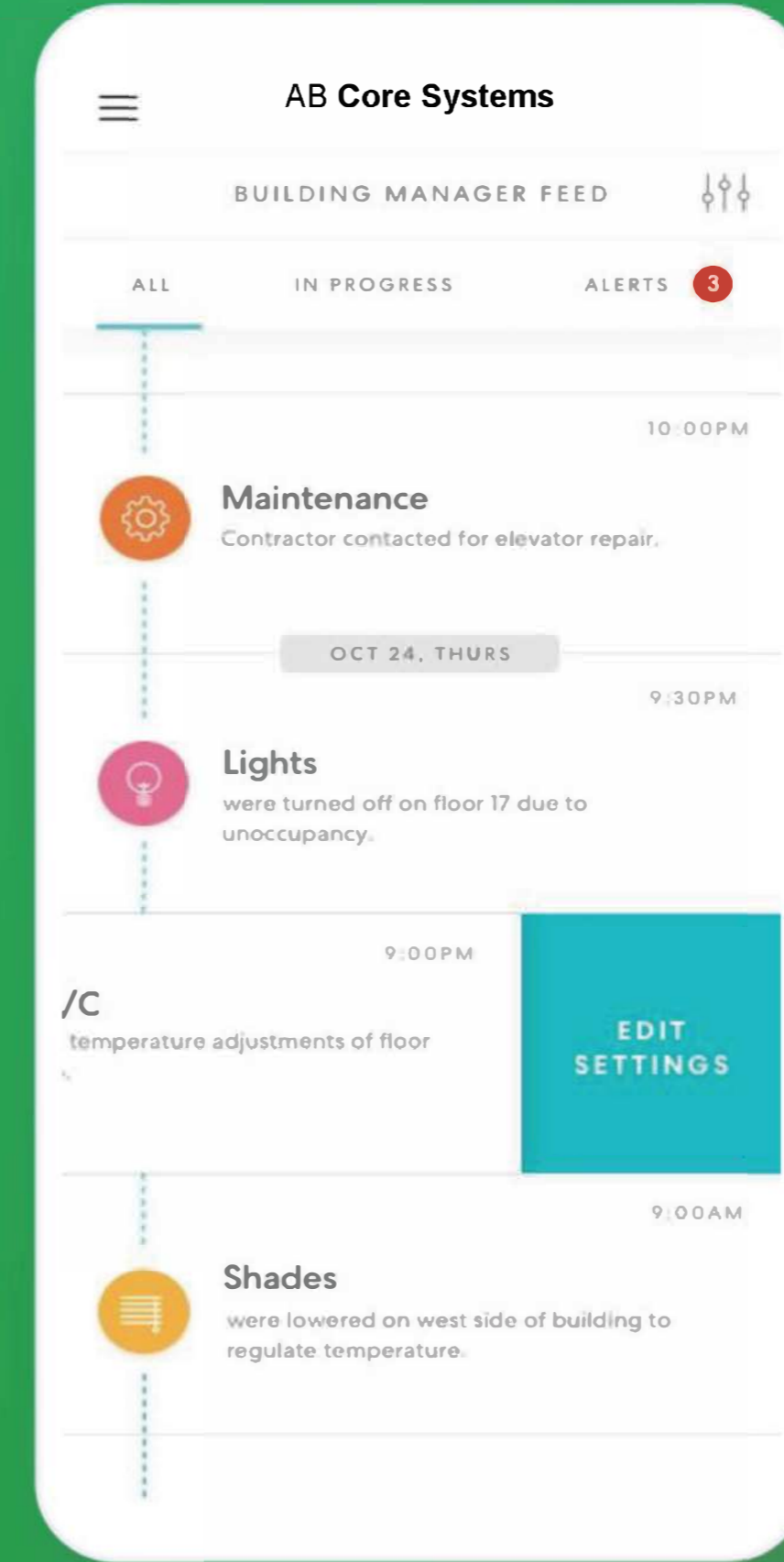
More comfortable, responsive office spaces with improved energy efficiency and less effort to control building systems.

## Fully Responsive Spaces



AB Office responds fully and fairly to tenant comfort requests

## Operational Efficiencies



AB Core Systems handles a lot of the nuisance in managing a building.

# Sustainable Buildings are About More Than Energy

New materials and technologies to create more livable spaces

## Reduced Construction Waste

75% less waste during construction through digital design, prefabricated construction  
Also, during operations reconfigurable interior wall panel systems reduce waste

## Cradle to Cradle

Plaster made from slake lime, seaweed and egg shells can be composted when removed and provides acoustic and fire protection properties similar to other materials

## Lower Embodied Carbon

Mass timber construction sequesters 1 ton of CO<sub>2</sub> per m<sup>3</sup> while the concrete or steel equivalent emits CO<sub>2</sub>. Also mass timber is a resource that is renewable and can be regionally available.

## Healthy Materials

Third Party Certified healthy materials that comply with the most aggressive LEED™ Requirements..

## Biophilic Design

Creating spaces that evoke nature, because it promotes wellness, creativity and health.

## Less Material

Hybrid DC/AC power system uses half the wiring and conduit of traditional AC power systems

# Synergistic Benefits of “Green Infrastructure” for Stormwater

Our Approach to Stormwater Management

## Reduce Heat Island Effect

Plants shade surfaces, reflect radiation, and release moisture to cool the urban environment

## Enhance Biophilia

Natural landscapes improve health and well being in the built world while embracing the seasons

## Reconnect with Lake Ontario

Land-Water Scapes direct the public to the waterfront with the natural flow of streams

## Design for Tomorrow

Permeable modular paving melds the artistry of the street with sustainable water treatment



Toronto gets about 10 percent more rain per year than it did in the mid-20th century.

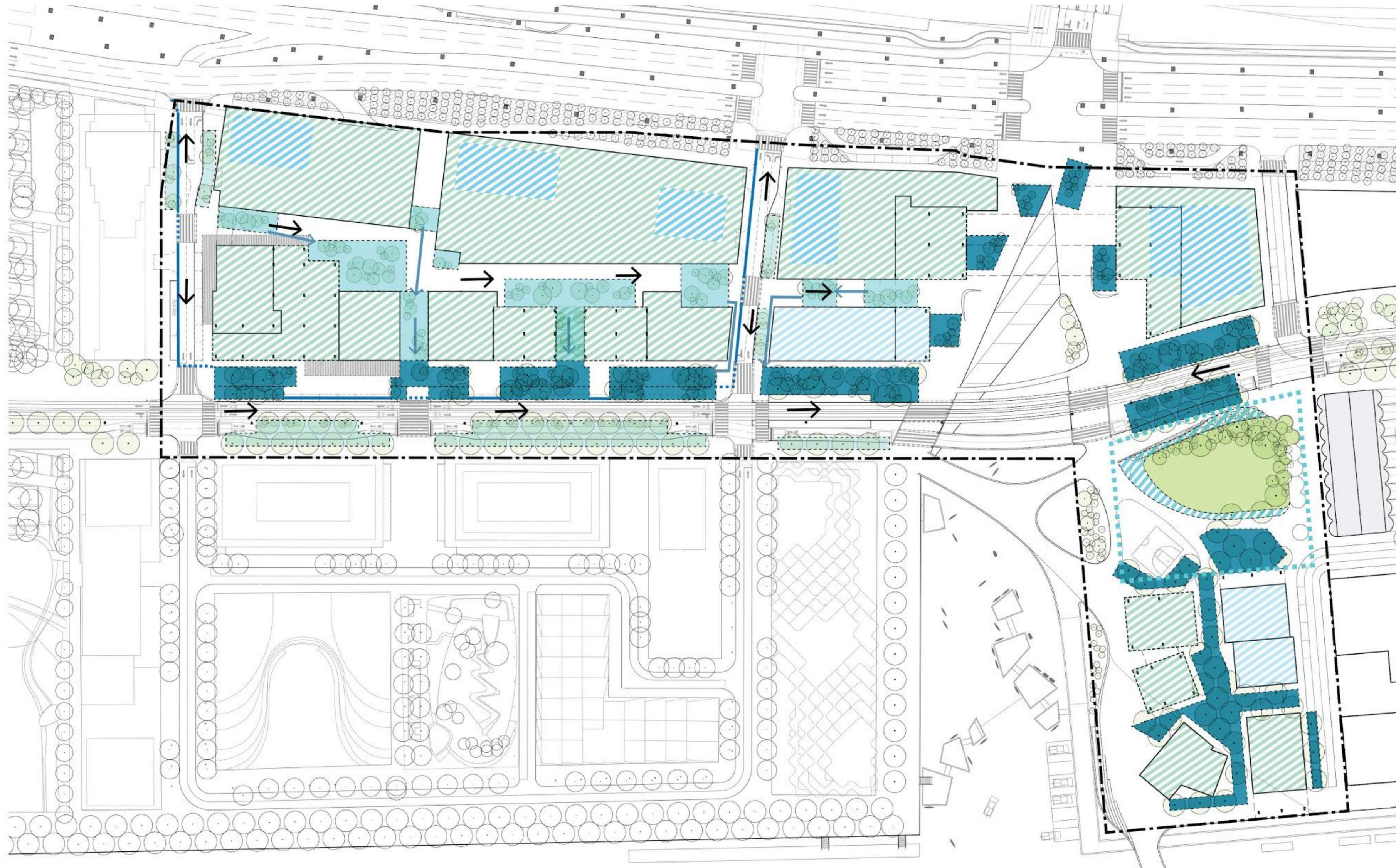


**And in the past five years, Toronto has endured two 100-year storms.**

# Site Plan of Green Infrastructure for Stormwater and Tree Canopy



Stormwater Strategy: Our Approach to Stormwater Management

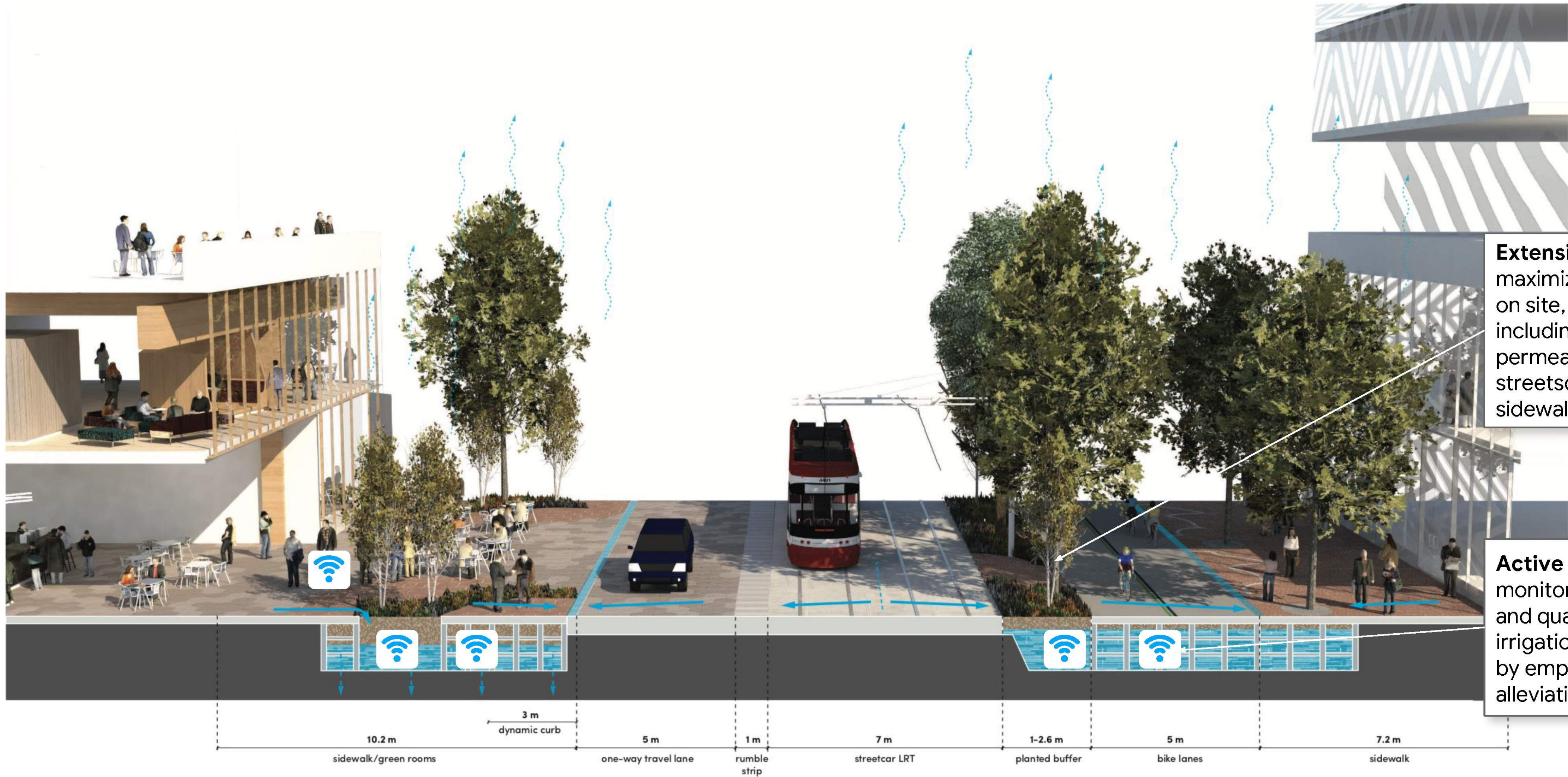


- Quayside Boundary
- Bio-Retention Type1**  
- mixed open planters and paving on soil cells  
- promotes infiltration
- Bio-Retention Type2**  
- planters on podium  
- no infiltration  
- connected to type 1 where possible for infiltration
- Bio-Retention Type3**  
- street trees in soil cell  
- infiltration only possible on small street
- 30-50% Green Roof**
- 80% Blue Roof**
- Open Runnel**
- Covered Runnel (Accessible)**
- Planted Stormwater Channel**
- Direction of Overland Flow**
- Subsurface Connection**
- Opportunity for Below Grade Infiltration**

N  
Scale 1:1000

# Queens Quay East Section of Green Infrastructure

Our Approach to Stormwater Management



**Extensive green infrastructure** maximizes capture of stormwater on site, in roadways and plazas, including increased vegetation, permeable paving in the streetscapes, and voids under the sidewalk or soil cells.

**Active water management** monitors stormwater quantities and qualities, utilizes water for irrigation, and anticipates storms by emptying detention tanks alleviating city storm drains.



# Bike Rack of Topics for Future Discussion

Aspects of Sidewalk Toronto's Sustainability Plan that we did not have time to cover in depth today



- . Building studies
- . More energy Management technologies
- . Solid waste diversion strategy
- . Fossil-fuel free thermal grid
- . Ecosystems and biodiversity

# BREAKOUT 4

# Q & A

## BREAKOUT 4

# Table Discussion

BREAKOUT 4

# Reporting Back

# SIDEWALK TORONTO

