Centre for International
Governance Innovation

Policy Brief No. 164 — February 2021

Accelerating a Just Transition to Smart, Sustainable Cities

Sarah Burch

Key Points

- Smart cities contain infrastructure that is infused with information and communications technologies (ICTs) in order to enable the monitoring and management of services.
- A city can be "smart," but not just or inclusive, and it can be environmentally sustainable, but not affordable. Therefore, smart cities may present challenges to the goal of governance, which is to be transparent, inclusive and citizen-centric.
- Smart cities hold the potential to make important contributions to environmental sustainability, but to do so, they must not neglect the dimensions of cities that defy measurement, including spiritual or historical significance, aesthetics and the non-monetary value of biodiversity.
- Without meaningful community participation in design, robust data management practices and a vision for sustainability that moves beyond incrementalism, smart city initiatives may generate new problems as they work to solve old ones.

Introduction

Smart cities collect and use data to better manage resources, provide services and allocate assets. The increasing popularity of the smart city approach raises important governance questions about the different ways that technology can both foster and inhibit effective approaches to public health and sustainability. Not all smart cities have as their primary goal an inclusive and just transition toward development pathways that deliver economic, environmental and social well-being for current citizens as well as future generations. The importance of accelerating these sustainability transitions, however, has been made clear by the overwhelming economic and social vulnerability of marginalized groups, especially in densely populated urban areas, laid bare by the coronavirus disease 2019 (COVID-19) pandemic. This policy brief will explore both the potential benefits and the negative consequences of the smart city approach to the governance of sustainability transitions. It will offer case studies of rapidly changing approaches to smart cities, considering the changes that decision makers might implement to ensure that sustainability transitions in smart cities are also just and inclusive.

Background

Cities are under increasing pressure to deal with a suite of complex, interacting challenges: air quality, climate change (both impacts, such as increasing temperatures and flood risk, and the task of decarbonization), traffic

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She is a lead author of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (the organization was the winner of the Nobel Peace Prize in 2007). She was a coordinating lead author of the Earth System Governance Project's New Directions Initiative, which created the Science and Implementation Plan that informs the research of the largest international network of environmental governance scholars. She was also a coordinating lead author of the Second Assessment Report of the Urban Climate Change Research Network, *Climate Change and Cities.*

Sarah holds a Ph.D. in resource management and environmental studies from the University of British Columbia (2009), was a visiting research associate at the University of Oxford's Environmental Change Institute (2010–2013) and was awarded a Banting Fellowship for her work on sustainability innovation. Her most recent book is titled *Understanding Climate Change: Science, Policy and Practice* (University of Toronto Press, 2014).

congestion, affordability of housing, public health, social inequality, biodiversity and more (Revi et al. 2014). Exacerbating many of these challenges are outdated infrastructures that fail to incorporate potentially transformative technologies and practices, some of which dramatically increase resource efficiency, enable smooth flows of traffic, improve public health and build resilience.

Smart cities contain infrastructure that is infused with ICTs in order to enable the monitoring and management of services such as transportation, energy usage and water quality (van Zoonen 2016). Most developed cities contain elements of the smart city already, such as sensors that monitor air quality, traffic, parking or light-emitting diode streetlights. Newer and more contentious dimensions, however, pertain to the use of public space, predictive policing or crowd control.

The vibrant discourse around the smart city approach raises important governance questions about the different ways that technology can both foster and inhibit effective approaches to public health and sustainability. In other words, can the abundant data generated by citizens in urban spaces, as well as the technologies that produce and consume that data, be governed in a way that is transparent, inclusive and citizen-centric? As in any complex system, unintended consequences and potentially hidden feedback loops abound (Meadows 2008). A city can be "smart," but not just or inclusive; environmentally sustainable, but not affordable. This policy brief explores these tensions to reveal not only the potential benefits of a smart city approach for accelerating sustainability transitions, but also the important governance challenges that emerge as we seek to design communities that are healthy, just and inclusive as well.

The Rise and Spread of the Smart City Approach

With rapid urbanization comes the need to more effectively manage not only the flows of people and resources, but also the growing influence of ICTs that might support this process. The predecessor of the smart city is the concept of "smart growth," which emerged in the 1990s, focusing attention on creating communities that

are more compact, multi-dimensional and livable. In practice, this concept meant moving away from the vast urban monoculture of exclusively residential suburban zones and lifeless commercial districts that forced long commutes between them (typically by car). Instead, more walkable, attractive communities became the vision, ones that could preserve urban nature, offer a variety of transportation choices and integrate commercial, residential and recreational uses of space.

Smart cities injected a distinctly technical flavour into the smart growth discourse, triggering an initial wave of optimism that, with better data collection and management, we might ease congestion and use resources more efficiently. Smart cities, furthermore, form a new and invigorated union between public and private entities; ICT and infrastructure companies see a tantalizing opportunity to engage in "city building," which is most commonly the domain of municipal governments, including urban planners and engineers (overseen by elected officials).

Data sensing and information processing are rapidly being woven into the fabric of many contemporary cites (Bibri and Krogstie 2017), and big data has been key to the rise of smart cities (Taylor and Richter 2015). So, most of the technologies that support a smart city already exist, but they are neither woven together nor integrated systematically into infrastructure at multiple scales (Höjer and Wangel 2015), nor are they effectively governed through transparent, inclusive processes. However, alongside these trends of urbanization and ICT development run escalating environmental challenges, prompting the vibrant scholarship and practice in the domain of smart, *sustainable* cities (ibid.).

Ultimately, definitions of smart cities can range from the very narrow, in which the goal is simply to use ICT to better allocate and manage resources (Batty et al. 2012; Neirotti et al. 2014), to the most multi-faceted and transformative, in which smart cities integrate physical, human and digital systems and employ participatory governance to deliver prosperity, sustainability and inclusivity (British Standards Institution [BSI] 2014; European Parliament 2014). Integrating the normative (and ever-evolving) goal of sustainability into the smart cities approach yields a mode of governing cities that uses ICTs to deliver the intertwined economic, environmental and social goals of sustainability (Höjer and Wangel 2015).

Critically, a "smart, sustainable city" builds various kinds of capacity (human, technical, democratic) by fostering deeper and more meaningful public engagement, with an evolving and holistic vision of sustainable development as its goal (Estevez, Lopes and Janowski 2016).

Tensions and Trade-offs: Governing Smart Cities with Sustainability in Mind

The technological optimism surrounding the smart city movement is tempered by persistent tensions that have, in some cases (see following section), served to derail ambitious new projects and proposals. While these issues are as diverse as their proponents, they generally cluster around three themes: concerns around justice or inclusivity (but, more broadly, the strength and legitimacy of democratic governance); privacy; and sustainability. Taken together, these concerns highlight a deep governance gap in the design and cultivation of urban spaces.

Smart cities proposals that appear to be driven by "technology for technology's sake," or commercialization without coherent integration with other city plans and long-term strategies, are less likely to succeed than their more integrated and inclusive counterparts (ibid.). Indeed, transparent and inclusive governance is increasingly viewed as a "fourth pillar" of sustainability, which relies on institutional capacities that include robust regulatory mechanisms, financial stability, meaningful inclusion of Indigenous and local knowledge, and procedures for monitoring and evaluation (de Coninck et al. 2018). The governance of smart cities is a multi-level process, not simply a set of outcomes (Robinson and Biggar, forthcoming 2021), involving a wide range of actors, each with their own motives and capacities. Gaps remain in our understanding of the contributions that non-state actors do (or could) make to sustainability — especially the role of marginalized communities and civil society groups (de Coninck et al. 2018).

Privacy issues often relate to the reality that certain types of data are more sensitive or personal than others, and also to concerns about the particular use to which the data might be put (van Zoonen 2016). Data that is impersonal in nature and used for service provision (for example, access to transportation options) presents the fewest risks, while data that is very personal and that could be used for surveillance raises the most controversy (ibid.). Without privacy safeguards in place, data that is personal in nature could be used to track individuals, shared or used for a purpose for which the individual did not give consent, or be exposed to security breaches (Barrette 2018). Many potential remedies have been offered to address these concerns, ranging from avoiding the collection of data unless absolutely necessary, carefully determining whether personal information is needed, de-identifying data at the earliest possible opportunity, improving transparency and community engagement, and developing policies that ensure accountability, security and privacy management (ibid.).

Smart cities hold the potential to make important contributions to environmental sustainability, yet at least two aspects of sustainability may make these efforts more challenging than they appear on the face of it. While it is clear that important dimensions of sustainability can be measured and therefore managed (Huovila, Bosch and Airaksinen 2019), such as greenhouse gas (GHG) emissions or water quality, entrusting the entire project of sustainability to tools that rely on quantification may foster neglect of critical, intangible dimensions of sustainable communities. These aspects include, for instance, a sense of place, aesthetics, trust, spiritual or historical significance, and the non-monetary value of biodiversity. Furthermore, given the rapidly closing window within which GHG emissions must be reduced by 80 percent in order to limit global warming to less than 2°C (Intergovernmental Panel on Climate Change [IPCC] 2018), it is important that smart city proposals push communities along paths aligned with these ambitious global commitments (such as those embodied in the Paris Agreement on climate change).

Ultimately, urban sustainability transitions that focus not just on the environment (reducing GHG emissions, enhancing biodiversity and so forth) but also on social inclusivity, public health and income equality, are complex, multi-actor and emergent processes. They are a delicate marriage between technology and behaviour, undergirded by values and supported through policy. Perhaps most importantly, these transitions take place not simply within one firm or one level of government but within and among clusters of actors, or ecosystems of innovation, and are facilitated by intermediaries such as civil society groups or business associations (Kundurpi et al. 2021).

Diverse, Promising and Contested: Global Experiments in Smart, Sustainable Cities

Given smart cities' relative nascence, there are not yet examples of fully implemented, comprehensively monitored, smart, sustainable cities. Even so, early successes show the potential benefits for mobility, citizen participation, electricity generation and distribution, and environmental integrity. Strategic plans that focus on fostering the circular economy (which aims to create closed-loop systems in which the waste of one process becomes the fuel or "food" of another process) through integration of ICTs now exist, for instance, in Lisbon, Portugal; Paris, France; Gothenburg, Sweden; London, England; Glasgow, Scotland; and many other cities.[1] One study of 119 smart city initiatives showed that the largest proportion (25 percent) focused on the role that digital technologies can play in supporting healthy and safe lifestyles, with initiatives targeting environmental issues (21 percent) and technology-enabled production and delivery of services (19 percent) playing an important role as well (Estevez, Lopes and Janowski 2016). With some notable exceptions, however (see, for example, Elmaghraby and Losavio 2014; Pöhls et al. 2014), few issues related to privacy and surveillance, which have been at the core of concerns around many smart city initiatives, have been deeply examined.

Here in Canada, a high-profile smart city experiment in Toronto showed early promise as

1 See https://smartsustainablecities.uk/case-studies/.

a blend of public and private city building with sustainability in mind, but ultimately collapsed under both the weight of public scrutiny and, potentially, the economic downturn that is unfolding around the COVID-19 pandemic. In October 2017, Sidewalk Labs (the city-building subsidiary of Alphabet Inc., parent company of Google) proposed Quayside, a 12-acre mixed-used (and high-tech) development destined for Toronto's waterfront. Designs included multi-storey composite timber buildings, a zero-emissions microgrid, spacious transit pathways that prioritize cycling and walking along with autonomous vehicles, permeable surfaces that absorb snowmelt and floodwater, and interconnected greenspaces (Bliss 2018). Largely invisible to the eye, however, and woven throughout every dimension of Quayside (from its garbage bins to its roadways), was a "digital layer" that would monitor and measure movement, sending information back to a centralized map of the neighbourhood. The challenges that pervade the project of creating cities that are *both* smart *and* sustainable emerge out of the synergies — and potential trade-offs — between these very diverse goals. Without a comprehensive assessment that applies a digital lens to sustainability, it remains unclear whether positive sustainability outcomes (energy efficiency, for instance, or more connected greenspaces) come at a cost to privacy and transparent governance.

A series of setbacks plagued the proposed Quayside development from the beginning, ranging from the controversy that surrounded the original bidding process, inadequate consultation with multiple provincial and federal ministries as well as municipal departments, and a lack of detail on data governance (Office of the Auditor General of Ontario 2018), to a failed proposal for infrastructure cost-sharing to be offset by the incremental growth in tax revenues that would only be possible because of the infrastructure built by Sidewalk Labs (McGrath 2019). From community groups and stakeholders, the most frequently cited concerns were less about funding, however, but rather focused on the collection, use and ownership of personal data. At the root of some of these concerns is the suspicion that corporate interests propose developments such as Quayside that trumpet high-tech solutions to sustainability problems and more efficient urban governance, but reveal little about underlying motives surrounding the monetization of citizen data (Bliss 2018).

Finally, in May 2020, the Quayside proposal collapsed. While some attribute this outcome to the financial hardships that unfolded as a result of the COVID-19 pandemic, others point to the path that the development has been on since 2017: one deeply fraught with public objections and intractable disagreements with both provincial and municipal authorities. Some critics argued that the failure of Quayside had less to do with the proposal itself than with the deeply flawed, underlying smart city model, in which private entities increasingly influence urban spaces and undermine democratic governance (Wylie 2018).

The challenges faced by Sidewalk Labs in Toronto, and the relatively narrow focus of many smart city initiatives (Estevez, Lopes and Janowski 2016), highlight important opportunities to build momentum behind open, accountable governance that pursues a more inclusive and holistic vision of sustainability. This pursuit may benefit in unexpected and dramatic ways from the widespread deployment of smart city technologies, but without meaningful community participation in design, robust data management practices, and a vision for sustainability that moves beyond incrementalism, smart city initiatives may generate new problems as they work to solve old ones.

Policy Recommendations

Smart, sustainable cities that meet the goals of inclusive and transparent governance require effort from a variety of actors and levels of government. Creative strategies can be found that help navigate this contested terrain and build capacity for a more just transition. These strategies can enhance the usefulness of digital technologies while also acknowledging the deeply human dimensions of urban spaces and the ever-evolving goal of sustainability.

→ **Implement a creative, engaging and inclusive visioning process that enables deep participation in the design of ICT-supported urban spaces.** Sustainability is both a value proposition (not a simple list of objective or universal traits) and an ever-evolving process (rather than a static target). This approach reinforces the need for inclusive urban-visioning processes that account for varying world views and the synergies or trade-offs between

various development priorities. Furthermore, marginalized or racialized groups are particularly vulnerable to data-gathering efforts that neglect proper consent, security and de-identification procedures. Transparent public engagement procedures, accompanied by rigorous analyses of the underlying biases reinforced through data gathering, are needed to address these concerns. This approach will help to both move beyond incrementalism and ensure that trade-offs with other priorities are avoided.

→ **Cultivate a strong capacity for transparent, rigorous public governance of private engagement in the digital dimensions of urban systems.** Without rigorous oversight, increased public participation and open government initiatives, technology can exacerbate rather than remedy weaknesses in urban democratic governance. Data can, however, be a crucial tool for revealing and perhaps even remedying marginalization (for instance, where it makes visible pay equity gaps, racist policing procedures or uneven provision of services).

→ **Both top-down and bottom-up governance is needed to foster smart, sustainable cities.** The inclusion of local and Indigenous knowledge, tailored solutions developed by small firms with close connections to the community and place-based initiatives should be matched with government-led, long-term, holistic planning processes. As this knowledge shifts and grows, mechanisms should be in place for the adjustment and adaptation of projects that no longer suit the values of the communities they impact.

→ **Bring lessons learned from existing smart, sustainable city experiments to bear on COVID-19 recovery.** As the COVID-19 pandemic continues to unfold, experiences with smart, sustainable cities offer important lessons for public health. To limit virus transmission, many cities are using this opportunity to create more spacious active transit corridors, expansive outdoor public spaces and vibrant urban nature.

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