



### **About the Sidewalk Toronto Sustainability Advisory Working Group:**

The Sidewalk Toronto Sustainability Advisory Working Group was established in March 2018 to be a source of external expertise to Waterfront Toronto and Sidewalk Labs. Meetings were chaired by Charlotte Matthews, Director of Sustainability at Sidewalk Labs, and Aaron Barter, Manager of Sustainability and Innovation at Waterfront Toronto.

Members were selected by Waterfront Toronto and Sidewalk Labs as local leaders and experts on issues related to the Quayside project. The list was developed to ensure a range of diverse opinions that balanced institutional affiliations and perspectives on urban issues. Members were primarily from civil society and academia, with a few from the private sector.

Members were invited to attend 4 meetings — March 22, May 1, and September 12, 2018, and January 23rd, 2019 — though not all members were able to attend every meeting.

The role of the advisors was to:

- Provide guidance, critiques and suggestions on proposed approaches, concepts and designs;
- Consider and convey the perspectives of relevant constituencies and stakeholders;
- Provide a sense of the broader community's reactions and concerns and explore how these might be addressed; and
- Provide feedback on any other relevant matters that Sidewalk Labs and Waterfront Toronto refers to the Advisory Group for comment.

Group members operated using a consensus-based approach, and any points of disagreement were noted in the minutes.

The following minutes from each meeting may include editor notes for clarity and context, and have omitted any commercially sensitive content. Meetings followed 'Chatham House Rules'— comments were recorded but not attributed to specific individuals.

In the notes, 'project team' refers to staff, variously, of Waterfront Toronto and Sidewalk Labs who were involved in convening and presenting to the advisory group.

We list the members of the Sustainability Advisory Working Group below in order to establish a complete record. We are grateful for their time, expertise, and their work to refine and improve the ideas that will make up the Master Innovation and Development Plan (MIDP) proposed by Sidewalk Labs. It is, however, important to note that their participation in the advisory working group, and their identification here, does not imply endorsement of the MIDP, any component thereof, or this project, generally.

**Members of the Sustainability Advisory Working Group:**

<b>Name</b>	<b>Organization</b>
Bryan Purcell	The Atmospheric Fund
Helen Platis	QUEST
Katie Harper	Project Neutral
Lesley Herstein	WaterTAP
Milfred Hammerbacher	s2e Technologies
Paul Erlichman	Canada Green Building Council
Peter Halsall	Canadian Urban institute
Aisha Bukhari	MaRS Discovery District - Partnerships
Scott Demark	Theia Partners
Seana Irvine	Centre for Social Innovation



**Sidewalk Toronto Sustainability Advisory Working Group  
Meeting 1; March 22, 2018  
Globe and Mail Centre**

Sidewalk Labs and Waterfront Toronto convened the first meeting of the Sidewalk Toronto Sustainability Advisory Working Group on March 22, 2018 to discuss and seek advice on initial plans for the proposed development of Quayside. This was the first of four planned meetings.

The Working Group comprises sustainable development experts with a range of experience including renewable energy, low carbon development, innovative water technologies, green building standards, and community energy planning.

**Executive Summary**

- The project team reviewed the working relationship between Sidewalk Labs and Waterfront Toronto and presented their mutual sustainability goals and objectives.
- Participants discussed how citizens broadly agree that sustainability is important, but relatively few make environmentally-driven choices.
- Participants widely believed that the project should foster and encourage sustainable living. Participants were split on whether education and direct engagement can significantly increase tenant action / active environmental choice-making or whether convenience will rule the day and beneficial action should be automated.
- Sidewalk Toronto's sustainability focus on building performance, active energy management, thermal, electricity, waste and stormwater aligned with the group's priorities. Delivering best-in-class indoor air quality is also a priority.

**Summary**

After a round of introductions and integrated discussion on topics including resident engagement and low carbon development, the project team gave an overview of the partnership between Sidewalk Labs and Waterfront Toronto, and reviewed the overall Sidewalk Toronto vision. The Terms of Reference for the advisory group were discussed and broadly agreed to.

The chairs then opened the conversation to general comments and questions about the vision for Quayside.

- Participants noted that members of the public can be apathetic about sustainability and discussed the importance of considering behavioural economics when introducing sustainability strategies. While the public is likely to say that they care about this issue, they don't feel that others do, and that can lead to people feeling discouraged from taking action.
- The group discussed the project's direction and how it can best encourage residents to engage in sustainable, energy conserving practices.
  - A participant suggested that embedding sustainability into a neighbourhood's culture may help change behaviour toward more ecologically-conscious living.
  - Another participant noted that if a development has a stated interest in sustainability, it may attract an eco-friendly crowd, which would render efforts to educate the public effectively "preaching to the choir".
  - Another participant noted that there is already a lot of work being done to educate the public about eco-friendly practices and the barrier to sustainable personal choices is often motivation in the moment. It is important to make the sustainable choice also the most convenient one.

Participants were asked to comment on what sustainability success for Sidewalk Toronto might look like five and ten years into the future.

- Most participants felt that rapid changes in climate issues and in technology make it difficult to define what success looks like, and the key is for the development to make adopting new technologies and advancements easy and cost effective,
- Many participants felt the project should push the envelope as much as possible in the hopes of providing new climate positive strategies for other developments and parts of the world. Sidewalk Toronto is an opportunity to introduce innovative strategies that traditional developments don't have interest in or the budget to implement.

The project team then shared their vision for sustainability in the Sidewalk Toronto project. They emphasized their ambition to achieve a climate positive community while balancing innovation and cost effectiveness.

The group next discussed the importance of energy management and ensuring buildings can minimize their energy consumption.

- The project team is exploring the reduction of conditioning in buildings - reversing a trend in overheating and overcooling - by expanding acceptable comfort bands with implications on conventional business attire. The group discussed whether this would be viewed as a step back in comfort and building sophistication, with several participants warning that buildings need to be capable of (over)heating and cooling to attract top

tenants. The group also discussed whether selective tenants demand floor to ceiling glass, despite its less insulative properties.

- Participants discussed industry acceptance for automated building controls and optimization, and the notion of replacing direct system (e.g. thermostat) control with delivering desired outcomes (“I’m cold. Make it warmer (in an energy efficient and cost effective way).”)
- Several participants talked about how to incentivize residents to use only as much energy as needed and not to create new utilities that make money by selling energy (and thus working against conservation). The group discussed how to manage energy bills. Participants noted that residents often prefer one bill that lists all utilities, while still being able to identify how much they are spending on each.

Participants next talked about how best to minimize carbon emissions through the built environment.

- Lowering carbon emissions is a major issue for Toronto. The project team will need to keep transportation emissions close to zero while still providing efficient and reliable mobility options.
- One participant anticipated Renewable Natural Gas could power a significant number of vehicles.
- The group discussed the option of DC power and how significant it might be as an energy source in the future, including whether DC could power entire buildings.
  - Participants were interested in the idea but felt there are a lot of barriers at the moment, and that more information and experimentation is required before being able to make a recommendation either way.
  - A participant noted other countries, like Japan, are using DC power and can give us better information about the potential of this technology.
  - Using DC to power water pumps and street lights would make sense from a sustainability standpoint, but there are lots of concerns about the economic feasibility.
- Participants next talked about waste management.
  - There is an opportunity to innovate on waste management by creating automated waste separation systems that enable single stream collection. Participants advised against such innovation, since Toronto’s current system is designed to support source-separation and moving away from this will jeopardize current progress, as well as contaminate otherwise recyclable paper.

The meeting ended with plans to reconvene on May 1 for the second meeting. The project team committed to bringing more detail on their plans for feedback from the group at this time.



## **Sidewalk Toronto Sustainability Working Group**

**Meeting 2: May 1, 2018**

**Cooper Koo YMCA**

Sidewalk Labs and Waterfront Toronto convened the second meeting of the Sidewalk Toronto Sustainability Working Group on May 1, 2018. A group of sustainability experts met to provide input on the early stages of sustainability initiatives on the Sidewalk Toronto project.

### **Executive Summary**

- Participants expressed a commitment to working with the project team to develop strategies and technologies that would contribute to the goal of creating a carbon neutral/climate positive community.
- Participants generally felt that though many of these solutions will involve technological innovations, there are larger questions to answer about what it means to live in a sustainable community, and how to encourage residents to embrace this idea.
- Participants discussed how Quayside could encourage and promote behaviour change without imposing a static and top-down idea of sustainability allowing for individual control of the environment.
- The group discussed a number of different technological and technical solutions to some of the issues that might come up in the creation of a climate positive community.
- Participants agreed that by Quayside can improve energy efficiency by automating building management systems and other systems relating to energy use.

### **Presentation**

The working group meeting began with a general discussion of participants' reflections on the last meeting.

- Participants emphasized that the discussion about sustainability should only be partly about technology. Another important part is about considering what it means to live in a sustainable community.

- Participants spoke in support of Quayside as an opportunity to promote behavioural change around sustainability. Participations recognized that a tension will be encouraging this change while not forcing it.
- Some participants suggested that this development could offer an opportunity to use DC power rather than AC. A participant suggested that Quayside could move to DC power by creating a DC micro-power grid. Other participants expressed concerns that this would not be viable at this point and would overly complicate this discussion.
- Participants wondered if it would make sense to move to single stream sorting for recycling, composting and other waste diversion to improve efficiency and usefulness.
  - Other participants felt that the research suggests that improving sorting behaviour is the better approach. Since behaviour change is already a priority, this approach might make more sense.
- One participant felt it is important for the project team to think about planning around future obsolescence of materials and technology. This will allow for flexibility as the technology and research underpinning this work inevitably evolves and develops.

The project team then led the working group through a review of the core principles supporting the Sidewalk Toronto vision as well as of the timeline for delivering the Master Innovation and Development Plan. Participants discussed the process for developing the project.

- Participants expressed support for using Sidewalk Toronto to push the envelope around city planning and development in the City of Toronto.
- One participant asked if the working group should also be talking about the built environment within the sustainability pillar.
  - The project team responded that there is already a built environment working group and that many of these pillars overlap. There may be opportunities later to engage with other pillar working groups.

The project team led the working group through a brief discussion of the pillar vision and objectives. The project team requested that participants keep in mind two questions in the ensuing discussion:

- What do we mean when we talk about carbon positive?
- How we get to this point within the Quayside project?

### **March-April Work Highlights**

The project team reviewed the progress they have made since the last working group meeting. Participants discussed various outstanding issues that the project team has prioritized within the sustainability pillar.

### Low Energy Load Buildings

- The project team is working towards the goal that all buildings will be designed to a low load outcome-based energy target.
- This will included extensive study of different energy use models and how well these models work in improving energy efficiency.
- Issues to solve:
  - Gap between energy model and building energy use;
  - Setting energy intensity targets for dynamic buildings.

### Discussion

- Participants suggested that for this initiative to be effective, the study has to look at data on the cost of energy use efficiency as well as energy use itself. One participant felt that since all of this data would be collected as part of this study this could be a good opportunity to do a thorough analysis of all aspects of the energy efficiency problem.
- Participants felt that it will be important to meet and support the Toronto Green Standard, but that it would be even more valuable if we ensure that the performance target meets the models.
- Participants generally agreed that the project team can develop a more nuanced and sophisticated target for different buildings and different uses. This would help in understanding buildings' optimal use and occupancy. This would further allow the project team to move to more dynamic energy-use targets.
- Participants were comfortable with the goal of automating the energy-optimization of buildings in Quayside.

### Active Energy Management

- The project team is working towards the goal of creating a more automated building management systems (BMS) that will “wring out” energy waste.
- The ultimate goal is to create a new BMS that will re-imagine how this could work.
- Issues to solve:
  - Building data is messy and requires expert analysis;
  - Buildings are overheated, overcooled, and just left to run;

- 40 to 60% of buildings' energy use is (un)controlled by tenants.

## Discussion

- Participants recognized that conventional energy use is controlled by consumers, many of whom leave systems to run on their own with very little involvement. Participants felt that it would be worthwhile to take control of energy management in order to:
  - Intervene to eliminate energy waste; and,
  - Get to a future state of optimization;
- Participants agreed that a need to attempt to standardize building data would be needed to achieve to take control
- Participants agreed that it would be beneficial to move away from users controlling energy use, and that it would be preferable to have users get the results they want without having to intervene directly in energy use decisions. (i.e. 'I'm cold or I'm hot', not 'I need the temperature up 2 degrees vs 8 degrees'.)
- Participants suggested that much of this is already possible with smart home technology, though this use would need to be expanded to meet the much larger needs of broader community energy use.
- Participants felt that these kinds of interventions can have a real impact on health, happiness and behaviour. If people feel that they're actively involved in a sustainability project there's more of a willingness to be involved in these kinds of interventions.
- Participants recognized that there could be concerns about data use and storage and were happy that the project team is working towards standards and rules for data governance. Participants agreed that it is important that the use of this data is democratic.
- Participants asked if there has been discussion around whether the use of these technologies would be mandatory for residents, and how transparent this data use would be.
  - Discussion of implementation are ongoing as are conversations about privacy and transparency. Determining the interventions necessary to get to climate positive will help to determine what needs to be required (technology and data).
- Participants noted that many of these building management technologies could be prohibitively expensive. An important part of this work would also be ensuring that the design of systems is flexible enough to adapt to technological shifts.

## Thermal Grid

- The project team is committed to utilizing waste heat and geothermal resources to offset the use of fossil fuels for heating.
- Issues to solve:
  - Constant hot and chilled water production and circulation losses;
  - Central plants do not accommodate phased and dynamic developments;
  - Indirect transfer of thermal energy between buildings.

## Discussion

- Participants considered how to negotiate the tension between the diffusion of equipment that will regulate this system, and the need for central control and transparency in the system to maximize efficiency.
- Participants felt that there is a risk of building managers opting out of these systems and losing the benefit of the system-wide focus on efficiency.
- Participants warned that too often we assume that buildings will perform as planned in this kind of system, though this is often not the case, and that if they do not, the system does not work. If we do not have the temperature variations that will allow for the exchange of this energy we may need to inject heat into the system to preserve the exchange.
  - Participants asked how to do this in a way that maintains the focus on carbon neutrality. It is relatively easy to inject heat into these systems, but many of these interventions will rely on fossil fuel or external electrical sources. The issue then is that you will either undermine carbon neutrality or will be forced to pay excessive cost.
- Participants concluded that for this system to work it needs to have central control that will be able to manage and run the system in such a way that the very narrow energy savings margins are maintained.

## Advanced Electrical Grid

- The project team is looking to create a smart grid with 50% solar, electric vehicle (EV) supercharging, and operator visibility.
- The project team is hoping to prototype potential solutions for electrical grid issues within Toronto.

- Issues to solve:
  - Limited visibility/control of behind the meter loads, storage and generation;
  - Customers disengaged from energy conservation and demand management;
  - Control and management of large electrical loads, like EV supercharging.

### Discussion

- Participants discussed technologies that could allow for Quayside to create various types of micro-grids powered by alternative energies.
  - Participants talked about how solar panels can be much more integrated into other uses than has been conventionally envisioned. For example;
    - Solar panels can be mounted on the roofs of picnic shelters or other public buildings;
    - Solar panels can increasingly be integrated into other rooftop uses
    - Solar panels can be mounted on facades as well. In this case south-facing walls would be the best orientation for solar panels in a Canadian winter.
- Participants felt that this discussion needs to be integrated with built environmental and public realm discussions, maybe in a shared meeting with groups working on those pillars.
- Participants noted that solar has evolved significantly in the past decade. Solar technologies are much more affordable and efficient and will continue to become more so.
  - Solar panels are much less obtrusive than they have been, and are much more flexible in how they can be integrated.
  - Solars are now on the verge of becoming bifacial which expands how they can be mounted and arranged.
- Participants emphasized the importance of simplicity of energy systems, not just for efficiency but also to ensure the trades can install and maintain systems.
  - One of the benefits of solar power is it has minimal moving parts, which is important given the challenges of icy weather in Toronto.
- One participant reminded the group that there is continuing development of paints and pigments that reduce energy loss and that can also gather solar power.

- Participants discussed the rapidity of technological developments, and the importance of maintaining flexibility as new technologies emerge.
- One participant asked if the project team could find significant savings in taking over secondary distribution from a hydro utility. This would allow for greater flexibility and future proofing.
- Participants discussed the renewed smart grid office within Toronto Hydro that may be a good partner for this kind of grid development.
- Participants brainstormed consultants and public utilities that could help with the development of new types of grids.
- Participants suggested that Quayside could be developed as a campus so that it could be custom designed, and then expand to more of a partnership with larger utilities.
- One participant felt that virtual net metering will be an important part of this.
- Participants wanted the project team to be aware of issues around street lighting and how this is municipally owned but needs to be connected to the grid.

### **Breakout Discussion**

Participants split into three groups to discuss different sets of questions.

Group 1: People want to know that they're living in a "sustainable community" and feel part of the mission. How can this be done well? Is it okay to suggest people wear a sweater in corridors? What should our new comfort norms be?

### Discussion:

- Participants noted that people who will be most excited about sustainable communities may not be a representative sample.
- Participants felt it will be hard to make a system that works for everyone. Sidewalk Labs needs to decide who this new community is targeted for.
- Participants said it's okay to have new comfort norms, but they have to ensure it won't be perceived as a sacrifice. It can be framed as a positive development; eg. better air quality, soundproofing, lower energy bills, as well as smart leadership and innovation.
- Participants discussed which frames were most likely to engage the public: highlighting the technological innovations of the community, or highlighting sustainability?

- Presenting a compelling narrative around the positive idea of being in a sustainable community may make it easier for people to agree to change their expectations around comfort.
- A participant also noted there are probably many inefficiencies we can get rid of before actually requesting sacrifices from the public.
- A participant suggested presenting information to the public about costs and benefits of different approaches.
  - A big part of this would be continuing community programming and marketing that continues to emphasize the draw of this kind of a community, and emphasizing that this is a unique and special idea, and discuss the quality of life.

Group 2: We believe we can manage power demand better if we charge for it differently. What do you think of the following concepts?

- Tiered rates, in which usage in excess of norms is hit with a premium pay for carbon offsets;
- Real time greenhouse gas-based rates, with a price on carbon;
- Other ideas.

### Discussion

- Participants said very few people actually know what energy costs or how their energy use breaks down. For these ideas to work the public needs appropriate information about cost and use of energy.
- The group felt positively about peak pricing, but that it is more effective to have this for issues of automation and smart devices and it's not really that important when it comes to individual behaviours.
- For individual behaviours, the group was much more enthusiastic about ideas of premiums for over-use of energy based on consumption. The system could provide warnings that would allow consumers to understand rate use and modify behaviour (similar to data use warnings on a cellular plan).
- A participant commented that we can't depend on technology for everything, and that 'common sense solutions' like opening windows more could be encouraged.
- It will be important to provide tools that will allow consumers to make smart decisions about energy use.

Group 3: We plan to automate building optimization, because we don't believe people manage buildings well, or care. In our public forum, residents suggested that the project team create technologies that could regulate power use when residents are absent from their homes.

- How deep should we get into residential energy use?
- How can we do this in a more comfortable way?

### Discussion

- The consensus of the group was that automation to some degree, and overrides of some sort, are essential. However, participants also agreed that too much interference in power regulation becomes problematic.
- Participants liked the idea of phased approach, where automation makes decisions with you at first and then automation gradually takes more of an initiative in these decisions.
- Participants noted that it is possible to over-do automation. They asked about what the limit should be.
- Participants commented that comfort with automation is likely to evolve with different generations.
- A participant noted that much of this technology already exists or can be easily enabled.

### **Next steps**

- There are three more work-streams in the Sustainability pillar that will be discussed at the next working group meeting.
- The project team will continue to develop its plans around sustainability and will report back to the working group in preparation for subsequent meetings.



**Sidewalk Toronto Sustainability Advisory Working Group  
Meeting 3: September 12, 2018  
Sidewalk Labs - 307 Lake Shore Blvd E**

The Sidewalk Toronto Sustainability Working Group met for their third meeting on Sept 12, 2018 at 307 Lake Shore Blvd.

**Executive Summary**

- The project team delivered updates on a variety of concepts they are working on for the Master Innovation and Development Plan (MIDP), including the Smart Waste Chain, Active Stormwater Management plans, and concepts for the Thermal Grid and Advanced Power Grid.
- Consultants from Urban Equation and EQ Building Performance delivered a presentation on a recent study exploring performance gaps between building energy use intensity (EUI) models and actual performance. The average gap was about 13%. Deck attached.
- Participants requested more information about how the project team will make Quayside Climate Positive, rather than just carbon-neutral. This information will be in the MIDP and the project team will walk through the roadmap at the next meeting.
- Participants were excited about many of the proposed concepts and systems to manage waste and energy use through encouraging behaviour change, as well as some of the technological solutions proposed to manage stormwater and allow buildings to exchange heat more efficiently.
- Participants emphasized the importance of economic solvency of some of the concepts.

## Updates

The project team began the meeting by updating the group on the public engagement process to date, including the most recent public roundtables on August 14 and 15th. The [deck](#) is available online.

The project team also updated the group on the release of the Plan Development Agreement on July 31st, which articulates and encodes the process under which Waterfront Toronto and Sidewalk Labs will work together to create the Master Innovation and Development Plan (MIDP). The project team committed to presenting the Sustainability Working Group with a preview of what will be in the MIDP with regards to sustainability prior to the draft plan's release.

- A participant asked for clarity about how the MIDP would be realized and Sidewalk's role as it relates to developers.
  - Sidewalk Labs responded that they see themselves as an enabler and are open to partnering with developers, both at Quayside and at scale in the future.

The project team gave an update on potential future meetings of the advisory group. They intend to convene at least one more meeting in 2018 to brief the group on the sustainability components of the MIDP. Any meetings beyond that would have to be discussed with the group.

- A participant requested clarity on how the MIDP would address the project team's commitment to making the project climate positive.
  - Sidewalk Labs responded that the MIDP would set out a roadmap to get to climate positive, and that this is a central commitment that will not change.

Finally, participants discussed the recent change in government in Ontario and whether and how this might impact the Sidewalk Toronto project.

## Presentation: Smart Waste Chain

Sidewalk Labs presented the group on their current plans for handling waste diversion. Sidewalk Labs noted that they had initially proposed taking waste sorting out of the hands of residents and dealing with it on the back end, but changed this approach based on feedback from this Advisory Group.

Sidewalk Labs is now proposing a 'smart chute' system that would require residents to sort trash at the disposal point. The system would track what is disposed of at the chute, potentially also with a 'pay as you throw' system. The waste would go into a pneumatic system using underground pipes to convey waste through the system to a neighbourhood consolidation centre. The waste will be stored in large sealed containers that will be picked up at a single pickup location in Quayside, eliminating the need for garbage trucks within the site.

Public realm trash would be handled both by pneumatics that connect to the underground conveyance system, and flexible bins deployed as needed by robotics.

Organic processing at a large scale would be done with anaerobic digesters to generate heat for the thermal grid.

Sidewalk Labs also noted they are working on a pilot project on material recovery to test visualization technology, especially how the tracking and reporting back metrics on waste contamination at a building level could impact individual behaviour around waste sorting. The Pilot is using traditional methods with people to sort and characterize the waste and pairing with computer vision. A camera is placed on a conveyor belt, and uses machine learning to identify the waste type. Using computer vision for this would allow for ongoing tracking and direct feedback in a real world scenarios.

- A participant suggested that Sidewalk Labs ensure they connect with local behavioural scientists to get the best possible advice on how to make this as effective as possible.
  - Participant stated that people react to disincentives 5 times more than incentives.
- Participants discussed whether this system would lead to behaviour change, or incentivize people to use common bins to avoid paying and bypassing the public education component.
- A participant asked for more information on how Sidewalk Labs is engaging with recycling companies, since these companies are often changing their guidelines around what they accept, which could impact waste diversion goals.
  - Sidewalk Labs agreed it is important, and noted that their system would likely help recycling companies by providing less contaminated loads, as well as better information about what is in each bale of recycling, allowing companies to more accurately price the commodities.
- A participant suggested looking at setting up structures and rules to limit upstream waste that can't be recycled, such as certain types of grocery packaging.
- A participant asked about how the pricing in the smart chute system would compare to what a person currently pays for waste through taxes and fees in a multi unit residential building. They noted that previous similar pilots have proved prohibitively expensive, and noted that the economics might prove difficult in Quayside.
  - Sidewalk Labs responded that they are figuring out the rate structure now and that some of this might only prove profitable at scale. It is difficult to do true cost comparisons because municipalities heavily subsidize waste collection, making it difficult to understand the true cost to residents.

- A participant suggested that since many biogas systems are not yet economical in Ontario, Sidewalk Labs should partner with existing aerobic digesters or wastewater treatment plants to add capacity and monetize that, rather than building a new community scale digester.

### **Presentation: Multi-Unit Residential Building Study: Diagnosing performance gaps between design and operational energy use**

Next, Jenny McMinn from Urban Equation and Craig McIntyre from EQ Building Performance visited the working group to present the results of a recent study they conducted to quantify and diagnose the performance gap between modelled and actual building performance when it comes to energy use.

The study found that there was an average 13% performance gap between modeled and actual building energy use intensity in multi-unit residential buildings, but that this can be managed to reasonably inform on delivered performance of buildings. The study leaders and Industry Advisory Group were surprised that the gap was not larger.

The study identified four areas where the gap between the models and the actual usage was significantly different: in the base building/common space load, domestic hot water heating, in-suite electricity usage, and space heating. — A participant noted how pleased they were to see their instincts about suite electricity usage confirmed with data.

The study also looked specifically at the difference between water-source heat pump (WSHP) systems and fan coil unit (FCU) systems. The presenters noted that counter to what might be expected, there was no clear trend of WSHP buildings using less gas than FCU buildings. They noted this may be because many of the FCU buildings were also LEED-certified and thus have more efficient DHW systems. When normalized for building age however, the difference in gas use was only 10%. The study also found no appreciable energy efficiency benefit for FCU over WSHP, as modeling would imply.

The study showed that the current market could face challenges in meeting new Toronto Green Standard levels of performance when it comes to energy usage, with less than half of the buildings approved for construction before May 2018 meeting the new Toronto Green Standard v3 Tier I requirement.

Participants discussed these findings with considerable interest and requested a copy of the presentation, as well as a preview of the report once it passes through its final editing.

## **Presentation: Active Stormwater Management**

Sidewalk Labs next delivered a presentation about their stormwater management strategy.

The strategy has three layers, incorporating green infrastructure, hard infrastructure, and active management. Sidewalk Labs hopes to integrate green infrastructure such as bioswales, soil cells, and low green roofs into the public realm. They also intend to use soil infiltration systems with regular water quality monitoring to reduce the need for UV filtration.

Hard infrastructure would include both existing infrastructure and blue roofs. Active management would involve a weather station to track incoming storm events, ongoing tracking of water levels to allow for pumping prior to storm events, moisture tracking within landscaping systems to trigger irrigation, and tracking and adjustment of water treatment based on water quality. This tracking would be done by a cloud-based system that uses real-time data and predictive weather forecasting. Sidewalk Labs is working with Ryerson University to further explore issues with installing and maintaining green infrastructure, so as to ensure people are trained to run and maintain these systems.

- Participants discussed the challenges of handling stormwater in a neighbourhood so close to the lake.
  - Sidewalk Labs noted that current city codes require them to hold and treat the water, but Sidewalk Labs would like to explore alternatives, such as tracking water quality more precisely so as to potentially bypass UV treatment when water quality is not a risk.
  - Participants asked about whether Sidewalk Labs is considering reusing stormwater for building uses such as toilet flushing.
  - Sidewalk Labs has toured buildings where they have done that, but the additional infrastructure is considerable. The preferred strategy is to enable clean rainwater to flow to the lake.

## **Presentation: Thermal Grid Concept**

Sidewalk Labs presented on their thermal grid concept. They noted that while their buildings will be extremely well insulated, they still need heating, which is typically provided with gas-fueled boilers (even in buildings with WSHP, as shown by the study discussed previously.) They are thus working towards building a thermal grid that is scalable to surrounding neighbourhood, and uses multiple low-grade heat sources to replace the need for gas in condenser water systems. To achieve this, Sidewalk Labs is exploring a 'bi-directional' district energy system that allows buildings (and other heat sinks and sources) to efficiently exchange energy directly, rather than passing through a central plant. The design for Quayside uses geothermal and sewer heat recovery for supplemental heating and cooling.

- Participants thought the bi-directional system sounded interesting. One participant suggested connecting with researchers at McMaster who are working on similar low temperature district energy systems.

### **Presentation: Advanced Power Grid Concept**

The project team ended with a presentation on the advanced power grid concept for Quayside.

This concept aims to advance a model for climate-positive urban development, while enabling operational operational transparency and control from utility interconnection through to end-use (i.e. plug level). The project team believes that active and automated control of the grid will enable right-sizing capital investment in the electricity grid, improving planning for future grid expansion, and reducing capital costs of grid expansion over time.

The project team also intends to keep electricity bills reasonable and lower than typical, where possible, while providing additional services and transparent rate design to assist end-users in managing their energy costs and to reduce GHG emissions.

This system would rely on Toronto Hydro as the primary source of electricity, while also supplementing with solar power. The neighbourhood will introduce energy storage, electrification of cooking (no natural gas would be used in Quayside), heat pumps, and new electricity rates that reward people who use power in off-peak hours.

- Participants asked for more information on whether Sidewalk Labs has approached Toronto Hydro or the Ontario Energy Board about this concept.
  - Sidewalk Labs indicated that there are conversations ongoing with Toronto Hydro to map scenarios for supplying power to the neighbourhood.
- A participant also asked whether the model described would make Sidewalk Labs an LDC (local distribution company).
  - Sidewalk Labs responded that they are not an LDC, and that they would not be establishing a new LDC. The process of defining the roles and responsibilities for supplying electricity and charging rates is an active and ongoing conversation.
- A participant suggested that the project team reach out to the Canadian National Exhibition to inquire about how their model works, as there may be applicable learnings for Sidewalk Toronto.
- Participants asked several questions about the rate structure and whether rates would be higher than outside of Quayside.
  - The project team responded that the rates would be different, but that customers who are responsive to pricing and non-intrusive prompts should pay at least the

same, if not less overall for energy. This includes the inherent savings for not having a gas account.

- A participant suggested that it might be more effective to leave the rate structure as is but layer on new incentives, as well as virtual net metering, which has been discussed in Ontario already and is better known to the Ontario Energy Board.
  - The project team mentioned dynamic and real-time pricing would mean residents with relatively inflexible demand during peak hours could choose to pay for access to energy storage (battery), instead of relying on grid electricity at peak.
- A participant felt that the project would face challenges due to electrification of loads being a more expensive alternative to natural gas, specifically domestic hot water.
- A participant suggested that while energy storage is currently expensive and not economical, in the near-future the tech will be more cost-effective. They suggested that in anticipation of these improvements, Sidewalk Labs not try to avoid new delivery capacity from Toronto Hydro and instead look at generating and storing more energy onsite.
- A participant asked for more information on how Sidewalk Toronto will get to climate positive with less than 10% of energy generated onsite through solar panels.
  - The project team responded that reducing peak demand usage will result in a higher-than-usual portion of low-carbon off-peak electricity from the grid.
  - The project team noted that participants will receive a full briefing on the climate positive strategy in our next meeting, including an approach to renewable energy.
- A participant asked whether Sidewalk Labs will use thermal storage methods, since much of the neighbourhoods emissions will come from heating and cooling.
  - Sidewalk Labs responded that the geothermal system is essentially a storage system, but they are open to looking at supplemental forms of thermal storage.
- A participant asked whether Sidewalk Labs has considered using the lake as a heat sink instead of the geothermal to avoid the cost of drilling. Sidewalk Labs said they had looked into it but the design consultants determined that geothermal was preferable. Sidewalk Labs will circle back with the consultants to take another look.

## Conclusion

The meeting wrapped up with participants giving their reflections on what most excited, and most concerned them.

- Participants were excited by the overall vision, modular and flexible designs, and the bidirectional loop concept for heating. (Thinking outside of the box)
- Participants were concerned about the economic viability of some of the concepts and wanted to see more information at future meetings. A few participants expressed some questions about the assumptions about behaviour change and consumer decision making that underpin some of the concepts, and suggested connecting with local behavioural scientists. A participant noted people respond more to disincentives than to incentives.
- Participants also expressed concern about Ontario's changing political context and how this might have some impact on the project.
- Participants questioned if there was an appetite for this type of development in Toronto?
- Participants had a few final suggestions for the project team, including:
  - Setting up a microgrid structure for electricity that enables solar and geothermal storage to meet most of the demand, with the Toronto Hydro supply making up the rest; and
  - Utilizing the expertise at Canada's universities more, both for their knowledge and for their connections.



**Sidewalk Toronto Sustainability Advisory Working Group  
Meeting 4: January 23, 2019  
Sidewalk Labs - 307 Lake Shore Blvd E**

The Sidewalk Toronto Sustainability Advisory Working Group met for their fourth and final meeting on January 23, 2019 at 307 Lake Shore Blvd E.

**Executive Summary**

- The project team delivered updates on the ongoing work for the Master Innovation and Development Plan (MIDP), including the Climate Positive roadmap, path to affordable electrification, tools like Target and dynamic utility pricing, as well as stormwater and solid waste management plans.
- Chris Sitzenstock from the Sidewalk Labs Buildings team delivered a presentation on sustainable building materials: timber and shikkui plaster.
- Rachel Steinberg and Jeff Tarr from Sidewalk Labs delivered a presentation on technology updates, around the Responsible Data Use Agreement and Digital Electricity.
- As per feedback to incorporate behavioural science in encouraging smart waste diversion and energy use, the project team shared that they've started working with the Behavioural Insights Team. (Story further told at the [City of the Future podcast](#) episode, Closing the Recycling Loop.)
- The project team noted that they are closely consulting with respective authorities to achieve innovative approaches like taller timber buildings and dynamic utility pricing.
- Participants were excited about the >75% reduction of per capita carbon emissions at Quayside.
- Participants emphasized the importance of social sustainability impact, such as leveraging the project's material supply chain to engage indigenous communities working in forest management, or creating training and public awareness opportunities for electrical induction cooking in lieu of natural gas.

## Updates

The project team noted that their presentation to Waterfront Toronto's Design Review Panel is now available [online](#).

The meeting started with an acknowledgement to various consultants engaged by Sidewalk Labs for thought leadership and research on different concepts in the sustainability pillar. The project team acknowledged that Canada has researched and put out policy guidelines that have inspired the ongoing work, and updated the group on some areas of alignment with City of Toronto policy. The team noted that they have done a synopsis of different policies across all three levels of government and their objectives to ensure consistent alignment.

- The new Toronto Green Standard v3.0 was released in May 2018, and there are four performance Tiers, each with Core and/or Optional measures.
- The project team shared that Tier 4 is achievable (notably the GHG intensity level), but overall, SWL is committing to Tier 3 for now while the building designs are finalized.
- The project team also described how updated energy modelling practices (with updated criteria for building envelope) have revised some energy performance estimates.

The latest Climate Positive roadmap for Quayside indicates a 75% reduction of per capita carbon emissions (metric tons CO<sub>2</sub>e) compared to Toronto's baseline average (2016).

- The team noted that one of the next steps is identifying existing carbon emissions within adjacent waterfront neighbourhoods, that could be offset by the Sidewalk Toronto project, to bring down emissions to truly Climate Positive. Some of these opportunities could include energy efficiency upgrades and installation of rooftop solar PV.

Research from The Atmospheric Fund (TAF) shows that 60% of Toronto's emissions are buildings, which is lower than some other major cities due to Toronto's dense (but not overly dense), development (i.e. creating less mobility emissions).

- 87% of the emissions from buildings are from natural gas, thanks to the Ontario electricity grid already being very green. Therefore, the team emphasizes the need to take natural gas out of the system in order to reduce emissions.
- In order to keep overall utility costs consistent with BAU in this all-electrification scenario, the project team intends to manage the electrical load through effective building envelopes, an advanced power grid and thermal grid, such that the design can remain within the capacity of a typical electricity grid.
- It is envisioned that Quayside will be served by two independent substations, each capable of serving the entire neighborhood but also islanding the neighborhood and individual buildings during a power outage. The resulting higher level of resiliency is complemented by on-site energy resources including solar PV, biodiesel emergency generators and battery storage.

- Also, because buildings are highly insulated, the temperature of the heat pumps does not need to be extremely hot or cool, contributing to higher thermal efficiency.
- The team noted that Toronto Hydro has been a great collaborator in early conversations to date.

The group was surprised to discover that Toronto MURBs with water source heat pumps use nearly as much natural gas as those with traditional hot water heating (i.e. natural gas boilers). The project team learned that heat pump loops require considerable tempering, most often from boiler-fed hot water. In response, the project team presented their initial thermal grid concept, which uses geothermal wells, sewer heat recovery and multiple tiers of heat pumps tied into an ambient temperature water loop with mini-plants.

- The group asked if there were offsite energy sources like the Ashbridges Bay Wastewater Treatment Plant or the Redpath factory under consideration. The project team responded that they are speaking with energy sources outside of the boundary and a neighborhood data center to bring rejected heat from commercial buildings and to ultimately form a broader thermal grid network.
- The team also noted that some adjacent heat sources have decided not to proceed with SWL. The team further noted that there will be an RFP to operate the thermal grid.

A participant noted that there are public stigmas against removing natural gas. The group discussed importance of public engagement on this topic. The project team noted that off-site tall timber prefabrication and construction could reduce emissions during the construction phase, and that removing gas would also remove fire hazards from tall timber buildings.

- The team noted that there is an interesting social engagement opportunity around the absence of natural gas in the neighbourhood; it may be attractive for pilots to raise awareness around commercial and residential inductive cooking (e.g. in restaurants).

The team emphasized the need for air tightness testing to ensure building performance is up to par with modelling standards. Strong results were observed in the City of Seattle, which requires air tightness testing for new developments.

The project team outlined several observed common challenges to increasing building energy efficiency were noted to be:

- Current practices are to regulate design vs. actually regulating the energy use in buildings post-development.
  - In response, the project team is trying to create tool that can enable an outcome-based energy performance code. The tool will help identify how the different tenants appropriately consume energy, so higher occupancy or otherwise productive energy use is not penalized unfairly.

- Consumer response. Ontario's Time-Of-Use electricity pricing in Ontario led to only a 3% reduction in demand, but when coupled with automation of a few appliances and thermostat in other jurisdictions, it has been shown to decrease demand by 20-40%.
  - In response, the project team intends to pilot predictable, dynamic utility rates, which Sidewalk Labs hopes to bring to market through Quayside. In this pricing model, there would be a low-cost monthly plan that includes high levels of automation and device-level interventions, while a higher-cost monthly plan would have minimal intervention (i.e. only consumer-initiated demand management). The rate will also account for community ownership of solar PV and batteries to assist with managing exposure to peak electricity prices.
  - A participant asked if Toronto Hydro has been supportive of a local utility rate structure.
    - The project team noted that there was a charette in October that included utilities and smart grid thought-leaders in Ontario. In that conversation, many stakeholders showed an openness to new approaches, such as creating a sandbox for innovative pilots. The team noted that they will be initiating discussions with regulators as appropriate.
    - The project team highlighted the proposed approach: Can we create an energy management tool that is smart enough to 'figure out the rest', once a resident's preferences have been noted?

### **Advanced Stormwater Management**

In response to public feedback suggesting that nature should be incorporated into the design of Quayside, the project team has embedded green infrastructure into the advanced stormwater management plan. The proposed model will invite individual development parcels to pay for 'stormwater credits', enabling use the green stormwater management infrastructure in the public right-of-way, instead of installing individual big grey tanks. The team noted that this is ongoing work, especially in consultation with the City of Toronto, as it involves public right-of-way.

The team noted that the site plan may change, especially how Queens Quay continues across the Parliament Slip. This would affect the design and layout of green stormwater infrastructure.

### **Smart Disposal Chain**

Sidewalk Toronto is committed to achieving 80% waste diversion, and believes this will be enabled by a smart disposal chain including waste characterization using computer vision (a the material recovery facility), dynamic user feedback, and Pay-as-You-Throw solid waste plans. These techniques will reduce processing costs from waste and recycling contamination and create accountability for MURBs. This model builds upon successful models observed by the project team in Seoul and Tokyo.

- The team has engaged The Behavioural Insights Team in response to the group's comments about applying nudge theory at the last Advisory Working Group meeting, and they are working to create a feedback loop, ideally at the user interface.
- The team updated the group on the waste pilot, including plans for each individual user to use a simple app instead of a tablet chute interface.

## **Presentation: Sustainable Building Materials**

Chris Sitzenstock from Sidewalk Labs' Building Innovation team presented on two sustainable building materials: tall timber construction and Shikkui plaster.

### *Updates on tall timber construction:*

- Concrete and steel are rising in costs, but timber prices has remained flat/consistent.
- Pace of construction can be as rapid as 1 storey/day, which is 30% faster than concrete and steel construction. This was observed at Brock Commons at UBC.
- The project team anticipates utilizing cross-laminated timber (CLT) panels that use adhesives that are VOC and formaldehyde free.
- The project team is developing a 'Kit of Parts' system to standardize buildings, which has been seen in Europe, which success. Off-site fabrication also brings down costs.
- The project team anticipates that 100,000 cubic metres of timber products would be required for the first phase of the 12-acre Quayside site. The working group noted that this will be a large opportunity to drive lower prices and commoditization.
- Transportation for timber is much more efficient: 7 times less trucks needed versus same volume of concrete (i.e. it is a lighter weight material - less transportation emissions.).

Chris shared some of the tests the team has undertaken to date:

- Fire testing of CLT mock-ups has been conducted, and floor plates will begin testing in February, aiming for demonstration at 307 at the end of Q1.
  - The project team reported that CLT passed the 1-hour and 2-hour burn tests at a facility in the US (conducted in January 2018).
  - More testing and certification efforts will continue to end of Q3.
- The project team noted that they are planning to conduct demo burn tests with fire officials and starting to talk to fire chiefs. The group noted this was a good idea, mentioning that some tall timber developers have offered classes for local firefighters.
- A participant suggested that the Canadian Wood Council has done a number of wood burning tests, which are public and may be useful.

On the topic of certified sustainable forests, Chris emphasized that Canada has the most Forest Stewardship Council (FSC) certified forests worldwide. It was further noted that additional timber could be FSC certified, but is not currently.

- The group noted that there may be a disconnect between what you can buy and what the forest management looks like. The group suggested at the scale of 100,000 cubic metres, Sidewalk Labs may be able to surpass intermediaries to go directly from sustainable foresters to factories.
- The group suggested that the project team speak with First Nations communities with forestry operations underway (e.g. communities in sub-boreal forest north of Ottawa, or in Quebec) whose rates of success have been markedly better.
  - Responsible forest management for CLT production could be an excellent opportunity for the project to create benefits for local indigenous communities.
- The group finally emphasized that Forest Stewardship Council (FSC) certified wood products should be utilized, versus wood products certified under the Programme for the Endorsement of Forest Certification (PEFC) or other standards.

A participant asked about regulatory approval risks.

- The project team responded that the plan is to approach authorities with full building designs, as soon as possible and appropriate.
- The project team also mentioned that that by the time of construction, it is possible that the building code will have changed to allow higher wood buildings, and that alternative compliance paths or exceptions may be made for buildings up to 30 storeys.

*Updates on Shikkui plaster:*

Shikkui plaster was introduced with a brief history of its wide application in Japan, where it has been used to coat timber buildings to mitigate fire risks from oil lamps for over 1,000 years. Shikkui plaster would be an effective replacement for drywall and paint, and easy application (e.g. spray, cast, etc.) allows for easy adoption.

- The group noted that the price premium for Brock Commons (tall timber building in Vancouver) came from the three layers of drywall, required for fire protection
- The project team noted that the CLT portion that requires fire-proofing will be coated with Shikkui at Quayside.

A participant asked about the price comparison.

- The team noted that Shikkui is cost neutral or bit less for material than drywall.
- Off-site and wet-on-wet application can also reduce labour costs by half.

A participant asked about any issues with high alkalinity levels in the downstream wastewater at the plant.

- The team noted that the plaster has high end-of-life value, and can even be used as fertilizer in agriculture (and the alkalinity in the walls will become inert once applied).

A participant asked about challenges sourcing Shikkui plaster in Canada/Toronto.

- The team responded that most of Shikkui is currently imported, but it is anticipated that a supply chain could be easily established in North America, with increased demand.
- The team also noted that Shikkui plaster is being used for a number of high-end projects today, and that it is currently Cradle to Cradle (C2C) Silver certified, but working towards C2C Gold certification.

### **Presentation: Technology Pilots and Innovations**

The project team provided an overview of the proposed new model for data governance, including the recommendation for the establishment of an independent Civic Data Trust, the recommendation that all parties (including Sidewalk Labs) who desire to collect, use and disclose urban data in Quayside conduct a Responsible Data Impact Assessment (RDIA) that asks key privacy by design and data governance questions and assesses the benefits of such activity against any impacts on individuals and the community, the use of published standards, and a commitment to adhere to Responsible Data Use (RDU) Guidelines.

The project team also highlighted the ongoing effort led by Waterfront Toronto on Civic Data Trust with the MaRS Discovery District. More information is available [here](#).

Participants noted that there has been a lot of public discussion around data governance. A participant noted there are two issues regarding data that should be addressed separately. The first is privacy and misuse of personal information. The second is public discomfort with the broader commercialization of data. The group agreed that more public distinction between these concerns could lead to a more constructive discussion around how data can be meaningfully used for collective benefit (e.g. meeting climate targets).

The presentation team also introduced a pilot currently underway at Sidewalk Labs' New York office. The pilot, mostly centred around indoor comfort level and thermal energy consumption, combines multiple data streams (e.g. sensors, surveys, occupancy level, utility bills and outdoor conditions) to better identify areas for energy conservation. The team noted that even using existing data, like occupancy sensors, could provide helpful insights on energy efficiency. It was noted that no personally identifiable information is collected, nor any images from cameras.

Lastly, Jeff Tarr, Principal Engineer at Sidewalk Labs, delivered a presentation on the concept of Digital Electricity (DE). The presentation highlighted the main efficiencies of using DE, such as:

- Wiring through data cabling that can be hidden and added to easily and safely without a licensed electrician.

- Better monitoring, submetering and control of individual circuits (e.g. dynamic response based on policy-based load shedding or owner's adjustments).
- Compatibility with off-site building construction (e.g. built-in power distribution closets)
- Compatibility with both new and legacy devices (significant electrical efficiencies gained through eliminating the need for a AC-to-DC converting transformer.)

The team noted that the LG appliances at 307 were adapted to be powered by DE.

## **Conclusion**

The project team thanked the Advisory Working Group for their insightful discussions and recommendations. The group also exchanged updates on their own projects, and the meeting adjourned for a brief tour of DE installation at 307.