

Public Realm

Introduction

p120

Part 1

Creating More
Open Space

p126

Part 2

Making Open
Space More
Usable More
of the Time

p150

Part 3

Ensuring Open
Space Is More
Responsive

p178

Public Engagement

p192



Introduction

The Vision

A system of **streets, parks, plazas, and open spaces that encourages people to spend more time outdoors, together.**

An expansive open space network is vital to creating a neighbourhood culture and forming community bonds. That is a big reason why the United Nations has embraced “access to safe, inclusive and accessible” open spaces as part of its Sustainable Development Goals and why Toronto has been developing a new open space plan for downtown.

Decades of research have substantiated the tie between urban nature and well-being, and yet only 40 percent of Canadians say they get outside every day.¹ Time spent inside is increasingly spent alone; solo living is by far the most common household type in Toronto.² Loneliness has become such a public health problem that it is comparable to smoking as a risk factor for illness.³

This growing sense of urban isolation threatens the social fabric of vibrant neighbourhoods. Research from the Center for Active Design has found that more responsive programming,

operations, and maintenance can increase neighbourhood interactions by 10 percent and community pride by as much as 15 percent.⁴ An “everyday” public realm is not meant to be an escape from the city, but instead to be a fundamental shaper of the community — filled with civic engagement, exploration, and connections to people and place.

Sidewalk Labs believes that plentiful, accessible, and exciting public space filled with people all day and all year is a fundamental element of urban life, not an exclusive amenity. This approach to the public realm incorporates new design practices and emerging digital tools to provide more open space, to activate that space more of the time, and to enable it to be more responsive to the community. This three-part strategy aims to help people spend more time outdoors, together.



The innovation plan.

First, Sidewalk Labs plans to deliver more space. Increased walking, cycling, and transit options — coupled with ride-hail services and eventually self-driving vehicles — create an opportunity to reclaim street space for the public realm.

This expansion of open space not only enables more public activity but also creates more room for green landscaping and urban nature. To make the most of this space, Sidewalk Labs plans to design flexibility into parks and plazas and to use a digital planning and evaluation tool that can help maximize access to open space while preserving the dense downtown development that creates housing and jobs.

Second, Sidewalk Labs plans to enable open space to be activated more of the time. Adaptable ground-floor spaces could evolve throughout the days, seasons, or years and accommodate a much wider variety of uses than conventional developments — from traditional retail, to social or community initiatives, to production work. A digital leasing and operations system would enable easier set-up for short-term pop-ups and co-tenancy arrangements among businesses with diverse operating hours. A carefully engineered outdoor comfort system could respond to real-time weather patterns to provide shade on sunny days and protection on rainy or snowy ones.

Finally, Sidewalk Labs plans to make space more responsive to the needs of the community. Shared physical infrastructure (such as communal access to projectors or power) would empower the community to program public spaces, making it easy to stage events, such as art installations or local gatherings. A real-time map of park assets — from drinking fountains to garbage bins to utility pipes — would help managers operate and maintain these spaces in ways that keep them active and detect infrastructure issues early.



The impact.

In a neighbourhood the size of Quayside, these initiatives would lead to streets with up to 91 percent more pedestrian space and nearly twice the number of trees; ground-floor space that is activated for 33 percent more time each day; and outdoor spaces that are comfortable for 35 percent more hours throughout the year — all compared with conventional development.⁵ The expanded availability of the public realm, activated by commu-

nity-driven programs and better maintenance, would create shared spaces that encourage exploration and provide new opportunities for small business.

In Quayside, Sidewalk Labs proposes that the administration of these innovations be handled by a new non-profit entity called the Open Space Alliance that would bring together government, residents, landowners, and tenants.

Deployed at the full scale of the IDEA District, this holistic approach would result in a seamless network of spaces unlike any in the world. Sidewalk Labs estimates that the IDEA District could become home to more open space than previously planned, with a greater variety of spaces and double the number of comfortable outdoor hours for key spaces. People would be able to comfortably walk for kilometres through lively streets that open onto intimate plazas full of busy cafés, passing through an array of parks that weave together rolling gardens with renewed post-industrial structures. That variety of uses would draw ever more people into the public realm, which would act as the backbone of local civic life and a backyard for families.

Additionally, as jobs are increasingly attracted to dense neighbourhoods, a diverse network of open spaces would be a key driver for fostering economic growth and opportunity. Flexible, affordable ground-floor spaces could support the growth of urban production and become both community incubators and regional attractions.

A great public realm should serve as the foundation of a great community, where people spend more of their time outdoors, together — improving health and happiness and strengthening social ties.



Benefits of implementing the vision

- Nearly twice the number of sidewalk trees as on typical boulevards
- A community empowered to program its public spaces
- New opportunities for small businesses through flexible ground floors
- Outdoor spaces that are comfortable year-round



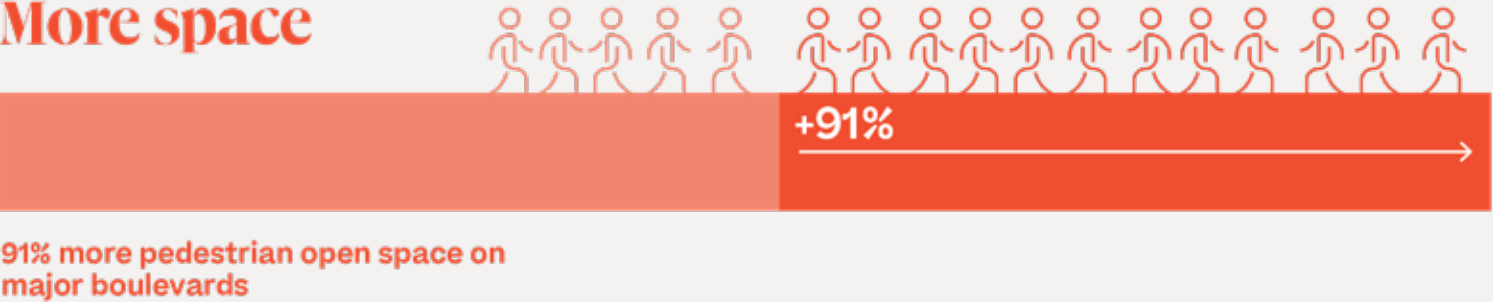
IDEA District

The 77-hectare Innovative Design and Economic Acceleration (IDEA) District, consisting of Quayside and the River District, provides sufficient geographic scale for innovations to maximize quality-of-life impact and to become financially viable.

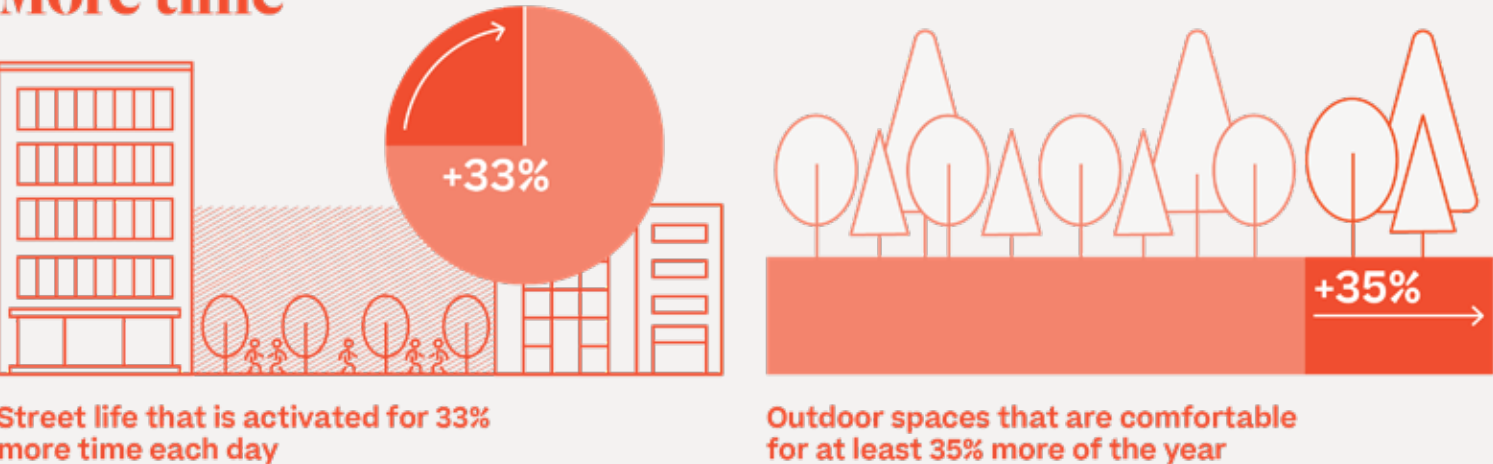
More time outdoors, together

Sidewalk Labs has proposed a public realm vision that would create more space for more people, more of the time. The plans outlined in this chapter achieve the following impacts:

More space



More time



More responsive



The proposed Open Space Alliance is detailed on Page 178 of this chapter and in Volume 3.

Six lessons from user research on designing inclusive public spaces

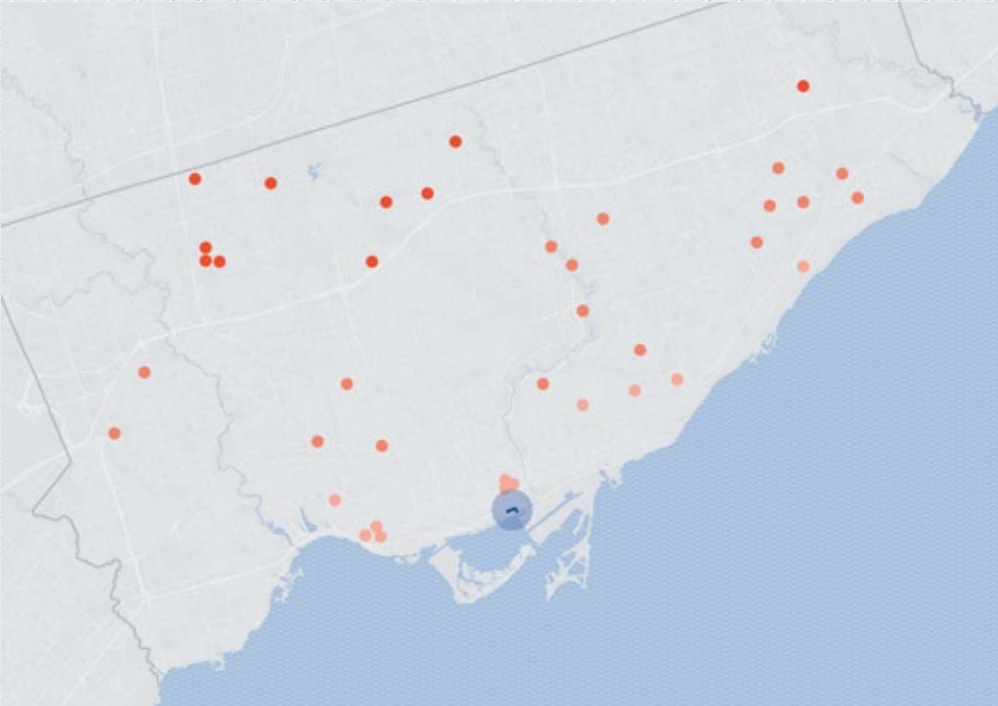
Toronto is ahead of the pack when it comes to using data to study public space. In 2016, the City Planning Department worked with national charity Park People and consulting firm Gehl Architects to conduct a comprehensive study of downtown public spaces as part of TOCore, the city’s long-term planning vision.⁶ Waterfront Toronto has also conducted extensive outreach on public space, including its “How to Make a Great Park” survey.⁷

To build on that data-driven work during the planning of Quayside, Sidewalk Labs collaborated with Park People and Doblin, Deloitte’s human-centred design and innovation practice, on a research study to help inform people-first park design. The partners carefully screened and selected 40 people from across the city to participate in a qualitative research exercise focused on the question: What factors create a sense of belonging and ownership in public space?

Researchers spent an afternoon with participants in their homes or went on walks with participants in public spaces in different neighbourhoods to help answer this question. Most of the participants came from outside of the downtown core, and they had never previously participated in a public consultation process.

In addition to the input heard during the broader public consultation process described on Page 192, the results from this user research effort helped shape Sidewalk Labs’ public realm plan and provide a general playbook for how to think about designing inclusive public spaces in diverse cities. (Initial results from the Doblin and Park People study were also shared as part of the broader public consultation process.) Six of the lessons are described on the following page.

Seeking a diversity of voices from across the city



Sidewalk Labs, Doblin, and Park People collaborated on a study exploring how Torontonians use public space, with a focus on reaching out to people normally not included in public consultations. The research participants included a diverse mix of roughly 40 respondents from across the city, weighted towards respondents who live more than 30 minutes from the waterfront by public transit.

Key

Quayside development

0-30 min by public transit

30-60 min by public transit

60+ min by public transit

A Design a living room, not a sitting room. One of the core lessons from this user research was that people want the opportunity to help shape their public spaces. People are motivated to interact when there is evidence that a place has been used by others. While it is important for public spaces to be well maintained, small imperfections — even a bit of patina or grit — add a human quality that helps people understand that they are invited to contribute.

B Foster small interactions. People crave face-to-face interactions and opportunities for personal connection, however brief. The job of urban design is to encourage people to meet, dwell, and share a moment together in public space. That means integrating interactive features that prompt conversation: public art installations, communal picnic tables, or playgrounds with activities for parents, such as adjacent food and beverage stalls.

C Promote unique but not unapproachable. The best public spaces include recognizable features but still manage to surprise and delight. The job of design is to strike that balance, helping people orient themselves while still delivering a unique experience. That involves placing the known in the unknown (familiar elements in a new context), as well as the unknown in the known (new elements in a familiar context).

D Build in sensory variety. Variety in public space is far more than what a person can see. The job of urban design is to give people the full spectrum of sensory experiences. Smells, sounds, tastes, and textures — these are the traits people remember about a space, and during the design process they risk being overlooked in favour of exterior architectural variety. But sensory variety helps people experience a single space in a personalized context, increasing the appeal to a more diverse community.

E Set positive rules. Signs filled with lists of *don*’ts are stifling, but spaces governed by rules that are hard to decipher are just as problematic. The job of urban design is to create accessible rules that lead with positivity and inclusion. Setting positive rules includes subtle cues, like lights that indicate a space is still open, as well as explicit encouragement — rules that lead by telling community members what they can do, not what they cannot do.

F Celebrating slowing down. Part of the beauty of public space is its ability to help people escape from the speed of everyday life. The job of design is to help celebrate cherished moments of pause, which are increasingly lost to the on-demand nature of society. Striving for a perfectly planned experience eliminates the magic of chance — the chance to see an old friend or stumble onto a new treat. Public spaces are actually better when there is a bit of friction.



2 Make the most of new parks, plazas, and open spaces

According to Toronto's Parkland Strategy, the city's standardized tool for measuring park supply, per capita park space has fallen across the city. In pre-amalgamation Toronto and East York, where it



The challenge of preserving or expanding public space amidst downtown growth is familiar to high-demand cities around the world. To help address it, Sidewalk Labs proposes a new approach to street design that would reclaim space for people, and new physical and digital innovations that would help maximize public space in dense neighbourhoods.

Lively streets past and future

A black and white photograph of a crowded street scene in New York City, likely Broadway. The street is filled with a large crowd of people, many wearing hats and coats, suggesting a busy day. On the left side of the street, there are several storefronts with signs. One prominent sign reads "MFG 60". Another sign above a storefront says "MORPHY'S" and "WATCHES JEWELRY". There are also signs for "SPALDING" and "BENTIST". A large awning covers the sidewalk on the left. In the background, a streetcar is visible, and the street extends into the distance with more buildings and flags. The overall atmosphere is one of a bustling, historic urban environment.

A celebration on Yonge Street circa 1902.¹⁰ Crowds of people mingle under storefront awnings and spill out into the street, surrounding the light rail transit. Cycling had grown in popularity throughout the city in the late 19th century, and a few cyclists can be seen walking their bikes in the foreground of the photo. Credit: City of Toronto Archives

A hypothetical afternoon on Queens Quay East. By then, streets in Quayside could resemble those designed in the pre-automobile era, which provide room for all travel modes.

- A Indoor-outdoor space
- B Building Raincoats
- C Dramatic increase in greenery
- D Dedicated bike lanes
- E Below-ground smart utilities



Creating More Space

Reclaim street space for people

The term “public realm” can conjure up images of a leafy green park. But streets are the type of public space that people use most often in cities, acting as the spines of a connected public realm network. In Toronto, roughly 27 percent of space is devoted to the street network (approximately 5,617 kilometres),¹¹ while only about 13 percent of space (approximately 8,000 hectares) is devoted to parks.¹²

As in most major North American cities, many streets in Toronto were planned or retrofitted with the private vehicle as the priority. They have narrow sidewalks and rigid crosswalks, making pedestrians feel like second-class street users. Cars parked at the curb take up space that might otherwise be used for trees, bikes, or street furniture. Parents with strollers, elderly people using canes, and people using wheelchairs often struggle to navigate cracked pavement or slippery winter sidewalks. Loud utility work ties up streets for days. There is no easy way to transform a street into true public space.

Toronto has been a leader in progressive street design, including innovative “complete streets” and “green streets” policies. For example, Waterfront Toronto’s revitalization of Queens Quay West turned a previously scant sidewalk into a generous promenade and bike path now used by thousands of people daily.¹³ But only select streets realize these ambitious policies. The Sidewalk Toronto project offers an opportunity to advance the city’s

vision and demonstrate what is possible when such policies are integrated into the foundation of the neighbourhood from the outset.

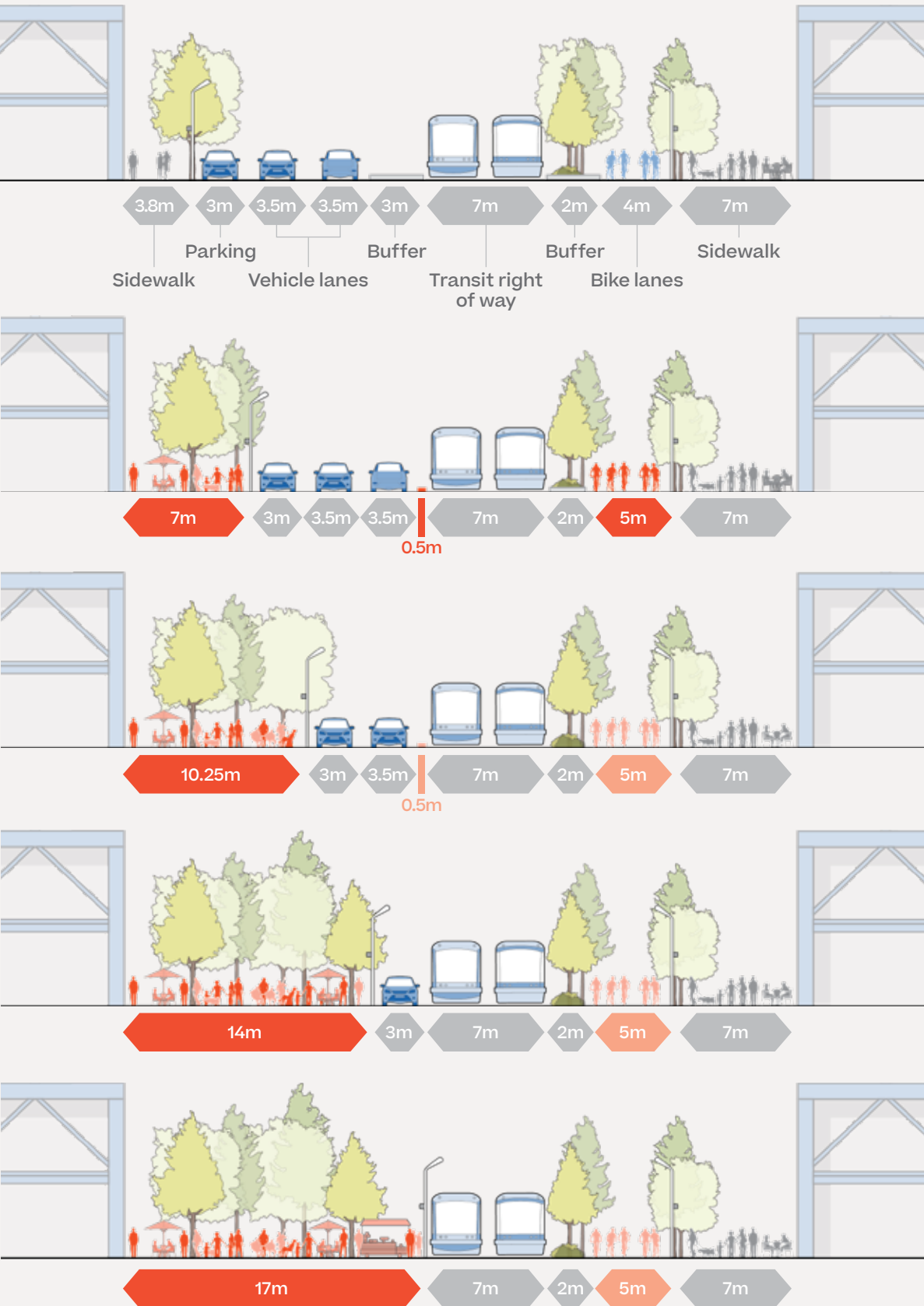
Building on new street designs emerging across the city, Sidewalk Labs plans to reclaim city streets for people, turning streets into lush environments that are truly integrated with parks, plazas, and the water — creating a vibrant, safe network of open spaces for everyone.

By designing streets around a comprehensive mobility system that prioritizes shared (and eventually self-driving) vehicles, Sidewalk Labs could dramatically shrink the amount of street space needed for parking or vehicle travel, while still enabling people to get around the city conveniently and affordably. And by implementing more flexible and resilient pavement and green infrastructure, Sidewalk Labs could advance the aims of complete and green streets policies.

On boulevards in a neighbourhood like Quayside or elsewhere in the IDEA District, this approach would enable street design to include up to 91 percent more space devoted to people and room for nearly twice as many trees compared to the existing precinct plans for Quayside, creating a new norm where space to play and linger is right outside everyone’s door.

A vibrant and safe network of open spaces can be created by reclaiming street space from parking and vehicles.

Four street design innovations that together create at least 91% more pedestrian space



Through a series of measures, Sidewalk Labs plans to capture the potential upside of a shift towards ride-hail and self-driving vehicle services to create more space for people and nature.¹⁴

Applied in Quayside, the impact of these measures would stretch across all streets, but they would be most visible on Queens Quay — a busy 38-metre boulevard that is typical of most major cities, with all forms of transit and street life.

1 Narrowing lanes and buffers. Achieving this new balance starts by narrowing the width of vehicular lanes and reducing the adjacent buffer space.

Wide lanes and buffers are planned into boulevards designed for cars travelling at fast speeds, but by prioritizing public transit, cycling, and walking, it is natural to strip back vehicular maneuvering space. European streets are already planned this way, prompting drivers to travel slower and exercise caution, while leaving more space for more sustainable travel modes. With widespread adoption of self-driving vehicles, streets with narrow lanes and buffer areas would become even more safe, because self-driving vehicles would be even more reliable drivers than people are, and could be programmed to stay within a lane's boundaries.

By applying this approach to Queens Quay East, it would be possible to safely reduce both vehicular lanes from 3.5 metres to 3.2 metres and to reduce the total amount of buffer space by 3.5 metres. With this newly created space, a bike lane could be increased by 25 percent and pedestrian space could be increased by 28 percent, over a business-as-usual scenario.

2 Reducing vehicle lanes. Next, it is possible to regain space by reducing the number of lanes devoted to vehicle traffic.

This design is enabled by reductions in private vehicle travel that would result from public transit expansions, improved cycling infrastructure, and new mobility options, such as ride-hail services that would eventually become self-driving vehicles. A coordinated mobility system that routes drivers (or self-driving vehicles) around heavy-traffic areas would also support this design shift.

By applying this approach to Queens Quay East, it could be possible to reduce a vehicle lane over time, leading to a cumulative 57 percent increase in pedestrian space over a business-as-usual scenario.

3 Sharing rights-of-way. Lastly, Sidewalk Labs plans to encourage the sharing of rights-of-way among public transit vehicles (such as light-rail vehicles) and self-driving vehicles, once those become ubiquitous.

While sharing lanes today usually results in slower transit times because cars travel at variable speeds and may get into collisions, Sidewalk Labs is studying the potential for self-driving vehicles to share the right-of-way without hindering transit efficiency. This approach would become possible because self-driving cars could be programmed to travel at the same consistent speed as a public transit vehicle and stay in a narrow lane. These capabilities would support the priority of public transit and keep service flowing smoothly, while freeing up additional space for pedestrians.

Applied to Queens Quay East, the ability to have public transit share a right-of-way with self-driving vehicles would enable the closure of another vehicular lane, leading to a cumulative 91 percent increase in pedestrian space over business as usual.

4 Eliminating curbside parking. Additional, temporary space gains could come through the ability to eliminate fixed curbside parking and replace it with flexible drop-off and pick-up zones that would be actively managed throughout the day — a concept called the “dynamic curb” that is fully compliant with the Accessibility for Ontarians with Disabilities Act (AODA).

Shared or self-driving vehicles help make this design possible, since they move immediately from one passenger to the next without needing to wait for long periods at the curb. To further discourage standing vehicles and reduce traffic congestion, Sidewalk Labs proposes to apply curbside pricing.

Applied on Queens Quay East, 3 metres of width would be reserved for flexible pick-up and drop-off zones. As demand for pick-up and drop-off declines based on time of day, those spaces could be individually reprogrammed as expansions of the sidewalk for uses like more café tables during lunch. When a space is open for pedestrians, it would be clearly marked as unavailable for vehicles through digital signage, lighting, and movable street furniture arranged to form a physical barrier.

When all dynamic curb spaces are open to pedestrians, which would occur during very low pick-up and drop-off periods (such as late evening), there would be a 118 percent increase in pedestrian space over a business-as-usual scenario.



See the “Mobility” chapter of Volume 2, on Page 22, for more information on pricing.



New Road in Brighton & Hove on the South coast of England was converted to the U.K.'s first shared street in 2007. The street was redesigned as a flat surface without curbs or crossings, giving pedestrians priority over other types of transit. Credit: Gehl

Going curbless.

To facilitate the expansion and contraction of public space throughout the day, Sidewalk Labs proposes to design a fully curbless street. Unlike a typical street with a hard curb separating street from sidewalk, the entire street would be at one consistent grade, enabling the sidewalk to grow or shrink quickly and easily.

The notion of a curbless street builds on a design innovation used for years by Europeans, particularly the Dutch. A curbless street is shared by pedestrians, cyclists, and slow-moving vehicles. Though it may seem counterintuitive at first, much like narrower lanes, this shared-streets design has been found to increase safety, because it forces drivers to be hyper-vigilant at very low speeds. There is growing global momentum around shared streets, with popularity growing in Toronto, where the first shared street opened in 2015 in the West Don Lands, shortly followed by a revamped Market Street in the St. Lawrence neighbourhood.¹⁵

Ensuring these streets remain inviting for people who are visually impaired is essential and could be accomplished through responsive sounds and tactile pavement.

A curbless street enables the quick and easy expansion and contraction of public space throughout the day.

Adaptable streets in action: Future evolution of Queens Quay



At 8 a.m., this dynamic curb space could open to vehicles dropping off commuters at work.

A future Queens Quay could have **95 trees per hectare** almost doubling the number of trees relative to Queens Quay West today.



See the “Sustainability” chapter of Volume 2, on Page 296, for more details on stormwater management.



After 8 p.m., as commuter traffic slows, select pick-up and drop-off zones could be used for mobile food pop-ups or movie screenings.

Thinking of streets as parks: Programmed and green


Taking full advantage of curbless streets and expanded sidewalks means thinking of streets more as parks — deserving of their own programming and flush with greenery. As more cities push to reimagine streets for public uses, this approach can be emulated on wide boulevards as well as smaller local streets.

Queens Quay West significantly advanced the design of tree-rich urban boulevards in Toronto and North America. In Quay-side, on Queens Quay East, Sidewalk Labs proposes to advance this goal even further and demonstrate a world-leading model for greening a major boulevard. Over time, the result would be a roughly 5,486-square-metre linear park in Quay-side, with movable tables and seats set beneath clusters of trees.

For Queens Quay East, Sidewalk Labs is proposing a forest model successional planting strategy, where a mix of understory and canopy species are clustered together and share soil in large beds. This approach to street-greening would deliver streetscapes that not only feel like parks but create the conditions to support increased biodiversity and improve the resiliency of the urban forest. It would also result in more apartments and offices having sightlines to green space than comparable downtown areas.

Additionally, all of these trees would have the 30-cubic-metre soil volume set out in the Toronto Green Standard, resulting in healthier trees.

In addition to these ecological benefits, on Queens Quay East in 2025, it would be possible to plant trees at a concentration of 59 trees per hectare, a 20 percent increase over the concentration of 49 trees per hectare achieved on Queens Quay West today. In a future Queens Quay East, when vehicle lanes could be closed thanks to self-driving vehicles and additional trees could be planted, it would be possible to achieve 95 trees per hectare,¹⁶ almost doubling the number of trees relative to Queens Quay West today.

These measures are good for the environment, because a green landscape sequesters carbon, absorbs particulates, helps mitigate the urban heat island effect, and reduces the risk of flooding.¹⁷ Green infrastructure in streets is also a key component of advanced approaches to stormwater management that design cities in concert with nature. 

Extensive behavioural evidence has found that greenery promotes the health and happiness of residents and workers more generally.¹⁸ For example, a 2015 study of Toronto found that having just 10 more trees on a block was comparable, on average, to being seven years younger in terms of self-reported health outcomes, controlling for other socio-economic factors.¹⁹

Heated, lighted, green pavement

Throughout the MIDP, there are a number of references to advanced pavement capabilities, such as heating, lighting, and permeability. Sidewalk Labs proposes to bake all these facets into its modular pavement, forming an ambitious pavement combination that has not yet been achieved.

Heated.

Heating capabilities clear snow and ice, eliminating the need for plowing and salting, improving safety, facilitating all-season use, and minimizing ecological damage.

Green.

Permeable pavement and other green street features absorb storm-water or melted snow — guiding it towards soil or underground storm-water management systems.

Lighted.

LED lights help signal changes in street use, making it easier and safer for people to take over street space for public uses, such as pop-up markets or temporary road closures.

Modular pavement and open access channels could work as a pair to increase the ease of utility work.

Modular pavers could be easily removed or replaced in less than half a day.

Deploying modular pavement to facilitate utility access and street repairs

Reclaiming streets for people involves more than just filling space left over by vehicles. It also requires reconsidering how streets are paved, and the role that streets play in providing access to underground utilities.

Traditional streets are constructed with rigid pavement that degrades over time, especially as the street is cut up to repair and install new underground utilities. Utility-related street cuts in Toronto have nearly tripled since 2000,²⁰ and the city now evaluates more than 50,000 utility work permits annually.²¹ Each cut is a time- and cost-intensive endeavour that discourages rapid innovation and investment in new infrastructure, such as fibre-optic cables that have become a basic need for homes and businesses.

To tackle this challenge, Sidewalk Labs plans to implement a modular pavement solution coupled with open access channels consisting of precast concrete sections, enabling streets and the infrastructure they house to evolve as technology changes.

Sidewalk Labs has prototyped this new approach to street design at its Toronto-based office, 307, inspired by a pilot project in Nantes, France, to address disruptive street and utility maintenance in cities. In the mid-2000s, the French Institute of Science and Technology for Transport, Development, and Networks (IFSTTAR) designed a modular paver system, consisting of hexagons that are easy to remove and replace. In IFSTTAR’s sys-

tem, one person can perform a standard utility cut in less than half a day using a small hand-operated machine featuring suction cups or levers. After testing at its research facility, IFSTTAR installed pilot streets, including one in Nantes that has endured 10 years of heavy truck traffic while remaining stable and requiring no maintenance.²²

Building on the Nantes design, Sidewalk Labs has prototyped a modular pavement system consisting of thick concrete slabs with interlocking lap joints that would provide equal or better performance as a traditional road. The sub-base would consist of a bed of granular material specifically engineered as part of the pavement section based on anticipated traffic volumes, vehicle loads, soil sub-grade characteristics, and climate.

Sidewalk Labs recognizes that this new approach to street systems would require changes to existing regulations and operations. In 2019, Sidewalk Labs plans to work with local universities and regulators to refine the prototype and develop a pavement that would work in a Toronto context.

Further, Sidewalk Labs proposes to couple modular pavement with open access channels that provide easy access to utilities. Each channel would be about 1 metre deep by 2 metres wide, with a removable lid built into the modular pavement. These channels would house “dry utilities” distribution, including power, street lighting, and information communications technologies, such as fibre optics. The channels would be fitted with spare conduits (protective tubes for electrical wiring) and would include additional capacity for the expansion of existing utilities or the emergence of new ones.

Modular pavement coupled with open access channels would have a number of important advantages over traditional pavement and buried utility systems.



Fewer disruptions.

A conventional utility street cut typically takes a full crew of road workers and trucks several days to remove and restore pavement — a disruptive, noisy process that impacts street life. With modular pavement, an equivalent utility street cut could be made by one person removing and replacing the pavers in less than half a day. The addition of open access channels further reduces the amount of time that would normally be dedicated to trench excavation and backfill, lessening the disruption to businesses, residents, visitors, and traffic. Modular pavement would also eliminate the patching that results from utility work, improving the aesthetic and texture of the street. About 20 percent of the total street surface in Toronto is cut and patched to access underground utilities over a given 30-year period.²³



Greater flexibility.

The inherent flexibility of modular pavers and open access channels would provide greater access for routine maintenance and enable streets to change over time. With conventional pavement and buried utilities, transformations to street and underground infrastructures can be cost-prohibitive, creating a significant barrier to advancements. Sidewalk Labs’ proposed system would make infrastructure transformations possible in days at a fraction of the current costs. Suddenly, it becomes fast and affordable to swap out a dozen sidewalk pavers for a community garden, or lay out a new communications infrastructure network with higher performance capabilities.



Less cracking.

In 2017, Toronto city staff received requests to fix 214,253 potholes.²⁴ Cracking in typical roadway pavement tends to occur at the sharp, 90-degree angles of rectangular slabs. Sidewalk Labs’ modular pavement prototype has a greater ability to resist wear and tear, because a hexagon’s 120-degree angles distribute vehicle weight more evenly than rectangles do, and the smaller dimension of the modular paver allows for subtle movements that reduce cracking overall. Additionally, heating capabilities (described further in the “Mobility” chapter) would reduce damage from the seasonal freeze-and-thaw cycle.



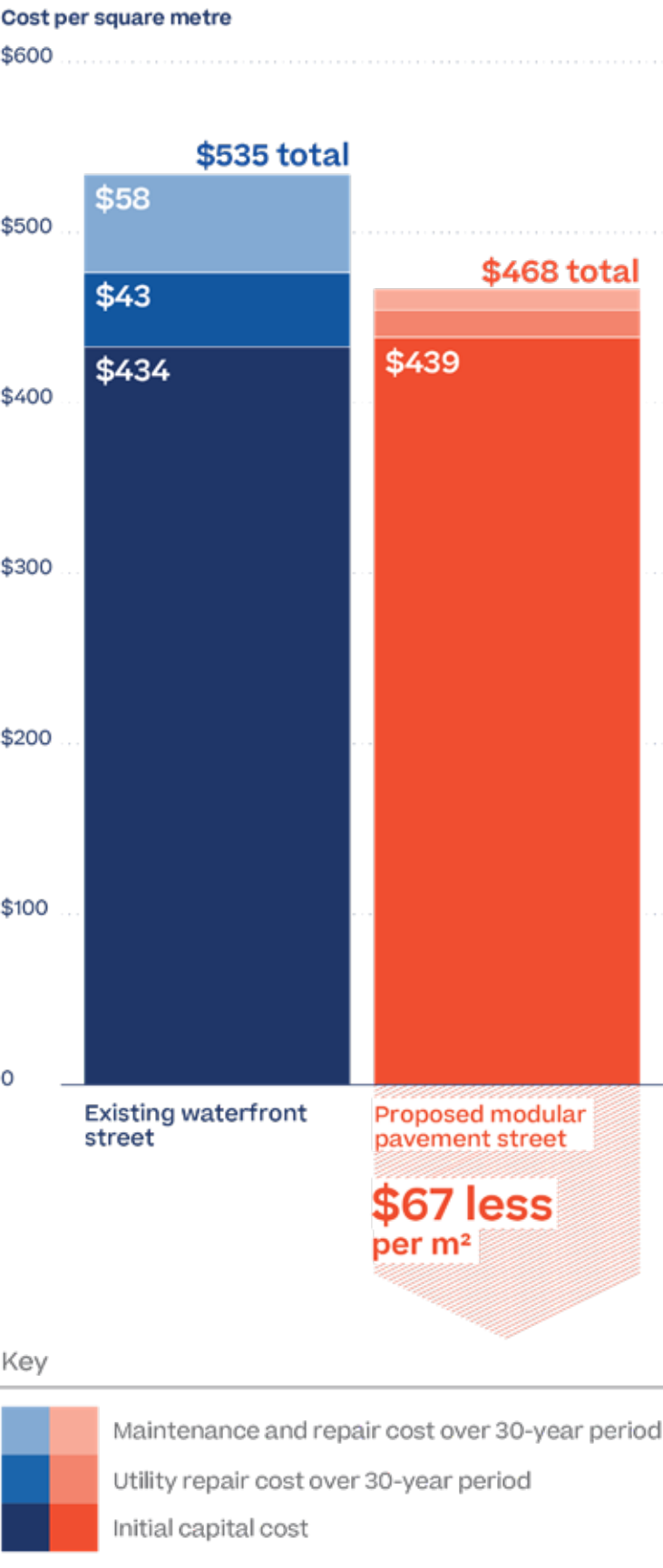
Lower long-term cost.

Sidewalk Labs estimates that over a 30-year period — the standard unit of time used to analyze road performance — modular pavement coupled with an open access channel system would be 13 percent less expensive per square metre than the standard waterfront streetscape in Toronto today. Installation costs for pavement construction would be similar, as would the cost of constructing the open access channels (relative to burying utilities). But savings would accrue over time due to significantly lower maintenance and repair costs (\$12 per square metre versus \$58) and the lower cost of utility repair that results from easier access and accelerated road work (\$17 per square metre versus \$43).²⁵

In addition to being less costly to maintain and repair, modular pavement makes it fast and affordable to use street space in new ways.

Modular: 13% less costly than standard pavement

Modular pavement coupled with open access channels can create savings driven by lower maintenance and repair costs, as well as the lower cost of utility repair.



Make the most of new parks, plazas, and open spaces

Reclaiming streets for people is a critical step in creating more public space in downtown neighbourhoods, but wider sidewalks are not a replacement for traditional parks, plazas, and open spaces. In fast-growing cities like Toronto, population and market pressures can lead new developments to devote as much space as possible to buildings. That density is critical, but if it comes at the expense of a vibrant network of open space, the quality of life suffers.

Toronto is ahead of the curve in planning a proactive response. The city's Parkland Strategy includes a robust tool for mapping priority areas for new parks, and its 20-year Facilities Master Plan outlines a sound, future-looking strategy for delivering recreation outposts.²⁶

Sidewalk Labs plans to build on such efforts to ensure access to high-quality open spaces that meet the needs of a community in two key ways. First, it has developed a **data-driven planning and evaluation tool called "generative design" to identify opportunities for more open spaces that complement a city's existing park network**. Second, Sidewalk Labs plans to embrace multi-use, flexible public space design to deliver parks, plazas, and open spaces that are better able to accommodate the diverse needs of an expanding population.

Maximizing open spaces using "generative design"

Urban planning involves navigating a series of tradeoffs. For example, achieving one development objective (such as access to sunlight in public spaces) might impact the ability to achieve another (such as building higher for population density).

To help inform that decision-making process, Sidewalk Labs has developed a generative design tool that uses computational design, machine learning, and improved simulations to show urban planners many possible choices and their impacts, often producing surprising results. Planners could then use these insights to evaluate key decisions, with increased confidence in how their plans would play out in real life. They could also use the tool to show stakeholders how their concerns would be represented in a development.

For the Sidewalk Toronto project, Sidewalk Labs plans to use the tool to explore this outcome in areas across the IDEA District, such as Villiers Island.

Planning for more courtyards.

Villiers Island is already planned to be encircled by one of the world's most extraordinary new parks through the naturalization of the Don River. This 16-hectare park will be a destination for the entire region.²⁷

In Villiers East, a new pedestrian-first street network could be designed to create a series of intimate walkways and courtyards.



Because there is so much park space dedicated to the island's perimeter, there are no dedicated parks in the neighbourhood's interior.

Generative design could be used in the Villiers development process to enhance the amount of quality open space in the neighbourhood's interior, while still increasing density and thus important access to housing and jobs. The existing Villiers Precinct Plan contemplates the idea of breaking down the development blocks into series of small buildings with pedestrian courtyards, creating more intimate environments where residents can mingle. As planning proceeds in Villiers, the generative design tool could help evaluate the performance of different courtyard options by running thousands of simulations that weigh factors such as building massing, lighting, and wind.

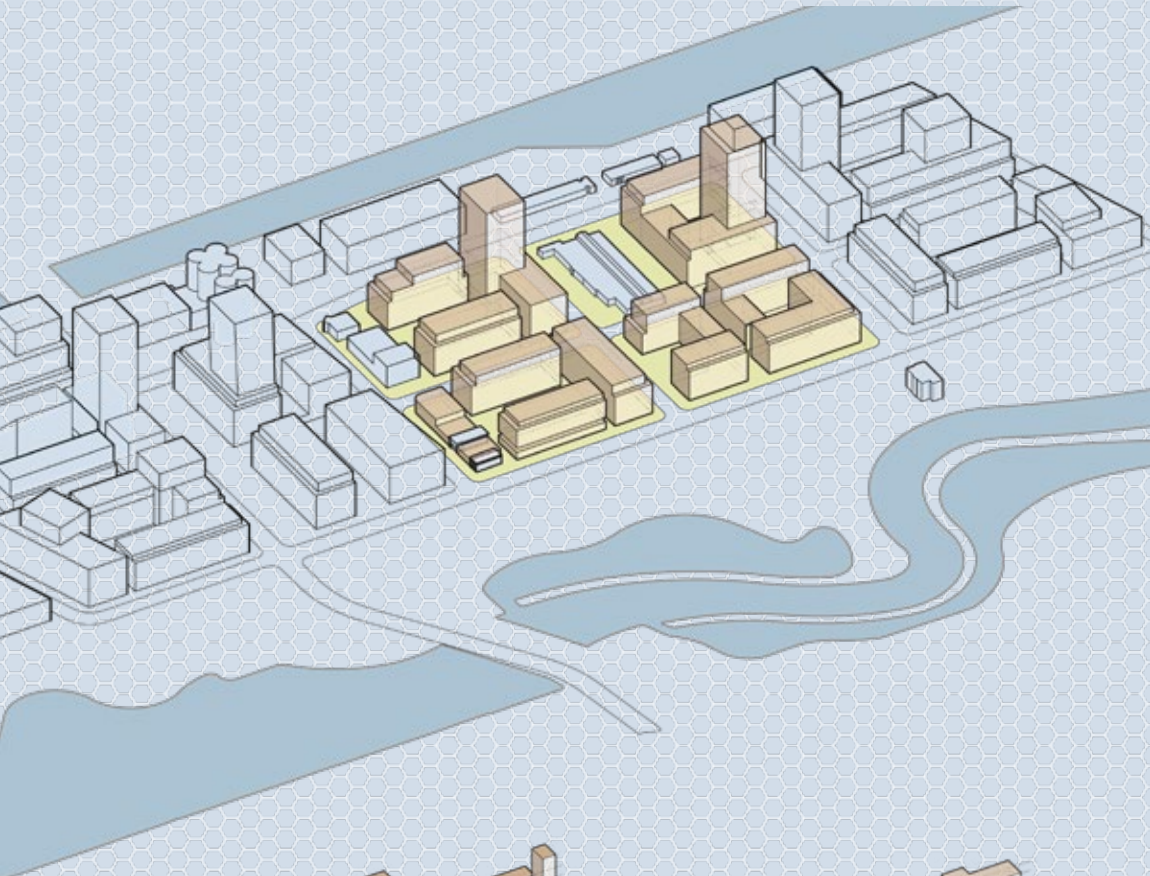
To test the tool's capabilities, Sidewalk Labs conducted a preliminary study of possible courtyard configurations for a two-by-two block area of Villiers, aiming to optimize for three variables: percentage of open space, sunlight access in the courtyard, and density (gross floor

area). In an initial run, the tool generated and analyzed thousands of permutations and surfaced roughly 400 plans that outperformed the precinct plan on these three specific variables (see Page 142). For example, one scenario (Run #01140) demonstrated the ability to increase open space by 12.6 percent, while still increasing daylight access by 8.6 percent and density by 496,781 square feet.²⁸

The resulting interior spaces would play an important role in supplementing the city's park network as intimate neighbourhood spaces, each distinct from the other. These spaces would create important pedestrian connections across the island and provide residents and workers with access to open space right outside their door. They could resemble, for example, the open areas that link certain housing blocks in Helsinki, or the alleys and courtyards that link Hutongs in Beijing.²⁹

Through applying this planning and evaluation tool across development areas such as Villiers, planners could finesse buildings and street grids to carve out these pocket-sized, quality open spaces, creating forums for community bonding.

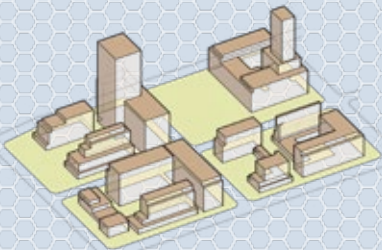
Helping planners analyze thousands of options



A generative design analysis of a two-by-two block in Villiers Island produced roughly 400 plans (out of thousands of permutations) that outperformed the existing precinct plan on open space, daylight access, and density.

Precinct plan

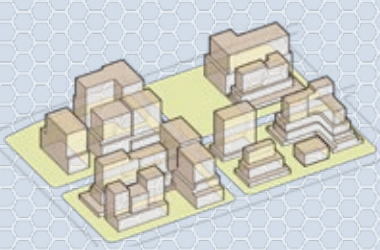
Open space	45.3%
Daylight access	49%
Total GFA	1,513,144 ft²



Generative design #00530

Open space	5.2% increase
Daylight access	13.6% increase
Total GFA	+24,243 ft²

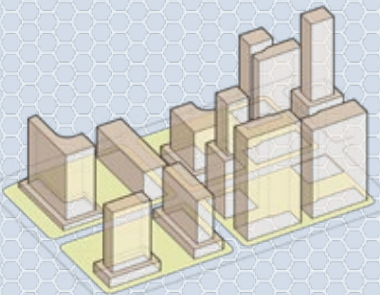
This run was created through making marginal changes to the precinct plan; it has small increases in open space and density, and a large increase in daylight access.



Generative design #00469

Open space	3.31% increase
Daylight access	20.61% increase
Total GFA	+196,710 ft²

This run was created through making moderate changes to the precinct plan; it has a small increase in open space, a medium increase in density, and a large increase in daylight access.



Generative design #01140

Open space	12.6% increase
Daylight access	8.6% increase
Total GFA	+496,781 ft²

This run was created through making significant changes to the precinct plan; it has a medium increase in daylight access, and a large increase in open space and density.

Flexible open spaces can be quickly reconfigured by day or by season.

Designing flexibility into parks, plazas, and water spaces

A generative design tool could help urban planners map out the distribution of open spaces to ensure equitable access across a given development area. Another way to ensure access is to design facilities that are more flexible, enabling them to cater to the widest possible variety of people.

The traditional approach to designing open spaces is to plan them with a fairly prescribed purpose in mind. A swingset here, a baseball diamond there, a basketball court in another corner. Once the space opens, the community is expected to use it in those very specific ways. But such inflexible designs often struggle to meet the diverse needs of a growing population and accommodate evolving preferences.

Like many cities, Toronto built a lot of its parks and recreational facilities decades ago; its average rec centre is nearly 40 years old.³⁰ Many favourite activities from back then have lost their appeal: the number of youth enrolling in hockey has shrunk, while sports like soccer have become more popular. Demographics have shifted; walking tracks and pickleball courts are now big hits with the city’s growing elderly population. New trends and technologies arrive. Community kitchens are all the rage, and Wi-Fi has become a necessity when delivering new public space.

This shift underscores a larger insight: Given the constraints on open land in dense urban cores, it is critical for these types of spaces to be designed in ways that are flexible, and therefore more usable, by more people over time.

To create a network of open spaces that can be shaped and reshaped in response to community needs, Sidewalk Labs plans to infuse its parks, plazas, and water spaces with significant flexibility from the start. Using design practices focused on multi-use spaces and technology advances around movable infrastructure, Sidewalk Labs proposes to create multi-purpose parks that could serve a host of different users, flexible plazas that could be quickly reconfigured by day or by season, and adaptable water spaces that could draw people to the lake year-round.

Flexible principles such as play features and movable furniture can help maximize the diversity of uses within urban parks.

Multi-purpose parks.

Cities around the world have started to make better use of their limited park space through multi-purpose design and new technology tools.

The Athletic Exploratorium in Odense, Denmark, has a topography designed to facilitate a multitude of different sporting events.³¹ Klyde Warren Park in Dallas brings together diverse residents from across the city and is able to fit a stage, a splash pad, an outdoor reading and games room, a dog run, food, and community art in a 2.1 hectares park on top of a freeway.³²

Low-cost lighting makes it possible to imagine a single court embedded with lights that could redefine its space for basketball or street hockey at the push of a button.

Sidewalk Labs plans to work with Waterfront Toronto and the City of Toronto to maximize the diversity of uses within urban parks, with a number of flexible principles in mind.

Designing Silo Park using multi-purpose planning principles

By incorporating flexibility into its foundation, Silo Park can become a lively public space that brings together people of all ages across all seasons.



In Quayside, Sidewalk Labs hopes to work with Waterfront Toronto and Toronto Parks, Forestry, and Recreation to build multi-purpose recreational infrastructure into Silo Park by applying the following principles:

- A All courts and fields must be designed to accommodate at least three sports in the same space.
- B All recreational spaces must be designed to be active and accessible year-round.
- C At least one “play” feature must be incorporated that has activities designed for users of all ages.
- D At least 90 percent of furniture must be easily movable.
- E There must be a space for regular food and beverage.

Initially, these principles could inform the approach to Silo Park in Quayside and, based on their success there, potentially be adopted elsewhere.

Campo de' Fiori, in Rome, uses flexible plaza design to shift uses throughout the day. Credit: iStock



Flexible plazas.

The world’s best plazas are naturally flexible, giving the same space many different lives. Often this goal is achieved with simple, lightweight, adjustable street furniture that people can move around to meet their needs. In Utrecht, for example, visitors can “pop-up” a series of benches and other street furniture elements on demand.³³ In Rome, the Campo de’ Fiori transforms from market to nightlife destination by shifting around stalls and seating throughout the day.³⁴

Drawing from these precedents, Sidewalk Labs plans to design flexible plazas that balance the stability of permanent features with the spaces that are open to ongoing community programming.

For example, in Quayside, Sidewalk Labs plans to design Parliament Plaza with convertible capabilities in mind. On a Saturday in summer, the plaza could be totally flat. Children could play in a splash pad while parents stroll through the markets spilling out from the stoa. In the evening, the splash pad could convert into mist machines that form a public art installation when mixed with movable lighting from a nearby canopy, turning the whole space into an interactive public theatre. In winter, that same flat splash pad surface could be turned into a free skating area.

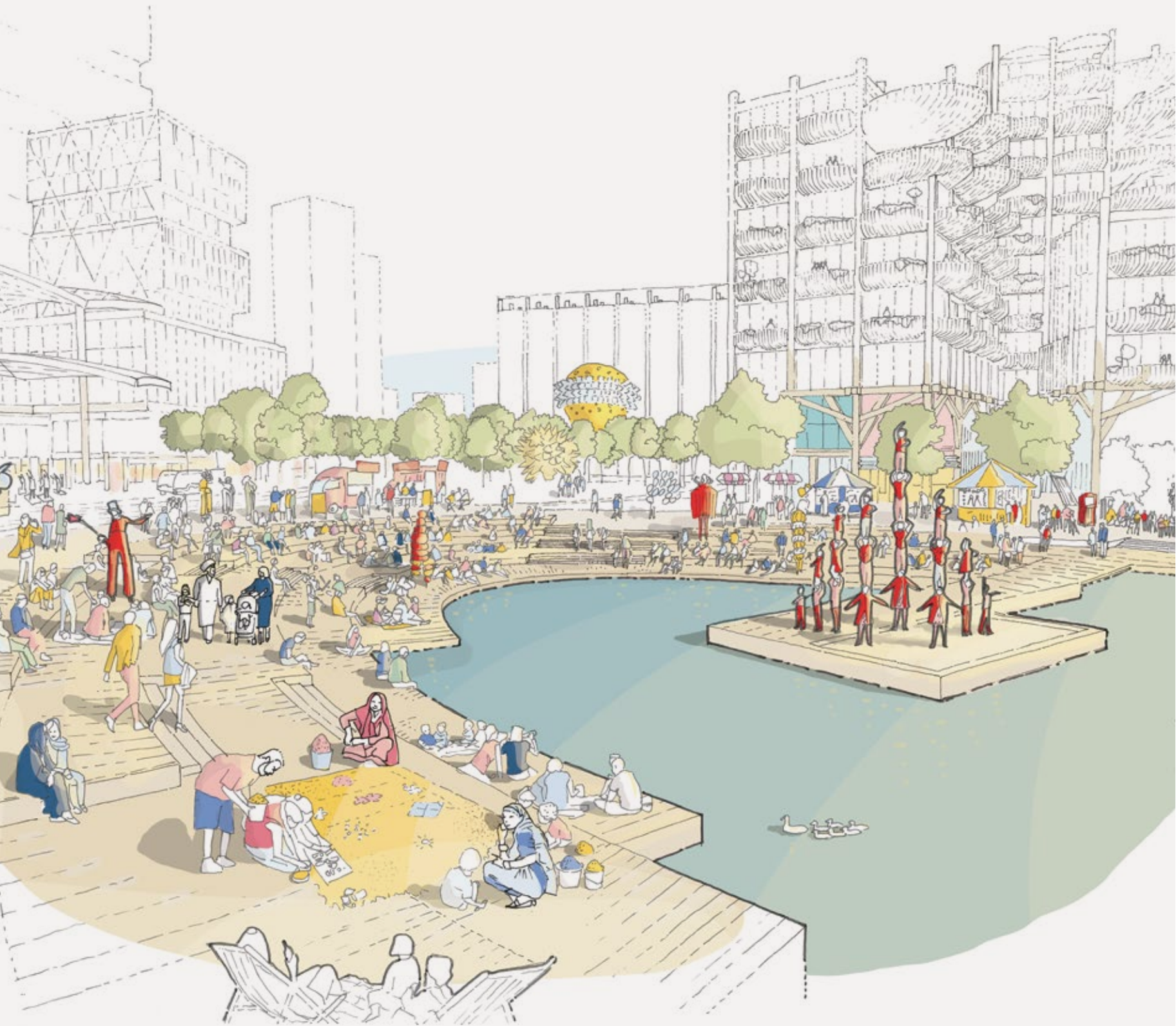
Parliament Plaza

At the heart of Quayside, Parliament Plaza would be a flexible space well-suited for markets, public art installations, all-ages play, and events that integrate with surrounding buildings.



Parliament Slip

At the 6,000-square-metre Parliament Slip, residents, workers, and visitors could connect directly with the water via a new “cove” feature (Parliament Cove), as well as a stretch of dedicated parkland running along the slip’s eastern edge.



The Islands Brygge Harbour Bath, in Copenhagen, helps to connect people to the water for recreation or travel. Credit: Rasmus Hjortshøj for Bjarke Ingels Group



Water-bound spaces.

Water-bound spaces often struggle to make room for all the community groups who hope to use the water in different ways, from water rituals to kayaking to fishing to sailing. But many cities have made progress improving the use of their waterfront spaces through a variety of means.

In Toronto, the Port Lands Flood Protection work includes a plan to increase water access through a naturalized Don River mouth. This new park will provide beaches, kayak launches, and wetlands, all features that do not currently exist on the central waterfront today. In Copenhagen, the harbour baths carve out space for lounging and swimming in the middle of downtown; public harbour buses, recreational motor boats, and even bookable floating hot tubs all share the waterway.³⁵ More than 200 *splavs* — Serbian for “floating lounges” — anchor themselves in Belgrade’s rivers, appealing to a diverse crowd.³⁶

Inspired by these precedents, Sidewalk Labs proposes to deploy a series of barges in Lake Ontario that are designed for community water-based programming across the seasons. At Quayside’s Parliament Slip and throughout Keating Channel, a series of five-by-five-metre barges would be designed to accommodate a range of rotating uses: a research field station to study local ecology, a waterfront classroom, food growing on water (a progressive technique known as “aquaponics”), bars and cafés, or more. Every season would present a new programming opportunity for all ages.



Making Open Space More Usable More of the Time



Key Goals

1
Reinvent the role
of the ground
floor

2
Design an
outdoor comfort
system for all
seasons

Reclaiming street space and maximizing access to parks and plazas is the start of bringing more people together in the public realm. The next step is creating the conditions to ensure that those spaces remain active throughout the day, across the seasons, and over the decades as neighbourhoods evolve.

Promoting vibrant street life is a challenge that continues to vex many cities around the world, including Toronto. The separation of 9-to-5 business districts from the places where people live leaves parts of the city vacant at night, a challenge Toronto is trying to address through its Complete Streets Guidelines. Harsh winters empty out public spaces,³⁷ and the shift to an online, on-demand economy threatens to uproot the role of ground-floor retail.

To help tackle that challenge, Sidewalk Labs has a two-part strategy that integrates new digital and design capabilities to make public space more usable more of the time.



The first part of the strategy leverages adaptable building structures and flexible leasing tools to create ground-floor spaces that would be far more diverse, active, and inviting than traditional ground-floor retail strips. The second part uses real-time climate data and a set of deployable weather-mitigation fixtures — such as retractable awnings and inflatable shelters — to create an outdoor comfort system that would dramatically expand the amount of time the public realm is usable.



Reinvent the role of the ground floor

There is a long history of street-level markets serving as vibrant public spaces. One of the most iconic examples is the agora of Ancient Greece.³⁸ These central squares were not just places for merchants to sell things, but also civic centres meant for general community engagement. They were framed by covered walkways called “stoa,” where vendors sold goods and the public gathered to debate new ideas — from the Hippocratic Oath, to the Pythagorean Theorem, to the practice of democracy itself.

Modern cities often reserve the ground floor for retail or expansive office lobbies, but those spaces tend to be closed off from the street and built largely for commercial purposes. As a result, the ground floor plays a limited role in promoting street life, and is constrained in its ability to accommodate other community uses.

The past decade has also seen traditional retailers dying off, as the meteoric rise of e-commerce, the rigidity of long-term lease agreements, and soaring rents that incentivize landlords to hold out for high-value chains have led to papered storefronts. The retailers who have performed best amid these shifts are those who recognize that their stores are less about selling things and more about creating memorable experiences.³⁹

**Ground floors
should be about
more than retail.
They should be
forums for civic
exchange.**

Toronto's retail corridors have fared better than retail corridors in other major cities, like New York and London, in part because Canadians have been slower to adopt online shopping, with per capita annual online spending in Canada roughly half that in America (\$2,319 to \$4,552).⁴⁰ But Toronto has seen a few high-profile closures, including the 2018 shuttering of Sears Canada.⁴¹ As online shopping continues to grow, the future of brick and mortar remains unknown.

These conditions set the stage for the next evolution of the ground floor: a return to the public markets of an earlier time, blending an assortment of uses from maker spaces to community meeting spots to food stalls, as well as traditional retail stores.

To catalyze this shift, Sidewalk Labs plans to devote its ground floors to a 21st-century stoa structure — with a flexible, bare bones core and shell system that opens to the street, supplemented by a digitally managed leasing and operations platform. These tools would allow a supply of ground floor space to stay in lock-step with the market forces increasingly driving towards experience-based consumption. As in Ancient Greece, the stoa would enable ground floors to be about far more than just selling goods: they would feel like a bustling marketplace that spills onto the street, where people could converge to exchange ideas.

Ground-floor space that is activated 33% more time each day

A typical street in Quayside would have a more diverse program mix and more flexible co-tenancy options, leading to three hours more daily activity relative to the weighted average of Toronto street activity today.

9hrs

10am - 7pm

Average street activity today across destination, local, and downtown streets

12hrs

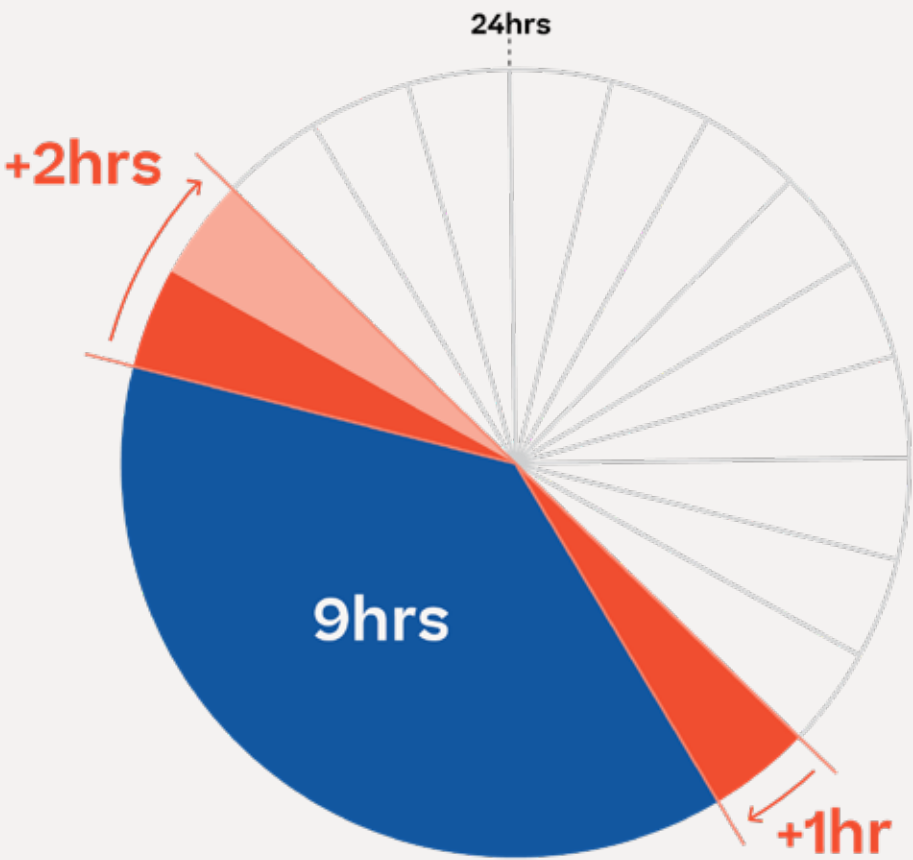
9am - 9pm

Average street activity for the Sidewalk Toronto project

+33%*

More street activity

* A street is considered active when one-third of businesses or more are open.



Diverse program mix



Quayside's stoa space is designed to accommodate a more diverse program than ground-floor spaces on typical downtown, local, and destination streets elsewhere in Toronto, enabling an ongoing mix of traditional retailers, pop-ups, community spaces, light production, and other uses.

Co-tenancy options



Tenants with complementary opening hours (such as a retailer and a bar) would be able to share a lease, and Sidewalk Labs estimates that 20 percent of tenants would use this co-tenancy option, extending the projected street activity even more. Stoa naturally encourages the sharing of space by different types of tenants, and co-tenancy would be further encouraged through Sidewalk Labs' proposed digital leasing and operations platform.

At the neighbourhood scale of Quayside, the planned diverse mix of ground-floor tenants would help expand the amount of time the street is active by two hours a day, relative to other Toronto retail corridors. In addition, a new digital platform designed to encourage co-tenancy and use of space during off-peak hours could increase activity by an additional hour a day. Together these advances would produce a 33 percent increase in the amount of time the street is active.⁴²

At a greater development scale across the IDEA District, ground floors could become diverse micro-neighbourhoods unto themselves. Keating Channel could become the new heart of an integrated neighbourhood that spans the canal, with both sides brought to life through small retail stalls on the water's edge that could be connected to large, open-air market spaces. Within the heart of Villiers Island, stoa could spill into neighbourhood plazas at key intersections. In old industrial buildings, large caverns could become hubs of activity, from markets to light manufacturing to community services.

Reimagining ground-floor space in this way would bring the public realm that much closer to the goal of getting people to spend more time outdoors together.

Providing a flexible shell for exploration

Today, most ground floors are constructed to meet the needs of a new tenant that is expected to move in on Day One. If a building is intended for a restaurant, the developer would design the ground floor with servicing for a kitchen and a dining area. If a building is intended for an industrial user, the developer would design a factory floor. The rigidity of these fit-outs means accommodating a new layout in the future may be cost-prohibitive.

Sidewalk Labs small research grant

The changing face of street-level commerce

In 1970, Toronto pioneered the now-common concept of business improvement districts to revitalize neighbourhood shopping (the Bloor West Village BIA was the first in North America).⁴³ Today, new trends reshape the urban retail landscape, and Toronto continues to push urban retail innovation. A report by Ryerson University's School of Urban and Regional Planning, commissioned by Sidewalk Labs,⁴⁴ pulled out a few of these innovative retail concepts:



Credit: Vince Talotta via Getty Images

Market 707.

Repurposed shipping containers on the grounds of the Scadding Court Community Centre, filled with pop-up retail concepts, from food vendors to tattoo parlors.⁴⁵ First established in 2011, the containers not only offer short-term leases, but Scadding Court also provides wrap-around entrepreneurship programs for first-time business owners.

The Nooks.

Located on Danforth at Woodbine, the Nooks is an incubator for artisans and producers of hand-made goods. As many as 120 entrepreneurs sell their goods in exchange for a membership fee. Like Market 707, the Nooks also offers business coaching and workshops for its members.

Concepts such as these have key ingredients in common that respond to the realities of urban retailing today: affordable spaces, shorter lease terms, shared services, and entrepreneurial supports.

Stoa: Designed to create flexible ground floors

A series of architectural choices enable stoa space to change inexpensively over time, accommodate a range of uses, and support businesses as they grow.



- A Double-storey ceiling heights** create sufficient vertical space for a variety of interior uses.
- B Spacious column bays** make it easier to subdivide the same space for new uses.
- C Deconstructable partitions** (50 percent of walls) are designed for faster renovations, reducing vacancy times.

- D Utilities** wired through flexible baseboards — instead of being embedded into walls — enable flexible walls to be moved or removed with far less demolition work.
- E Retractable facades** open to the outdoors for all-season programming.
- F Building Raincoats** protect sidewalks adjacent to stoa spaces in from rain or snow.

- G Movable kiosks** can be easily moved outside for a livelier market experience.
- H Exposed timber walls** support the greater integration of nature into the urban environment.
- I Modular ceiling grids**, with lighting and AV plug-ins, further support accelerated renovation.



See the “Buildings and Housing” chapter of Volume 2, on Page 202, for more details on adaptable buildings.

To address this challenge, stoa would be built with a flexible interior to easily allow for a wide array of reconfigurations. The structural bones of stoa would consist of an open floor plate with high ceiling height and spacious column bays, offering a shell in which tenants can experiment with a variety of layouts and store concepts using a new system of flexible interior walls. Designed with “plug and play” utility connections that make mechanical, plumbing, and electrical systems far more versatile, these walls would enable operators to safely renovate interiors much faster than usual. In addition, the ceiling would host a modular grid that would allow for easy lighting and audio-visual customization. The finishings could be warm and neutral — for example, a polished concrete floor and an exposed timber structure — providing a durable framework for each tenant’s fit out.

At key locations, the stoa would have double-height ceilings and retractable facades that could be opened to the outdoors, enabling them to be populated with stalls that could be moved outside to act as kiosks for a true market experience.

In practice, these features mean that the stoa could, with relatively minimal intervention, support uses ranging from a grocery store with broad aisles to a small network of art studios. Similarly, a 10-person startup could rent out a small, shared temporary space within the stoa, then take over larger and larger spaces as it balloons to 100 people, rather than having to endure the cost of relocating.

Of course, some fit-outs — like creating a commercial kitchen, which requires unique servicing — would still be challenging. But Sidewalk Labs estimates that costs associated with structural and mechanical elements of renovation, such as moving walls and electrical wiring, would decline by roughly 50 percent. So if it would typically take a landlord \$40 per square foot to conduct these aspects of a renovation, it would instead only take \$20 per square foot.

In addition, tenants who choose to take full advantage of Sidewalk Labs’ prefabricated components and finishings could reap additional cost savings.

Stoa can support a range of uses, from a grocery store with broad aisles to a small network of art studios.

Enabling an all-day ground floor

Stoa's flexible physical and digital infrastructure enables ground-floor space to evolve over time: from day to night, across seasons, and over long-term economic cycles.

Day to night.

Traditional ground-floor spaces are leased and designed by an individual tenant. If that tenant chooses to stay open just for five hours at night, street life suffers for the rest of the day. Many developers and planners strive for roughly 18 hours of street life, but they struggle to find tenants to help them realize this ambition.

A fleet of startups are starting to show how tenants with different peak hours can more effectively share spaces. In Toronto, Flexday converts restaurants into co-working spaces during the morning and early afternoon, before dinner prep commences.⁴⁶

Sidewalk Labs proposes to make this type of sharing easier through a digital leasing and operations service (see Page 164), which would help to co-locate symbiotic businesses or organizations that have different service hours, such as a retail space and a coffee shop.

Season to season.

Business demand and community needs often fluctuate seasonally.⁴⁷ Large, garage door-style systems in some stoa spaces would make it easy to move stalls out into open spaces, helping tenants stay active over the course of the year, and blend into bustling street life.

Along these indoor-outdoor spaces, retractable canopies and deployable building “Raincoats” attached to facades would enable stoa to be open-air in warmer months (see Page 170 for more details). In cooler months, building Raincoats would help protect stoa from rain, snow, and wind, in response to real-time weather data. These weather-protection capabilities would make it easy for stoa spaces to change uses to fit the temperature. For example, the stoa could play host to an open-air cinema during the summer and close off to become a space for students to study in the winter.

Long-term.

While buildings can be built to last centuries, the industries and uses that dominate the ground floor tend to shift over decade-long cycles. The rise of e-commerce is accelerating these natural fluctuations, even transforming sectors that are typically known for their stability, like grocery.⁴⁸ In today's on-demand world, brands and up-and-coming retailers want flexibility — a brick-and-mortar arrangement as easy to adjust as a website.⁴⁹

Stoa can go where the economy is headed. For example, as stores become less about on-site purchases and more about experience, retailers might opt to ship more items directly from an off-site warehouse to customers' homes. In this scenario, a stoa retail tenant could start with a business-as-usual amount of inventory in store, and scale it back as the store moves towards this new model of commerce.

Similarly, as self-driving vehicles become more common, a two-storey ground-floor car dealership could shrink down to a one-storey showroom, and eventually down to a micro stall for on-demand rentals.

Sidewalk Labs estimates that costs associated with renovation, such as moving walls and electrical wiring, would decline by roughly 50 percent.

How stoa enables multiple uses across the same day

The flexibility of the space makes it possible for a morning flower shop to become an evening jazz club.

A flower shop could stay open from 9 a.m. to 5 p.m., before closing to receive a nighttime jazz club.



When the flower market closes, it could go through a quick clean-up and furniture could be shifted around to prepare for opening as a jazz club in the evening.





This same stoa space could be occupied by a jazz club from 7 p.m. to midnight.

Helping businesses open and grow with a digital platform

Ground-floor tenants increasingly want their physical sites to be as easy to open and evolve as their digital sites. Stoa's structural shell provides a baseline of flexibility. Another key innovation is a digital leasing and operations platform — a concept Sidewalk Labs is calling Seed Space — which would provide services that make it easier for businesses to establish a physical presence, and test out new store concepts in Quayside.

Today, there are lots of barriers to opening up a new physical retail footprint, especially for first timers. In Toronto, a typical commercial lease ranges from five to 10 years, and landlords often do not want to take on the risk of a short-term (or uncredited) tenant.⁵⁰ From the tenant perspective, opening a business requires not only locating the right space, but also having the capital to pay for it, finding staff to do everything from check-out to cleaning, and doing enough market research to make smart decisions on questions like branding and hours.⁵¹

These challenges are magnified for young businesses, like mom-and-pop startups that add character and opportunity to a neighbourhood, as well as online businesses that may want to try out a physical presence without a long-term commitment. But they also affect more established retailers each time they open a new storefront.

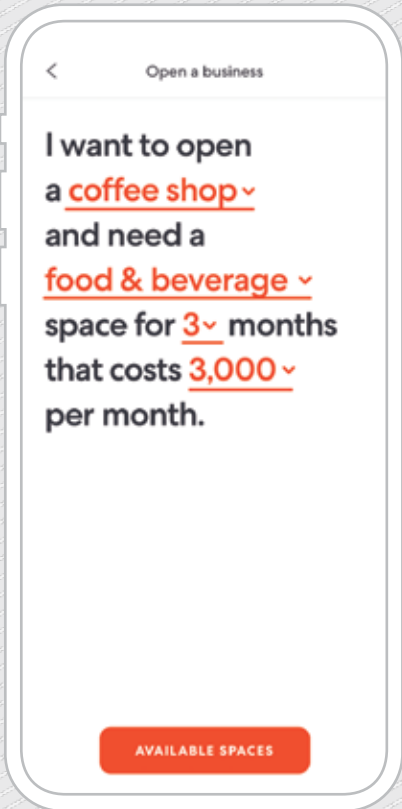
Companies such as Appear Here, Storefront, and Toronto-based UpperCase are helping to de-risk brick and mortar for emerging retailers by providing short-term space commitments, and, in some cases, starting to offer fit-out services and even ongoing operational support. They are also de-risking these short-term spaces by creating online marketplaces that can match property owners to a ready population of potential tenants from around the world.

In Quayside, Sidewalk Labs plans to build on these best-in-class concepts, offering a suite of services ranging from on-demand leasing to help with permitting to opt-in customer analytics.

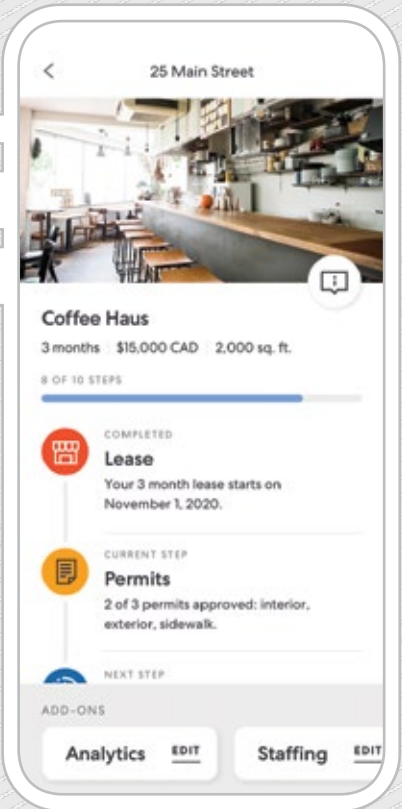
These tools — which are intended to supplement, not replace, brokers — can help tenants by moving some of the big, upfront costs that are normally associated with real estate into more manageable variable costs. For landlords, these innovations provide a marketplace, and reduce short-term space vacancies and downtime between leases. Seed Space services would make it possible for neighbourhoods to keep the street more active, and for landlords to take risks on more dynamic tenants, who might not be equipped or willing to sign up for a five- or 10-year contract.

Innovation spotlight

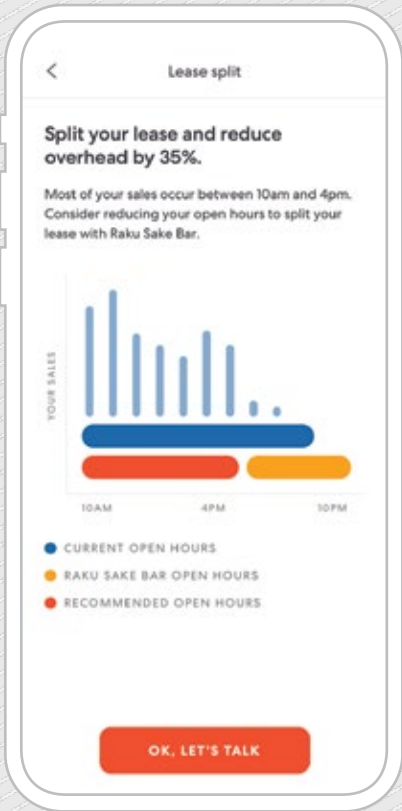
How Seed Space empowers businesses



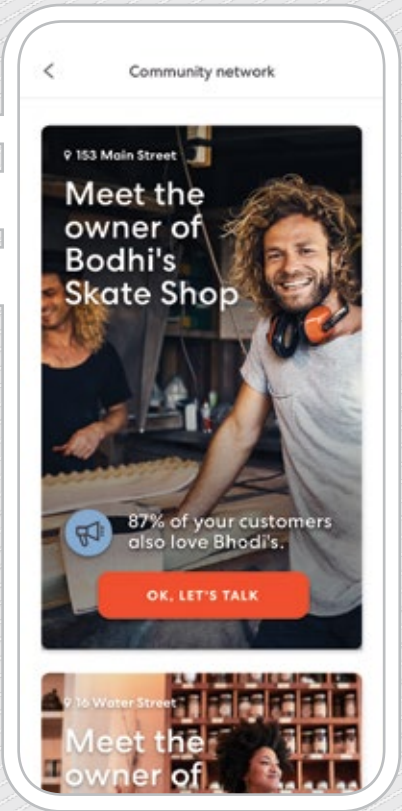
Flexible leases. Flexible lease terms and tailored space recommendations would break down barriers to entry and open pathways to low-risk explorations.



Guided process. A guided and expedited process would offer full transparency of the necessary steps, with expertise to support planning and management for a space.



Performance tips. Adaptable spaces and leases would help merchants maximize space utilization while fostering joint ventures.



Merchant collectives. A nurtured network of merchants could bond and unite for better business and neighbour experiences.

Committing to a diversity of businesses

It is important that businesses of all sizes — and entrepreneurs from underrepresented backgrounds — have the opportunity to partake in the growth process enabled by stoa’s flexible structure and the Seed Space platform. Sidewalk Labs plans to ensure this diversity in two ways: an incubator program, and shared equipment and facilities for ground-floor tenants.

1

Small business incubator.

In Quayside, Sidewalk Labs plans to sponsor a small business incubator designed to help those without access to capital open up shop. A pilot of this effort took place during summer of 2018 at Sidewalk Labs’ main Toronto office, 307. Sidewalk Labs hosted new Canadian food entrepreneurs who had previously launched their first retail business with support from the Scadding Court Community Centre at Market 707, on the corner of Dundas and Bathurst.⁵²

Sidewalk Labs plans to issue a Request for Proposal for partners to help launch and operate this incubator program. That partner would help source, vet, and provide requisite training to entrepreneurs. In turn, as part of the incubator, Sidewalk Labs would reserve a portion of stalls at below-market rents, enabling the cohort to test ideas and sharpen business skills in a low-risk environment.

2

Shared ground-floor facilities.

In Quayside, Sidewalk Labs also plans to leverage shared equipment and facilities to help local makers thrive in three priority sectors: public food markets, experiential arts, and production uses.

To encourage public food markets to participate in the open stoa concept, vendors would have access to a shared commercial kitchen, allowing them to cook food on-site. To encourage the arts, creatives would have access to shared fabrication and digital tools in the Civic and Cultural Assembly, along with affordable spaces to produce and present works, drawing on the tremendous talent in Toronto, including those who have graduated from Artscape Daniels Launchpad, a short walk away at 130 Queens Quay East. And to encourage production uses, stoa would provide shared fabrication equipment and create opportunities for crossover between production and other industries — be it retail, arts and culture, or food and beverage.



Making Open Space
More Usable More of the Time

Design an outdoor comfort system for all seasons

Even when the conditions are right to promote a vibrant ground floor, the weather plays a big role in determining how much time people spend outdoors. While the seasons drive the character of public life in Toronto — from summer day trips to the Islands, to fall pumpkin parades across the city — it is no secret that outdoor activity is concentrated in the six-month period from late April through October, when the weather is pleasant.

For centuries, cities have used architecture to moderate the weather and keep public life active on the street. In the late 1800s, as historical photographs show, Toronto was filled with a maze of awnings that extended from storefronts and glass arcades to cover alleyways, providing protection from the sun, snow, and rain.

This approach of mitigating outdoor weather changed in the 20th century, as technologies like central heating and air-conditioning shifted activity indoors to climate-controlled, sealed environments. In Toronto, from November through April, the underground PATH network is the centre of gravity for commuting, and the home is the centre of gravity for social activity. Popular outdoor hangouts like Queen West and Trinity Bellwoods quiet down.

That effect is particularly noticeable on the waterfront, which is uniquely exposed

to chilly winds. Using climate data collected at Billy Bishop Airport and a standard metric called the Universal Thermal Climate Index, Sidewalk Labs calculated that the waterfront is only comfortable, on average, for 30 percent of the year. The rest of the year is either too hot (29 percent), too cold (37 percent), or too wet (4 percent).⁵³

Toronto’s waterfront does not have to hibernate, because the capabilities exist to help streets and outdoor space retain their vitality year round. After analyzing climate data and studying how it impacts street grids and buildings, Sidewalk Labs has developed a replicable system of weather-mitigation tools and architectural interventions that could help dramatically increase outdoor comfort. This system would leverage the latest advances in lightweight material technology, and could respond in real time to changing weather.

Systematically applied in Quayside, this approach to weather mitigation would increase the hours it is comfortable to be outdoors by 35 percent, drawing more people into public spaces, together.

Implemented at the full scale of the IDEA District, this approach could go even further, potentially doubling the number of hours it is comfortable to be outdoors each year for key spaces.⁵⁴

Weather-mitigation tools create 572 more comfortable hours outdoors

Figure 1.
Typical development: Comfortable hours outdoors

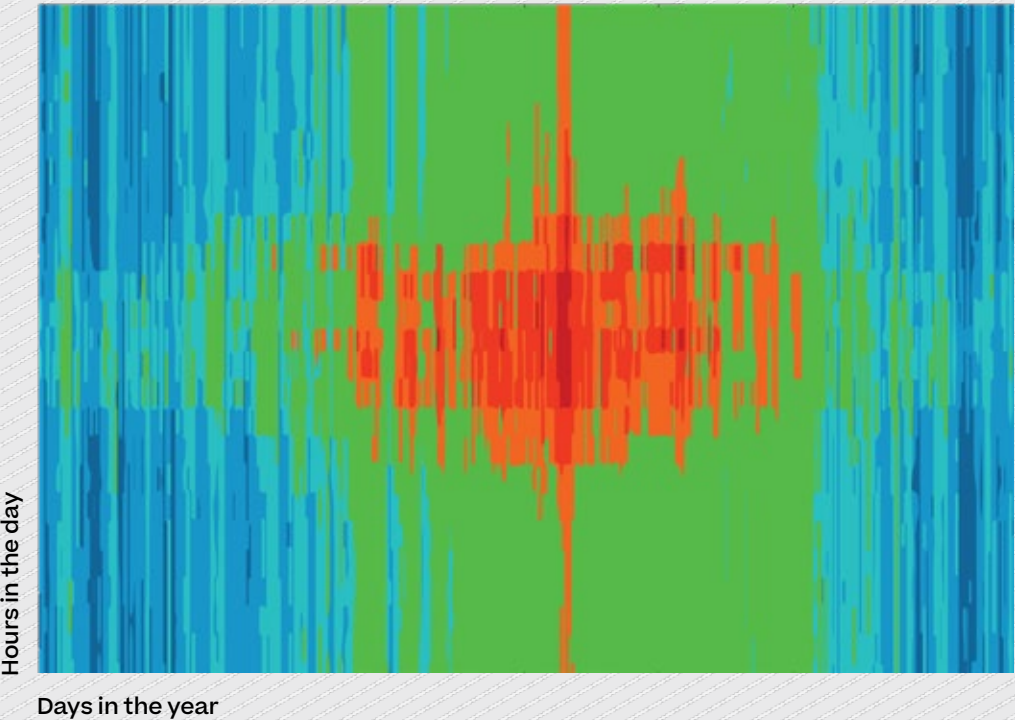


Figure 2.
Sidewalk Labs: Comfortable hours outdoors

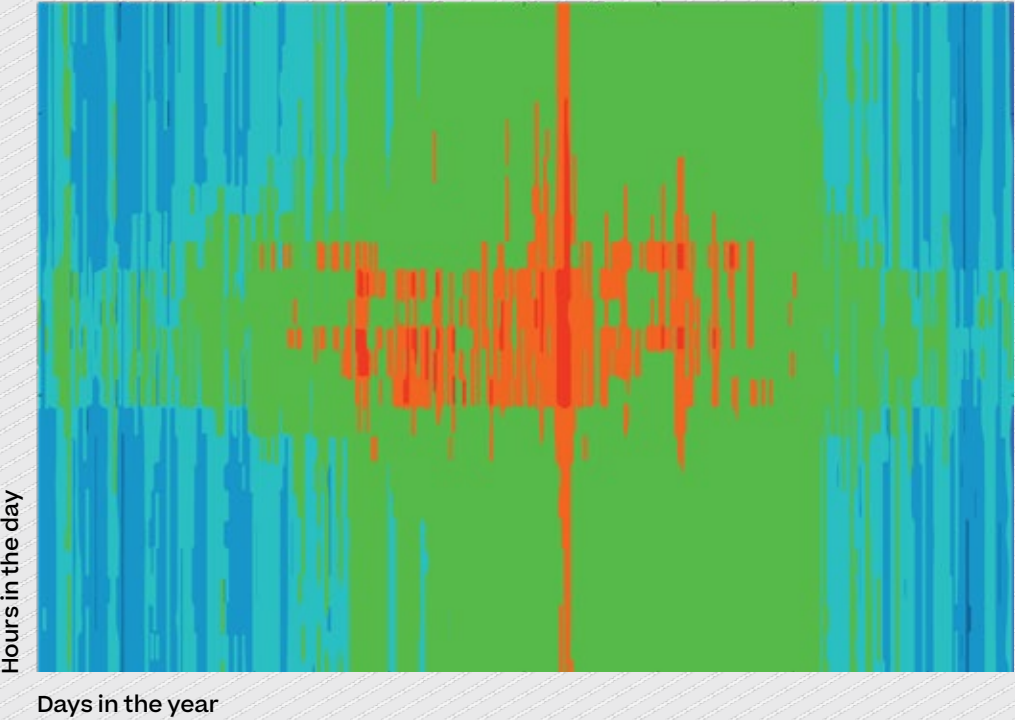


Figure 1 shows baseline outdoor comfort levels for Quayside, based on the Universal Thermal Climate Index. Red areas indicate times when it is uncomfortable to be outside because it is too hot, blue areas show when it is too cold. Green represents times that are comfortable. Because microclimates are complex and dynamic, this methodology focuses on improving comfort in key locations within a neighbourhood, such as pedestrian walkways, plazas, and parks. The metrics in this chart refer to these locations.

Figure 2 shows outdoor comfort levels for Quayside with planned outdoor comfort interventions applied to the neighbourhood site plan. Relative to a typical development on the waterfront, which is comfortable outdoors for 1,653 daylight hours per year, Sidewalk Labs' proposed suite of weather-mitigation tools would make Quayside comfortable for 2,225 hours — an increase of 572 hours, or 35 percent.⁵⁵



This increase would be possible thanks to the impact of optimizing the street grid and building massings over a large area. And because the system's core components are modular, it could be replicated in other areas of the city — or adjusted to different climates in other parts of the world.

Partnering to develop a data-driven design approach

Designing for outdoor comfort requires studying an area's "microclimate." Microclimate refers to the weather patterns of a very specific geography. In an urban context, that could be down to the level of an individual street or plaza. It looks at factors like sunshine, temperature, humidity, precipitation, and wind chill — all of which are measured on the Universal Thermal Climate Index.

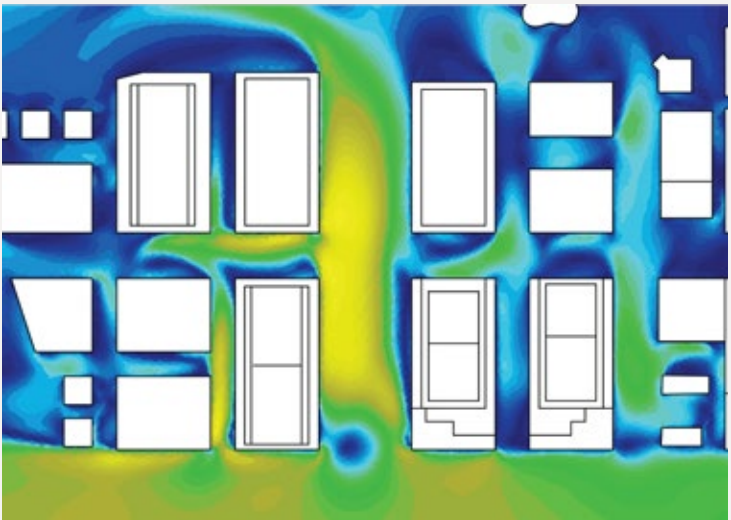
Precision is important when it comes to designing for comfort, because every nook of a city has its own conditions. One street might be in the shade and afflicted by a vicious windtunnel, whereas the next might be flooded with daylight and have only a pleasant breeze. The difference between these two spaces stems from planning and architecture choices, not inherent qualities of weather patterns.

To create a system that proactively predicts and plans for outdoor comfort, Sidewalk Labs worked in close collaboration with multiple partners. RWDI, a team of Toronto-based climate engineers, ran climate analyses for Quayside and the full IDEA District. They collaborated with PARTISANS, a Toronto architecture firm with expertise in new materials and tensile structures, to help iterate on architectural interventions in response to climate data.

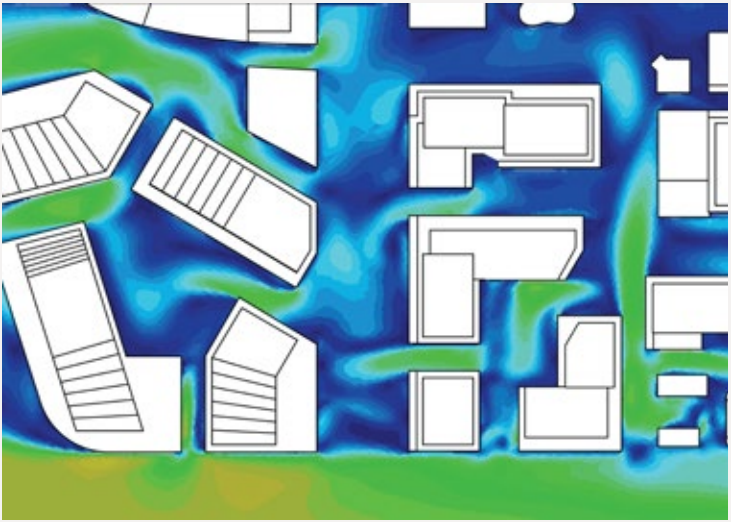
The first step in this joint exercise was to look at the street grid and building masses, and tailor each for wind protection and optimized solar gain. For example, on Cherry Street, adjusting the building facade reduced wind speeds by an average of 35 to 45 percent, and up to 80 percent in certain areas.⁵⁶

Villiers Island: Adjustments to massing can reduce wind speeds and increase outdoor comfort

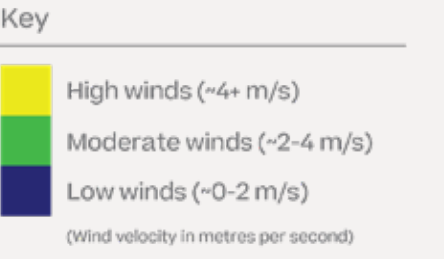
Precinct plan:
Villiers massing and wind speed



Sidewalk Labs-adjusted:
Villiers massing and wind speed



At Cherry Street, creating slanted building facades reduces wind speed. In the top diagram, the yellow areas represent wind tunnels; in the bottom diagram, those tunnels have been eliminated through the facade adjustment.



Creating a core set of weather interventions: Raincoat, Fanshell, Lantern Forest

Next, to achieve an even higher level of comfort, the partners developed a toolkit to address microclimates in and around common urban environments planned for the waterfront. Three prototypical architectural interventions formed an initial set of tools that designers could adapt and recombine to meet the outdoor comfort targets of a specific site: a Raincoat for the building’s edge, a Fanshell for open spaces, and a Lantern Forest for urban canyons (spaces between buildings).

For the Sidewalk Toronto project, these interventions could be installed, managed, and secured through the joint efforts of the ground-floor operator and the Open Space Alliance, a new public realm non-profit entity described on Page 178.

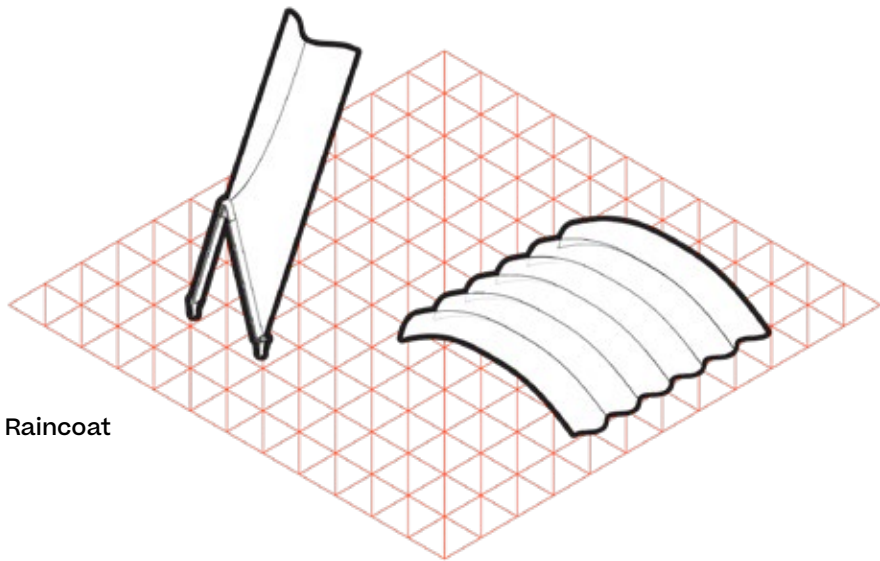
Sidewalk Labs is currently testing these interventions through full-scale prototypes at its Toronto office, 307, which will provide a baseline to evaluate fabrication, installation, maintenance, durability, and comfort performance over the coming months. Design and fabrication partners will provide input on the structure, materials, and costing, and RWDI will measure the comfort performance through the collection of meteorological data around the prototypes.

Sidewalk Labs plans to work with local regulators to ensure AODA compliance for these systems, building on best practices for indicating low clearance zones with tactile cues, and to gain support for pilots in areas where a system (such as the Raincoat) would extend into the right of way.

The outdoor comfort system would leverage the latest advances in lightweight material technology, and could respond in real time to changing weather.

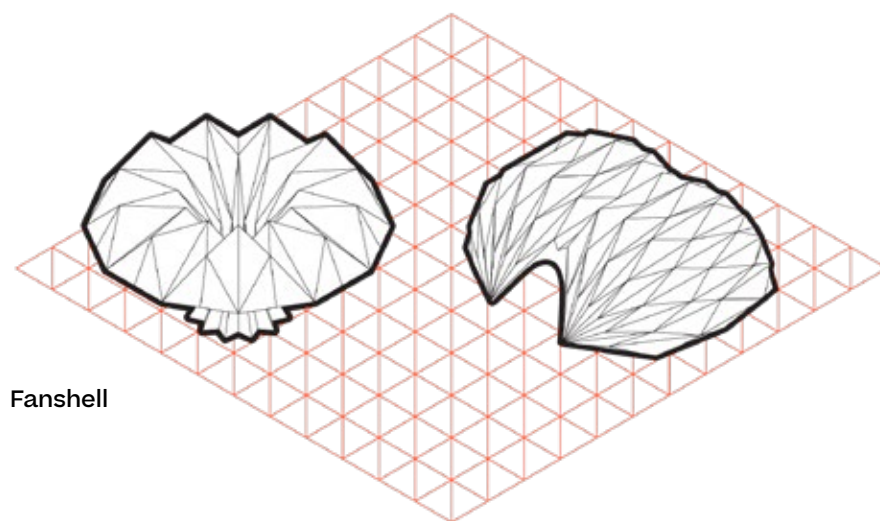


The Raincoat extends a building’s edge to protect the sidewalk from rain, wind, and sun.



Raincoat

The Raincoat consists of an adjustable awning or “second skin” that could extend outward from a building’s edge to protect the sidewalk from rain, wind, and sun. It could attach to one side of a building and anchor into piles beneath the street pavers, or it could be applied as a retractable canopy, spanning from building to building. In that sense, the Raincoat follows the grand tradition of shop awnings, fixed arcades, colonnades, and other installations that help integrate street life into the ground floor of buildings — albeit with a greater capacity to adjust to outdoor conditions. Unlike awnings, the Raincoat is able to more effectively block wind, and change its transparency to allow in more sunlight on cold days and less on warm days.



Fanshell

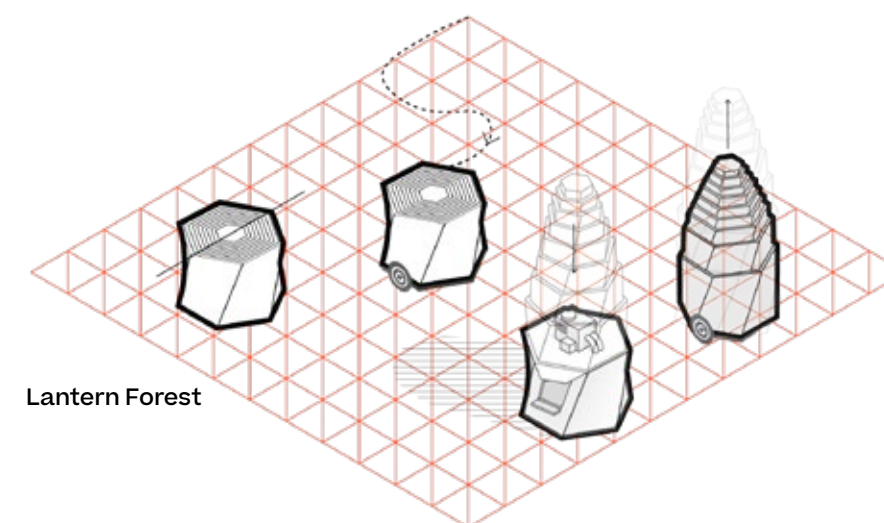
The Fanshell provides open-space coverage for up to 100 people.



The **Fanshell** is a collection of large, temporary urban shelters that could provide outdoor comfort in open spaces, such as Silo Park. The system includes two distinct shelter types: the Shell type, a more enclosed system that protects from wind, rain, and sun, and the Fan type, a more open, umbrella-like covering that protects from sun and rain. Both types cover 80 square metres, can accommodate free-standing heaters, and have the capacity to shelter up to 100 people. Both types also employ an origami-style folded fabric construction, which allows them to achieve wide spans, deploy easily and quickly, and be packed flat and stored more easily than a tent.



The Lantern Forest mitigates wind tunnels that form between buildings.



Lantern Forest

The **Lantern Forest** represents a collection of lightweight, tall, narrow structures that could create shelter from wind when grouped together on the ground (almost like a stand of trees), or when hung together from buildings (like paper lanterns). The Lantern Forest would help address the challenge of wind tunnels that form in the spaces between buildings, often called urban canyons. The structures, which could reach eight metres tall, could be useful in many different conditions: a few Lanterns could be placed along lanes, alleyways, and streets; a flock of Lanterns could be placed in larger open areas. The inside could be inhabited by a few people at once in a variety of ways, from kiosks for vendors to warming stations, and could be secured or collapsed during off hours.



ETFE is a lightweight plastic building material that can adjust its transparency in response to weather patterns. It is becoming increasingly popular for entertainment venues, such as The Shed at Hudson Yards in New York City, which opened in April 2019. Credit: Brett Beyer

Materials. Across the outdoor comfort system, Sidewalk Labs plans to leverage the building material Composite ETFE (Ethylene Tetrafluoroethylene), a durable, highly transparent, lightweight plastic film. ETFE provides transparency without the heavy and expensive structure required to support glass, and is uniquely customizable through printed patterns that can control light and opacity.⁵⁷

ETFE gained popularity as a building material around the turn of the 21st century, and it is now commonly used in venues like sports and entertainment stadia. As its use increased, a panel system of air-filled ETFE cushions was developed to improve energy performance. Each cushion is capable of inflating or deflating on-demand. Depending on how much the cushion is inflated, opaque patterns printed on the film layers align to let in more sun or overlap to block it.

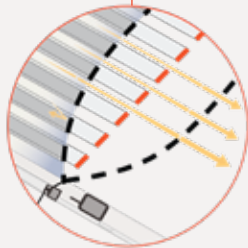
Today, ETFE panels are often applied on one-off projects — such as The Shed in New York City — but they are rarely used systematically as a building material across a neighbourhood. To Sidewalk Labs’ knowledge, the Raincoat prototype at 307 is the first use of ETFE as a building material in Ontario.

Sidewalk Labs estimates that maturing the raincoat technology and installing Raincoats at multiple locations within Quayside would lead to a 71 percent cost reduction per installation (relative to the prototype). There should be an even greater drop in expenses per square foot at the scale of the full IDEA District. This scale also affords a great opportunity to explore diverse architectural expressions.

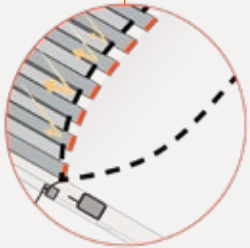
How ETFE works

The Raincoat is designed to change its transparency to allow in more sunlight on cold days and less sunlight on warm days. A panel system of air-filled ETFE cushions is capable of inflating or deflating on-demand. Depending on how much each cushion is inflated, opaque patterns printed on the ETFE’s exterior and interior layers align to let in more sun or overlap to block it.

Building Raincoat



Scenario 1: Opaque patterns printed on the exterior (shown in blue) and interior (in red) layers of ETFE film are aligned, allowing more sunlight to pass through.




Scenario 2: As the pressure in the air cushion is adjusted, the internal layer (in red) shifts to cover more surface area and therefore block sun with its opaque pattern.

Environmental sensing.

Another key feature of the outdoor comfort system is an embedded network of microclimate measurement instruments, including wind anemometers, thermometers, and sunlight and rain detectors.

Many of these (non-personal) sensors have dropped dramatically in price over the last 10 years, and can now share information digitally rather than through cumbersome manual transfers.⁵⁸ While a wind anemometer may not seem innovative, the integration of many local sensors with a predictive and responsive weather-mitigation system is new.

To ensure real-time deployment, these sensors would gather daily data at key distribution points, such as on building rooftops and around Raincoat canopies, and would be capable of communicating live with the comfort system — for example, telling a set of Raincoat canopies to open in advance of rain, or providing instructions for the placement of Lanterns in response to wind patterns. This network could be further enhanced with computational weather-prediction systems to provide an extra layer of resilience and climate responsiveness to neighbourhoods and cities. The ground floor operator could use this data to make decisions regarding frequency of Raincoat deployment, and the Open Space Alliance could play a similar role for Fanshells and Lanterns. 

Deployment.

Each structure in the outdoor comfort system intervention would be light and collapsible. The structures would all be capable of attaching to building facades or plugging into power and data outlets located at grade or on buildings. These features create a system that could be quickly deployed, moved, taken down, and stored. As kinetic technologies and autonomous delivery systems evolve, Sidewalk Labs anticipates that the set-up, take-down, and delivery of these structures could become increasingly automated.

For example, each Lantern would include a mobile base that could serve as a kiosk — similar to those used by street vendors today — as well as a roof structure that could expand to provide wind protection. The roof structures could be placed atop each kiosk, collapsed when the kiosk is moved or stored, and extended upwards to create progressively larger wind breaks when the kiosks are deployed. Alternatively, the Lantern roofs could be hung between two buildings on a catenary wire (included in the design of the street), keeping the ground free until their programming is needed. Some Lanterns could be leased by vendors, while others could be requested for special events.

Weather-mitigation tools can increase comfortable hours by at least **35%** annually in Quayside.

Scaling.

The outdoor comfort system’s modularity would enable it to accommodate a wide range of community activities and needs.

For example, the Fanshell system is designed to provide large urban canopies that could be reserved and used for things like social events, art installations, and cultural gatherings. The coverage that each Fanshell provides could grow by placing additional Fanshells side-by-side: one Fanshell might be enough to provide shade for a family barbecue, while multiple Fanshells might help an arts organization put on a festival during a rainy spring day. Reservations and requests could be managed through a digital booking system, and two-to-four trained installers could deploy each Fanshell in a matter of hours — making this system much more agile than current rental tents, which require a large crew for setup sometimes a day or more in advance.⁵⁹

Adaptability.

Each aspect of the system features adaptable materials and components that would respond to microclimate data in different ways.

For example, the Raincoat’s ETFE panels have a sensitive exterior cushion that could respond to sunlight by inflating (creating more shade) or deflating (letting in more light). This adaptability would help the Raincoat protect ground-floor space from summer heat; it also would enable the system to transition easily between daytime and nighttime activities, as temperatures and light patterns change. Furthermore, the Raincoat could cover plazas and narrow streets, providing on-demand shelter for pedestrians.

Cost-Benefit.

The cost to build this outdoor comfort toolkit ranges from \$500 to \$2,100 per square metre, depending on the module.⁶⁰ Sidewalk Labs expects further cost declines as technology advances and the markets for new materials grow. The price of ETFE has already dropped significantly in the past decade, as it is used in solar panels and has benefited from economies of scale related to the growth of the renewable energy industry.⁶¹

Such costs can be justified when weighed against the increase in usable hours of public space. A study done at MIT showed that people were twice as likely to eat lunch in a public courtyard, and stay outdoors for longer, during weather that was comfortable according to the Universal Thermal Climate Index.⁶² When more people are comfortable going out, restaurants, stores, and services see more business, offsetting build and operating costs with increased economic activity. Economic activity is known to drop during winter months throughout Canada, with retail sales falling up to 20 percent.⁶³

Based on climate modelling of the outdoor comfort system in Quayside, Sidewalk Labs anticipates an increase in comfortable hours of 35 percent annually. While it is hard to determine the exact impact of more comfortable days on economic activity, it is reasonable to assume at least an incremental increase in spending derived by making outdoor spaces, streets, and shopping areas more comfortable.



For more on the proposed use of data in public spaces, see the “Digital Innovation” chapter of Volume 2, on Page 374.



Ensuring Open Space Is More Responsive



Key Goals

- 1 Establish an entity to coordinate programming, operations, and maintenance
- 2 Provide physical infrastructure that enables community programming
- 3 Provide digital infrastructure that enables proactive maintenance
- 4 Connect urban innovators and public spaces

Public spaces typically look fantastic on opening day. Local leaders rally around a ribbon-cutting, inaugurating a space with freshly cut grass, shiny new play equipment, and perhaps a sports field serving a new rec league. But the excitement of Day One aside, the most successful public spaces continuously respond to how people want to use the space, and its ongoing operational and maintenance needs.

In great public spaces, planners, workers, and users are all in sync. The community adopts the space as their own, filling it with programming, and volunteering to help with tasks like raking leaves. But when these groups are misaligned, public spaces can fall into disrepair. In 2017, the Center for Active Design conducted a large-scale quantitative study, which found that it was actually better for a neighbourhood’s civic life to have no green space than green space that is poorly maintained.⁶⁴



Sidewalk Labs proposes to build a public realm that is more responsive by establishing a non-profit entity called the Open Space Alliance (OSA), which would focus on delivering local programming, operations, and maintenance, working in close concert with the community and leveraging new technology. In partnership with the City of Toronto, the OSA would create opportunities to pilot ideas together with city staff, enabling a continuous cycle of knowledge sharing and learning to help successful innovations benefit Torontonians around the city.

The proposed OSA would administer shared physical infrastructure that could help people shape and program shared spaces, as well as digital infrastructure that could proactively address operational and maintenance needs. The proposed entity could also help urban innovators, ranging from civic technologists to startups, run pilots in open space, advancing the urban innovation economy in Quayside and turning Toronto into a global leader in public realm management.



Establish an entity to coordinate programming, operations, and maintenance

The idea for the Open Space Alliance to play a central coordination function across programming, operations, and maintenance stems from a few trends visible across cities, including Toronto.

Cities typically try to create an integrated open space experience across a neighbourhood, but face the reality that open spaces are owned or managed by a medley of different entities, from private developers to the parks department to transportation agencies. Coordination across these groups is often difficult, and when they are not in sync it can lead to disjointed programming and maintenance standards, creating a suboptimal experience for residents, workers, and visitors.

Additionally, cities want to explore how technology can improve open space programming, operations, and maintenance, but existing structures do not allow for easy experimentation. Technology development cycles require rapid prototyping, but most cities lack the processes to conduct fast pilots around new software like digital permitting processes, or new hardware like automated trash removal.

Lastly, cities want to maintain a high-quality open-space network, but face chronic funding shortages. In Toronto, the city’s parks budget has grown only \$8 million in

the past four years — an amount that has not kept pace with inflation — despite the opening of many new parks.⁶⁵ The limited funds that are available are generally focused on daily upkeep, making it challenging to cover the types of temporary arts and cultural programming that bring a space to life.

In Quayside, along with other areas of the IDEA District, management and funding disparities risk becoming even more pronounced, as self-driving vehicles create the opportunity to expand pedestrian areas by up to 91 percent and create new open spaces. These new spaces, which occur in former vehicular rights-of-way, would still be owned by the city and managed by its transportation department, but would now be operated more like parks. These spaces would need to be effectively integrated with the local park network and would benefit from comparable levels of management and funding.

For Quayside and other areas of the IDEA District, Sidewalk Labs proposes the OSA as a public-private partnership, jointly governed and financed by both sectors, to help address these challenges. All city-owned open spaces would remain owned by the government, which would participate in programming, operations, and maintenance with the OSA.

Establishing a clear mission and governance principles

Sidewalk Labs proposes that the OSA convene residents, commercial tenants, landowners, and government partners to identify and achieve a clear mission consisting of the following objectives:

Objectives

- A Create a dynamic, well-programmed, well-maintained public realm that benefits the community and city.
- B Create a seamless public realm experience that establishes a unique sense of place and generates value for the neighbourhood.
- C Create the conditions for technology exploration in programming, operations, and maintenance, piloting new approaches that maximize access and enjoyment of shared open space.
- D Create a mechanism for operating open space that is viable over the long term, including sustainable funding, and that ensures public-private sector knowledge-sharing.

This type of public-private partnership on open space management is not new in Toronto, although the technology focus is unique to the Sidewalk Toronto project. When developing open spaces with outside entities, including non-profit institutions, the city typically structures “collaborative management agreements” to share programming, operations, and maintenance responsibilities. Such partnerships include Evergreen at the Brick Works, the AGO at Grange Park, Artscape at Wychwood Barns, and the Bentway Conservancy under the Gardiner Expressway. Partnerships also include agreements with Business Improvement Areas, like at the Village of Yorkville Park, where the Bloor-Yorkville BIA supplies maintenance of specialized features and programming. Sidewalk Labs proposes that the OSA take inspiration from these local best-practice examples.



The Bentway is a public space under the Gardiner Expressway. Programming, operations, and maintenance at the Bentway is performed by the Bentway Conservancy, a local non-profit established through a public-private partnership, which was kickstarted by a donation from the Matthews Foundation. Credit: Andrew Francis Wallace via Getty Images

Sidewalk Labs plans to work with the city, Waterfront Toronto, and a local non-profit partner with experience in open space management to develop the details of the non-profit entity. The working group would apply a version of the following governance principles in the design of that entity:

Principles

- 1 The public realm needs to reflect a truly public space — with the city retaining ownership of city-owned open spaces — while also protecting the needs and rights of private property owners on their land.
- 2 The day-to-day function of the public realm needs to be as seamless as possible, both to create a better sense of place and to facilitate operational efficiencies.
- 3 The entity needs to be responsive (through legal agreements, board seats, public transparency, or other means) to both government and private landowners.
- 4 The entity needs to be structured to support creative experimentation in all facets of its operations, taking advantage of the physical and digital infrastructure in Quayside.

While the proposed OSA would have the capacity to perform programming, operations, and maintenance services, where and how it delivers these services would depend on agreements with individual landowners, including private landowners, and local land-holding government agencies. The OSA would also be informed by the needs of the community, who would have representation in the entity’s decision making.

The OSA would not have its own product development arm. Instead, as proposed, it would manage the physical and digital infrastructure that Sidewalk Labs plans to deliver, and it would have funds in its annual operating budget to procure technology services that could help improve programming, operations, and maintenance. In addition, its budget would include funds to support technology-enabled arts and cultural programing, such as artist residencies. Generally, the OSA should be set up to facilitate the ideas of others who want to activate and improve open space, rather than act as a top-down planning body.

Like all other technologies proposed for the IDEA District, all projects or pilots involving urban data would have to follow the proposed Responsible Data Use Guidelines, and be subject to the oversight of the proposed Urban Data Trust.



For more on the proposed use of data in public spaces, see the “Digital Innovation” chapter of Volume 2, on Page 374.



Ensuring Open Space
Is More Responsive

Provide physical infrastructure that enables community programming

The most vibrant public spaces are the ones in which people have a role in their creation. Toronto knows that well, whether through the community group that organizes Tai Chi in Yonge Dundas Square, Scadding Court's transformation of a defunct Target in Hamilton into a community centre, the families that rally to convert their block in the Annex into a play street, and so many others.

In all of these examples, a small group of passionate people banded together with an idea, and jumped through hoops to make that idea a reality. To build that type of participatory ability into a neighbourhood's foundation, Sidewalk Labs plans to deliver shared physical infrastructure that the community could program and a tool to help communities measure the impact of those efforts.

In Quayside and across the greater geography of the IDEA District, these initiatives would empower the community to turn its needs and ideas into reality, democratizing placemaking across public spaces. The aforementioned 2017 Center for Active Design study found that people who report access to an abundance of community events say that they interact more with their neighbours (up 10 percent); that they work more with others for change (up 11 percent); and that they attend a greater number of events in their neighbourhood (up 22 percent).⁶⁶ Shared

infrastructure enables an abundance of diverse, new, community-driven programs, resulting in people spending more time outdoors, together.

Creating the conditions for community-led programming

In Quayside, Sidewalk Labs plans to build shared, adaptable programming infrastructure into the foundation of the neighbourhood, creating the necessary groundwork for affordable experimentation.

The community would be encouraged to take a leading role in programming its own spaces, supported by diverse types of infrastructure built into the environment to make a broad range of visions possible. Open spaces would be equipped with infrastructure such as projection screens, universal mounts, and utility hook-ups, which people could easily access to bring their vision to life — whether it be an immersive art show or a pop-up food market.

Community members would be able to access this infrastructure for their own programming purposes through the OSA. Shared physical infrastructure could also be complemented by civic engagement tools that enable community members to express their preferences for events that take place in shared spaces.

This kind of shared physical infrastructure could enable any number of ideas for community programming and neighbourhood improvement:

Play.

A teenager could join a virtual queue to play a life-size chess game projected onto the side of a building. The next day, the projected game could be Chinese checkers, and an elderly resident might sign up. Crowds could gather to watch the game in action.

Arts.

A local arts collective could be chosen to set up an installation in Parliament Plaza. They would be able to affix various components of their installation to the buildings and use the power conduits to operate a moving display. They could also use the proposed public Wi-Fi network to run an augmented-reality experience that complements the art.

Community.

The leader of a youth dance group could schedule a practice time slot at a park stage. She could request an outdoor-comfort Fanshell to cover the stage in case it rains. She could also control the speakers, which would be programmed to shut off at a certain decibel level.

Nature.

An environmental advocacy group wants to measure air-quality levels. They could receive permission from the Urban Data Trust to hook up (non-personal) air-quality sensors to mounts around Quayside. The data would be transmitted live over the connectivity network and become publicly accessible for others to use as well.

Helping communities measure impact and drive change

Digital tools that make measuring the success of public spaces easier for everyone, from community groups to municipalities, provide yet another way to encourage local participation and programming.

Urbanists have a long tradition of using data to champion the reform of public space. In the 1960s, Jan Gehl's careful documentation of people standing, sitting, waiting, and talking along Strøget, Copenhagen's main thoroughfare, made the case for pedestrianizing the street, helping to transform the city into a global leader for public space.⁶⁷ More recently, after conducting public-life studies to inform TOcore, Toronto's new plan for downtown, the City of Toronto has begun to integrate the practice of public-life studies into their public-realm improvement and capital-planning processes.⁶⁸

But the tools used to study public space have changed very little since they were developed in the 1960s. Today, many managers of public space and community advocates still rely on clipboards or manual clickers to count the number of people in a space and classify what they are doing. Given these high barriers to collecting data and insights, managers are left to steer design, programming, and maintenance without full knowledge of what is happening on the ground. And while there are many forms of obtaining community feedback, lack of quantitative information can make it hard to share findings and compare interventions.

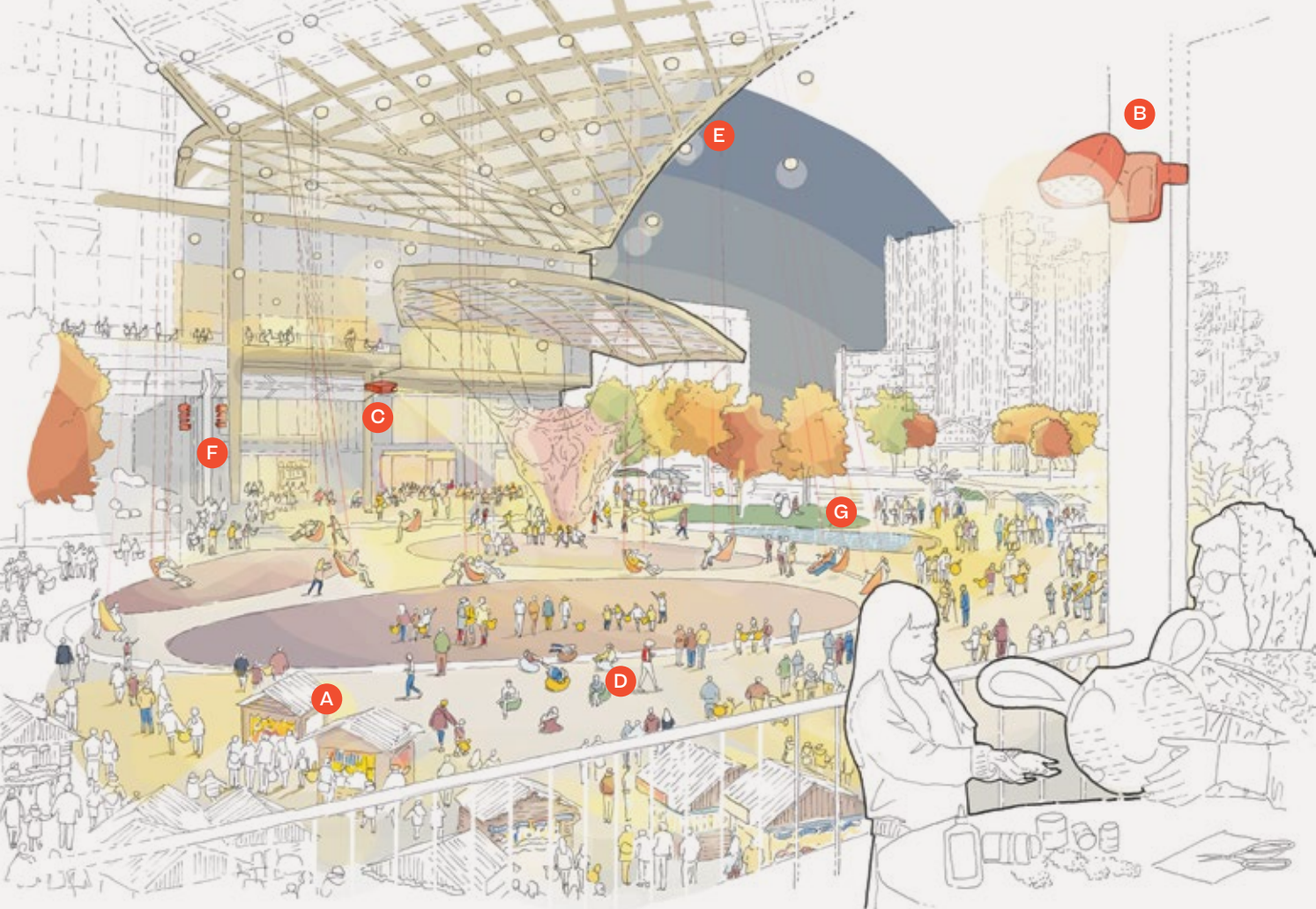
To address this problem, Sidewalk Labs developed a digital application called CommonSpace that makes it easier to

→ Continued on Page 185

The 2017 Center for Active Design study found that more community events foster up to

10%
more interactions
with neighbours.

Shared physical infrastructure supports community programming



- A Power and conduits.** Weather-protected outlets, with 220 and 110 voltage capabilities, would be interspersed on stoa and trusses throughout public spaces. They would have ample conduit space to run cable for data, electricity, or another utility. Having power and conduits available throughout the public realm would enable flexible events or installations.
- B Physical mounts.** Mechanical and electrical connection points located on buildings, light poles, bollards, and other public-realm furniture would enable the installation of new devices and creations on a temporary basis, ranging from lighting to banners to environmental sensors.
- C Projection.** A series of high-resolution laser projectors with interactive capabilities would be accessible throughout

- the neighbourhood. These would be mounted to fixed lampposts but have the ability to be repositioned depending on the program. Advanced projection-mapping technology would turn the city into a three-dimensional screen that could be used to show content or for playful artistic creations.
- D Public Wi-Fi.** Ubiquitous connectivity capabilities would be accessible throughout the waterfront. Public Wi-Fi helps tackle the digital divide and enable new experiences in physical space, such as augmented- or virtual-reality exhibitions.
 - E Lighting.** An LED lighting system throughout the public realm (typically mounted to stoa or light poles) would allow for dynamic adjustment of lighting levels, colours, and moods. This exterior lighting would provide the

- optimal balance of visibility and comfort, allowing for concerts and other activities to take place in the evening.
- F Sound.** An array of speakers and public address systems would be deployed throughout the public realm. In some spaces, speakers would be mounted to trusses or stoa; in others, the sound systems would be movable. Speakers and audio systems would enable things like outdoor movie screenings, cultural performances, or intimate audio art installations.
 - G Water.** Controlled applications of potable water would be available in key public spaces, including fountains and service hook-ups at pop-up sites. Not only is water necessary for food and beverage services, but it could also add playfulness to the public realm in the form of mist machines, splash pads, and more.

A volunteer in R.V. Burgess Park uses the CommonSpace app to document activity in the park.



Continued from Page 183

collect reliable data on how people use public spaces. To prototype CommonSpace, Sidewalk Labs has partnered with the non-profit Gehl Institute and a national charity, Park People. The app was field tested as part of Park People's Public Space Incubator Program, an initiative that awards grants to pilot experimental programming in Toronto's public spaces.

With CommonSpace, park operators or community organizers can enter information they observe about public life into a user-friendly app, such as what assets or areas people prefer or what spaces they avoid. The app records data in accordance with the Public Life Data Protocol, an open data standard (published by the Gehl Institute and founding municipal and private partners) that makes it possible to compare public spaces. The data captured with CommonSpace can be easily exported into visualization and analysis tools that communities and space managers alike can use to see patterns, generate insights, and develop evidence-based approaches to advocating for change.

In fall 2018, Sidewalk Labs worked with Park People and the Thorncliffe Park Women's Committee to conduct a field test of CommonSpace in R.V. Burgess Park. The Thorncliffe Park Women's

Committee was funded by Park People's Public Space Incubator to further develop the community cafe and market the committee had started in the park. The test concentrated on using CommonSpace to measure how increased programming and better cafe seating changed how people used the space. Local youth and other residents collected data on how many people came to the park and how the new chairs and programming affected what they did there.

The team found that the park saw a massive, 365 percent spike in visitors on programming days, and that the activity was far more social, with large increases in people coming in groups, meeting new people, and staying into the evening. The study not only gathered valuable data that can help the Thorncliffe Park Women's Committee understand and communicate the impact of its efforts, but it also enabled participants to learn about their community while changing how they think about the park.⁶⁹

CommonSpace's code is open-source and based on an open-data standard, so it can be further developed by users in Toronto and around the world to gather the data needed to improve public life in their communities.



Ensuring Open Space
Is More Responsive

Provide digital infrastructure that enables proactive maintenance

Another key to fostering highly active and responsive public spaces is upkeep of operations and maintenance, tasks that can benefit greatly from new technology.

Operations and maintenance are becoming increasingly challenging in cities around the world, including Toronto, as budgets stay flat while infrastructure ages and urban populations grow. The 2016 Canadian Infrastructure Report Card found that public sport and recreation facilities were in worse physical condition than any other asset category, including roads, bridges, and water systems, reflecting lower levels of maintenance and repair spending.⁷⁰ Public-space operators responsible for vast portfolios often struggle to keep up with both everyday issues such as overflowing waste bins or broken benches as well as more sudden, severe problems that may arise.

While technology cannot solve budget constraints, it can help cities like Toronto achieve open spaces that work better for everyone. Drawing on new digital capabilities that can make operations and maintenance more responsive, Sidewalk Labs proposes to create a real-time digital map that acts as a centralized repository of information about the conditions of the public realm. This map would leverage environmental (non-personal) sensing to ensure that new issues — from a broken

pipe to dehydrated horticulture — are detected and promptly addressed.

Applied in Quayside and across the IDEA District, this digital infrastructure would lay the foundation for public spaces that are better operated and maintained, encouraging people to invest in their neighbourhood and form community bonds. The Center for Active Design has found that people who report high levels of litter have 10 percent less community pride and believe 10 percent less frequently that community members care about one another than those who report low litter levels.⁷¹ Operational and maintenance upkeep creates public spaces that people want to spend time in and work collectively to improve, creating a virtuous cycle that leads to a thriving neighbourhood.

Launching a real-time digital map of open space assets

The popularization of real-time digital maps over the past 15 years has revolutionized the ways people interact with cities — from planning a commute to deciding where to eat. But while live, shared digital maps are now pervasive in many industries, they are still relatively uncommon as a tool for open-space management.

Workers could be alerted to a water pipe pressure change that may indicate a leak. A digital map could show them where the sensor is that triggered the warning, so they know where to target their inspection, preventing the leak from worsening.



Planning drawings are typically static files, with geospatial data manually updated at specific intervals, leading to information that is outdated or inaccurate. The various city entities responsible for managing different aspects of the public realm — such as recreation, landscape, and capital projects — might use different operations software built on separate databases, resulting in difficulty coordinating activities. And the public rarely has access to operations data, precluding people from making decisions based on open-space conditions.

During Quayside's design and construction process, Sidewalk Labs plans to create a high-resolution, 3D, comprehensive digital map of the public realm. This map would serve as a single repository for information about open spaces and related infrastructure, creating a shared foundation for ongoing operations and proactive maintenance by the OSA.

This map would be populated by geospatial data that clearly defines boundaries of spaces and managed assets. It would include all types of public spaces, such as parks, plazas, and public libraries; ameni-

ties and physical infrastructure, such as swing sets and benches; and utility systems, such as stormwater pipes, waste systems, and power grids. It would also include the shared participatory infrastructure described on Page 184, such as electrical outlets, Wi-Fi, and media projectors, as well as movable components like picnic tables, chairs, and signs.

The map would be updated continuously through data transmitted by environmental sensors and information provided by open-space managers and users — ensuring it always stays up to date.

Sidewalk Labs proposes that access to the map vary by role. Open-space managers would have a full view of the map and be able to run their operations software on top of it, enabling the integration of complex workflows — for instance, automatically scheduling maintenance staff after a big event. A public visualization would help community members make far more informed decisions about their use of public spaces based on actual conditions — for instance, people could see when construction is scheduled.

The 2017 Center for Active Design study found that community pride drops by

10%

when open spaces are poorly maintained.

Keeping the map updated in real time.

To be most useful, a holistic public-realm map needs to stay updated with actionable information. That is where environmental sensing technology comes into play.

Connected infrastructure is increasingly used by cities to monitor conditions and manage the delivery of public services across sprawling jurisdictions. Many cities, including Toronto, have deployed smart water meters that both reduce costs by eliminating the need for manual meter reads and alert property owners and the city to unexpected changes in usage that may signal leaks.

Sensing systems also help level the playing field of information. Research has shown that the propensity to call 311 and report problems differs among socioeconomic and demographic groups in a manner that can exacerbate inequalities.⁷² Environmental sensors have the potential to ensure equity in service delivery by identifying needs in a uniform manner.

Sensors also enable predictive maintenance to prevent major infrastructure failures — for instance, by identifying water main breaks that can lead to sinkholes. These tools identify opportunities for proactive repairs that can save hundreds of thousands of dollars.

Digitally monitored utilities.

As an example of the power of a real-time map coupled with environmental sensing infrastructure, consider the operation and maintenance of utilities.

Today, the lack of well-organized paper records used to track utilities is a major source of street disruption and project delay. Every time an operator performs work on a utility, someone must check the

records to identify any potential conflicts at a work site, many of which are not readily available or were never recorded in the first place. Even when documents are available, it is not uncommon for work crews to hit some long-forgotten water pipe or old power line installed in an unexpected location, halting work so the hazard can be properly reviewed.

A real-time digital map of the utility network — with utility status regularly updated by sensors — has the potential to reduce the incidence of accidental utility strikes and the overall time associated with maintenance. Such a map could keep an accurate, ongoing record of utility conditions and alert work crews of potential conflicts during repairs or installations. It could also reduce by several weeks the time it typically takes to locate underground utilities and research records.

The application of utility sensors goes far beyond facilitating road work. They could help extend the life of infrastructure systems by providing operators with early warnings, such as the systems monitoring the conditions of water pipes that Toronto and many other cities already have in place to prevent leaks. Sidewalk Labs estimates that, in Quayside, a water pipe sensing system could ultimately save up to \$200,000 a year in preventing quotidian water leaks, and another \$300,000 for each prevented water main break.⁷³

More novel applications include the ability to monitor stormwater systems and empty detention tanks before a heavy rain; track temperatures on a thermal grid to maintain the desired range; identify failures in underground freight tunnels or blockages in pneumatic waste collection pipes; and detect street light outages that require bulb replacement, among many other uses that would be helpful for the OSA.

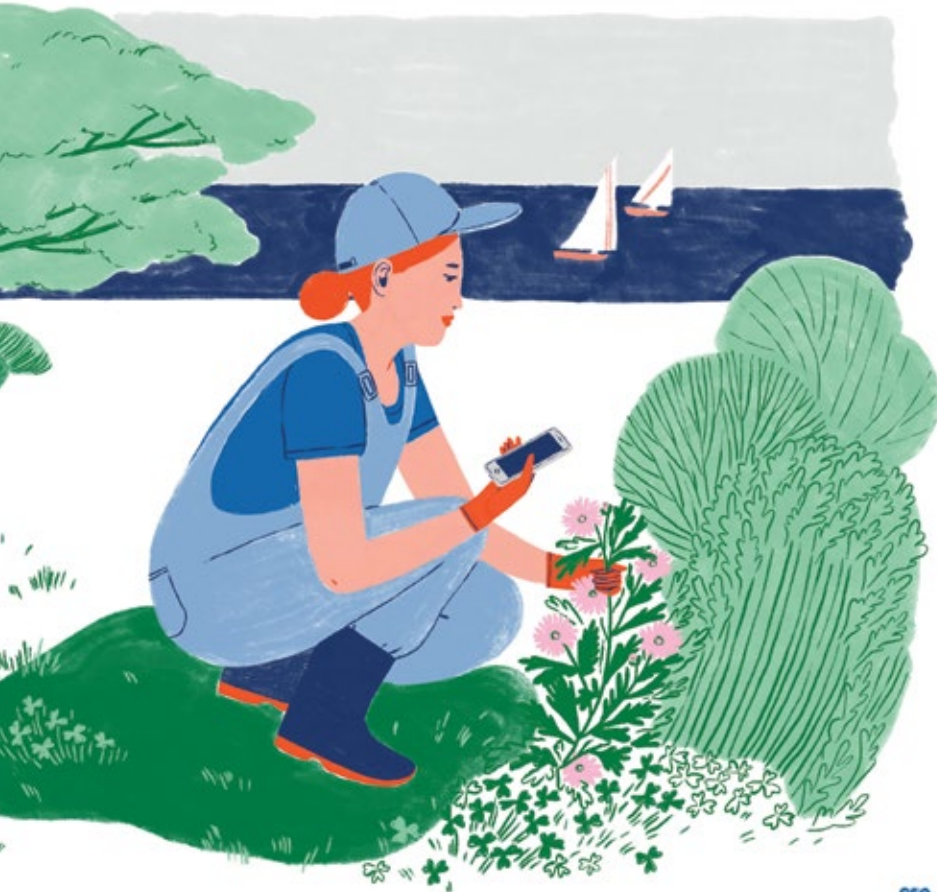
The Open Space Alliance would enable a continuous cycle of knowledge sharing and learning to help successful innovations benefit Torontonians around the city.

Water pipe sensors could save up to **\$200,000 a year** in prevented leaks.



Ensuring Open Space
Is More Responsive

Connect urban innovators and public spaces



The OSA's new policy and funding framework, which encourages experimentation, coupled with the shared physical and digital infrastructure described on Page 184, enables urban innovators, from civic technologists to businesses, to prototype their ideas in a real-world environment. These tools would not only improve the operations and maintenance of open space but would also have the potential to scale elsewhere and help other parts of the city. The following page describes two hypothetical examples.

A maintenance worker uses image recognition to identify a plant and pull up pruning instructions.



1

Horticultural maintenance.

Take one common operations challenge: a designer plans a park with a naturalistic landscape and a specialized maintenance regime, but maintenance instructions are not readily available to the workers in the field responsible for pruning. In Quayside, the designer could decide to upload instructions into the digital map during the design and construction phase through the OSA's online portal. With access to the map, the designer could include geo-tagged information spelling out how the naturalistic plantings should be maintained.

After the park opens, a computer science software class could build an app that makes it easy for these instructions to pop up whenever maintenance workers arrive on location. This app could use image recognition to help identify plants as well as pest and disease issues, making it easier for people to keep the garden in a state of good repair without specialized landscaping knowledge. The OSA could agree to instruct their maintenance workers to use the app as part of a pilot.

If the pilot were successful, the team of students could seek venture funding — perhaps from the Urban Innovation Institute, a proposed new venue for practical research on the future of cities — to try to further advance or scale the idea. [\[P\]](#)



See the “Economic Development” chapter of Volume 1 for more details on the Urban Innovation Institute.

2

Waste robots.

Take another challenge: making sure that public trash receptacles are emptied before they overflow.

In Quayside, the OSA could place a call for proposals to launch a self-driving waste pilot program. Startups could bid, and once the selected company's proposal was approved by the Urban Data Trust, in coordination with the OSA, it could place self-driving trash cans throughout the public realm for a testing period. The trash cans could include sensors that detect when each bin is filling up. When a bin became full, it could shut itself and travel to a nearby pneumatic chute, dispose of its contents, and promptly return to its original location. It could then transmit data on waste bin location and refill rates into Quayside's digital map, which the OSA's operators could analyze to make more informed choices regarding where waste bins should go.

If the pilot were successful, the startup would have shown valuable proof of concept in a real world environment, and the OSA would have identified a new system that improves the standard of care for its parks at a lower cost. In turn, such successful technologies could spread back to the rest of Toronto, turning the city into the global leader of open-space management.

Public Engagement

The following summary describes feedback related to the **public realm** and how Sidewalk Labs has responded in its proposed plans.



As part of its public engagement process, members of Sidewalk Labs' planning and innovation teams talked to thousands of Torontonians — including members of the public, expert advisors, civic organizations, and local leaders — about their thoughts, ideas, and needs across a number of topics.

1 Create a sense of belonging through participatory design, accessible amenities, and diverse programming

What we heard

Participants urged Sidewalk Labs to make public spaces as inclusive as possible, no matter a person's background or ability. Participants in co-design sessions noted that all public spaces should be built with people with disabilities in mind and should relay information in multiple modes (haptic, visual, audio). Visitors to 307 wanted to see spaces for diverse cultural practices as well as food stores that cater to diverse cultures. And multiple participants raised the importance of critical amenities, including accessible non-binary washrooms, places for changing diapers or breastfeeding, and affordable retail space.

Participants were particularly enthusiastic about a ground-floor strategy that could provide affordable space for vendors, small businesses, and social enterprises. The experts who attended one workshop on mass timber buildings were similarly enthusiastic about the strategy's potential; however, they urged Sidewalk Labs to consider the governance and management of the space, asking questions like: how would leases or occupancy be ensured, and how would the balance between retail and community use be determined?

Various participants also recommended that inclusion extend to the design process itself, asking that Sidewalk Labs bring community members, especially Indigenous voices, to the planning table. Design excellence need not sacrifice the accessibility or inclusivity of the public realm.

Two visitors embrace as they view RWDI weather-mitigation visuals in the main hall of 307. Credit: Jenna Wakani

How we responded

Emphasizing inclusion.

Sidewalk Labs has incorporated an expansive, diverse network of open spaces into the plan for Quayside, and followed design principles focused on inclusive, participatory programming (see Page 178).

Incorporating accessibility.

In keeping with Sidewalk Labs' accessibility principles, all public spaces would incorporate responsive sounds and tactile pavement. Sidewalk Labs plans to continue working with the community to ensure that public spaces are accessible to all (see Page 106).

Making space affordable.

Sidewalk Labs proposes to include adaptable retail spaces, flexible lease terms, options for co-tenancy, and operating tools and services that tenants can use to reduce the upfront and ongoing costs of occupying ground floor spaces. This mix of offerings would make it financially feasible for community, cultural, and smaller businesses to set up shop (see Page 164).



2 Emphasize connections to nature and water

Expanding opportunities.

Sidewalk Labs plans to offer a small business incubator program that would encourage diversity by both providing space at below-market rents and offering shared equipment and facilities for ground-floor tenants, helping those without access to capital open up shop (see Page 166).

Engaging Indigenous groups.

The Brook Mollroy Indigenous Design Studio has created a framework for Indigenous engagement and project development — including principles for Indigenous design — based on aspirations of the Indigenous community and the desire for common ground. Sidewalk Labs is committed to continue to engage with these principles and Indigenous communities throughout the planning process.

What we heard

Participants across public engagement events and co-design sessions were incredibly enthusiastic about the potential for plentiful green public spaces that can better connect people to nature, especially water.

Participants from the design jam on “Water Connections” and the Residents Reference Panel were particularly emphatic on this point: water should be both a destination feature and an accessible, everyday amenity. As one panelist explained, “I make great use of the parks around me. ... I hope Quayside, and the eastern waterfront, will have that same kind of easy access to park space. There needs to be a reason for people to go there other than to live or work. And Lake Ontario is majestic.”

Some visitors to 307 recommended that the public realm design reduce the impact of the Gardiner Expressway and mitigate noise pollution. And Roundtable 4 participants asked about how the community could be more self-sustaining, potentially with urban agriculture, green roofs, and food gardens.

How we responded

Expanding green space.

Sidewalk Labs proposes to reclaim significant street space for the public realm and tree plantings by narrowing lanes, reducing vehicle lanes, and eliminating curbside parking. It also proposes to leverage a digital planning tool to identify opportunities for more high-quality parks, maximizing access to green space (see Page 128).

Infusing greenery.

Sidewalk Labs proposes to plant far more greenery than most cities do today. Greenery sequesters carbon, mitigates the urban heat island effect, reduces the risk of flooding, and promotes the health and happiness of residents and workers. For example, the proposed Queens Quay East could host 95 trees per hectare, roughly double the current coverage on boulevards (see Page 135).

Incorporating water features.

Sidewalk Labs proposes that Parliament Plaza include water features, such as a splash pad for children and mist machines for public art installations (see Page 146).

Connecting to the lake.

Sidewalk Labs proposes to deploy a series of barges in Keating Channel designed for community water-based programming across the seasons, from a waterfront classroom to an aquaponics farm to a cafe (see Page 149).

Accommodating marine uses.

Sidewalk Labs proposes that Parliament Slip accommodate a variety of marine uses, from personal watercrafts to water taxis to kayaks, allowing for marine transit to the inner harbour and islands. These uses would be linked to, and supported by, the neighbouring Bayside Community Centre (see Page 148).

Integrating gardens.

As the designs for Quayside are refined, Sidewalk Labs plans to explore the integration of community gardens as key amenities.

A crowd gathers to hear remarks at the opening of 307 on June 16, 2018. Credit: Sidewalk Labs



Two 307 visitors spend time in the Learning Garden, developed in partnership with Bowery Project. Credit: David Pike



3 Invite participation to a lively, flexible, delightful public realm

What we heard

Participants were excited by the possibility of a flexible, lively public realm that could accommodate a diverse number of uses and needs. Torontonians wanted public spaces that are active with events and programs — that are delightful, playful, and inviting. As the Sidewalk Toronto Fellows put it: “Equip public spaces to become an extension of a front and backyard.”

Many participants urged Sidewalk Labs to create spaces that could be enjoyed all year, especially in winter. One 307 visitor pen-named “Cold Australian” asked for “year round comfort in public spaces because Toronto’s weather is inhibiting,” adding: “I want to live life to the fullest.”

Specific ideas for uses that could be accommodated ran the gamut, from dog parks, to spaces for creating and learning, to playgrounds, to outdoor swimming pools. Participants made multiple requests that Sidewalk Labs create opportunities for youths and the arts community to be more present in public space.

While many Torontonians were excited by the flexibility of the spaces proposed, which would give them greater agency over their environment, participants wanted to ensure that flexibility would never preclude accessibility. Some co-design session participants suggested that spaces leverage technology to inform users, in real-time, about the status and layout of these dynamic spaces.

How we responded

Incorporating flexibility.

Sidewalk Labs proposes to create flexible designs for parks, plazas, and open spaces that better accommodate the diverse needs of an expanding population while preserving accessibility. Such spaces would be multi-purpose and could be quickly reconfigured by day or season. Silo Park, for example, should be able to accommodate at least three sports; one “play” feature; space for food and beverage; and recreational spaces designed to be active and accessible all year (see Page 145).

Mitigating weather.

Sidewalk Labs proposes to deploy an outdoor comfort system that can respond to real-time weather patterns, providing protection on rainy, snowy, or windy days and shade on sunny days. Residents or businesses could reserve these tools for gatherings or events (see Page 167).

Sharing infrastructure.

Sidewalk Labs proposes to equip public spaces with shared physical infrastructure (such as projectors or power outlets) to encourage users to program these spaces themselves (see Page 184).

Encouraging arts and culture.

Sidewalk Labs proposes to encourage and celebrate arts and culture through the provision of rotating installations, affordable production space, and a Civic and Cultural Assembly with shared fabrication equipment and a room for exhibits and teaching (see Page 183).

Emphasizing accessibility.

In keeping with its accessibility principles, Sidewalk Labs plans to work with the accessibility community to ensure the accessibility of flexible spaces, including installing options such as way-finding beacons (see Page 106).

4 Pursue governance models that ensure safe, well-maintained public spaces over the long term

What we heard

The Public Realm Advisory Working Group urged Sidewalk Labs to consider an innovative governance model for public space and to work with the City of Toronto’s Parks, Forestry, and Recreation department to structure a sustainable management and funding plan that would ensure public ownership of parks while allowing for innovation in programming, operations, and maintenance.

Participants were similarly concerned about maintenance, wondering how public spaces would be “future-proofed” and how safety would be ensured.

Sidewalk Labs’ Craig Nevill-Manning teaches young children how to adjust the lights in the 307 Dynamic Street prototype.
Credit: David Pike



How we responded

Proposing the OSA.

To sustain high-quality open spaces over the long term, Sidewalk Labs proposes the creation of the Open Space Alliance as a non-profit entity that could deliver local programming, operations, and maintenance in Quayside. The OSA could also create mechanisms for sustainable funding, staffing, and oversight that ensure the long-term viability of public spaces (see Page 178).

Empowering the community.

Sidewalk Labs has partnered with Park People and the Gehl Institute to prototype CommonSpace, a tool that makes it easier to collect reliable data on how people use public spaces, enabling space managers to see patterns, generate insights, and develop evidence-based approaches to advocating for change (see Page 183).

Leveraging technology.

Sidewalk Labs proposes to create a real-time map of park assets, from drinking fountains to garbage bins, that can help managers operate and maintain public spaces (see Page 186).

Reimagining pavement.

Sidewalk Labs proposes to deploy a novel system of modular pavers that would lower maintenance and repair costs of hardscape in the public realm (see Page 139).

Planning for safety.

Sidewalk Labs incorporated safety into every facet of its planning process and plans to design spaces that promote safety — for example, by including lighting in the public realm that would ensure the appropriate visibility at all times.

Engagement spotlight



Leading Toronto accessibility organizations showcase their work at 307 for Open Sidewalk: The Accessible City. Credit: Jenna Wakani

In developing ideas for the future city, Sidewalk Labs has been interested in exploring a system of prefabricated modular pavers that would enable curbless streets and be easy to maintain and repair. Modular pavers also allow for the embedding of new technologies, such as heating elements to melt snow and ice, LED lighting to communicate new street uses, and permeability to improve storm-water management.

Over the past year, Sidewalk Labs has been prototyping and testing these pavers, and sharing its progress with a variety of groups. At the design jam, “People on Wheels,” accessibility advo-

cates were enthusiastic about the pavers, as road maintenance, ice, and snow present some of the biggest challenges for accessibility. But they pointed out an important flaw: the pavers were the same width as wheelchairs, meaning that when crossed at the wrong angle, wheels could catch in the gaps.

It was a crucial insight that took the planning team back to the drawing board. As a result, the team is testing a design of pavers that are now 20 percent wider and — thanks to those co-design participants — would create a more accessible public realm for all.

An expanded public realm, activated by community-driven programs and responsive maintenance, would serve as the foundation of a great neighbourhood.

Acknowledgements

Sidewalk Labs would like to extend special thanks to the participants of the Sidewalk Toronto Public Realm Advisory Working Group, and to the staffs of the City of Toronto, Province of Ontario, and Government of Canada for their time and guidance.

Endnotes

General note: Unless otherwise noted, all calculations that refer to the full proposed IDEA District scale are inclusive of the entirety of its proposed geography, including all currently privately held parcels (such as Keating West). Unless otherwise noted, all currency figures are in Canadian dollars.

Charts note: Sources for the charts and figures in this chapter can be found in the accompanying copy for a given section; otherwise, the numbers reflect a Sidewalk Labs internal analysis. Additional information can be found in the MIDP Technical Appendix documents, available at www.sidewalktoronto.ca/midp-appendix.

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9. For this figure and those in the paragraph that follow, see *Parkland Strategy: Growing Toronto Parkland*. City of Toronto, November 2017.
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23. For background information on this calculation, consult the "Cost Comparison of Modular Pavement vs. Typical Waterfront Streetscape" section of the MIDP Technical Appendix. This estimate is based on 50,000 cuts/year x 30 years x 7.5m2 area per cut on average / by the size of Toronto's road network (58,000,000 m2).

24. Elyse Parker, *Strategies for Maintaining & Renewing Innovative Street Projects*. City of Toronto. Presentation to the National Association of City Transportation Officials, Los Angeles, CA, October 2018.

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26. *Parkland Strategy: Growing Toronto Parkland*. City of Toronto, November 2017; *Parks and Recreation Facilities Master Plan, 2019-2038*. City of Toronto, October 2017.

27. *Port Lands Flood Protection and Enabling Infrastructure Due Diligence Report*. Waterfront Toronto, October 20, 2016.

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Open space was expressed as a percentage representing the amount of non-building area on the ground, against the total area of the four blocks. For the Sidewalk Toronto project, Sidewalk Labs envisions that the dynamic curb will allow for useful expansion of open space into the right-of-way, but for the purpose of simplifying calculations, this study took a more strict definition of open space.

Sky access was calculated at points on an analysis grid which matched the study area and included all four blocks. For every point in the analysis grid not inside a building, Sidewalk Labs computed the percentage of a hemisphere of view which can see the sky. Sky access for the entire study area was then expressed as the average of all individual percentages.

Gross floor area was calculated by summing the total area of each floor in all buildings. For the precinct plan, ground floors were assumed to be 5 metres high and all other floors 4 metres high. For building massings produced by generative design, floor heights were 5 metres, 4.5 metres, 4 metres, and 3.3 metres depending on use type.

Sidewalk Labs produced 2,051 different block configurations using the generative design pipeline and evaluated them against the precinct plan with the same measures. The generative design pipeline operated in two distinct modes: (1) modifying and optimizing human-created building massings through geometric operations of translation, scaling, rotation, and reflection, and (2) creating new designs using a series of algorithms for block subdivision and massing creation. For the former, designs from Beyer Blinder Belle were modified to fit on the four blocks; for the latter the pipeline used inputs for target ground floor areas that matched the original precinct plan.

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41. The Canadian Press, "Sears Canada closes its final stores after months-long liquidation." *The Globe and Mail*, January 14, 2018.

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This data was used to compute a blended average of street activity for each type of street: 10 hours a day for destination, 10 hours a day for local, and eight hours a day for downtown. Street activity was defined as more than one-third of businesses being open. The average across all three types of streets was nine hours of street activity a day.

Sidewalk Labs then conducted the same computation for the Sidewalk Toronto project, looking at expected hours of street activity in Quayside, based on an anticipated program in 2035. Due to the more diverse program mix than typical Toronto streets, Sidewalk Labs anticipated 11 hours of street activity a day in Quayside.

In addition, tenants in Quayside would be able to easily share space. Sidewalk Labs assumed that 20 percent of tenants would participate in space sharing, either through co-tenancy arrangements they broker themselves, or through shared space by design, as seen in the stoa. The impact of space sharing is that the street would be active for an additional hour, as it is anticipated that businesses with complementary opening hours will co-locate. That takes Quayside's total average street activity to 12 hours a day, in contrast to nine hours a day seen on typical streets in Toronto.

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